

Reserve Name Kachemak Bay ((include 3 letter code here) KAC) NERR Nutrient Metadata

Months and year the documentation covers January – December 2023

Latest Update: Date that the last edits were made

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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 –

Contact Persons:

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{Instructions/Remove: List the reserve staff members responsible for the implementation and collection of the nutrient data. List the laboratory staff members responsible for processing of the samples and data output. Include name, title, mailing address, phone number, and email address for the Research Coordinator, SWMP technician(s), person(s) responsible for data management, and laboratory contact.}

2) Research objectives –

The Kachemak Bay Research Reserve (KBRR) is a temperate region fjord with hydrographic conditions unique among the NERR system estuaries. The circulation in the bay is driven primarily by tidal forcing. Regional circulation is generally characterized by cyclonic ocean currents in the Gulf of Alaska flowing onto the shelf off Cook Inlet. Nutrient rich bottom water is upwelled and mixed with the surface water. These enriched waters stream into Kachemak Bay and the inflow tends to stay along the southern shore while water flowing out of the bay stays along the northern shore. These trapped coastal flows divide the bay into two distinct ecosystems. As the inflowing water proceeds up the bay, freshwater runoff from the surrounding ice fields and watersheds dilute the salinity and increase the sediment load. The in-flowing water, therefore, initially supports a marine system while the northern out-flowing water is more estuarine. The vertical profile is stratified all year with the stratification increasing in strength during the summer. We are monitoring to quantify the variability of the nutrient stratification of both the marine and estuarine ecosystems within Kachemak Bay.

a) Monthly Grab

Monthly grab samples are collected to quantify the vertical and horizontal spatial variability of important nutrients in the water column at sites representing the marine and estuarine endpoints of the local salinity gradient.

b) Diel Sampling Program

Once per month, samples are collected every two hours thirty minutes (11 samples total) through a 24-hour tidal cycle to quantify the temporal variability of important nutrients in the water column as a function of tidal forcing.

[Instructions/Remove: Describe briefly the nature of each monitoring program resulting in this data set (monitoring along land use, vertical, salinity or habitat gradients).]

- a) Monthly grab sampling program
- b) Diel sampling program (mention if samples were taken over a lunar day)

3) Research methods –

a) Monthly Grab Sampling Program

Monthly grab samples are collected at two depths (near-surface and near-bottom) at the Homer and Seldovia data sonde stations. Unless delayed by weather, all grab samples from both stations were taken within a 24-hour period. To clearly delineate the stratification, we attempt to sample near high tide. The Homer station is accessed year round by vehicle. Because the Seldovia station (24-kilometers from Homer) is not connected to the road system, access is via airplane or boat and is weather-dependent. At each station, two replicate (N=2) samples are collected using a triggered vertical Niskin bottle at a depth of one meter from the surface. Two replicates are also collected one meter from the bottom. All samples are transferred to wide-mouth Nalgene sample bottles that were previously acid washed (10% HCL), rinsed (3x) with distilled-deionized water, dried and followed by rinsing (3x) of ambient water prior to collection of the sample. Samples are immediately shielded from light and returned to the laboratory. Once in the laboratory, samples are shaken and processed for nutrient and chl-a analysis.

b) Diel Sampling Program

Within the same 24-hour period as our grab sample collection, we deploy an ISCO water sampler from a floating dock in the Homer Harbor. This device automatically samples 850 ml of water every 2 hrs 30 min. All samples are pumped into polyethylene sample bottles that were previously acid washed (10% HCL), rinsed (3x) with distilled-deionized water and dried. The 11 samples are kept in the dark and at the end of the 24-hr period are returned to the laboratory for immediate processing. [Instructions/Remove: Detail the specifics of sample collection, collection intervals, sample processing, how samples are held, and QA/QC of the equipment and analyzers for each program.]

- a) Monthly grab sampling program
- b) Diel sampling program

4) Site location and character –

[Instructions/Remove: Describe your NERR site in general and the sampling sites associated with each YSI data logger / nutrient collection in more detail. Include the following table, one for each site, to describe the sampling locations.]

