

Tijuana River (TJR) NERR Water Quality Metadata
January to December 2021
Latest Update: August 5, 2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

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2) Entry verification –

Deployment data are uploaded from the YSI data logger to a personal computer with Windows 7 or newer operating system. Files are exported from KOR Software in a comma separated file (CSV) and uploaded to the CDMO where they undergo automated primary QAQC; automated Depth/Level corrections for changes in barometric pressure (cDepth or cLevel parameters); and become part of the CDMO's online provisional database. All pre- and post-deployment data are removed from the file prior to upload. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove any overlapping deployment data, append files, and export the resulting data file for upload to the CDMO. Upload after secondary QAQC results in ingestion into the database as provisional plus data, recalculation of cDepth or cLevel parameters, and finally tertiary QAQC by the CDMO and assimilation into the CDMO's authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. For more information on QAQC flags and codes, see Sections 11 and 12. Monica Almeida is responsible for data management.

3) Research objectives –

The Tijuana River National Estuarine Research Reserve (TRNERR) represents the largest, most intact coastal marsh system remaining in Southern California. It has contiguous beach, dune, tidal channel, mudflat, marsh, transitional, and upland habitat. It is also home to numerous threatened and endangered species. TRNERR experiences a Mediterranean climate, with warm, dry summers and cool, wet winters. The majority of rainfall occurs between the months of October and March. Because of its highly urbanized setting, situated between the cities of Tijuana, Baja California, Mexico, and San Diego, California, USA, it is heavily impacted. A primary management concern is transboundary flows of the Tijuana River, which convey anthropogenic pollutants (primarily associated with partially-treated and untreated wastewater), nutrients, and sediment. About a quarter of the reserve's 2,531 acres are tidally influenced and few channels are deep enough for datalogger deployment. Currently, there are two SWMP stations located within the TRNERR boundaries, and two SWMP stations are located nearby in south San Diego Bay. Station locations are designed to investigate spatial patterns of water quality parameters, with comparisons between the Tijuana Estuary and San Diego Bay. In addition, telemetry of Tijuana Estuary water quality stations informs management action, particularly related to potential closure of the tidal inlet by wave-driven accumulation of sediment. Mouth closures (detected by cessation of tidal action as indicated with the water level sensors on the dataloggers) can cause anoxia, mortality of fish and shellfish, and flooding.

Two stations were originally set up: a “control” station Oneonta Slough (OS), which is still in place, was established on the northern end of Oneonta Slough, relatively far away from the main source of river-borne pollution. Another station, River Channel (RC), was situated in a site most affected by sewage outflow. Datalogger deployment at RC, however, was continually interrupted by both shifting sediment and massive wracks of kelp (*Macrocystis pyrifera*), which would often bury the deployment set-up on incoming tides. After a number of different deployment designs were implemented without success, data collection at the RC site was terminated in 2004. Another station was located at the inlet to the Model Marsh (MM), a constructed 20-acre restoration site in the southern arm of the estuary. The Model Marsh was opened to tidal flushing in February 2000 and datalogging at the station began in October 2000. The site was discontinued in January 2008, again due to heavy sedimentation. The Boca Rio (BR) site is located near the mouth of the Tijuana River, although the mouth has migrated south in recent years. The BR station was established in December 2004 to replace the RC station and remains active and is the site closest to the interface of the river and ocean.

The South Bay (SB) station was established in January 2008 and is located at the mouth of Otay River, which flows into South San Diego Bay. It is within the San Diego National Wildlife Refuge Complex, which also includes portions of the TRNERR. It was established to document conditions in the south bay, particularly associated with a marsh restoration in the adjacent salt ponds. The Pond Eleven (PE) station was located in a non-tidal salt pond adjacent to the South Bay logger. A tide gate was the only source of water into the pond, which was one of the first in a series of ponds with increasing salinities. The PE sonde was deployed from July 2008 to September 2010. The US Fish and Wildlife Service began restoration of this area, including Pond Eleven, from September 2010 to its completion in October 2011. A levee was breached to open Pond Eleven to the bay, which made the area tidal, and channels were excavated to further enhance circulation. Due to extensive restoration, the site had to be relocated. Datasonde deployments and nutrient data collection began in January 2012 at a new location site named Pond Restored (PR) (the name change was warranted because of the different location and profound differences in the pond before and after restoration). The Pond Restored datalogger is located approximately 560 meters southwest from where the Pond Eleven datalogger was originally. The images below show pre- and post-restoration of the salt ponds and the station locations. The post restoration photo includes the PE site as a reference to the new PR site. No sampling currently occurs at the PE site.



4) Research methods –

Each datalogger deployment site is comprised of a 4-inch diameter PVC/ABS pipe strapped vertically to either two “rail” style fence posts or a 2-inch diameter galvanized steel pole (depending on the channel substrate - i.e. sand/cobble or silty/clayey sediment) that have been driven into the sediment. Multiple 1.5-inch diameter holes have been drilled around the bottom length of the PVC pipe to permit unrestricted water flow to the sensors. Upon deployment, the datalogger is placed into and rests on a bolt fixed across the bottom of the pipe.

The sampling period is between four to six weeks, with measurements taken every 15 minutes. Measurements for specific conductivity, salinity, dissolved oxygen (percent saturation), dissolved oxygen (mg/l), temperature, turbidity, pH and water level are recorded. Prior to deployment, each sensor is calibrated with its associated calibration standard(s)/method in the laboratory. At the end of each sampling period, the YSI dataloggers are brought back to the laboratory for data downloading, cleaning and recalibration. These procedures are carried out according to the methods described in the YSI Operations Manual (see sections 3 and 7). Calibration standards for specific conductivity (50mS/cm) and turbidity (126 NTU) are purchased from YSI, and pH standards (7 and 10) are manufactured by Ricca Chemical Company and purchased from Fisher Scientific. The QA/QC procedures for the collected data are followed from the CDMO Operations Manual version 6.6 – February 2015.

In the field, concurrent with the datalogger’s deployment, the YSI ProDSS multiparameter water quality meter is used to collect data for comparison. Parameters such as specific conductivity, salinity, DO (percent saturation and mg/l), temperature and barometric pressure, are measured and recorded. Once a month, the handheld meter is calibrated in the specific conductivity standard (50mS/cm) and 100% oxygen saturated water before each use. Once a year, the optical DO probe is replaced.

