

Hudson River (HUD) NERR Meteorological Metadata
January 2024 – December 2024
Latest Update: 9/18/2025

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

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons –

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2) Entry verification –

Data are uploaded from the CR1000X 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.

The Research Coordinator is responsible for data verification.

3) Research objectives –

The objective of this study is to monitor the meteorological conditions at the Tivoli Bays component site of the Hudson River National Estuarine Research Reserve (HRNERR; the Reserve). Measurements of air temperature, relative humidity, barometric pressure, precipitation, photosynthetically active radiation, and wind speed and direction are taken throughout the year at the Tivoli Bays Field Station (FS). A water quality monitoring program has been

ongoing since 1991 at this component site, and the meteorological data will help provide ancillary data. This will help us to better understand the relationships between the atmospheric conditions and aquatic environments at this site.

In 2018, a “secondary SWMP” meteorological monitoring station was incorporated into the Reserve. This station provides a secondary source of the above-mentioned protocol and parameters in the vicinity around the Norrie Point Environmental Center which is home to HRNERR offices. This station will provide supplemental data in conjunction with a water quality station at the same location. The station has been operational since 2008 and historical data are available upon request. Secondary SWMP stations do not undergo tertiary review.

4) Research methods –

Campbell Scientific data telemetry equipment was installed at the Field Station (FS) station on 11/14/2005 and transmits data to the NOAA GOES satellite, NESDIS ID #3B00B4F4. Identical telemetry equipment is installed at the Norrie Point (NP) monitoring station which transmits data to the NOAA GOES satellite, NESDIS ID #3B01301A. The transmissions are scheduled hourly at 0:39:30 after the hour for FS and at 0:35:40 after the hour for NP and contain four (4) data sets reflecting 15-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>.

Data are collected in Eastern Standard Time (EST) for the entire year.

The 15-minute data are collected in the following formats for the **CR1000X**:

Averages from 5-second data:

Air Temperature (°C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed (m/s), Wind Direction (degrees), Battery Voltage (volts)

Maximum and Minimum Air Temperature (°C) and their times from 5-second data (these data are available from the Reserve)

Maximum Wind Speed (m/s) and time from 5-second data

Wind Direction Standard Deviation (degrees)

Totals:

Precipitation (mm), PAR (millimoles/m²), and Cumulative Precipitation (mm) (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.)

Recommended calibration frequency for the MET station sensors:

- Temperature/Humidity - yearly recalibration
- Precipitation Gauge - yearly recalibration
- Wind Speed/Direction - yearly or every 2 years (depending on the sensor)
- Barometric Pressure - every 2 years recalibration
- PAR - every 2 years recalibration
- CR1000X - every 5 years (required beginning 2014)

5) Site location and character –

The HRNERR is a multi-component site totaling approximately 5,000 acres. Each component of the Reserve is referenced by River Mile (RM) of the Hudson River in New York State proceeding north from the southern tip of Manhattan (RM 0). The Reserve includes the following four component sites: Piermont Marsh, Rockland County (RM 24) (41°02'30"N 73°54'15"W), Iona Island, Rockland County (RM 45) (41°18'15"N 73°58'45"W), Tivoli Bays, Dutchess County (RM 98) (42°02'15"N 73°55'10"W), and Stockport Flats, Columbia County (RM 124) (42°02'30"N 73°46'00"W). The Reserve sites are managed at the Norrie Point Environmental Center, the headquarters for the Reserve, in Staatsburg NY, Dutchess County (41°49'53"N, 73°56'32"W). The four component sites include open water, tidal wetland, and adjacent upland buffer habitats and are representative of the diverse plant and animal communities that occupy the salinity gradient within the Hudson River Estuary. Development within the watersheds of the four component sites ranges from predominantly urban/suburban to forested/agricultural.

The “Field Station” weather station (FS) is located at the Tivoli Bays component site in Annandale, NY (42°01'05.46"N 73°55'01.13"W). A 30-foot, aluminum tower is used to elevate some of the weather monitoring equipment. The tower is on the deck of an office building, on the west side, 9 feet (2.7m) off the ground. The wind anemometer is located at the top of the tower, 39 feet (11.9m) off the ground. The photosynthetically active radiation (PAR) sensor is situated approximately 9.7 feet (3m) above the deck and is installed onto a metal arm affixed to the tower. The datalogger and the barometric pressure sensor are enclosed within a fiberglass case attached to the tower, 12 feet (3.7m) off the ground. A rain gauge is adjacent to the tower, attached to the building, 16 feet (4.9m) off the ground. The temperature/humidity sensor is next to the tower, attached to the deck handrail, 12 feet (3.7m) off the ground. GOES telemetry equipment includes a large solar panel and battery, a large enclosure to house the battery, a Campbell TX-312 transmitter, associated GPS for time synchronization and a Yagi antenna.