Site name	Homer Surface and Deep
Latitude and longitude	59.6028°N 151.4081°W <i>Decimal degrees or degrees, minutes, seconds format</i>
Tidal range (<i>meters</i>)	7.5 to 16.8
Salinity range (<i>psu</i>)	20.5 to 32.0
Type and amount of freshwater input	Most of the freshwater during the summer comes from snow and ice melt on the glaciers. Starting in August, rainfall reduces salinity until November when the rain begins to shift to snow, and there is very little fresh water input into the bay.

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Water depth (<i>meters, MLW</i>)	<u>Surveyed</u> (Mean low water depth at site, NOT depth of sonde deployment. Indicate if this is an estimate or if the site has been surveyed.) <u>0.505</u>
Sonde distance from bottom (<i>meters</i>)	Fixed distance sonde is deployed above the bottom <u>1.0</u>
Bottom habitat or type	<u>Predominantly Soft sediment, grassbed, oyster bar, ete</u> <u>sand</u>
Pollutants in area	<u>Minimal</u>
Description of watershed	(in reference to station) <u>Coastal marine</u>

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<u>Site name</u>	<u>Seldovia Surface and Deep</u>
<u>Latitude and longitude</u>	<u>59.4413°N 151.7186°W</u>
<u>Tidal range (<i>meters</i>)</u>	<u>4.3 to 13.3</u>
<u>Salinity range (<i>psu</i>)</u>	<u>25.0 to 33.9</u>
<u>Type and amount of freshwater input</u>	<u>Most of the freshwater during the summer comes from snow and ice melt on the glaciers. Starting in August, rainfall reduces salinity until November when the rain begins to shift to snow, and there is very little fresh water input into the Bay.</u>
<u>Water depth (<i>meters, MLW</i>)</u>	<u>Surveyed 0.517</u>
<u>Sonde distance from bottom (<i>meters</i>)</u>	<u>1.0</u>
<u>Bottom habitat or type</u>	<u>Predominantly sand</u>
<u>Pollutants in area</u>	<u>Minimal</u>
<u>Description of watershed</u>	<u>Coastal marine</u>

<u>Site name</u>	<u>Homer Harbor</u>
<u>Latitude and longitude</u>	<u>59.60308°N 151.41815°W</u>
<u>Tidal range (<i>meters</i>)</u>	<u>4.0 to 13.3</u>
<u>Salinity range (<i>psu</i>)</u>	<u>20.5 to 32.0</u>
<u>Type and amount of freshwater input</u>	<u>Most of the freshwater during the summer comes from snow and ice melt on the glaciers. Starting in August, rainfall reduces salinity until November when the rain begins to shift to snow, and there is very little fresh water input into the Bay.</u>
<u>Water depth (<i>meters, MLW</i>)</u>	<u>0.505</u>
<u>Sonde distance from bottom (<i>meters</i>)</u>	<u>NA</u>

Bottom habitat or type	Rocky
Pollutants in area	Minimal but possibility of hydrocarbon pollutants due to site location on a fuel dock
Description of watershed	Coastal marine

All [reserve name] NERR historical nutrient/pigment monitoring stations:

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
kachdnut	PP	Homer Deep	59° 36' 7.24 N, 151° 24' 31.61 W	02/01/2002 - current mm/dd/yyyy current	NANA	NANA
kachhnut	P	Homer Harbor	59° 36' 12.31 N, 151° 25' 2.14 W	02/01/2002 - current	NA	NA
kachsnut	P	Homer Shallow	59° 36' 7.24 N, 151° 24' 31.61 W	02/01/2002 current	NA	NA
kacsdnut	P	Seldovia Deep	59° 26' 27.56 N, 151° 43' 15.46 W	02/01/2002 - current	NA	NA
kacssnut	P	Seldovia Shallow	59° 26' 27.56 N, 151° 43' 15.46 W	02/01/2002 - current	NA	NA
kachdnut	P	Homer Deep	59° 36' 7.24 N, 151° 24' 31.61 W	02/01/2002 - current	NA	NA

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5) Coded variable definitions –

[Instructions/Remove: Explain the station code names and monitoring program codes. Use the following format]

~~cbvtenut = Chesapeake Bay Virginia Taskinas Creek nutrients~~

~~...~~

~~monthly grab sample program = 1~~
~~Reserve/deployment site/file definition/year~~
~~(ex: kacssnut2016 = Kachemak Bay/Seldovia Surface/Nutrients/2016).~~