In 2015, TRNERR started to report level data. In January and February, datalogger holders were surveyed using the Spectra Precision Epoch real-time kinematic (RTK) GPS and calculations were done to find the correct depth offset. In December of 2017, Boca Rio and Oneonta Slough datasondes were resurveyed after cleaning the logger holder and switching from YSI 6-series datasondes to YSI EXO2. In all surveys, RTK GPS data used the NAD_1983_2011_StatePlane_California_VI_FIPS_0406 (meters) projected coordinate system, NAVD88 vertical datum (meters), and GEOID 12A model. Each datalogger specific offset is found in the Specific Site characteristics section of this document. In late November and early December of 2021, all stations were re-surveyed with RTK GPS.

Site Name	Boca Rio
Site infrastructure description	Datalogger is deployed in a PVC/ABS holder strapped vertically to two “rail” style fence posts driven into a sand (with some silt and clay) substrate
Surveying equipment	Spectra Precision Epoch50 real-time kinematic (RTK) GPS
Survey monument used	TJR NERR local benchmarks installed by a contractor company and leveled to the NGS reference benchmark U 1305 (PID - DC1330)
Survey occupation date	January 27, 2015
Survey occupation duration	Approx. 10 minutes
Ellipsoid height	-35.028 (from top of battery cap)
“Quick Check” marker for deployment tube	Mark on the pole
“Quick Check” for sonde being deployed at the same location	Sonde rests on a bolt
Annual resurveying	November 15, 2021 -0.065m NAVD88 -35.164 Ellipsoid height (from top of battery cap) Spectra Precision SP80 real-time kinematic (RTK) GPS

Site Name	Oneonta Slough
Site infrastructure description	Datalogger is deployed in a PVC/ABS holder strapped vertically to a 2-inch diameter galvanized steel pole driven into a silty clay substrate
Surveying equipment	Spectra Precision Epoch50 real-time kinematic (RTK) GPS
Survey monument used	TJR NERR local benchmarks installed by a contractor company and leveled to the NGS reference benchmark U 1305 (PID - DC1330)
Survey occupation date	January 23, 2015
Survey occupation duration	Approx. 10 minutes
Ellipsoid height	-34.677 (from top of battery cap)
“Quick Check” marker for deployment tube	Mark on the pole
“Quick Check” for sonde being deployed at the same location	Sonde rests on a bolt
Annual resurveying	November 2, 2021 0.263m NAVD88 -34.544 Ellipsoid height (from top of holder) Spectra Precision SP80 real-time kinematic (RTK) GPS

Site Name	Pond Restored
Site infrastructure description	Datalogger is deployed in a PVC/ABS holder strapped vertically to a 2-inch diameter galvanized steel pole driven into a silty clay substrate
Surveying equipment	Spectra Precision Epoch50 real-time kinematic (RTK) GPS
Survey monument used	Local benchmarks installed by a contractor company and leveled to the NGS reference benchmark U 1305 (PID - DC1330)
Survey occupation date	February 25, 2015
Survey occupation duration	Approx. 10 minutes
Ellipsoid height	-34.678 (from top of holder)
“Quick Check” marker for deployment tube	Mark on the pole
“Quick Check” for sonde being deployed at the same location	Sonde rests on a bolt
Annual resurveying	November 30, 2021 -0.397m NAVD88 -34.763 Ellipsoid height (from top of holder) Spectra Precision SP80 real-time kinematic (RTK) GPS

Site Name	South Bay
Site infrastructure description	Datalogger is deployed in a PVC/ABS holder strapped vertically to a 2-inch diameter galvanized steel pole driven into a silt and clay substrate
Surveying equipment	Spectra Precision Epoch50 real-time kinematic (RTK) GPS
Survey monument used	Local benchmarks installed by a contractor company and leveled to the NGS reference benchmark U 1305 (PID - DC1330)
Survey occupation date	February 25, 2015
Survey occupation duration	Approx. 10 minutes
Ellipsoid height	-35.276 (from top of holder)
“Quick Check” marker for deployment tube	Mark on the pole
“Quick Check” for sonde being deployed at the same location	Sonde rests on a bolt
Annual resurveying	December 1, 2021 -0.629m NAVD88 -35.450 Ellipsoid height (from top of battery cap) Spectra Precision SP80 real-time kinematic (RTK) GPS

A Sutron Sat-Link2 transmitter was installed at the Oneonta Slough station on 12/20/2006 and was replaced by a newer WaterLog Storm 3 transmitter on 06/08/2021. The station data is transmitted to the NOAA GOES satellite, NESDIS ID #3B0252F2. (where #3B0252F2 is the GOES ID for that particular station.). The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen-minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The “real-time” telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation into the CDMO’s authoritative online database. Provisional and authoritative data are available at <http://cdmo.baruch.sc.edu..>

5) Site location and character –

General site Characteristics (TRNERR)

- Latitude and Longitude: 32° 34' N, 117° 7' W
- Tidal range: approximately -2ft to + 7ft MLLW
- Water depth: approximately 0.2m to 2m
- Type and amount of freshwater input: the dominant freshwater source to the estuary is the Tijuana River, which drains a 4,483km² watershed, approximately 2/3 of which resides in Mexico. Stream flows in the river vary considerably from season to season and year to year, with no flow during many months and a mean annual discharge of 0.82m³/s. Additional freshwater sources are storm drains located mostly in the northern arm of the estuary from the adjacent military airfield and residential area. The entire estuary is shallow and has a relatively small tidal prism (0.36 Mm³), so even low freshwater flows result in reduced salinity throughout the reserve. Estimated residence times for freshwater entering the estuary vary from 7 hours to a few days, depending on the tide and mouth conditions. Rainfall within the watershed accounts for most of the freshwater entering the reserve, with 90%

of the mean annual rainfall occurring between November and April. Vegetation in the area is dominated by common pickleweed (*Salicornia pacifica*) and Pacific cordgrass (*Spartina foliosa*).

e) Pollutants in area: Freshwater discharge with untreated sewage occurs year-round. Although these have decreased with the construction of a binational water treatment plant, repeated infrastructure failures have increased the frequency of raw sewage discharged throughout the year affecting the water quality.

Specific Site characteristics: Boca Rio (BR)

a) Location of site: the datalogger station is located approximately 400m north of the Tijuana River in the middle of a channel which runs north-south; 32° 33' 33.7" N, 117° 7' 44.3" W.

b) Elevation of sonde's depth port:

January 27, 2015 - December 12, 2017: 0.053m NAVD88, approximately 0.5m above the channel bottom.

