

Hudson River (HUD) NERR Meteorological Metadata
January 1, 2022 – December 31, 2022
Latest Update: 07/05/2025

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 Assistant 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. 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. 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 will provide 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 newly established water quality station at the same location. The station has been operational since 2008 and historical data are available upon request.

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 00:39:30 after the hour for Field Station and 00:35:40 after the hour for Norrie Point 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>.

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
- Rain 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

5) Site location and character –

The Hudson River National Estuarine Research Reserve (HUDNERR) 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 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, wind speed, and light sensors are located at the top of the tower, 39 feet (11.9m) off the ground. 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 heated rain gauge is next 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 larger solar panel and battery, a larger enclosure to house the battery, a Campbell TX-321-G 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 1.2 miles (1.9km) southeast of the Tivoli South Bay water quality monitoring station, 2.3 miles (3.7km) southeast of the Tivoli North Bay water quality monitoring station, and 0.2 miles (0.3km) northwest of the Saw Kill Creek water quality monitoring station.

The 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 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 heated 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.

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		Non-SWMP May 7, 2008- December 31 2017

6) Data collection period –

Weather data have been collected at the Field Station at Tivoli Bays since July 1999 and at Norrie Point since May 2008. Weather data provided in this document were collected between 01/01/2022 at 00:00 through 12/31/2022 at 23:45.

Data Retrieval intervals were as follows:

FS

11/18/2021 @ 14:30	01/13/2022 @ 10:30
01/13/2022 @ 10:45	03/08/2022 @ 11:15
03/08/2022 @ 11:30	07/01/2022 @ 11:30
07/01/2022 @ 11:45	07/29/2022 @ 10:15
07/29/2022 @ 10:30	09/08/2022 @ 11:45
09/08/2022 @ 12:00	10/19/2022 @ 11:45
10/19/2022 @ 12:00	11/18/2022 @ 10:30
11/18/2022 @ 10:45	01/05/2023 @ 13:45

NP

12/02/2021 @ 13:00	01/06/2022 @ 12:15
01/06/2022 @ 12:30	02/28/2022 @ 13:15
02/28/2022 @ 13:30	04/01/2022 @ 14:00
04/01/2022 @ 14:15	05/26/2022 @ 12:30
05/26/2022 @ 12:45	07/01/2022 @ 09:45
07/01/2022 @ 10:00	07/27/2022 @ 13:00
07/27/2022 @ 13:15	08/23/2022 @ 07:30
08/23/2022 @ 07:45	09/16/2022 @ 12:15
09/16/2022 @ 14:00	09/19/2022 @ 09:45
09/19/2022 @ 11:00	10/06/2022 @ 12:45
10/06/2022 @ 13:00	12/09/2022 @ 14:15
12/09/2022 @ 14:30	01/12/2023 @ 13:15

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 2022.

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 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.

II. Physical Structure Descriptors

9) Sensor specifications –

Parameter: Temperature

Units: Celsius

Sensor type: Campbell Scientific 1000 Ω Platinum Resistance Thermometer

Model #: EE-181-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	170516000140F8	11/09/2020	11/18/2021 – Current as of 12/31/2022
NP	170516000153DE	12/03/2019	10/06/2020 – 09/19/2022
NP	164516000139CC	04/21/2022	09/19/2022 – Current as of 12/31/2022

Parameter: Relative Humidity

Units: Percent

Sensor type: Campbell Scientific Capacitance RH Sensor

Model #: EE-181-L 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	170516000140F8	11/09/2020	11/18/2021 – Current as of 12/31/2022
NP	170516000153DE	12/03/2019	10/06/2020 – 09/19/2022
NP	164516000139CC	04/21/2022	09/19/2022 – Current as of 12/31/2022

Parameter: Barometric Pressure

Units: millibars (mb)

Sensor type: Vaisala Barocap © silicon capacitive pressure sensor

Model #: CS-106

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

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	L1440691	11/09/2020	11/18/2021 – Current as of 12/31/2022
NP	N1230355	12/03/2019	10/06/2019 – 09/16/2022
NP	L1430917	04/13/2022	09/16/2022 – Current as of 12/31/2022

Parameter: Wind speed

Units: meter per second (m/s)

Sensor type:

Model #: R.M. Young 05103-45 Wind Monitor

Range: 0-100 m/s (224 mph)