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Monitoring Programs: Grab Sampling (1), Diel Sampling (2)

Station code	Sampling station	Sampling site code	Monitoring Program
kachsnut	Homer Surface	HS	1
kachdnut	Homer Deep	HD	1
kachhnut	Homer Harbor	HH	2
kacssnut	Seldovia Surface	SS	1
kacsdnut	Seldovia Deep	SD	1

~~diel grab sample program = 2~~

6) Data collection period –

The first water samples for the SWMP nutrient monitoring program were collected January 19, 2022 at 12:48 and the last were collected on December 22, 2022 at 14:30. It normally takes 20 minutes to collect the four grab samples—2 “surface” and 2 “deep”—at both the Homer and Seldovia sites. We report all times in Alaska Standard Time.

[Instructions/Remove: List the date and time each sample was collected organized by station. For grab samples include replicate times or a general statement about the time frame for replicate collection. For diel samples, include start and end times for the sampling session.]

Homer Surface

Site	Rep 1	Rep 2	Notes
kachsnut	01/17/23 14:05	01/17/23 14:10	
kachsnut	02/15/23 11:30	02/15/23 11:35	
kachsnut	03/08/23 15:40	03/08/23 15:45	
kachsnut	04/05/23 10:50	04/05/23 10:55	
kachsnut	05/03/23 14:20	05/03/23 14:25	
kachsnut	06/08/23 14:20	06/08/23 14:25	
kachsnut	07/03/23 10:50	07/03/23 10:55	
kachsnut	08/07/23 11:20	08/07/23 11:25	
kachsnut	09/06/23 10:50	09/06/23 10:55	
kachsnut	10/04/23 13:50	10/04/23 13:55	
kachsnut	11/06/23 13:55	11/06/23 14:00	
kachsnut	12/05/23 12:45	12/05/23 12:50	

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Homer Deep

Site	Rep 1	Rep 2	Notes
kachdnut	01/17/23 14:15	01/17/23 14:20	
kachdnut	02/15/23 11:40	02/15/23 11:45	
kachdnut	03/08/23 15:50	03/08/23 15:55	
kachdnut	04/05/23 11:00	04/05/23 11:05	
kachdnut	05/03/23 14:30	05/03/23 14:35	
kachdnut	06/08/23 14:30	06/08/23 14:35	
kachdnut	07/03/23 11:00	07/03/23 11:05	
kachdnut	08/07/23 11:30	08/07/23 11:35	
kachdnut	09/06/23 11:00	09/06/23 11:05	
kachdnut	10/04/23 14:00	10/04/23 14:05	
kachdnut	11/06/23 14:05	11/06/23 14:10	
kachdnut	12/05/23 12:55	12/05/23 13:00	

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Seldovia Surface

Site	Rep 1	Rep 2	
kacssnut	01/12/23 11:10	01/12/23 11:15	
kacssnut	02/16/23 12:25	02/16/23 12:30	
kacssnut	03/09/23 11:50	03/09/23 11:55	
kacssnut	04/04/23 12:45	04/04/23 12:50	
kacssnut	05/12/23 10:45	05/12/23 10:50	
kacssnut	06/09/23 10:45	06/09/23 10:50	
kacssnut	07/10/23 11:00	07/10/23 11:05	
kacssnut	08/02/23 10:10	08/02/23 10:15	
kacssnut	09/04/23 10:17	09/04/23 10:22	
kacssnut	10/05/23 12:40	10/05/23 12:45	
kacssnut	11/02/23 12:10	11/02/23 12:15	

kacssnut	12/01/23 12:30	12/01/23 12:35	
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Seldovia Deep

Site	Rep 1	Rep 2	Notes
kacsdnut	01/12/23 11:20	01/12/23 11:25	
kacsdnut	02/16/23 12:35	02/16/23 12:40	
kacsdnut	03/09/23 12:00	03/09/23 12:05	
kacsdnut	04/04/23 12:55	04/04/23 13:00	
kacsdnut	05/12/23 10:55	05/12/23 11:00	
kacsdnut	06/09/23 10:55	06/09/23 11:00	
kacsdnut	07/10/23 11:10	07/10/23 11:15	
kacsdnut	08/02/23 10:20	08/02/23 10:25	
kacsdnut	09/04/23 10:27	09/04/23 10:32	
kacsdnut	10/05/23 12:50	10/05/23 12:55	
kacsdnut	11/02/23 12:20	11/02/23 12:25	
kacsdnut	12/01/23 12:40	12/01/23 12:45	