December 12, 2017 - November 15, 2021: -0.056m NAVD88, approximately 0.5m above the channel bottom.

November 15, 2021 – present: -0.065m NAVD88, approximately 0.5m above the channel bottom.

c) Water depth: approximately 0.5m to 2.7m.

d) Channel width: approximately 30 m.

e) Bottom type: sand, some silt and clay.

f) Salinity: 1 ppt (extreme rain events) to 36 ppt (average of 33ppt)

Specific Site characteristics: Oneonta Slough (OS)

a) Location of site: the datalogger station is located on the upper portion of the Oneonta Slough in the northwest corner of the reserve, approximately 1.4km north of the Tijuana River. OS station is established in the middle of the same channel as the Boca Rio site; 32° 34' 6.0" N, 117° 7' 52.6" W.

b) Elevation of sonde's depth port:

January 23, 2015 - December 5, 2017: 0.332m NAVD88, approximately 0.5m above the channel bottom.

December 5, 2017 - November 2, 2021: 0.295m NAVD88, approximately 0.5m above the channel bottom.

November 2, 2021 – present: 0.263m NAVD88, approximately 0.5m above the channel bottom.

c) Water depth: approximately 0.7m to 2.4m.

d) Channel width: approximately 23m.

e) Bottom type: silty clay.

f) Salinity: 1 ppt (extreme rain events) to 39 ppt (average of 32 ppt)

g) The area adjacent to the west side of the channel is developed. There is a 50+ meter buffer of natural vegetation between development and the channel. The area adjacent to the east side of the channel is relatively undisturbed. Direct impacts may be runoff from streets into channel during rain events.

Specific Site Characteristics: Pond Restored (PR)

a) Location of site: The datalogger is located at the middle levee breach between Pond Eleven and Pond Ten, which is part of the South San Diego Bay Coastal Wetland Restoration and Enhancement Project; 32° 35' 45.9", 117° 7' 5.5" W.

b) Elevation of sonde's depth port:

February 25, 2015 - January 7, 2021: -0.310m NAVD88, approximately 0.5m above the channel bottom.

January 7, 2021 - November 30, 2021: -0.381m NAVD88, approximately 0.5m above the channel bottom.

November 30, 2021 – present: -0.397m NAVD88, approximately 0.5m above the channel bottom.

c) Water depth: 0.5m to 3.2m.

d) Channel width: approximately 40m.

e) Bottom type: silt and clay.

f) Tidal Exchange (extremes): approximately -2ft to +7ft MLLW.

g) Salinity: 4ppt (extreme rain event) to 39 ppt (average of 35ppt)

Specific Site Characteristics: South Bay (SB)

a) Location of site: The datalogger is located at the mouth of Otay River where it flows into San Diego Bay; 32° 36' 3.6" N, 117° 06' 57.0" W.

b) Elevation of sonde's depth port:

February 25, 2015 – January 7, 2021: -0.379m NAVD88, approximately 0.5m above the channel bottom.

January 7, 2021 – December 1, 2021: -0.471m NAVD88 (EXO2) or -0.350m NAVD88 (EXO3), approximately 0.5m above the channel bottom.

December 1, 2021 – present: -0.629m NAVD88, approximately 0.5m above the channel bottom.

c) Depth: approximately 0.7m to 3.2m

d) Channel width: approximately 25m

e) Bottom type: silt and clay.

f) Tidal Exchange (extremes): approximately -2ft to +7ft MLLW.

g) Salinity: 4ppt (extreme rain event) to 39 ppt (average of 35ppt)

SWMP Station Timeline

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
tjrbrwq	P	Boca Rio	32° 33' 33.70 N, 117° 7' 44.30 W	12/23/2004 15:30	NA	NA
tjroswq	P	Oneonta Slough	32° 34' 6.00 N, 117° 7' 52.60 W	01/01/1996 00:00 -	NA	NA
tjrprwq	P	Pond Eleven Restored	32° 35' 45.90 N, 117° 07' 5.59 W	02/16/2012 11:00	NA	NA
tjrswbq	P	South Bay	32° 36' 3.60 N, 117° 6' 57.00 W	01/02/2008 00:00 -	NA	NA
tjrmmwq	P	Model Marsh	32° 32' 52.08 N, 117° 7' 22.80 W	10/01/2000 00:00 - 01/17/2008 00:00	Heavy sedimentation compromised the station	
tjrpewq	P	Pond Eleven	32° 36' 3.54 N, 117° 06' 58.46 W	07/25/2008 00:00 - 09/29/2010 00:00	Deployments at this site were interrupted due to an extensive Restoration project	Restoration project was concluded in October 2011. Datalogger was relocated and renamed – Pond Eleven Restored, and deployments resumed in January 2012.
tjrrewq	P	River Channel	32° 33' 28.08 N, 117° 6' 21.96 W	08/01/2002 00:00 - 11/11/2004 14:00	Heavy sedimentation compromised the station	Replaced by Boca Rio site
tjrtlwq	P	Tidal Linkage	32° 34' 27.84 N, 117° 7' 37.92 W	05/01/1997 00:00 - 10/08/2007 00:00	Heavy sedimentation compromised the station	

6) Data collection period –

Boca Rio

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
11/18/2020	15:30	5/6/2021	10:45
5/6/2021	11:00	6/8/2021	14:30
6/8/2021	14:45	7/1/2021	11:30
7/1/2021	12:00	8/16/2021	8:45
8/16/2021	9:00	10/4/2021	13:45
10/4/2021	14:00	11/15/2021	14:15
11/15/2021	15:15	12/14/2021	13:45
12/14/2021	14:00	2/10/2022	3:45

Oneonta Slough

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
11/18/2020	14:45	5/7/2021	11:45
5/7/2021	12:00	6/8/2021	13:15
6/8/2021	13:30	7/1/2021	11:00
7/1/2021	11:15	8/13/2021	8:45
8/13/2021	9:00	8/17/2021	11:00
8/17/2021	11:15	9/23/2021	13:15
9/23/2021	13:30	11/2/2021	13:15
11/2/2021	14:15	12/14/2021	10:30
12/14/2021	10:45	3/9/2022	12:30

