

**Tijuana River Estuary (TJR) NERR Nutrient Metadata
(January-March and July-December 2003)
Latest Update: June 13, 2025**

I. Data Set and Research Descriptors

1) Principal Investigators and Contact Persons

a) Reserve Contact

Dr. Jeff Crooks - Research Coordinator
301 Caspian Way
Imperial Beach, CA 91932
Phone: (619) 575 3614
e-mail: jcrooks@tijuanaestuary.com

Mike Wells - Reserve Manager
301 Caspian Way
Imperial Beach CA 91932

Michael Kiener – Research Associate
301 Caspian Way
Imperial Beach CA 91932
Phone: (619) 575 3614
e-mail: makiener@yahoo.com

b) Laboratory Contact

Nutrient analysis is performed in house.

Michael Kiener
301 Caspian Way
Imperial Beach CA 91932
Phone: (619) 575 3614
e-mail: makiener@yahoo.com

c) Other Contacts and Programs

None

2) Research Objectives

The Tijuana Estuarine Research Reserve (TERR) is impacted heavily by both periodic raw sewage inputs and urban development. Only about a quarter of the reserve's 2,531 acres are tidally influenced. The nutrient monitoring program will provide baseline inorganic nutrient and Chl a data for TERR. This data will also contribute to national baseline information. Nutrients were sampled at the four existing YSI water quality sonde locations. The Oneonta Slough (OS) site is located in the largest and deepest channel in the estuary. The Model Marsh (MM) site is located in a natural channel adjacent to a 20-acre mudflat restoration area. The Tidal Linkage (TL) site is located in a restored channel connecting mudflats to the north arm of the estuary. The River Channel (RC) site is located at the upper limits of tidal influence on the main river channel. These sampling sites are located throughout estuary to provide a insight into the possible sources of nutrients. The OS and TL sites are predominantly influenced by the US communities. The RC and TL sites are influenced by both activity in Mexico and the US. All sites are tidally influenced. Samples were also taken at the River Mouth (RM) and Helicopter Pad (HP) in the main river channel adjacent to the Naval Helicopter Training Center but these data are not included in this dataset. This data can be obtained from contacting the reserve.

a) **Monthly Grab:** Grab samples were collected monthly at all four YSI water quality sonde sites as well as the river mouth. Samples were collected no more than three hours before a projected slack low tide.

b) **Diel Sampling Program:** Diel samples were collected monthly at the Oneonta Slough site. Thirteen samples were collected at approximately two-hour intervals over one lunar day. Samples were taken using an ISCO auto-sampler model 6712 with a sixty-foot sample tube and polypropylene strainer attached to the YSI water quality sonde holder. The strainer was attached at a fixed height, adjacent to the sonde probes.

3) Research Methods

a) Monthly Grab Sampling Program

Monthly grab samples were taken at the four YSI sites (Oneonta Slough, Model Marsh, Tidal Linkage and River Channel). All samples were collected less than three hours prior to the projected slack low tide ending a diel sampling cycle. Samples were collected vertically, by hand, in amber wide mouth 250ml acid washed (10% HCl) Nalgene bottles. Sampling followed a dry period of 72 hours or greater. Samples were taken simultaneously January through March and July through September, and successively October through December. Samples were taken at the depth of and adjacent to the sonde probes in compliance with March 2002 grab sampling protocol scenario one. Field replicates (N=2) were collected after rinsing three times with ambient water. Samples were collected in order of MM, RC, TL and OS. All samples were immediately stored on ice and delivered to the lab within four hours.

At the time of nutrient sampling, in-situ samples of temperature, salinity and dissolved oxygen were measured using an YSI 85 meter. These data are not included in this dataset but can be obtained by contacting the reserve.

b) Diel Sampling

Diel samples were collected over one lunar day at the Oneonta Slough location. Samples were taken at approximately two-hour intervals for a total of 13 samples. Samples were collected using an ISCO model 6712 autosampler with a sixty-foot sample tube and polypropylene strainer attached to the fixed YSI water quality sonde station. The strainer was attached at a fixed height (approximately 30 cm above the channel bottom), adjacent to the sonde probes. The sampler was located approximately 2.5 vertical meters above the strainer. The autosampler was programmed to collect 300ml per sample utilizing ISCO's 24-bottle kit in a standard tub stocked with ice. At the time of retrieval, the sampling program was suspended, the sample bottles were capped and the ice reservoir was refilled. Samples typically reached the lab within one hour of retrieval.

