**San Francisco Bay (SFB)** **NERR Meteorological Metadata**

**January 1 – June 30, 2024**

**Latest Update:** July 31, 2024

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@belle.baruch.sc.edu) or Reserve with any additional questions.

**I. Data Set and Research Descriptors**

**1) Principal investigator(s) and contact persons**

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**2) Entry verification**

Data are uploaded from the CR1000 data logger to a personal computer with a Windows 7 or newer operating system. Files are exported from LoggerNet in a comma-delimited format and uploaded to the CDMO where they undergo automated primary QAQC and become part of the CDMO’s online provisional database. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the reserve 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, append files, and export the resulting data file to the CDMO for tertiary QAQC and assimilation into the CDMO’s authoritative online database. For more information on QAQC flags and QAQC codes, see Sections 11 and 12. Anna Deck was responsible for 2024 data management.

**3) Research objectives**

As part of the System Wide Monitoring Program (SWMP), a meteorological station is used to supplement the collection of water quality and biological data. Overall goals of the San Francisco Bay NERR/SWMP meteorological monitoring effort are to collect weather data to: 1.) Document short-term variability and long-term changes in atmospheric conditions at the Reserve sites (*e.g*., localized impacts of seasonal storm events, interannual differences in rainfall, magnitude and influence of El Niño – La Niña events, etc.). 2.) Provide insight into patterns or occurrences in meteorological conditions that have direct relevance to estuarine communities and resource-management practices. 3.) Integrate these data into the broader Central and Northern California Ocean Observing System (CeNCOOS) that links to a wide variety of real-time data on water quality, currents and weather around the region. Together these data provide an ecosystem-based network for understanding the environmental conditions and ecological processes of the San Francisco Bay.

**4) Research methods**

Campbell Scientific data telemetry equipment was installed at the Rush Ranch station on 8/16/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B016066. 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 in the CDMO’s authoritative online database. Provisional and authoritative data are available at [http://cdmo.baruch.sc.edu](http://cdmo.baruch.sc.edu/).

The Campbell Scientific weather station samples a variety of parameters every five seconds continuously throughout the year. High-resolution 5-second data are averaged over 15-minute intervals and recorded for air temperature (°C), relative humidity (%), barometric pressure (mb), wind speed (m/s), wind direction (degrees), and battery voltage (volts). Maximum wind speed (m/s) and timestamp from the five-second data and standard deviation of wind direction (degrees) are also recorded. Maximum and minimum readings and their times from 5-second data for air temperature are available directly from the Reserve through the contacts provided above. Fifteen minute totals are recorded for rainfall (mm), photosynthetically active radiation or PAR (millimoles/m2), and cumulative precipitation (mm). Data are reported in Pacific Standard Time (PST) for the year.

The meteorological station is visited monthly to download the data to a laptop computer through direct connection via a nine-pin serial cable. At the time of download, the current readings of the CR1000 are displayed and compared to readings from an external device (Kestrel 4000) to cross check sampling accuracy. The station is also maintained during these visits; the wind sensor is checked to make sure there are no obstructions and can move freely, and the PAR and temperature/relative humidity sensors and the tipping rain bucket are cleaned as needed. Sensors are calibrated on a one to two year schedule by swapping the existing sensors with ones that have been freshly calibrated, and by manually calibrating the precipitation gauge. The following is a list of the most recent installation and calibration dates for each sensor type in 2018. See Section 9 of this document for a complete list of sensor swaps and calibrations.

|  |  |  |  |
| --- | --- | --- | --- |
| Sensor | Calibration schedule | Date installed | Calibration Date |
| PAR | Every 2 years | 08/01/2023-current | 08/01/2023 |
| BP | Every 2 years | 02/15/2024-current | 12/28/2023 |
| Temp/RH | Yearly | 02/15/2024-current | 11/16/2023 |
| Wind Speed/Direction | Every 2 years | 11/21/2022-current | 08/25/2022 |
| Rain | Yearly | N/A | 08/01/2023 |
| CR1000 | Every 5 years | 08/16/2019-current | 07/24/2019 |

 During 2024, the following programs were in use. Program changes reflect minor updates.