Although trees surround the area, the tree line begins approximately 60 feet (18.3m) from the tower in most directions. In past years the trees were at similar heights to the tower, but the sensors were not shaded at the location. However, in recent years the surrounding forest canopy height has increased possibly leading to a decline in the accuracy of wind data during leaf-in months (typically May to October). The tower is approximately 0.8 miles (1.3km) southeast of the Tivoli South Bay water quality monitoring station, 1.3 miles (2.1km) southeast of the Tivoli North Bay water quality monitoring station, and 0.2 miles (0.3km) northwest of the now-decommissioned Sawkill Creek water quality monitoring station.

The Norrie Point (NP) weather station is located at the Norrie Point Environmental Center, the HRNERR headquarters in Staatsburg, NY (41°49'53"N, 73°56'32"W). A 30-foot, aluminum tower is used to elevate all of the weather monitoring equipment. The tower is anchored to the concrete patio, south of the HRNERR offices. It is situated directly adjacent (2 meters) to the Hudson River. The wind anemometer and wind speed sensors are located at the top of the tower, 30 feet off the ground. The datalogger and the barometric pressure sensor are enclosed within a fiberglass case attached to the tower, 6 feet off the ground. A rain gauge is attached to the tower, 8 feet off the ground. The temperature/humidity sensor is attached to the tower, 10 feet off the ground. A light sensor is attached to an arm protruding from the tower 12 feet off the ground. GOES telemetry equipment includes a larger solar panel and battery, a larger enclosure to house the battery, a Campbell TX-325 transmitter, associated GPS for time synchronization and a Yagi antenna. The station is surrounded by the Hudson River in all directions but northeast. The tower is located approximately 60 feet from the building, which should minimize any impact from the structure.

Tables summarizing the station characteristics are below:

Field Station:

Tower and sensor heights	Height (meters)	Notes
Tower	9.144	Composed of aluminum
Platform (<i>if applicable</i>)	2.7	Tower is situated on the western deck of an office building
Temperature/Relative Humidity	3.7	Adjacent to the tower, attached to the deck handrail
Barometric Pressure	3.7	Situated within a fiberglass case attached to the tower
Wind	11.9	Situated at the topmost point of the tower
PAR	3	Situated on a metal arm, affixed to the tower
Precipitation gauge	4.9	Adjacent to the tower, affixed to the building roof

Norrie Point:

Tower and sensor heights	Height (meters)	Notes
Tower	9.144	Composed of aluminum

Platform (<i>if applicable</i>)		Anchored to a concrete patio directly adjacent (2m) to the Hudson River
Temperature/Relative Humidity	3.05	Installed directly onto the tower
Barometric Pressure	1.83	Situated within a fiberglass case attached to the tower
Wind	9.144	Situated at the topmost point of the tower
PAR	3.66	Affixed to an arm protruding from the tower
Precipitation gauge	2.44	Affixed to an arm protruding from the tower

SWMP Station Timeline

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
FS	P	Field Station	(42°01'05.46"N 73°55'01.13"W)	July 1999 - Present	NA	NA
NP	S	Norrie Point	(41°49'53"N 73°56'32"W)	Secondary SWMP January 1, 2018 - Present	NA	Non-SWMP May 7, 2008 - December 31 2017

6) Data collection period –

Weather data have been collected at the FS at Tivoli Bays since July 1999 and at NP since May 2008. Weather data provided in this document were collected between 01/01/2024 at 00:00 through 10/16/2024 at 08:30 at the FS and through 10/11/2024 at 10:00 at NP.

Data Retrieval intervals were as follows:

FS

01/01/2024 @ 00:00	01/12/2024 @ 11:15
01/12/2024 @ 11:30	02/26/2024 @ 13:45
02/26/2024 @ 14:00	03/29/2024 @ 09:15
03/29/2024 @ 09:30	04/22/2024 @ 12:45
04/22/2024 @ 13:00	05/23/2024 @ 11:15
05/23/2024 @ 11:30	06/14/2024 @ 10:30
06/14/2024 @ 10:45	08/01/2024 @ 12:30
08/01/2024 @ 12:45	09/17/2024 @ 10:15
09/17/2024 @ 10:30	10/16/2024 @ 08:30
10/16/2024 @ 08:45	11/12/2024 @ 13:30
11/12/2024 @ 13:45	12/10/2024 @ 14:00
12/10/2024 @ 14:15	12/31/2024 @ 23:45