All sample containers were acid washed. The washing procedure consisted of six rinses with DI water, a soak of at least twenty minutes in 10% HCl and six rinses with Type I reagent water.

4) Site Location and Character

a) General Site Characteristics (TJE)

- i. Tidal exchange (extremes): approx. -2 +7 MLLW,
- ii. Salinity: 4 ppt (extreme rain events) to 38 ppt
- iii. Latitude and longitude: 32 deg 34 min N, 117 deg 07 min W
- iv. Potential impacts: storm drain runoff from military airfield and adjacent residential areas, occasional sewage spills (10-15 MGD) into the Tijuana River from Mexico. The area surrounding the estuary is heavily developed by residential housing as is the watershed which drains into the estuary. Approximately 2/3 of the watershed is in Mexico. The North Eastern section of the reserve is bordered by a military helicopter training base. Vegetation in the

- area is dominated by common pickleweed (*Spartina virginica*) and Pacific cordgrass (*Spartina foliosa*).
- v. Size: 4532 km²

b) Specific Site Characteristics

Oneonta Slough (OS)

- i. Orientation of site: The Datalogger station is located on the upper portion of Oneonta Slough. The channel runs North to South and is located on the northwestern edge of the reserve. Latitude is 32 deg 34 min 04.8 sec N, longitude is 117 deg 07 min 52.3 sec W.
- ii. The elevation of the channel bottom directly below the datalogger is approx. 0.55m below Mean Sea Level.
- iii. Channel width is approx. 20 meters. Datalogger site is located 1km from mouth
- iv. Bottom type: sand and sediment.
- v. Area adjacent to west side of channel is developed. There is a 50-meter buffer of natural vegetation between development and the channel. Area adjacent to east side of channel is relatively natural.
- vi. Direct impacts are estimated to be runoff from streets into channel during rain events.

Model Marsh (MM)

- i. Orientation of site: The datalogger station is located in the middle of a natural channel which runs north to south. The channel is approximately 20 meters north of a newly constructed 20-acre mudflat restoration area in the southern section of the reserve. Latitude is 32 deg 32 min 52.5 sec N, longitude is 117 deg 07 min 22.9 sec W.
- ii. The elevation of the channel bottom: -.39 NGVD (last reading: 2001)
- iii. Channel width: 5 meters
- iv. Bottom type: Mostly mud with some sand.

Tidal Linkage (TL)

- i. Orientation of site: Datalogger station is located in the middle of the constructed channel known as the Tidal Linkage. The channel runs Northwest to Southwest and is located adjacent to the visitor's center in the northeastern section of the reserve. Latitude is 32 deg 34 min 27.9 sec N, longitude is 117 deg 07 min 37.8 sec W.
- ii. The elevation of the channel bottom: No survey data available.
- iii. Channel width: Approximately 5 meters.
- iv. Bottom type: very fine mud.

River Channel (RC)

- i. Orientation of site: Datalogger station is located in the main channel of the Tijuana River, the main drainage of the watershed. The channel runs East to West. Latitude is 32 deg 33 min 28.4 sec N, longitude is 117 deg 06 min 21.8 sec W.
- ii. The elevation of the channel bottom: no survey data available.
- iii. Channel width: Approximately 10 meters.
- iv. Bottom type: mostly sand, some mud.

5) Code Variable Definitions

Site Abbreviations: Model Marsh = MM, River Channel =RC, Tidal Linkage = TL and Oneonta Slough = OS.

Site Variable codes: Model Marsh = tjrmnut, River Channel = tjrcnut, Tidal Linkage = tjrtlnut and Oneonta Slough = tjrosnut.

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

Sampling was performed on a monthly basis attempting to sample at approximately 30 day intervals. Samples collected at all sites other than Oneonta Slough were grab samplings and so represent a point in time rather than a period. Sampling at Oneonta Slough began with the first of the ISCO samples at the projected slack low tide and ended with the grab sample at Oneonta Slough. Whenever possible, grab sampling at OS coincided with the last ISCO sampling. Sampling began on 18 January 2003 at 15:55 p.s.t. and ended on 31 December 2003 at 23:31 p.s.t.