sfbrrmet\_6.5\_072123 (8/1/23 – 2/15/24)

sfbrrmet\_CR1000\_6.5\_021524 (2/15/24 - current)

**5) Site location and character**

The San Francisco Estuary is the largest estuary on the west coast. There are four main bays; Central Bay, South Bay, San Pablo Bay and Suisun Bay. The San Francisco Bay National Estuarine Research Reserve (SFBNERR) is a multi-component site totaling approximately 3,700 acres. Reserve sites include tidal salt marsh at China Camp State Park (38°0'4.49"N, 122°27'37.28"W) in San Pablo Bay and brackish tidal marsh at Rush Ranch Open Space Preserve (38°13'21.00"N, 122°01'33.60"W) in Suisun Marsh. The two component sites include open water, tidal wetland, and adjacent upland buffer habitats and are well-protected remnants of the diverse plant and animal communities that once occupied the salinity gradient within the estuary. Development within the watersheds of the sites ranges from predominantly urban/suburban to protected land/agricultural.

The meteorological station is located within the Rush Ranch Open Space Preserve in the transition zone from the brackish tidal marsh to the upland grassland habitat. The station is placed just above mean higher high water in a flat grass area approximately 10 meters from marsh vegetation and is free from obstructions overhead or nearby. The latitude and longitude of the meteorological station are 38° 12’ 01.6 N, 122° 1' 35.3 W and its elevation is approximately 3.96 meters. The upland habitat is undeveloped aside from a nature center, historical barn, and horse corrals, all of which are almost a kilometer away from the meteorological station. The surrounding grassland is used intermittently for agricultural grazing of cattle.

The tower itself is a Campbell Scientific 20 foot (6.1 m) metal tower. The sensors are located at 7.5 m (wind, PAR), 2.5 m (barometric pressure), 1.75 m (temperature and relative humidity), and 1 m (rain gauge) above the ground. The rain gauge is a separate unit located about 3 m from the tower. Historically, the temperature and relative humidity sensor was located at 7.5 m, but was shifted to the lower 1.75 m height on 11/23/2015 to match standard National Weather Service protocol. See SFB MET 2015 metadata Section 13 for additional details.

There are two water quality monitoring stations at Rush Ranch Open Space Preserve. The First Mallard station is located at the intersection of Cutoff Slough and First Mallard Creek (38° 11' 41.70 N, 122° 1' 58.02 W) and is approximately 3.13 km southwest of the weather station. The Second Mallard station is located at the intersection of Cutoff Slough and Second Mallard Creek (38° 11' 02.8 N, 122° 0' 48.9 W) and is approximately 4.52 km southeast of the weather station.

The weather station’s location is representative of the atmospheric conditions at the water quality stations at Rush Ranch. Rush Ranch is located about 40 kilometers inland of the other Reserve site, China Camp State Park. At China Camp there are two water quality monitoring stations and due to the distance from and distinct differences in climate at Rush Ranch, this meteorological station is not representative of the conditions at China Camp.

Station Measurements:

|  |  |  |
| --- | --- | --- |
| **Tower and sensor heights**  | **Height (*meters*)** | **Notes** |
| Tower | 6.1 | Campbell Scientific metal tower |
|  |  |  |
| Temperature/Relative Humidity | 1.75 | Moved to 1.75 m in 2015, located ~2.5 m from tower |
| Barometric Pressure | 2.5 | Located inside enclosure attached to tower |
| Wind | 7.5 | Located ~0.6 m from tower |
| PAR | 7.5 | Located ~0.6 m from tower |
| Precipitation gauge | 0.8  | Located ~3 m from tower |

SWMP Station Timeline:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Station Code | Station Name | SWMP Status | Location | Active Dates | Reason Decommissioned | Notes |
| SFBRRMET | Rush Ranch | P | 38° 12' 01.6 N, 122° 1' 35.3 W | 08/01/2006 00:00 - | NA | NA |

**6) Data collection period -** Included in annual metadata document.

**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 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: <http://www.nerrsdata.org/>; *accessed* 12 October 2024.

NERR meteorological data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page [www.nerrsdata.org](http://www.nerrsdata.org).  Data are available in comma delimited format.