Pond Restored

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
11/24/2020	11:00	1/7/2021	12:00
1/7/2021	12:15	2/18/2021	10:30
2/18/2021	10:45	4/26/2021	11:45
4/26/2021	12:15	5/26/2021	13:00
5/26/2021	13:15	7/2/2021	9:45
7/2/2021	10:00	8/24/2021	15:00
8/24/2021	15:15	10/6/2021	12:15
10/6/2021	12:30	11/30/2021	13:30
11/30/2021	14:15	1/17/2022	14:15

South Bay

Deploy Date	Deploy Time	Retrieve Date	Retrieve Time
11/24/2020	11:30	1/7/2021	11:30
1/7/2021	11:45	2/18/2021	11:00
2/18/2021	11:15	4/26/2021	10:45
4/26/2021	11:15	5/26/2021	13:30
5/26/2021	13:45	7/2/2021	10:15
7/2/2021	10:45	8/24/2021	14:30
8/24/2021	14:45	10/6/2021	11:45
10/6/2021	12:00	12/1/2021	13:00
12/1/2021	13:30	1/17/2021	14:45

7) 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 process 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: <http://www.nerrdata.org/>; accessed 12 October 2020.

NERR water quality 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.nerrdata.org. Data are available in comma delimited format.

8) Associated researchers and projects –

The research program at the TRNERR focuses on adaptive approaches to wetlands management, which involves coupling scientific investigation with management action. One focal area of research continues to be adaptive restoration, and the TRNERR has a long history of science-based restoration efforts. These programs incorporate descriptive and experimental approaches to investigate biotic and abiotic responses to marsh restoration, including ways to better achieve desired ecosystem responses. Two SWMP sites, based in South San Diego Bay, are associated with planned restoration of salt ponds in that area. Another active area of research is invasive species ecology and management. Although estuaries are typically invaded by a broad suite of species from many habitat types, current research is focusing on terrestrial and riparian invaders able to cross ecotones and invade salt marsh habitats. Researchers at the TRNERR are investigating mechanisms of invasions, impacts of invaders, and ecosystem recovery after exotic species control.

NERR SWMP water quality and weather data are used in a variety of reserve-based and external research and education programs. Water quality data from the Tijuana River, which rarely experienced mouth closure prior to 2016, provided an interesting contrast to data from other regional systems, which experience frequent closure events. During the 2016 El Niño and until recently, the river mouth experienced few closures, and therefore the water quality and nutrient data were crucial to detect the imminent closures as well as to identify the effects on the system. Besides the importance of the SWMP data for Research and Stewardship purposes, SWMP water quality data are incorporated into a high school curriculum developed at the reserve, serving as a great tool for the Education and Outreach programs.

Tier 1 nutrient sampling is being conducted monthly at all water quality datalogger stations. NERR SWMP meteorological data is collected at 15-minutes intervals at 1 station which is located near the former Tidal Linkage water quality station. These data are available at www.nerrsdata.org.

II. Physical Structure Descriptors

9) Sensor specifications –

YSI 6600EDS V2-4 sondes were used at South Bay and Pond Restored until January 7, 2021. These sondes had depth, temperature/conductivity, ROX DO, pH, turbidity, and chlorophyll probes.

All sites now utilize YSI EXO2 or YSI EXO3 sondes with depth, temperature/conductivity, ROX DO, pH and turbidity probes.

YSI 6600EDS data sonde:

Parameter: Temperature

Units: Celsius (C)

Sensor Type: Thermistor

Model#: 6560

Range: -5 to 50 C

Accuracy: +/- 0.15

Resolution: 0.01 C

Parameter: Conductivity

Units: milli-Siemens per cm (mS/cm)

Sensor Type: 4-electrode cell with autoranging

Model#: 6560

Range: 0 to 100 mS/cm

Accuracy: +/- 0.5% of reading + 0.001 mS/cm

Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity

Units: parts per thousand (ppt)

Sensor Type: Calculated from conductivity and temperature

Range: 0 to 70 ppt

Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater

Resolution: 0.01 ppt

Sensor Type: Optical probe w/ mechanical cleaning

Model#: 6150 ROX

Range: 0 to 500% air saturation

Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 15% or reading

Resolution: 0.1% air saturation

Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 15% of the reading
Resolution: 0.01 mg/L

Parameter: Non-vented Level - Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1 m)
Accuracy: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH – bulb probe
Units: pH units
Sensor Type: Glass combination electrode
Model#: 6561
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90-degree scatter, with mechanical cleaning
Model#: 6136
Range: 0 to 1000 NTU
Accuracy: +/- 2% of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

Parameter: Chlorophyll Fluorescence
Units: micrograms/Liter
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6025
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

YSI EXO Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Wiped probe; Thermistor
Model#: 599827
Range: -5 to 50 C
Accuracy: ± 0.2 C
Resolution: 0.001 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: Wiped probe; 4-electrode cell with autoranging
Model#: 599827

Range: 0 to 100 mS/cm
Accuracy: $\pm 1\%$ of the reading or 0.002 mS/cm, whichever is greater
Resolution: 0.0001 to 0.01 mS/cm (range dependent)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Model#: 599827
Sensor Type: Wiped probe; Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: $\pm 2\%$ of the reading or 0.2 ppt, whichever is greater
Resolution: 0.01 psu

Parameter: Dissolved Oxygen % saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: $\pm 1\%$ of the reading or 1% air saturation, whichever is greater 200-500% air saturation: $\pm 5\%$ or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: ± 0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: $\pm 5\%$ of the reading
Resolution: 0.01 mg/L

Parameter: Non-vented Level - Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 33 ft (10 m)
Accuracy: ± 0.013 ft (0.004 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 599701(guarded) or 599702(wiped)
Range: 0 to 14 units
Accuracy: ± 0.1 units within $\pm 10^\circ$ of calibration temperature, ± 0.2 units for entire temperature range
Resolution: 0.01 units

Parameter: Turbidity
Units: formazin nephelometric units (FNU)
Sensor Type: Optical, 90 degree scatter
Model#: 599101-01
Range: 0 to 4000 FNU
Accuracy: 0 to 999 FNU: 0.3 FNU or $\pm 2\%$ of reading (whichever is greater); 1000 to 4000 FNU $\pm 5\%$ of reading
Resolution: 0 to 999 FNU: 0.01 FNU, 1000 to 4000 FNU: 0.1 FNU

Depth Qualifier:

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either vented or non-vented depth/level sensors. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.02 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or digital calibration log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR can be corrected.