Homer Harbor

Site	Diel Start	Diel End	
kachhnut	01/17/23 11:35	01/18/23 12:35	
kachhnut	02/16/23 09:40	02/17/23 10:40	
kachhnut	03/08/23 13:33	03/09/23 14:33	
kachhnut	04/06/23 15:50	04/07/23 16:50	
kachhnut	05/03/23 13:30	05/04/23 14:30	
kachhnut	06/08/23 13:30	06/09/23 14:30	
kachhnut	07/06/23 14:45	07/07/23 15:45	
kachhnut	08/03/23 09:00	08/04/23 10:00	
kachhnut	09/05/23 11:15	09/06/23 12:15	
kachhnut	10/03/23 13:20	10/04/23 14:20	
kachhnut	11/06/23 10:00	11/07/23 11:00	
kachhnut	12/04/23 10:10	12/05/23 11:10	

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7) Associated researchers and projects–

~~[Describe briefly other research (data collection) that correlates or enhances the nutrient data. You may provide links to other products or programs. At a minimum, mention the SWMP MLT and WQ datasets as below.]~~

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As part of the SWMP long-term monitoring program, ~~XXX-KAC~~ NERR also monitors 15-minute meteorological and water quality data which may be correlated with this nutrient/pigment dataset. These data are available at www.nerrsdata.org.

8) Distribution –

~~[Instructions/Remove: This section will address data ownership and data liability by including the following excerpt.]~~

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.nerrsddata.org; accessed 12 October 2022.

~~Also include the following excerpt in the metadata to address how and where the data can be obtained.~~

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.nerrsddata.org. Data are available in comma separated version format.

II. Physical Structure Descriptors

9) Entry verification –

~~{Instructions/Remove: This section explains how data acquisition, data entry, and data verification (QAQC) were performed before data were sent to the CDMO to be archived into the permanent database. Describe how your reserve receives data from the analytical laboratory, how it is entered into Excel, and how it is verified. If your reserve converts nutrient values to attain the required units of measurement, note that here and detail your process. List who was responsible for these tasks and include the following statement.}~~

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.

~~{Example of conversion documentation, update for your laboratory results} The University of Washington Marine Chemistry Laboratory calculates and reports results in μM . For purposes of consistency in the NERR System, Padilla Bay NERR calculates the concentrations as mg/L based on atomic weights of 14.01, 30.97, 28.09, and 12.01 for N, P, Si, and C respectively. Therefore, Padilla Bay NERR staff multiplies the concentrations reported by the University of Washington Marine Chemistry Laboratory by 0.01401, 0.03097, 0.02809, and 0.01201 to yield concentrations in mg/L as N, P, Si, and C respectively.~~

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10) Parameter titles and variable names by category –

[Instructions/Remove: **Only list those parameters that are reported in the data submission.** See Table 2 in the “Nutrient and Chlorophyll Monitoring Program and Database Design” SOP version 1.8 (March 2017) for a full list of available parameters. If NO2 and NO3 are not reported, modify note 2 to explain why.]

Required NOAA NERRS System-wide Monitoring Program nutrient parameters are denoted by an asterisk “*”.

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

Notes:

1. Time is coded based on a 2400 clock and is referenced to Standard Time.
2. Reserves have the option of measuring either NO2 and NO3 or they may substitute NO23 for individual analyses if they can show that NO2 is a minor component relative to NO3.