**8) Associated researchers and projects**

These meteorological data are part of the NERR SWMP long-term monitoring program. SFB NERR also monitors 15-minute water quality along with monthly grab samples and diel sampling for nutrient data which may be correlated with this meteorological dataset. These data are available at [www.nerrsdata.org](http://www.nerrsdata.org). There are a total of four water quality stations where data is collected continuously with YSI data sondes. There are two stations located at China Camp State Park and two stations at Rush Ranch Open Space Preserve. Nutrient sampling is also conducted at the four sites at water depths adjacent to the sondes. The Reserve also monitors marsh vegetation and benthic invertebrates.

**II. Physical Structure Descriptors**

**9) Sensor specifications**

Parameter: Temperature

Units: Celsius

12/05/2007 – 01/17/2020

Sensor type: Platinum resistance temperature detector (PRT)

Model #: HMP45C Temperature and Relative Humidity Probe

Operating Temperature: -40°C to +60°C

Range: -40°C to +60°C

Accuracy: ± 0.2 °C @ 20°C

01/17/2020 - present

Sensor type: Pt1000 Class A

Model #: EE181 Temperature and Relative Humidity Probe

Operating Temperature: -40°C to +60°C

Range: -40°C to +60°C

Accuracy: ±0.2 °C @ 23°C

Date of Last calibration:

2006: s/n A5250046 was installed (calibration date unknown)

12/05/2007: s/n C3610004 was installed (calibration date 09/03/2007)

09/22/2009: s/n A5250046 was installed (calibration date 08/09/2009)

09/23/2010: s/n F4610016 was installed (calibration date 08/28/2010)

09/29/2011: s/n F4610016 was installed (calibration date 11/16/2010)

11/29/2011: s/n F5230141 was installed (calibration date 10/17/2011)

10/23/2012: s/n D0930093 was installed (calibration date 09/20/2012)

09/25/2013: s/n F5230141 was installed (calibration date 08/13/2013)

09/03/2014: s/n D0930093 was installed (calibration date 02/12/2014)

04/08/2015: s/n F5230141 was installed (calibration date 10/28/2014)

11/23/2015: s/n D0930093 was installed (calibration date 05/15/2015)

08/15/2016: s/n F5230141 was installed (calibration date 07/27/2016)

08/17/2017: s/n D0930093 was installed (calibration date 07/20/2017)

07/10/2018: s/n F5230141 was installed (calibration date 06/06/2018)

07/16/2019: s/n C3610004 was installed (calibration date 05/07/2019)

01/17/2020: s/n 192416000.254AA was installed (calibration date 01/01/2020)

01/15/2021: s/n 201516001268AE was installed (calibration date 11/01/2020)

01/14/2022: s/n 192416000.254AA was installed (calibration date 11/19/2021)

02/13/2023: s/n 2015160012640C was installed (calibration date 12/08/2022)

02/15/2024: s/n 23451600108887 was installed (calibration date 11/16/2023)

Parameter: Relative Humidity

Units: Percent

12/05/2007 – 01/17/2020

Sensor type: Vaisala HUMICAP© 180 capacitive relative humidity sensor

Model #: HMP45C Temperature and Relative Humidity Probe

Range: 0-100% non-condensing

Accuracy at 20°C: +/- 2% RH (0-90%) and +/- 3% (90-100%)

Temperature dependence of RH measurement: +/- 0.05% RH/°C

01/17/2020 - present

Sensor type: HC101

Model #: EE181 Temperature and Relative Humidity Probe

Range: 0-100% non-condensing

Accuracy: –15 to 40 °C: ≤90% RH ± (1.3 + 0.003 • RH reading) % RH

–15 to 40 °C: >90% RH ± 2.3% RH

–25 to 60 °C: ± (1.4 + 0.01 • RH reading) % RH

–40 to 60 °C: ± (1.5 + 0.015 • RH reading) % RH

Temperature dependence of RH measurement: typically 0.03% RH/°C

***Note:*** This sensor caps relative humidity values at 100%, measured values >100% are altered to 100%

Date of Last calibration:

2006: s/n A5250046 was installed (calibration date unknown)

12/05/2007: s/n C3610004 was installed (calibration date 09/03/2007)