Monthly Grab Sampling

Site	Start Date	Start Time	End Time
MM	01/19/2003	14:35	14:36
MM	02/22/2003	05:50	05:51
MM	03/15/2003	11:16	11:17
MM	07/31/2003	04:30	04:31
MM	08/31/2003	03:00	03:01
MM	09/30/2003	04:30	04:31
MM	10/25/2003	13:20	13:24
MM	11/23/2003	12:15	12:19
RC	01/19/2003	15:09	15:10
RC	02/22/2003	06:41	06:42
RC	03/15/2003	12:13	12:14
RC	07/31/2003	05:03	05:04
RC	08/31/2003	03:38	03:39
RC	09/30/2003	05:17	05:18
RC	10/25/2003	13:45	13:49
RC	11/23/2003	13:15	13:20
TL	01/19/2003	16:05	16:06
TL	02/22/2003	07:44	07:45
TL	03/15/2003	12:41	12:42
TL	07/31/2003	05:49	05:50
TL	08/31/2003	04:26	04:27
TL	09/30/2003	06:02	06:03
TL	10/25/2003	14:22	14:25
TL	11/23/2003	14:17	14:20
OS	01/19/2003	16:25	16:26
OS	02/22/2003	08:11	08:12
OS	03/15/2003	12:56	12:57
OS	07/31/2003	06:49	06:50
OS	08/31/2003	05:16	05:17
OS	09/30/2003	07:06	07:07
OS	10/25/2003	16:12	16:13
OS	11/23/2003	15:00	15:05

Diel Sampling

Site	Start Date	Start Time	EndDate	End Time
OS	01/18/2003	15:55	01/19/2003	16:31
OS	02/21/2003	06:33	02/22/2003	07:57
OS	03/14/2003	13:18	03/15/2003	13:54
OS	07/30/2003	04:13	07/31/2003	04:49
OS	08/30/2003	04:39	08/31/2003	05:15
OS	09/29/2003	05:52	09/30/2003	07:04
OS	10/24/2003	14:23	10/25/2003	16:11
OS	11/22/2003	14:15	11/23/2003	15:03
OS	12/30/2003	21:31	12/31/2003	23:31

Note: Time code is based on a 2400 hour clock and refers to Pacific Standard Time. Date format is mm/dd/yyyy.

7) Associated Researchers and Projects

NERR SWMP water quality datalogger stations are present at four of the nutrient sampling sites (MM, RC, TL & OS). NERR SWMP meteorological sampling is being conducted at 1 station which is located near the Tidal Linkage water quality station.

Within the watershed, above the River Channel site, nutrient sampling and flow studies are being conducted by Dr. Richard Gersberg of the San Diego State University Department of Public Health. The Model Marsh is the ongoing site of research being conducted by PERL which focuses on methods for increasing the success of saltmarsh revegetation projects.

8) Distribution

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program, 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 the NOAA/OCRM supported research that are produced for publication in open literature, including referred 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 general information link on CDMO homepage) and online at the CDMO homepage <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**

Original data is in the form of a printout from the Lachat AE or Aquamate. This data is then manually entered into an Excel spreadsheet by the analyst (Michael Kiener). Data is checked for input error after 24 hours by the analyst. A final check of data is performed by someone other than the analyst i.e. a coworker or intern.

10) Parameter Titles and Variable Names by Data Category

Required NOAA/NERRS System-wide Monitoring Program water quality parameters are denoted by an asterisks “*”.

Data Category	Parameter	Variable Name	Units of Measure
a) Phosphorus	*Orthophosphate	PO4F	mg/L as P
b) 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
c) Plant Pigments	*Chlorophyll a,	CHLA_N	µg/L

11) Measured and Calculated Laboratory Parameter

a) Variables Measured Directly

Nitrogen species: NO2F, NO23F, NH4F,
 Phosphorus species: PO4F
 Chlorophyll a CHLA_N

b) Computed Variables

NO3F: NO23F-NO2F
 DIN: NO23F+NH4F

12) Limit of Detection

Method detection limit as defined in the Code of Federal Regulations, 40 CFR 136, Appendix B, as:

“the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.”

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

Parameter	Variable	Mean Conc. mg/L as N or P	Std. Dev.	MDL mg/L as N or P	Dates in use
Ammonium	NH4	0.054	0.002	0.005	Jan.-Dec. 2003
Nitrite	NO2	0.0061	0.001	0.002	Jan.-Dec. 2003
Nitrate	NO23	0.0094	0.001	0.003	Jan.-Dec. 2003
Orthophosphate	PO4F	0.046	0.0005	0.002	Jan. Dec. 2003

*There is no reported MDL for chlorophyll in 2003. It is unclear if there was an MDL and it was lost, or if there was never a determined MDL.

MDL's are determined by multiplying the standard deviation by the t value for the number of samples run.