11) Measured or calculated laboratory parameters –

[Instructions/Remove: This section lists all measured and calculated variables. Only list those parameters that are collected and reported, do not list field parameters. See Table 2 in the “Nutrient and Chlorophyll Monitoring Program and Database Design” SOP version 1.8 (March 2017) document for a full list of directly measured and computed variables. Do not include field parameters in this section.]

a) Parameters measured directly

Nitrogen species: NH4F, ~~NO2F~~, NO23F
Phosphorus species: PO4F
Other: CHLA_N, ~~PHEA~~, SiO4F

~~b) Calculated parameters~~

~~NO3F NO23F NO2F~~
~~DIN NO23F+NH4F~~

12) Limits of detection –

[Instructions/Remove: This section explains how the laboratory determines the minimum detection limit (MDL). List the method detection limits used and dates they were in use. You may copy this data from the MDL sheet created in the NutrientQAQC macro. **You must also include the date that each MDL was revisited by the lab for appropriateness (this should be done at least annually).**]

[Example, update for your laboratory:] 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	01/01/21	05/31/21	0.0006	
PO4F	01/01/23	12/31/23	0.0029	06/01/21
NH4F	01/01/23	12/31/23	0.0062	03/01/21
NO2F	01/01/21	02/28/21	0.0002	
NO2F	03/01/21	12/31/21	0.0003	03/01/21
NO23F	01/01/23	12/31/23	0.0055	03/01/21
CHLA-NSiO4F	01/01/23	12/31/23	0.0620	06/15/21
PHEACHLA_N	01/01/23	12/31/23	0.02	06/15/21

13) Laboratory methods –

[Instructions/Remove: This section lists the laboratory and reference method, the method reference, a brief description of method and a brief description of the sample preservation method used **for each parameter that is directly determined.**]

a) Parameter: NH4F

1) Method References:

- 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.

2) Method Descriptor: Alkaline phenol and hypochlorite react with ammonia to form indophenol blue that is proportional to the ammonia concentration. The blue color formed is intensified with sodium nitroprusside. Reaction is heat catalyzed at 37° C.

3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at -20°C until analyzed.

b) Parameter: NO23F, NO3F and NO2F

1) Method References:

- SKALAR Method: Nitrate+Nitrite/Total Dissolved Nitrogen. Catnr. 461-353.2 issues 120293/MH/93128060
- 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.

2) Method Descriptor: Nitrate is reduced to nitrite by a copper/cadmium redactor column. The nitrite ion then reacts with sulfanilamide to form a diazo compound. This compound then couples with n-1-naphthylenediamine dihydrochloride to form a reddish/purple azo dye. The color development chemistry is the same as that used in Nitrite. Nitrate concentration equals the (nitrate + nitrite) concentration minus the nitrite concentration.

3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at -20°C until analyzed.

c) Parameter: SiO₄F

1) Method References:

- a) SKALAR Method: Silicate Catnr. 563-052 issue 101899/MH/99208255
- b) U.S. EPA. 1974 Methods for Chemical Analysis of Water and Wastes, Method 370.1
- c) Grasshoff, K., M. Ehrhardt and K. Kremling. 1983. Methods of Seawater Analysis. Verlag Chemie, Federal Republic of Germany. Pp 374-376.
- d) EPA 600/R-97/072 Method 366.0 Determination of Dissolved Silicate 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.

2) Method Descriptor: This automated procedure for the determination of soluble silicates is based on the reduction of a silicomolybdate in acidic solution to "molybdenum blue" by ascorbic acid. Oxalic acid is introduced to the sample stream before the addition of ascorbic acid to eliminate interference from phosphates. The range is 0 - 1.4 mg Si/L.

3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at -20°C until analyzed.

d) Parameter: PO₄F

1) Method References:

- a) SKALAR Method: O-Phosphate/Total Phosphate Catnr. 503-365.1, issue 042993/MH/93-Demo1
- b) 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.
- c) EPA 600/R-97/072 Method 365.5 Determination of Orthophosphate 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.

2) 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.

3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at -20°C until analyzed.

e) Parameter: CHLA

1) Method Reference: EPA method 445.0; UNESCO (1994) Protocols for the joint global ocean flux study (JGOFS) core measurements. pp. 97-100.

2) Method Descriptor: CHLA is extracted in 10 ml 90% acetone. Five mL are decanted into a cuvette and fluorescence is measured and recorded (F_0). 150µL of 10% HCl are added to convert the CHLA to phaeopigments (PHAE). The fluorescence is again measured and recorded (F_1). The concentration (µg/L) of CHLA and PHAE are calculated using the F_0 / F_1 ratio.