09/22/2009: s/n A5250046 was installed (calibration date 08/09/2009)

09/23/2010: s/n F4610016 was installed (calibration date 08/28/2010)

09/29/2011: s/n F4610016 was installed (calibration date 11/16/2010)

11/29/2011: s/n F5230141 was installed (calibration date 10/17/2011)

10/23/2012: s/n D0930093 was installed (calibration date 09/20/2012)

09/25/2013: s/n F5230141 was installed (calibration date 08/13/2013)

09/03/2014: s/n D0930093 was installed (calibration date 02/12/2014)

04/08/2015: s/n F5230141 was installed (calibration date 10/28/2014)

11/23/2015: s/n D0930093 was installed (calibration date 05/15/2015)

08/15/2016: s/n F5230141 was installed (calibration date 07/27/2016)

08/17/2017: s/n D0930093 was installed (calibration date 07/20/2017)

07/10/2018: s/n F5230141 was installed (calibration date 06/06/2018)

07/16/2019: s/n C3610004 was installed (calibration date 05/07/2019)

01/17/2020: s/n 192416000.254AA was installed (calibration date 01/01/2020)

01/15/2021: s/n 201516001268AE was installed (calibration date 11/01/2020)

01/14/2022: s/n 192416000.254AA was installed (calibration date 11/19/2021)

02/13/2023: s/n 2015160012640C was installed (calibration date 12/08/2022)

02/15/2024: s/n 23451600108887 was installed (calibration date 11/16/2023)

Parameter: Barometric Pressure

Units: millibars (mb)

Sensor type: Vaisala Barocap © silicon capacitive pressure sensor

Model #: CS-105, CS-106

Operating Range: Pressure: 600 to 1060 mb (CS105), 500 to 1100 mb (CS106); Temperature: -40°C to +60°C;

Humidity: non-condensing

Accuracy: ± 0.5 mb @ 20°C; +/- 2 mb @ 0°C to 40°C; +/- 4 mb @ -20°C to 45°C; +/- 6 mb @ -40°C to 60°C (CS105); ± 0.3 mb at +20°C, ± 0.6 mb at 0°C to 40°C, ± 1 mb at -20°C to +45°C, ± 1.5 mb at -40°C to +60°C (CS106)

Stability: ± 0.1 mb per year

Date of Last calibration:

12/05/2007: s/n C2430021 was installed (calibration date 06/15/2007, multiplier 0.240/500)

09/22/2009: s/n A0240014 was installed (calibration date 08/26/2009, multiplier 0.184/600)

09/29/2011: s/n C2430021 was installed (calibration date 09/14/2011, multiplier 0.240/500)

09/25/2013: s/n A0240014 was installed (calibration date 08/22/2013, multiplier 0.184/600)

06/13/2014: s/n J4930005 was installed (calibration date 12/05/2013, multiplier 0.241/500)

11/23/2015: s/n A0240014 was installed (calibration date 10/27/2015, multiplier 0.184/600)

12/05/2017: s/n J4930005 was installed (calibration date 10/27/2015, multiplier 0.241/500)

01/17/2020: s/n D1440006 was installed (calibration date 11/26/2019, multiplier 0.241/500)

01/14/2022: s/n A0240014 was installed (calibration date 11/19/2021, multiplier 0.184/600)

Parameter: Wind speed

Units: meter per second (m/s)

Sensor type: 18 cm diameter 4-blade helicoids propeller molded of polypropylene

Model #: R.M. Young 05106 Wind Monitor

Range: 0-60 m/s (134 mph); gust survival 100 m/s (220 mph)

Accuracy: +/- 0.3 m/s

Date of last calibration:

12/05/2007: s/n 81058 was installed (Campbell check date unknown)

09/22/2009: s/n 65477 was installed (Campbell check date 08/26/2009)

09/29/2011: s/n 81058 was installed (Campbell check date 09/02/2011)

10/23/2012: s/n 65477 was installed (Campbell check date 08/16/2012)

10/08/2014: s/n 81058 was installed (Campbell check date 02/20/2014)

05/16/2016: s/n 65477 was installed (Campbell check date 01/15/2016)