13) Laboratory Methods

a) Parameter: PO4F

Lachat QuikChem Method 10-115-01-1-A

Method Reference: EPA-600/R-93/100, August 1993, Method 365.1
USGS, Method I-2601-78
Standard Methods 18th ed., Method 4500-P F (1992)

Method Descriptor: The orthophosphate ion (PO_4^{3-}) reacts with ammonium molybdate and antimony potassium tartrate under acidic conditions to form a 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: Filtered with 9cm membrane filter with pore size .47um and stored at or below -10° C for no more than 48 hours.

b) Parameter: NH4F

Lachat QuikChem Method 10-107-06-1-B

Method Reference: EPA-600/4-79-020, Revised March 1983, Method 350.1
USEPA, 40 CFR, Part 36 Table 1B, footnote 6, 1994

Method Descriptor: This method is based on the Berthelot reaction. Ammonia reacts with alkaline phenol, then with sodium hypochlorite to form indophenol blue. Sodium nitroprusside (nitroferrocyanide) is added to enhanced sensitivity. The absorbance of the reaction product is measured at 630 nm, and is directly proportional to the original ammonia concentration in the sample.

Preservation Method: Filtered through 47mm membrane filter with 0.47um pore size and store at or below -20° C for less than 72 hours.

c) Parameter: NO2F

Lachat QuikChem Method 10-107-04-1-C

Method Reference: USEPA, Methods for Chemical Analysis of Water and Wastes, Method 353.2.
Methods of Determination of Inorganic Substances in Water and Fluvial Sediments. Book 5. Chapter A1. U.S. Dept. of the Interior. U.S. Geological Survey.

Method Descriptor: Nitrite is determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is read at 520 nm.

Preservation Method: Filtered through 47mm membrane filter with 0.47um pore size and store at or below -20° C for less than 48 hours.

d) Parameter: NO23F

Lachat QuikChem Method 10-107-04-1-C

Method Reference: USEPA, Methods for Chemical Analysis of Water and Wastes, Method 353.2.
Methods of Determination of Inorganic Substances in Water and Fluvial Sediments. Book 5. Chapter A1. U.S. Dept. of the Interior. U.S. Geological Survey.

Method Descriptor: Nitrate is quantitatively reduced to nitrite by passing of the sample through a copperized cadmium column. The nitrite is determined by diazotizing with sulfanilamide followed by

coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is read at 520 nm.

Preservation Method: Filtered through 47mm membrane filter with 0.47um pore size and stored at or below –20° C for less than 14 days.

e) Parameter: CHLA

Method Reference: USEPA, In Vitro Determination of Chlorophylls a, b, c1 +c2 and pheopigments in Marine and Freshwater Algae by Visible Spectrophotometry.

Method Descriptor: Samples are filtered through 47 mm A/E glass fiber filters. Chlorophyll is extracted with aqueous acetone and chl a concentrations are determined with a spectrophotometer.

Preservation Method: Filtered through 47mm A/E filter, stored in a desiccator, at or below –20° C for less than 30 days.

14) Reporting of Missing or Deleted Data and 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 Program

- a) **Precision**
- i) **Field Variability:** All grab samples are duplicated. Replicate (N=2) samples are collected simultaneously.
 - ii) **Laboratory Variability:** A minimum of 10% of all samples are replicated (N=2).
 - iii) **Inter-organizational splits:** NONE
- b) **Accuracy**
- i) **Sample Spikes:** A minimum of 10% of all samples are spiked, in duplicate. Percent recovery must range between 95% and 105% to be considered under control.
 - ii) **Standard Reference Material Analysis:** NONE
 - iii) **Cross Calibration Exercise:** NONE

16) Other Remarks

On 06/13/2025 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> [SUU]		A	Value above upper limit of method detection
<4> [SBL]	<4> [SOB]	B	Value below method detection limit
no need to flag/code unless combined		C	Calculated value
<3> [GDD]	<3> [GCR]	D	Data deleted or calculated value could not be determined due to deleted data, see metadata for details
<1> (CHB)		H	Sample held beyond specified holding time
<0> (CSM) unless other flag		K	Check metadata for further details
<2> [GDM]	<2> [GOM]	M	Data missing, sample never collected or calculated value could not be determined due to missing data
<3> [SNV] and <1> [SOQ] for components (CRE) or F_Record (CRE)		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) No samples were collected within 72 hours of a rainfall event.
- b) Data was rounded by a Lachat AE which has since been removed from service and replaced with Thermo Electron Aquamate UV spectrophotometer. Lachat data was formatted to display three decimal places. The Lachat's programming rounded the third decimal place down where the fourth place equaled 1-4 and rounded up where the fourth place equaled 5-9.