NP

01/01/2024 @ 00:00	01/26/2024 @ 13:30
01/26/2024 @ 13:45	03/04/2024 @ 14:30
03/04/2024 @ 14:45	04/01/2024 @ 13:30
04/01/2024 @ 13:45	05/01/2024 @ 10:00
05/01/2024 @ 10:15	06/26/2024 @ 07:45
06/26/2024 @ 08:00	07/17/2024 @ 11:45
07/17/2024 @ 12:00	07/26/2024 @ 11:45
07/26/2024 @ 12:00	08/21/2024 @ 08:15
08/21/2024 @ 08:30	09/16/2024 @ 08:00
09/16/2024 @ 08:15	09/20/2024 @ 14:00
09/20/2024 @ 14:30	10/07/2024 @ 09:30
10/07/2024 @ 15:00	10/11/2024 @ 10:00
10/11/2024 @ 10:15	10/18/2024 @ 14:30
10/18/2024 @ 14:45	11/01/2024 @ 10:30
11/01/2024 @ 10:45	11/08/2024 @ 13:30
11/08/2024 @ 16:00	11/12/2024 @ 10:15
11/12/2024 @ 10:45	12/13/2024 @ 11:00
12/13/2024 @ 11:15	12/31/2024 @ 23:45

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 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. Data are available in comma delimited format.

8) Associated researchers and projects –

As part of the SWMP long-term monitoring program, HUD NERR also collects 15-minute water quality data and monthly grab and diel samples for nutrient/pigment data which may be correlated with this meteorological dataset. These data are available at www.nerrsdata.org.

II. Physical Structure Descriptors

9) Sensor specifications –

Parameter: Temperature

Units: Celsius

Sensor type: Campbell Scientific 1000 Ω Platinum Resistance Thermometer

Model #: EE181-L Temperature and Relative Humidity Probe

Operating Temperature: -40°C to +60°C

Range: -40°C to +60°C

Accuracy: ± 0.2 °C @ 23°C

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	170516000153DE	09/22/2022	09/12/2023 – Current
NP	164516000139CC	04/21/2022	09/19/2022 – 07/26/2024
NP	170516000140F8	04/21/2022	07/26/2024 – Current

Parameter: Relative Humidity

Units: Percent

Sensor type: HC101

Model #: EE181 Temperature and Relative Humidity Probe

Range: 0-100% non-condensing

Accuracy: -15 to 40 °C: $\leq 90\% \text{ RH} \pm (1.3 + 0.003 \cdot \text{RH reading}) \% \text{ RH}$

-15 to 40 °C: $> 90\% \text{ RH} \pm 2.3\% \text{ RH}$

-25 to 60 °C: $\pm (1.4 + 0.01 \cdot \text{RH reading}) \% \text{ RH}$

-40 to 60 °C: $\pm (1.5 + 0.015 \cdot \text{RH reading}) \% \text{ RH}$

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%

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	170516000153DE	09/22/2022	09/12/2023 – Current
NP	164516000139CC	04/21/2022	09/19/2022 – 07/26/2024
NP	170516000140F8	04/21/2022	07/26/2024 – Current

Parameter: Barometric Pressure

Units: millibars (mb)

In use at FS:

Sensor type: Vaisala Barocap © silicon capacitive pressure sensor

Model #: CS-106 (PTB110)

Operating Range: Pressure: 500 to 1100 mb; Temperature: -40°C to +60°C;

Humidity: non-condensing

Accuracy: $\pm 0.3 \text{ mb}$ at +20°C, $\pm 0.6 \text{ mb}$ at 0°C to 40°C, $\pm 1 \text{ mb}$ at -20°C to +45°C, $\pm 1.5 \text{ mb}$ at -40°C to +60°C

Stability: $\pm 0.1 \text{ mb}$ per year

In use at NP:

Sensor type: BaroVue 10

Model #: BVC10

Operating Range: Pressure: 500 to 1100 mb; Temperature: -40°C to +60°C;

Humidity: non-condensing

Accuracy: $\pm 0.3 \text{ mb}$ at 20°C, $\pm 0.5 \text{ mb}$ at -40°C to 60°C

Stability: $\pm 0.1 \text{ mb}$ per year

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	N1230355	09/26/2022	09/12/2023 - Current
NP	L1430917	04/13/2022	09/16/2022 – 10/11/2024
NP	2674	07/23/2023	10/11/2024 – Current

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 05103-45 Wind Monitor – Alpine Model

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

Accuracy: $\pm 0.3 \text{ m/s}$

Parameter: Wind direction
 Units: degrees
 Sensor type: balanced vane, 55 cm turning radius
 Range: 360°
 Accuracy: +/- 3°