07/10/2018: s/n 81058 was installed (Campbell check date 05/02/2018)

09/22/2020: s/n 84730 was installed (Campbell check date 08/24/2020)

11/21/2022: s/n 65477 was installed (Campbell check date 08/25/2022)

Parameter: Wind direction

Units: degrees

Sensor type: balanced vane, 38 cm turning radius

Date of last calibration:

12/05/2007: s/n 81058 was installed (Campbell check date unknown)

09/22/2009: s/n 65477 was installed (Campbell check date 08/26/2009)

09/29/2011: s/n 81058 was installed (Campbell check date 09/02/2011)

10/23/2012: s/n 65477 was installed (Campbell check date 08/16/2012)

10/08/2014: s/n 81058 was installed (Campbell check date 02/20/2014)

05/16/2016: s/n 65477 was installed (Campbell check date 01/15/2016)

07/10/2018: s/n 81058 was installed (Campbell check date 05/02/2018)

09/22/2020: s/n 84730 was installed (Campbell check date 08/24/2020)

11/21/2022: s/n 65477 was installed (Campbell check date 08/25/2022)

Parameter: Photosynthetically Active Radiation (PAR)

12/14/2007 – 8/17/2017:

Units: mmoles m-2 (total flux)

Sensor type: High stability silicon photovoltaic detector (blue enhanced)

Model #: LI190SB

Light spectrum waveband: 400 to 700 nm

Temperature dependence: 0.15% per °C maximum

Stability: <±2% change over 1 yr

Operating Temperature: -40°C to 65°C; Humidity: 0 to 100%

Sensitivity: typically 5 µA per 1000 µmoles s-1 m-2

Multiplier: see calibration information

8/17/2017 – 8/1/2023:

Units: mmoles m-2 (total flux)

Sensor type: Quantum Sensor; high stability silicon photodiode (blue enhanced) in anodized aluminum case with acrylic diffuser

Model #SQ110 Apogee Quantum Sensor

Light spectrum waveband: 410 to 655 nm

Temperature dependence: 0.06+/-0.06% per °C

Stability: <±2% change over 1 yr

Operating Temperature: -40°C to 70°C; Humidity 0 to 100%

Cosine Response: 45° zenith angle: +/- 2%; 75° zenith angle: +/- 5%

Sensitivity: 0.2mV per µmol s-1 m-2

Multiplier: 0.025

8/1/2023 – present:

Units: mmoles m-2 (total flux)

Sensor type: Quantum Sensor; high stability silicon photodiode (blue enhanced) in anodized aluminum case with acrylic diffuser

Model: CS310 (SQ-500)

Light spectrum waveband: 389 to 692 nm

Temperature dependence: –0.11 ± 0.04%/°C

Stability: < ±2% change over a 1-year periodOperating temperature: –40 to 70 °C

Cosine Response: ±5% at 75° zenith angle

Sensitivity: 0.01 mV per µmol/m2/s

Multiplier: 0.5

Date of last calibration:

12/14/2007: s/n Q38103 installed (model LI190SB, calibration 06/12/2007, multiplier 1.27)

09/22/2009: s/n Q41616 installed (model LI190SB, calibration 09/12/2009, multiplier 1.2997)

04/02/2010: s/n Q38103 installed (calibration 03/10/2010, multiplier 1.3245)

10/18/2010: s/n Q39861 installed (calibration 09/08/2010, multiplier 1.4809)

07/26/2011: s/n Q30334 installed (model LI190SB, calibration 06/01/2011, multiplier 1.1692)

09/29/2011: s/n Q45608 installed (model LI190SL, calibration 06/28/2011, multiplier -1.0 for our program, -200 from the cal sheet)

07/16/2012: s/n Q47150 installed (model LI190SL, calibration 02/08/2012, multiplier -1.0 for our program, -200 from the cal sheet)

02/27/2014: s/n Q45608 installed (calibration 02/14/2014, multiplier 1.019)

06/13/2014: s/n Q47150 installed (calibration 03/21/2014, multiplier -1.0 for our program, -200 from the cal sheet)

07/15/2016: s/n Q47064 installed (model LI190SL, calibration 05/20/2016, multiplier -1.0 for our program, -200 from the cal sheet)