In 2010, the CDMO began automatically correcting Depth/Level data for changes in barometric pressure as measured by the reserve's associated meteorological station during data ingestion. These corrected Depth/Level data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

NOTE: older Depth data cannot be corrected without verifying that the depth offset was in place and whether a vented or non-vented depth sensor was in use. No SWMP data prior to 2006 can be corrected using this method. The following equation is used for corrected Depth/Level data provided by the CDMO beginning in 2010:
$$((1013-BP)*0.0102)+\text{Depth/Level} = \text{cDepth/cLevel}.$$

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving forward, the NERR System will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

10) Coded variable definitions –

Sampling station:	Sampling site code:	Station code:
Boca Rio	BR	tjrbwq
Oneonta Slough	OS	tjroswq
Pond Restored	PR	tjprwq
South Bay	SB	tjrswq

11) 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_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

- 5 Outside High Sensor Range
- 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
- 2 *Open - reserved for later flag*
- 3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
- 4 Historical Data: Pre-Auto QAQC
- 5 Corrected Data

12) 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 deployment or YSI datasonde, sensor errors are sensor specific, 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, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

- GIC No instrument deployed due to ice
- GIM Instrument malfunction
- GIT Instrument recording error; recovered telemetry data
- GMC No instrument deployed due to maintenance/calibration
- GNF Deployment tube clogged / no flow
- GOW Out of water event
- GPF Power failure / low battery
- GQR Data rejected due to QA/QC checks
- GSM See metadata

Corrected Depth/Level Data Codes

- GCC Calculated with data that were corrected during QA/QC
- GCM Calculated value could not be determined due to missing data
- GCR Calculated value could not be determined due to rejected data
- GCS Calculated value suspect due to questionable data
- GCU Calculated value could not be determined due to unavailable data

Sensor Errors

- SBO Blocked optic
- SCF Conductivity sensor failure
- SCS Chlorophyll spike
- SDF Depth port frozen
- SDG Suspect due to sensor diagnostics
- SDO DO suspect

SDP	DO membrane puncture
SIC	Incorrect calibration / contaminated standard
SNV	Negative value
SOW	Sensor out of water
SPC	Post calibration out of range
SQR	Data rejected due to QAQC checks
SSD	Sensor drift
SSM	Sensor malfunction
SSR	Sensor removed / not deployed
STF	Catastrophic temperature sensor failure
STS	Turbidity spike
SWM	Wiper malfunction / loss

Comments

CAB*	Algal bloom
CAF	Acceptable calibration/accuracy error of sensor
CAP	Depth sensor in water, affected by atmospheric pressure
CBF	Biofouling
CCU	Cause unknown
CDA*	DO hypoxia (<3 mg/L)
CDB*	Disturbed bottom
CDF	Data appear to fit conditions
CFK*	Fish kill
CIP*	Surface ice present at sample station
CLT*	Low tide
CMC*	In field maintenance/cleaning
CMD*	Mud in probe guard
CND	New deployment begins
CRE*	Significant rain event
CSM*	See metadata
CTS	Turbidity spike
CVT*	Possible vandalism/tampering
CWD*	Data collected at wrong depth
CWE*	Significant weather event

13) Post deployment information –

Boca Rio (non-vented EXO2 and EXO3)

Deploy Date	Sonde Model	SpCond	DO	pH7	pH10	Turb	Turb	Depth	Level
5/6/2021	EXO2	49.66(50.0)	93.44	7.07	10.08	0.13(0.0)	117.92(124.0)	-0.05	-0.0070(-0.0060)
6/8/2021	EXO2	50.22(50.0)	83.5	10.07	10.07	0.12(0.0)	122.6(124.0)	(-0.0030)	-0.059(-0.059)
7/1/2021	EXO3	49.92(50.0)	88.9	7.07	10.07	-0.04(0.0)	124.54(124.0)	(-0.058)	-0.112(-0.114)
8/16/2021	EXO2	50.57(50.0)	98.3	7.04	10.01	0.3(0.0)	124.5(124.0)	(-0.0030)	-0.055(-0.059)
10/4/2021	EXO2	49.34(50.0)	94.6	7.25	10.25	-0.05(0.0)	124.0(124.0)	-0.011	-0.059(-0.045)
11/15/2021	EXO3	50.86(50.0)	100.2	7.07	10.09	0.07(0.0)	124.06(124.0)	-0.109	0.11(0.053)
12/14/2021	EXO2	49.61(50.0)	92.9	7.18	10.15	0.8(0.0)	121.5(124.0)	-0.013(0.0070)	0

Oneonta Slough (non-vented EXO2)

Deploy Date	Sonde Model	SpCond	DO	pH7	pH10	Turb	Turb	Depth	Level
5/7/2021	EXO2	49.2(50.0)	92.6	7.07	10.05	0.24(0.0)	122.34(124.0)	-0.053	0.354(0.348)
6/8/2021	EXO2	50.38(50.0)	83.1	7.11	10.1	0.28(0.0)	123.6(124.0)	(-0.0030)	0.292(0.292)
7/1/2021	EXO2	50.19(50.0)	82.19	7.05	10.05	-0.27(0.0)	124.34(124.0)	-0.027	0.323(0.322)
8/13/2021	EXO2	50.23(50.0)	101.7	7.1	10.09	0.02(0.0)	124.17(124.0)	(-0.031)	0.275(0.264)
8/17/2021	EXO2	49.79(50.0)	99.6	7.12	10.05	0.37(0.0)	121.12(124.0)	(-0.01)	0.28(0.285)
9/23/2021	EXO2	50.15(50.0)	98.6	7.09	10.09	0.25(0.0)	124.14(124.0)	-0.023	0.311(0.318)
11/2/2021	EXO2	50.8(50.0)	99.33	7.14	10.17	0.25(0.0)	125.15(124.0)	0.099(0.099)	0
12/14/2021	EXO2	49.63(50.0)	106.2	7.16	10.1	0.32(0.0)	123.15(124.0)	-0.0020(0.0030)	0

Pond Restored (non-vented EXO2 and EXO3)