Accuracy: $\pm 0.3 \text{ m/s}$ or 1%

Parameter: Wind direction

Units: degrees

Sensor type: balanced vane, 38 cm turning radius

Range: 360°

Accuracy: $\pm 3^\circ$

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	WM140711	11/09/2020	11/18/2021 – Current as of 12/31/2022
NP	WM125404	12/06/2019	10/06/2020 – 09/19/2022
NP	WM125766	04/18/2022	09/19/2022 – Current as of 12/31/2022

Parameter: Photosynthetically Active Radiation (PAR)

Units: mmol m⁻² (total flux)

Sensor type: Quantum Sensor; High stability silicon photovoltaic detector

Model #: Apogee SQ-110

Light spectrum waveband: 410 to 655 nm

Temperature Response: 0.06 ± 0.06% per °C

Stability: <±2% change over 1 yr

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

Sensitivity: 0.2mV per µmol s⁻¹ m⁻²

Multiplier: 0.025 (this does not change)

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	17012	11/01/2020	11/18/2021 – Current as of 12/31/2022
NP	17011	12/03/2019	10/06/2020 – 09/19/2022
NP	17009	04/25/2022	09/19/2022 – Current as of 12/31/2022

Parameter: Precipitation

Units: millimeters (mm)

Sensor type: Tipping bucket with magnetic reed switch

Model #: RainVue20

Rainfall per tip: 0.01 in (0.254mm)

Operating range: 1°C to +70°C; Humidity: 0 to 100%

Accuracy: 1% (0 – 500 mm/hr intensity of rainfall)

<u>Station</u>	<u>Serial Number</u>	<u>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	212610	11/18/2021	11/18/2021 – Current as of 12/31/2022
NP	203321	08/06/2021	08/06/2021 – Current as of 12/31/2022

GOES Transmitter:

Model #: TX321-G

Data Transmission Rates: 300 and 1200 bps

Transmit Power: 31.5 dBm for 300 bps, 37.5 dBm for 1200 bps

Frequency range: 401.701 MHz – 402.09850 MHz

Channel bandwidth: 3 kHz (300bps); 1.5 kHz NOAA/NESDIS GOES High Data Rate Certification Standards version 2 (1200 bps)

Time Keeping: Initial setting accuracy: ± 100 microseconds synchronized to GPS; Drift ± 10 milliseconds/day (without GPS) over operating temperature range; GPS scheduled updates are 1 at power up and once per day thereafter. Once every 28 days (without GPS fix) required for continual operation.

Operating range: -40° to +60°C; Storage -55° to +70°C

Power requirements: 10.8 to 16 VDC, <100 mA during GPS fix and 2.6 Amps during transmission

<u>Station</u>	<u>Serial Number</u>	<u>Dates of Transmitter Use</u>
FS	2299	10/01/2020 – 11/18/2021
FS	1987	11/18/2021 – Current as of 12/31/2023

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 6 days (without GPS fix) required for continual operation.

Operating range: -40° to $+60^{\circ}\text{C}$; Storage -55° to $+75^{\circ}\text{C}$

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 as of 12/31/2022

Datalogger:

CR1000x:

The CR1000X has a total onboard memory of 128 MB of flash and 4MB of battery backed SRAM. There is 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>Date of Cal</u>	<u>Dates of Sensor Use</u>
FS	CR1000x	8215	01/17/2019	10/29/2019 – Current as of 12/31/2022
NP	CR1000x	23320	12/16/2020	03/17/2021 – Current as of 12/31/2022

CR1000x Firmware Version (s):

<u>Station</u>	<u>OS</u>	<u>Dates of Use</u>
FS	5.0	11/18/2021 – Current as of 12/31/2022
NP	5.0	03/17/2021 – Current as of 12/31/2022

CR1000x Program Version(s):

<u>Station</u>	<u>Program Name</u>	<u>Dates Used</u>
FS	HUDFSMET_CR1000x_6.1.1_111721	10/29/2019 – Current as of 12/31/2022
NP	HUDNPMET_CR1000x_6.0.11_080121	03/17/2021 – Current as of 12/31/2022

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.

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.

Field Station

Due to the possibility the wind sensor was frozen because of precipitation and below freezing temperatures, wind data are considered suspect 02/04/2022 03:45 – 02/28/2022 09:00, 03/09/2022 11:30 – 03/10/2022 09:30, and 03/12/2022 11:00 – 18:00.