3) Preservation Method: A known volume of sample (200 mL) is filtered onto a 25 mm GF/F filter, folded in half and wrapped in aluminum foil. Sample is stored at -20°C until analysis.

a) Parameter: NH₄F

VIMS Laboratory Method: 126

EPA or other Reference Method: 170.1

Method Reference: U.S.E.P.A 1983. U.S.E.P.A 600/4-79-020. Method 170.1

Method Descriptor: Filtered sample subjected to hypochlorite phenol...

Preservation Method: Samples filtered and stored at 4 °C up to 24 hours.

b) Parameter: NO2F

~~VIMS Laboratory Method: 142~~

~~EPA or other Reference Method: 167.1~~

~~Method Reference: US EPA 1983, USEPA 600/4-79-020, Method 167.1~~

~~Method Descriptor: Filtered sample subjected to cadmium reduction column...~~

~~Preservation Method: Samples filtered and stored frozen at -20 °C up to 14 days.~~

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** – List the specific number (100%) of field replicates; describe how replicates are collected: true field replicates are successive grab samples, replicates split from a single field sample are considered laboratory replicates/splits.
- ii) **Laboratory variability** – List specific number (10%) of laboratory replicates.
- iii) **Inter-organizational splits** – Specify if samples were split and analyzed by two different labs.

b) Accuracy

- i) **Sample spikes** – List the % recovery of field and laboratory samples (% recovery should be 100% under ideal conditions) – cannot be done on samples analyzed directly from filters.
- ii) **Standard reference material analysis** – This will result from samples sent out from EPA to each lab.
- iii) **Cross calibration exercises** - *CBNERRVA participates in cross calibration exercises. Cross calibration exercises include the Chesapeake Bay Quarterly Split Sample Program and the US EPA Method Validation Studies.*

15) QAQC flag definitions –

[Instructions/Remove: This section details the primary and secondary QAQC flag definitions and requires no additional information. Include the following excerpt.]

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 –

[Instructions/Remove: This section details the secondary QAQC Code definitions used in combination with the flags above and requires no additional information. Include the following excerpt.]

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
<i>Tide stage</i>	
TSE	ebb tide
TSF	flood tide
TSH	high tide
TSL	low tide
<i>Wave height</i>	
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
<i>Wind direction</i>	
N	from the north
NNE	from the north northeast
NE	from the northeast
ENE	from the east northeast
E	from the east
ESE	from the east southeast
SE	from the southeast
SSE	from the south southeast
S	from the south
SSW	from the south southwest
SW	from the southwest
WSW	from the west southwest
W	from the west
WNW	from the west northwest
NW	from the northwest
NNW	from the north northwest
<i>Wind speed</i>	
WS0	0 to 1 knot
WS1	> 1 to 10 knots
WS2	> 10 to 20 knots
WS3	> 20 to 30 knots
WS4	> 30 to 40 knots
WS5	> 40 knots

17) Other remarks/notes –

~~[Instructions/Remove: Use this section for further documentation of the data set. Include any additional notes regarding the data set in general, circumstances not covered by the flags and comment codes, or specific data that were coded with the CSM “See Metadata” comment code. Any data coded CSM must have a corresponding statement in this section. You may include the metadata worksheets here if so desired. You may also include information on major storms or precipitation events that could have affected the data recorded. **You must include a table (not an image of a table) detailing sample/parameter collection and processing dates. Include the following excerpt:**~~

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 NO₂3F was 0.0005 mg/l as N (MDL=0.0008), the reported value would be 0.0008 and would be flagged as out of sensor range low (-4) and coded SBL. In addition, if any of the components used to calculate a variable are below the MDL, the calculated variable is removed and flagged/coded -4 SCB. If a calculated value is negative, it is rejected and all measured components are marked suspect. If additional information on MDL's or missing, suspect, or rejected data is needed, contact the Research Coordinator at the reserve submitting the data.