Deploy Date	SondeModel	SpCond	DO	pH7	pH10	Turb	Turb	Depth	Level
1/7/2021	EXO3	50.5(50.0)	102.5	7.18	10.17	0.2(0.0)	115.6(124.0)	-0.09	-0.212(-0.22)
2/18/2021	EXO2	49.27(50.0)	91.5	7.06	10.05	1.2(0.0)	125.9(124.0)	-0.016	-0.402(-0.386)
4/26/2021	EXO2	50.99(50.0)	99.1	6.97	9.97	0.9(0.0)	127.7(124.0)	-0.019	-0.38(-0.383)
5/26/2021	EXO2	48.24(50.0)	95.5	7.09	10.08	1.33(0.0)	126.4(124.0)	-0.038	-0.365(-0.326)
7/2/2021	EXO3	50.72(50.0)	98.4	7.15	10.06	0.09(0.0)	129.0(124.0)	(-0.039)	-0.399(-0.403)
8/24/2021	EXO2	49.83(50.0)	99.87	7.18	10.17	1.7(0.0)	123.46(124.0)	-0.029	-0.33(-0.335)
10/6/2021	EXO2	50.9(50.0)	103.5	7.08	10.08	0.13(0.0)	127.08(124.0)	-0.069	-0.301(-0.295)
11/30/2021	EXO3	49.24(50.0)	100.7	7.05	10.01	4.75(0.0)	126.0(124.0)	0.097(0.102)	0

South Bay (non-vented EXO2 and EXO3)

Deploy Date	Sonde Model	SpCond	DO	pH7	pH10	Turb	Turb	Depth	Level
1/7/2021	EXO3	51.09(50.0)	100.6	7.1	10.11	0.2(0.0)	109.5(124.0)	-0.092	-0.248(-0.258)
2/18/2021	EXO2	7.07(50.0)	90.3	10.05		0.4(0.0)	127.5(124.0)	-0.016	-0.46(-0.455)
4/26/2021	EXO2	50.3(50.0)	97.5	7.11	10.09	0.48(0.0)	130.65(124.0)	-0.022	-0.439(-0.449)
5/26/2021	EXO2	48.82(50.0)	97.2	7.19	10.18	1.68(0.0)	120.5(124.0)	0	-0.476(-0.471)
7/2/2021	EXO2	49.9(50.0)	99.2	7.07	10.01	1.24(0.0)	124.7(124.0)	(-0.067)	-0.534(-0.538)
8/24/2021	EXO3	50.29(50.0)	109.6	7.1	10.09	0.65(0.0)	119.15(124.0)	-0.033	-0.316(-0.317)
10/6/2021	EXO2	50.85(50.0)	100.6	7.09	10.06	-0.3(0.0)	124.45(124.0)	-0.067	-0.419(-0.404)
12/1/2021	EXO2	23.3(50.0)	101.3	7.06	10.06	14.48(0.0)	110.15(124.0)	0.103(0.103)	0

14) Other remarks/notes –

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for “not a number” and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

Precipitation

Rain data included here was recorded by a tipping bucket in the TJRNERR Tidal Link meteorological station.

1/19	0.01in
1/21	0.01in
1/22 -1/25	1in
1/28 -1/29	1.13in
2/13	0.01in
3/3	0.01in
3/10 -3/13	0.54in
3/15	0.01in
3/23	0.01in
3/25	0.05in
4/26	0.04in
5/2	0.01in
6/23	0.05in
8/3	0.01in
8/29	0.01in
10/4-5	0.58in
10/7-8	0.08in
10/25	0.24in
12/8-9	0.24in
12/14-17	1.08in

Site specific issues

Office and field work were still affected by COVID-19 restrictions, causing some of the datalogger deployments at TJR SWMP stations to exceed protocol time. Any data that exceeded the 30 days for YSI 6600 sondes or 45 days for YSI EXO sondes are marked and flagged as suspect if seem affected. In addition to COVID-19 restrictions, the water treatment plants at the U.S. and Mexico border had several infrastructure problems that prevented the sewage contaminated Tijuana River water to be treated before entering the estuary, posing a health risk to the reserve staff and affecting datasondes swap at two sites - Boca Rio and Oneonta Slough.

Data showing both recorded and nearly real-time daily discharge of the Tijuana River, measured by the U.S. International Boundary & Water Commission (IBWC) stream gauge, can be obtained at the [IBWC water data dashboard](#).

Boca Rio and Oneonta Slough

Anoxic conditions are frequently observed at the Boca Rio and Oneonta Slough sites. In recent years, these events have become more frequent and prolonged due to more constant polluted flows entering the estuary, resulting from failures in the wastewater infrastructure. The dissolved oxygen (DO) data has reflected this by showing longer periods of low DO, including zero and below zero values. Per protocol, we typically reject the negative (below-zero) values because they are beyond the sensor's specified limits.

To address the issue of negative values and ensure we capture the most accurate data possible with our equipment, we calibrated the dissolved oxygen (DO) sensor using a two-point method with both a zero

percent solution and 100% saturated water over several months. However, changing the calibration did not yield significant improvements.

Considering that small negative values are still within the sensor's accuracy range, and recognizing that rejecting these values would result in the loss of important information about anoxia, we have decided to flag all negative values at or above -5% DO as "suspect" instead of rejecting them. In these cases when DO% is at or above -5%, DO mg/L are only marked suspect if they are negative as well. DO mg/L values at or above 0 in those situations are not flagged/coded.

Boca Rio

The following data were flagged because they exceeded protocol time:

01/03/2021 00:00 - 05/06/2021 10:45.

08/16/2021 00:00 – 08/16/2021 08:45

10/01/2021 00:00 – 10/04/2021 13:45

01/01/2021 00:00 - 05/06/2021 10:45 Level data was flagged suspect because its post-check was 13.9cm off.

03/04/2021 05:00 – 05/06/2021 10:45 Water quality was highly affected by sewage contamination during this deployment. DO data seem affected and to have drifted, and therefore were marked suspect or rejected when exceeding the sensor limit, in this case, all values below zero.

05/06/2021 11:00 – 06/08/2021 14:30 There are several dips in Specific Conductivity and salinity data during this deployment. After investigating possible causes, it was determined to be a wiper issue, which might also have affected dissolved oxygen data.

11/15/2021 14:30 – 15:00: Data is missing due to the removal of the datasonde tube for cleaning and RTK GPS elevation survey.

11/15/2021 15:15 to 12/31/2021 23:45: RTK survey wasn't post-processed right away and, during this period, depth was calibrated without adding the station offset. Data were corrected by **adding** the surveyed offset, **-0.065 m**, to the level data.

Oneonta Slough

The following data were flagged as suspect because they exceeded protocol time:

01/05/2021 00:00 - 05/07/2021 11:45. DO data seem affected.