08/17/2017: s/n: 23192 was installed (model SQ-110, calibration 8/1/2017, multiplier 0.025)

09/25/2019: s/n: 28871 was installed (model SQ-110, calibration 5/6/2019, multiplier 0.025)

03/15/2021: s/n: 23940 was installed (model SQ-110, calibration 12/1/2019, multiplier 0.025)

01/14/2022: s/n: 28871 was installed (model SQ-110, calibration 3/1/2021, multiplier 0.025)

05/17/2023: s/n: 23192 was installed (model SQ-110, calibration 4/23/2023, multiplier 0.025)

07/11/2023: s/n: 28871 was installed (model SQ-110, calibration 3/1/2021, multiplier 0.025)

08/01/2023: s/n: 4631 was installed (model SQ-500, calibration 8/1/2023, multiplier 0.5)

Parameter: Precipitation

Units: millimeters (mm)

Sensor type: Tipping Bucket Rain Gauge

Model #: TE525WS

Serial Number: s/n 35455430 (8/1/2006 – 10/11/2017)

s/n 73210-617 (10/11/2017 - present)

Rainfall per tip: 0.01 inch

Operating range: Temperature: 0° to 50°C; Humidity: 0 to 100%

Accuracy: +/- 1.0% up to 1 in./hr; +0, -3% from 1 to 2 in./hr; +0, -5% from 2 to 3 in./hr

Date of calibration: 12/05/2007, 10/30/2009, 10/18/2010, 09/29/2011, 10/20/2012, 10/18/2013, 11/04/2014, 2/12/2015, 2/16/2016, 2/27/2017, 10/11/2017, 01/17/2018, 04/17/2019, 09/17/2020, 06/03/2021, 7/26/2022, 8/1/2023

The CR1000 has 2 MB of Flash EEPROM that is used to store the Operating System. Another 128 K Flash is used to store configuration settings. A minimum of 2 MB SRAM is (4 MB optional upgrade) available for program storage (16K), operating system use, and data storage. Additional storage is available by using a compact flash card in the optional CFM100 Compact Flash Module.

**Date CR1000 Installed:** 08/16/2019 (serial # 5479)

**Date CR1000 Calibrated:** 07/24/2019

**CR1000 Firmware Version (s):**

CR1000\_firmware32 (07/16/2019 - present)

**CR1000 Program Version(s):**

sfbrrmet\_6.5\_072123 (8/1/23 – 2/15/24)

sfbrrmet\_CR1000\_6.5\_021524 (2/15/24 - current)

**CR1000 Calibration/Installation History:**

07/26/2011: s/n 5479 was installed (calibration 05/20/2011)

04/23/2014: s/n 50765 was installed (calibration 09/20/2012)

05/23/2014: s/n 5479 was installed (calibration 05/03/2014)

07/21/2014: s/n 50765 was installed (calibration 09/20/2012)

09/03/2014: s/n 5479 was installed (calibration 05/03/2014)

07/16/2019: s/n 23697 was installed (calibration 03/07/2018)

08/16/2019: s/n 5479 was installed (calibration 07/24/2019)

**GOES transmitter:**

Model number: TX 312

Serial number: 1350

Date installed: 8/1/2006

**10) Coded variable definitions**

Sampling station: Sampling site code: Station code:

Rush Ranch RR sfbrrmet

**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 above or below sensor range, or missing. All remaining data are then flagged 0, as 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 Passed Initial QAQC Checks

 1 Suspect Data

 2 *Open - reserved for later flag*

 3 *Open - reserved for later flag*

 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 CR1000, 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

 GIM Instrument malfunction

 GIT Instrument recording error, recovered telemetry data

 GMC No instrument deployed due to maintenance/calibration

 GMT Instrument maintenance

 GPD Power down

 GPF Power failure / Low battery

 GPR Program reload

 GQR Data rejected due to QA/QC checks

 GSM See metadata

 Sensor Errors

 SDG Suspect due to sensor diagnostics

 SIC Incorrect calibration constant, multiplier or offset

 SIW Incorrect wiring

 SMT Sensor maintenance

 SNV Negative value

 SOC Out of calibration

 SQR Data rejected due to QAQC checks

 SSD Sensor drift

 SSN Not a number / unknown value

 SSM Sensor malfunction

 SSR Sensor removed

 Comments

 CAF Acceptable calibration/accuracy error of sensor

 CCU Cause unknown

 CDF Data appear to fit conditions

 CML Snow melt from previous snowfall event

 CRE\* Significant rain event

 CSM\* See metadata

 CVT\* Possible vandalism/tampering

 CWE\* Significant weather event

**13) Other remarks/notes**

Data are missing due to equipment or associated specific sensors 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.