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

~~Example explanation, update for your sample storage protocols~~ **Sample hold times for 2023:** 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	Date of analysis				
	NH4F	NO23F	PO4F	SiO4F	CHLA_N
01/17/2023, Homer grabs	<u>02/08/2023</u>	<u>02/08/2023</u>	<u>02/08/2023</u>	<u>02/09/2023</u>	01/19/2023
02/15/2023, Homer grabs	<u>02/27/2023</u>	<u>02/27/2023</u>	<u>02/27/2023</u>	<u>02/28/2023</u>	03/07/2023
03/08/2023, Homer grabs	<u>03/30/2023</u>	<u>03/30/2023</u>	<u>03/23/2023</u>	<u>03/23/2023</u>	04/07/2023
04/06/2023, Homer grabs	<u>04/19/2023</u>	<u>04/19/2023</u>	<u>04/19/2023</u>	<u>04/11/2023</u>	04/28/2023
05/03/2023, Homer grabs	<u>06/01/2023</u>	<u>06/01/2023</u>	<u>06/01/2023</u>	<u>06/01/2023</u>	05/19/2023
06/08/2023, Homer grabs	<u>06/21/2023</u>	<u>06/21/2023</u>	<u>06/21/2023</u>	<u>06/21/2023</u>	06/30/2023
07/03/2023, Homer grabs	<u>07/18/2023</u>	<u>07/18/2023</u>	<u>07/18/2023</u>	<u>07/18/2023</u>	08/03/2023
08/07/2023, Homer grabs	<u>08/23/2023</u>	<u>08/23/2023</u>	<u>08/23/2023</u>	<u>08/23/2023</u>	08/24/2023
09/06/2023, Homer grabs	<u>09/21/2023</u>	<u>09/21/2023</u>	<u>09/21/2023</u>	<u>09/21/2023</u>	09/19/2023
10/04/2023, Homer grabs	<u>10/18/2023</u>	<u>10/18/2023</u>	<u>10/18/2023</u>	<u>10/18/2023</u>	10/19/2023
11/06/2023, Homer grabs	<u>11/16/2023</u>	<u>11/16/2023</u>	<u>11/16/2023</u>	<u>11/16/2023</u>	11/17/2023
12/05/2023, Homer grabs	<u>12/14/2023</u>	<u>12/14/2023</u>	<u>12/14/2023</u>	<u>12/14/2023</u>	12/08/2023
01/17 - 01/18/2023, all diels	<u>02/08/2023</u>	<u>02/08/2023</u>	<u>02/08/2023</u>	<u>02/09/2023</u>	01/19/2023
02/16 - 02/17/2023, all diels	<u>02/27/2023</u>	<u>02/27/2023</u>	<u>02/27/2023</u>	<u>02/28/2023</u>	03/07/2023
03/08 - 03/09/2023, all diels	<u>03/30/2023</u>	<u>03/30/2023</u>	<u>03/23/2023</u>	<u>03/23/2023</u>	04/07/2023
04/06 - 04/07/2023, all diels	<u>04/19/2023</u>	<u>04/19/2023</u>	<u>04/19/2023</u>	<u>04/11/2023</u>	04/28/2023
05/03 - 05/04/2023, all diels	<u>06/01/2023</u>	<u>06/01/2023</u>	<u>06/01/2023</u>	<u>06/01/2023</u>	05/19/2023
06/20 - 06/09 2023, all diels	<u>06/21/2023</u>	<u>06/21/2023</u>	<u>06/21/2023</u>	<u>06/21/2023</u>	<u>06/30/2023</u>
07/06 - 07/20 2023, all diels	<u>07/18/2023</u>	<u>07/18/2023</u>	<u>07/18/2023</u>	<u>07/18/2023</u>	08/03/2023
08/03 - 08/04 2023, all diels	<u>08/23/2023</u>	<u>08/23/2023</u>	<u>08/23/2023</u>	<u>08/23/2023</u>	08/24/2023
09/05 - 09/06 2023, all diels	<u>09/21/2023</u>	<u>09/21/2023</u>	<u>09/21/2023</u>	<u>09/21/2023</u>	09/19/2023
10/03 - 10/04 2023, all diels	<u>10/18/2023</u>	<u>10/18/2023</u>	<u>10/18/2023</u>	<u>10/18/2023</u>	10/19/2023
11/06 - 11/07 2023, all diels	<u>11/16/2023</u>	<u>11/16/2023</u>	<u>11/16/2023</u>	<u>11/16/2023</u>	11/17/2023
12/04 - 12/05 2023, all diels	<u>12/14/2023</u>	<u>12/14/2023</u>	<u>12/14/2023</u>	<u>12/14/2023</u>	12/08/2023
01/12 2023, Seldovia grabs	<u>02/08/2023</u>	<u>02/08/2023</u>	<u>02/08/2023</u>	<u>02/09/2023</u>	01/19/2023
02/16 2023, Seldovia grabs	<u>02/27/2023</u>	<u>02/27/2023</u>	<u>02/27/2023</u>	<u>02/28/2023</u>	03/07/2023
03/09 2023, Seldovia grabs	<u>03/30/2023</u>	<u>03/30/2023</u>	<u>03/23/2023</u>	<u>03/23/2023</u>	04/07/2023
04/04 2023, Seldovia grabs	<u>04/19/2023</u>	<u>04/19/2023</u>	<u>04/19/2023</u>	<u>04/11/2023</u>	04/28/2023
05/12 2023, Seldovia grabs	<u>06/01/2023</u>	<u>06/01/2023</u>	<u>06/01/2023</u>	<u>06/01/2023</u>	05/19/2023
06/09 2023, Seldovia grabs	<u>06/21/2023</u>	<u>06/21/2023</u>	<u>06/21/2023</u>	<u>06/21/2023</u>	06/30/2023
07/10 2023, Seldovia grabs	<u>07/18/2023</u>	<u>07/18/2023</u>	<u>07/18/2023</u>	<u>07/18/2023</u>	08/03/2023
08/02 2023, Seldovia grabs	<u>08/23/2023</u>	<u>08/23/2023</u>	<u>08/23/2023</u>	<u>08/23/2023</u>	08/24/2023