06/09/2021 13:45 - 14:30 We changed the telemetry equipment from Campbell Scientific Sutron to YSI Storm3. The deployment file template in the sonde wasn't compatible with the new Storm3 equipment and data weren't telemetered. To resolve this issue, we took the sonde back to the office for an hour to modify the deployment file. As a result, the sonde generated multiple raw files, but they all belong to a single deployment period from June 8th to July 1st.

07/01/2021 11:15 – 08/13/2021 08:45 There are dips in Specific Conductivity and salinity data during this deployment. After investigating possible causes, it was determined to be a wiper issue.

11/02/2021 13:30 – 14:15: Data is missing due to the removal of the datasonde tube for cleaning and RTK GPS elevation survey.

11/02/2021 14:15 to 12/31/2021 23:45: RTK survey wasn't post-processed right away and, during this period, depth was calibrated without adding the station offset. Data were corrected by **adding** the surveyed offset, **0.263m**, to the level data.

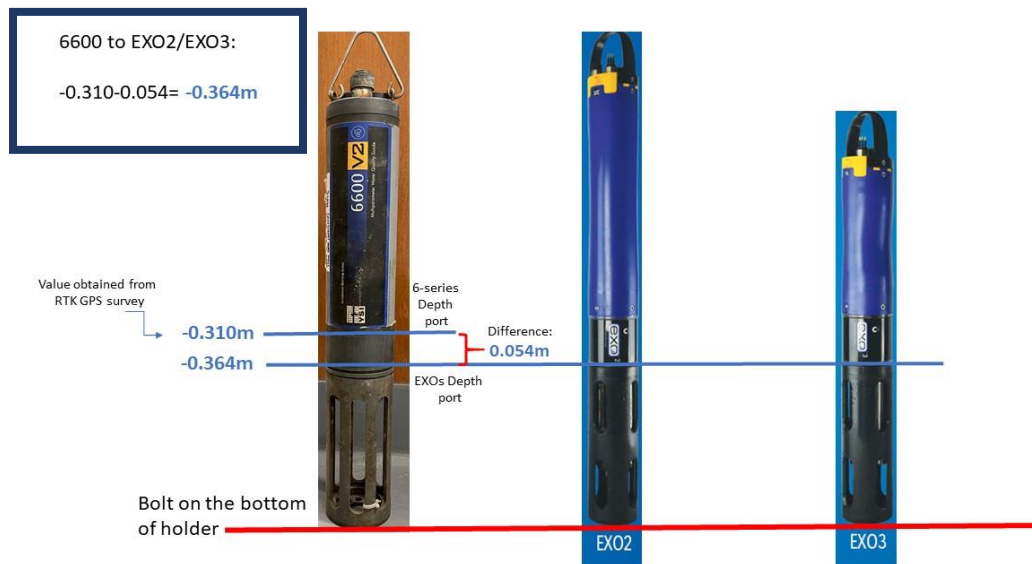
Pond Restored

The following data were flagged as suspect because they exceeded protocol time:

01/01/2021 00:00 - 01/07/2021 12:00
04/05/2021 00:00 - 04/26/2021 11:45
08/16/2021 00:00 – 08/24/2021 14:30
11/21/2021 00:00 – 11/30/2021 13:30

On January 7, 2021 the sonde model at this site was changed from YSI 6-series to YSI EXO, resulting in the following changes to the dataset:

- Chlorophyll measurements were no longer recorded
- Station offset changed from -0.310m to -0.364m (NAVD88). The new offset was calculated as shown below:



11/30/2021 13:45 – 14:00: Data is missing due to the removal of the datasonde tube for cleaning and RTK GPS elevation survey.

On November 30, 2021, the Pond Restored sonde was surveyed with RTK GPS before removing the tube for deep cleaning and after reinstalling it. The measurements were:

Before removal: -0.381m

After reinstalling: -0.397m

The measurement before removal was 0.017m different from the offset calculated when changing sonde models. So, after this survey the level data was corrected to reflect the offsets measured with the high accuracy RTK GPS. Data before the survey was corrected to -0.381m, and data after the survey were corrected to -0.397m; see details below:

1. 01/07/2021 12:15 to 02/18/2021 10:30 – Data was incorrectly calibrated to -0.310m.
Correction was done to the right offset, -0.381m, by **subtracting 0.071m** from the level data.
2. 02/18/2021 10:45 to 05/26/2021 13:00 – Data was incorrectly calibrated to -0.402m.
Correction was done to the right offset, -0.381m, by **adding 0.021m** to the level data.
3. 05/26/2021 13:00 to 11/30/2021 13:30 – Data was calibrated to -0.364m.
Correction was done to the right offset, -0.381m, by **subtracting 0.017m** from the level data.
4. 11/30/2021 14:15 – 12/31/2021 23:45 – RTK survey wasn't post processed right away and, during this period, depth was calibrated without adding the station offset. Data was corrected by **adding** the surveyed offset, **-0.397m**, to the level data.

South Bay

The following data were flagged as suspect because they exceeded protocol time:

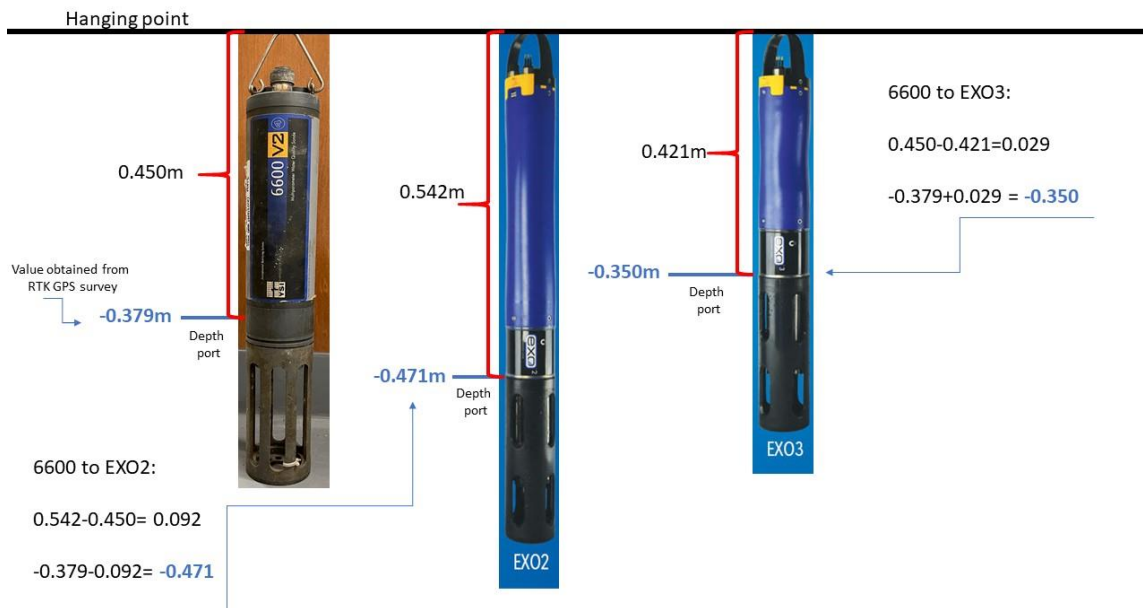
01/01/2021 00:00 - 01/07/2021 11:30
04/05/2021 00:00 - 04/26/2021 10:30
08/16/2021 00:00 – 08/24/2021 15:00
11/21/2021 00:00 – 12/01/2021 13:00