The model EE181 temperature and relative humidity sensor caps relative humidity values at 100%, measured values >100% are altered to 100%.

Data recorded for all parameters (with the exception of cumulative precipitation) at the midnight timestamp (00:00) are the 15 minute averages and totals for the 23:45-23:59 time period of the previous day. Cumulative precipitation data at the midnight timestamp (00:00) are the sum of raw (unrounded) precipitation data from 00:00 to 23:59 of the previous day. Summing each individual 15-minute total precipitation value from the same period will result in small differences from cumulative precipitation due to rounding. It is especially important to note how data at the midnight timestamp are recorded when using January 1st and December 31st data. **Note: Cumulative precipitation is no longer available via export from the CDMO. Please contact the Reserve or the CDMO for more information or to obtain these data.**

**As recommended by Campbell Scientific, the vent tube for the BP sensor was removed on 8/11/2014 and is no longer being used. Moisture intrusion into the enclosure through the vent tube may reduce sensor and electronic life. The data appear to be unaffected and are not flagged or coded because of this.**

**ALL PARAMETERS**

2/15/24 11:00-11:30 <-3> [GPD] or [GPR] (CSM): all parameters. The datalogger was powered down during this time to install recently calibrated barometric pressure and temperature/relative humidity sensors. A new program was uploaded to the station to accommodate coding for a different model of barometric pressure sensor.

7/17/24 10:00-10:30 <-3> or <-2> [GPD] (CSM): all parameters. The datalogger was powered down to install a new battery at the station.

**PAR**

2/19/24 18:30, 3/14/24 1:15-1:30 <1> (CSM): PAR. At night during these timepoints, the PAR sensor recorded small negative values within the specifications of the sensor. This has not occurred previously with this sensor.

1/1/24 00:00 – 1/8/24 10:30, 1/25/24 11:45 – 2/15/24 10:45 <1> (CSM): PAR. Birds were perching on top of the PAR sensor and mount intermittently during this time. Because it is not possible to discern precisely when birds were interfering with the sensor, all data during this time are marked as suspect.

1/8/24 10:45 – 1/25/24 11:30 <-3> [SMT] or [SSR] (CSM): PAR. The PAR sensor was removed during this time to add additional bird deterrents that would have interfered with sensor readings. The sensor was reinstalled on 1/25.

2/20/24, 3/4-3/8, 3/10, 3/19, 3/28, 3/29, 3/31, 4/6, 4/7, 6/10, 6/11, 6/24-29, 7/2-7/7, 7/9-7/13, 7/17 <1> (CSM): PAR. A new wildlife camera was installed on 2/15/24 to monitor bird activity that may interfere with PAR sensor readings. Because of the way the wildlife camera records activity, it remains difficult to discern each individual timepoint that may have been affected, so all daytime hours on days with some recorded bird activity are marked as suspect.

**Precipitation**

3/19/24 10:15 –3/20/24 00:00 <5> [SMT] (CSM): TotPrcp, CumPrcp. The rain gauge tipping bucket was tipped during cleaning at 9:45. Total precipitation was corrected to 0 at the flagged timepoint on 3/19 10:15, and cumulative precipitation corrected to 0 for the period 3/19 10:15 –3/20 00:00.

6/13/24 7:30 –6/14/24 00:00 <5> [SMT] (CSM): TotPrcp, CumPrcp. The rain gauge tipping bucket was tipped during cleaning at 9:45. Total precipitation was corrected to 0 at the flagged timepoint on 6/13 7:30, and cumulative precipitation corrected to 0 for the period 6/13/24 7:30 –6/14/24 00:00.