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	WM135260	01/11/2023	09/12/2023 - Current
NP	WM125766	04/18/2022	09/19/2022 – 10/11/2024
NP	140711	10/09/2023	10/11/2024 – Current

Parameter: Photosynthetically Active Radiation (PAR)
 Units: mmols 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

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	4655	07/01/2023	10/24/2023 – Current
NP	17009	04/25/2022	09/19/2022 – 10/11/2024
NP	4657	07/01/2023	10/11/2024 - Current

Parameter: Precipitation
 Units: millimeters (mm)
 Sensor type: Tipping Bucket Rain Gauge with magnetic reed switch
 Model #: RainVue20
 Rainfall per tip: 0.01 inch
 Operating range: Temperature: 1° to +70°C; Humidity: 0 to 100%
 Accuracy: 1% (0 – 500 mm/hour intensity of rainfall)

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	212610	10/24/2023	11/18/2021 – Current
NP	203321	11/01/2024	10/06/2022 - Current

GOES Transmitter:

Model #: TX321
 On-board memory: Non-volatile flash for setup parameters. 16 Kbytes for data.
 Data Transmission Rates: 100, 300 and 1200 BPS
 Transmit Power: 5.6 Watts for 100 and 300 bps, 11.2 watts for 1200 bps
 Frequency range: 401.701 MHz – 402.09850 MHz
 Channel bandwidth: 100/300 BPS 1.5 KHz; 1200 BPS 3 KHz
 Time Keeping: Initial setting accuracy: ± 100 microseconds synchronized to GPS; Drift ± 10 milliseconds/day over operating temperature range; GPS scheduled updates are 1 at power up and once per day thereafter. Once every 28 hours required for continual operation.

Operating range: -40° to +60°C; Storage -50° to +70°C; 0-99% RH, non-condensing
 Power requirements: 10.8 to 16 VDC, 5 mA during GPS fix and 2.6 Amps during transmission

<u>Station</u>	<u>Serial Number</u>	<u>Dates of Transmitter Use</u>
FS	1987	11/18/2021 – Current
NP	1698	05/2008 - 08/06/2021*

Model#: TX325

Data Transmission Rates: 300 and 1200 BPS

Transmit Power: 31 dBm for 300 BPS, 37 for 1200 BPS

Frequency range: 401.701 MHz – 402.09925 MHz

Channel bandwidth: 300 BPS 0.75 KHz; 1200 BPS 2.25 KHz

Time Keeping: Initial setting accuracy: ± 100 microseconds synchronized to GPS; Drift ± 40 milliseconds/day without GPS synchronization; GPS scheduled updates are 1 at power up and once per day thereafter. Once every 28 hours required for continual operation.

Operating range: -40° to +60°C; Storage -55° to +75°C

Power requirements: 10.5 to 16 Vdc; < 2.5 A when transmitting (typical 1.8 A at 12 Vdc); > 5 mA standby (typical 2.8 mA at 12 Vdc); < 50 mA during GPS acquisition (typical 25 mA at 12 Vdc)

<u>Station</u>	<u>Serial Number</u>	<u>Dates of Transmitter Use</u>
NP	300001940	08/06/2021 - Current

Datalogger:

CR1000X:

The CR1000X has a total onboard memory of 128 MB of flash and 4MB of battery backed SRAM. There are 8 MB of flash memory reserved for loading the operating system and 1MB of flash reserved for configuration settings. SRAM is used for the CRBasic program operating memory, communication memory, and data storage, with 72 MB of flash for extended data storage. Additional data storage expansion is available with a removable microSD flash memory card of up to 16 GB.

<u>Station</u>	<u>Type</u>	<u>Front Serial Number</u>	<u>Rear Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	CR1000x	8215		01/17/2019	10/29/2019 - Current
NP	CR1000x	23320		12/16/2020	03/17/2021 - Current

CR1000x Firmware Version (s):

<u>Station</u>	<u>OS</u>	<u>Dates of Use</u>
FS	5.0	11/18/2021 - Current
NP	6.02	03/10/2023 - Current

CR1000x Program Version(s):

<u>Station</u>	<u>Program Name</u>	<u>Dates Used</u>
FS	HUDFSMET_CR1000x_6.1.2_091523	09/15/2023 - Current
NP	HUDNPMET_CR1000x_6.0.13_110723	11/07/23 – 05/01/24
NP	HUDNPMET_CR1000x_6.0.14_050124	05/01/24 – 10/07/24
NP	HUDNPMET_CR1000x_6.0.15_100724	10/07/24 – 11/01/24
NP	HUDNPMET_CR1000x_6.0.16_110124	11/01/24 – 11/08/24
NP	HUDNPMET_CR1000x_6.0.17_111224	11/08/24 - Current

10) Coded variable definitions -

Sampling station:	Sampling site code:	Station code:
Field Station	FS	hudfsmet
Norrie Point	NP	hudnmet

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/CR1000X, 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.