Dissolved oxygen seems affected by mud and biofouling from
04/01 20:00 – 04/26 10:45

On January 7, 2021, the sonde model at this site was changed from YSI 6-series to YSI EXO, resulting in the following changes to the dataset:

- Chlorophyll measurements were no longer recorded

- Station offset changed. Because sondes hung from a fixed length chain, EXO2 and EXO3 models had different offsets. The new offsets were calculated by measuring the distance from the hanging point to the depth port on each EXO sonde and adding/subtracting that to/from the 6-series sonde offset. See the measurements and calculations below:



In summary, sondes were calibrated to the following offsets (measurements are in NAVD88 vertical datum):

6-series (surveyed in February 2015): -0.379m
EXO2: -0.471m
EXO3: -0.350m

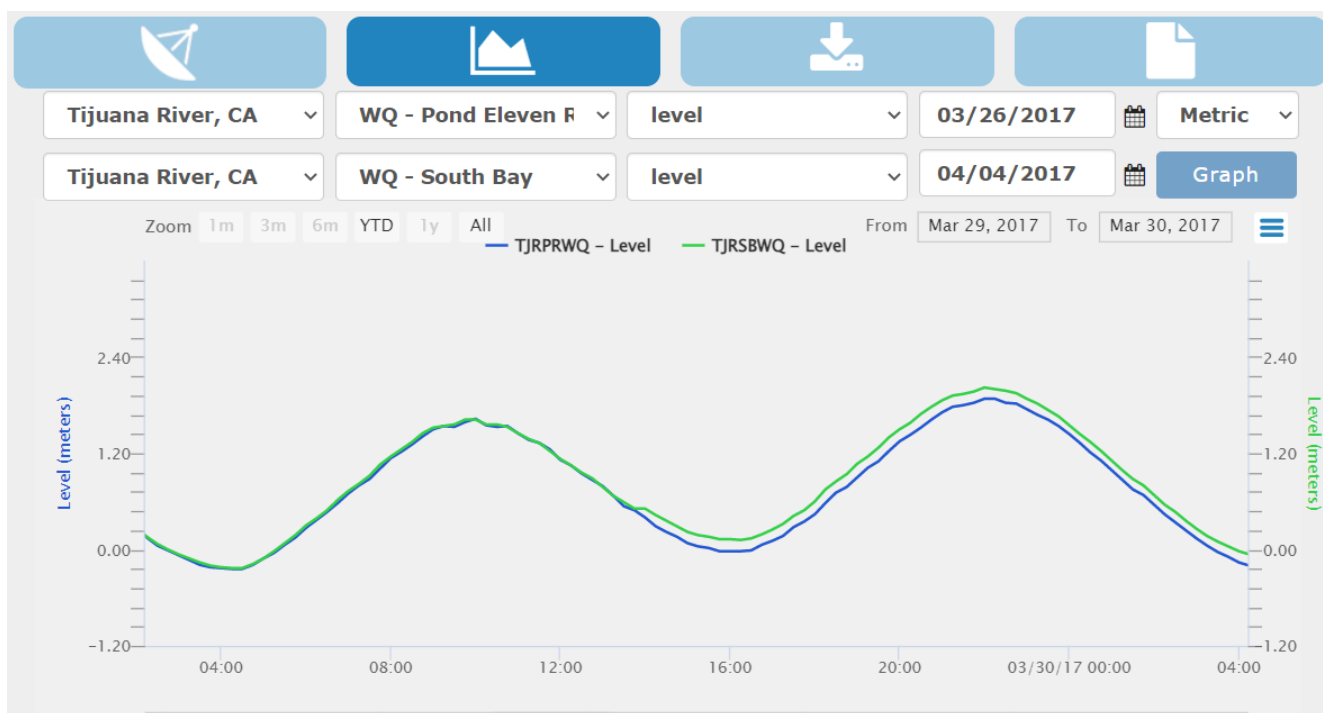
12/01/2021 13:15: Data is missing due to the removal of the datasonde tube for cleaning and RTK GPS elevation survey.

On December 01, 2021, the South Bay sonde was RTK surveyed before removing the tube for deep cleaning and after reinstalling it. The measurements were:

Before removal: -0.631m (EXO2 model)

After reinstalling: -0.629m (a bolt was placed on the tube and both EXO2 and EXO3 models now rest on it, therefore the depth port offset for the two models are now the same).

The difference between the offset used to calibrate the sondes and the offset measured before the removal was 0.160m. After investigating the data and the field procedures, it was determined that the sonde was inadvertently hung on a different chain link at the 03/29/2017 14:00 switch out, and the sonde was deployed 0.160m deeper, as Seen in the graph below:



In addition, after surveying the datasonde on 12/01/2021, the survey results weren't post-processed until 05/11/2022; during this period, sondes were calibrated without the station offset.

For these reasons, there are two periods of differing Level data correction:

1. 03/29/2017 14:00 to 12/01/2021 13:15 – we subtracted 0.160m from the data.
2. 12/01/2021 13:30 to 05/11/2022 10:30 – we added the new offset -0.629m to the data.

All level corrections were verified by graphing level data recorded by SWMP datasondes and compared to NOAA tide stations that share general location and characteristics. For instance, Boca Rio and Oneonta Slough were graphed together and verified against data from the NOAA 9410230 La Jolla, CA tide station. South Bay and Pond Restored were graphed together and verified against data from the NOAA 9410170 San Diego, CA tide station.