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09/04/2023, Seldovia grabs	09/21/2023	09/21/2023	09/21/2023	09/21/2023	09/19/2023
10/05/2023, Seldovia grabs	10/18/2023	10/18/2023	10/18/2023	10/18/2023	10/19/2023
11/02/2023, Seldovia grabs	11/16/2023	11/16/2023	11/16/2023	11/16/2023	11/17/2023
12/01/2023, Seldovia grabs	12/14/2023	12/14/2023	12/14/2023	12/14/2023	12/08/2023

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[Example explanation 2, update for your sampling protocols] **Sample hold times for 2022:** NERRS SOP allows nutrient samples to be held for up to 24 hours if held at 4°C with no preservation, for NH₄F and NO₃F up to 28 days if acidified and held at 4°C, and up to 28 days (CHLA for 30 days) if held at -20°C. Tier II parameters, with a few exceptions, are subject to the same sample hold times. In all cases, up to an additional 5 days is allowed for collecting, processing, and shipping samples. Samples held beyond that time period are flagged suspect and coded CHB in the data set.

[Example table, format however makes sense for your reserve but do not use an image of a table]

Sample-Descriptor	Data-of-analysis					
	PO4F	NH4F	NO2F	NO3F	CHLA_N, PHEA	SiO4F
1/4/2022, all grabs	1/13/2022	1/13/2022	1/13/2022	1/13/2022	1/12/2022	1/21/2022
2/29/2022, all grabs	3/24/2022	3/24/2022	3/24/2022	3/24/2022	3/21/2022	4/1/2022
2/29-3/1/2022, all diels	3/24/2022	3/24/2022	3/24/2022	3/24/2022	3/21/2022	4/1/2022
3/28/2022, all grabs	4/22/2022	4/22/2022	4/22/2022	4/22/2022	5/10/2022*	5/10/2022*
3/30-3/31/2022, all diels	4/22/2022	4/22/2022	4/22/2022	4/22/2022	4/18/2022	5/4/2022
4/25/2022, all grabs	5/20/2022	5/20/2022	5/20/2022	5/20/2022	5/11/2022	5/23/2022
4/25-4/26/2022, all diels	5/20/2022	5/20/2022	5/20/2022	5/20/2022	5/17/2022	5/23/2022
5/2/2022, all grabs	5/20/2022	5/20/2022	5/20/2022	5/20/2022	5/24/2022	5/23/2022
5/16-17/2022, all diels	6/8/2022	6/8/2022	6/8/2022	6/8/2022	6/1/2022	6/10/2022
---	-	-	-	-	-	-

*sample held longer than allowed by NERRS protocols