Small negative PAR values are within range of the LI-COR sensor and are due to normal errors in the sensor and the CR1000 Datalogger. The Maximum signal noise error for the LI-COR sensor is +/- 2.214 mmoles/m² over a 15 minute interval. These values are automatically flagged and coded as <1> (CAF).

Relative Humidity data greater than 100 are within range of the sensor accuracy of +/-3% and are flagged and coded as suspect, <1> (CAF). Values greater than 103 are rejected <-3>.

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.**

Precipitation data collected with rain gauges that are not designed specifically for measuring frozen precipitation (snow/ice/hail), including heated gauges and those that use antifreeze to melt frozen precipitation, may not be measured accurately. Blowing wind, sublimation, and rate of snowfall/ice melt all effect the amount of recorded precipitation. The reserve has made attempts to accurately record dates and times when frozen precipitation and subsequent melting has occurred.

Although it is not practical to indicate the exact volume of snowfall and melt, significant rainfall events are cross-referenced with air temperature taken at the simultaneous interval. During months that snowfall is typical, significant rain events (CRE) that coincide with temperatures below 0 C will be recorded as CWE. It is assumed that precipitation fell in the form of ice or snow during these events. Due the non-uniform water content in precipitation in the form of snow and ice, it is assumed that the volume collected is an average and is not indicative of blowing snow or snowdrifts.

Data coded [GPF] Power failure/low battery**NP (04/16/2024 @ 23:30 – 10/15/2024 @ 14:30)**

Periodically within this date, power failures occurred. Each of these periods is marked as <-2>[GPF](CSM). A new battery was installed on 10/18/2024 that resolved these issues. Data points before and after these events that are clearly affected are labeled as <-3>[SSM]. Missing total precipitation data from these events caused a failure of cumulative precipitation calculations, which returned NANs which are marked as <-3>[SSN].

Data coded as [SSN] Not a number/unknown value**NP (05/12/2024 @ 14:30 – 09/15/2024 @ 04:30)**

Within this date range, the station was experiencing infrequent power failures from a failing battery. The battery was replaced on 10/18/2024 which resolved the problem. Sensor specific NANs were caused by these power failures, and affected data are marked as <-3>[SSN](CSM) whereas clearly affected sensor specific data before, after or during these events are marked as <-3>[SSM]. NANs occurring in the total precipitation data during these events caused a failure of cumulative precipitation calculations. These data are marked as <-3>[SSN].

FS (11/14/2024 @ 02:30 – 11/15/2024 @ 11/15/2024 @ 00:00)

A NAN in total precipitation data caused an error with the calculations for cumulative precipitation for the rest of the 24 hour period. Cumulative precipitation data are marked as <-3> [SSN](CSM) for the duration of this event.

Data coded [SSM] Sensor malfunction**NP (03/11/2024 @ 20:30 – 05/01/2024 @ 10:30)**

During this period, the barometric pressure spiked infrequently due to a failing BP sensor. Affected barometric pressure data are labelled as <-3>[SSM](CSM) and <1>[SSM](CSM). The sensor was swapped which resolved the problem on 05/01/2024.

Data coded [SIC] Incorrect calibration constant, multiplier, or offset**NP (11/01/2024 @ 10:45 – 11/08/2024 @ 13:30)**

A new program sent to the datalogger caused the wind direction to have the incorrect multiplier. All wind direction data during this period are labelled <-3>[SIC](CSM). A new program on 11/08/2024 resolved the issue.

Data coded [SMT] Sensor maintenance**NP (10/18/2024 @ 09:15 – 14:30 + 11/01/2024 @ 10:30 – 12:15)**

Precipitation gauge was down for calibration and maintenance during these two periods. Data are labelled <-2>[SMT](CSM).

NP (07/26/2024 @ 12:00)

Air temperature sensor was replaced, data are marked <-2>[SMT](CSM).

Data coded [GMT] Instrument maintenance**NP (10/07/2024 @ 09:45 – 10/07/2024 @ 14:45)**

Box was replaced and rewired, data are labelled as <-2>[GMT](CSM).

NP (10/11/2024 @ 12:30 – 10/11/2024 @ 13:15)

Tower was dropped for replacement of sensors, data are labelled <-2>[GMT](CSM).