Data coded CRE GSM (Significant Rain Event) or CWE GSM (Significant Weather Event)

Data are coded CWE when the observed conditions or associated temperatures are indicative of snow/ice events. The CWE code is used because the nature of snow, even utilizing a precipitation gauge with a heating element, is subject to blowing out of the collection device. Snowfall totals calculated using a tipping bucket, likely underestimate the amount of precipitation which actually fell.

Data are coded CRE when the 24 hour rainfall total exceeds 20mm. The data for both CRE and CWE events will be coded until the event ends, and cumulative total (available from the reserve or CDMO) for the day reset at 00:00.

The following were observed CRE or CWE events:

FS

Start of precipitation	End for total precipitation	End for cumulative precipitation
02/03/2022 @ 06:00	02/04/2022 @ 04:15	02/05/2022 @ 00:00
03/31/2022 @ 15:45	04/01/2022 @ 13:00	04/02/2022 @ 00:00
04/07/2022 @ 01:45	04/08/2022 @ 08:15	04/09/2022 @ 00:00
04/18/2022 @ 18:45	04/19/2022 @ 08:30	04/20/2022 @ 00:00
05/16/2022 @ 12:00	05/16/2022 @ 19:30	05/17/2022 @ 00:00
06/09/2022 @ 02:00	06/09/2022 @ 06:15	06/10/2022 @ 00:00
07/13/2022 @ 19:15	07/13/2022 @ 23:15	07/14/2022 @ 00:00
07/18/2022 @ 06:45	07/18/2022 @ 21:00	07/19/2022 @ 00:00
08/26/2022 @ 13:45	08/26/2022 @ 14:00	08/27/2022 @ 00:00
08/30/2022 @ 14:45	08/30/2022 @ 23:30	08/31/2022 @ 00:00
09/05/2022 @ 03:45	09/06/2022 @ 21:00	09/07/2022 @ 00:00
10/04/2022 @ 10:45	10/05/2022 @ 16:30	10/06/2022 @ 00:00
10/13/2022 @ 09:00	10/14/2022 @ 04:15	10/15/2022 @ 00:00
10/24/2022 @ 06:30	10/25/2022 @ 11:30	10/26/2022 @ 00:00
11/11/2022 @ 13:45	11/11/2022 @ 22:00	11/12/2022 @ 00:00
11/15/2022 @ 19:00	11/16/2022 @ 09:45	11/17/2022 @ 00:00
12/06/2022 @ 10:45	12/07/2022 @ 05:00	12/08/2022 @ 00:00
12/15/2022 @ 23:45	12/17/2022 @ 02:15	12/18/2022 @ 00:00
12/22/2022 @ 16:45	12/23/2022 @ 14:15	12/24/2022 @ 00:00

Norrie Point

The CDMO does not authenticate the data from the Norrie Point station since it is a secondary site in the NERR SWMP. Only primary SWMP sites go through tertiary review by the CDMO.

On 09/16/2022 @ 12:30, the station was powered down to facilitate the replacement of the equipment housing box and of the barometric pressure sensor. Power was restored at 14:00, however, it was observed during the following intervals (14:15 – 14:30) that barometer readings were inaccurate due to a wiring issue. The sensor was re-wired and data resumed correctly at 14:45.

On 09/19/2022 @ 10:00, the station was powered down to facilitate the replacement of the PAR sensor, air temperature/relative humidity sensor, and anemometer. Power was restored at 11:00.

Data coded CRE GSM (Significant Rain Event) or CWE GSM (Significant Weather Event)

Data are coded CWE when the observed conditions or associated temperatures are indicative of snow/ice events. The CWE code is used because the nature of snow, even utilizing a precipitation gauge with a heating element, is subject to blowing out of the collection device. Snowfall totals calculated using a tipping bucket, likely underestimate the amount of precipitation which actually fell.

Data are coded CRE when the 24 hour rainfall total exceeds 20mm. The data for both CRE and CWE events will be coded until the event ends, and cumulative total (available from the reserve or CDMO) for the day reset at 00:00.

The following were observed CRE or CWE events:

NP

Start of precipitation	End for total precipitation	End for cumulative precipitation
02/03/2022 @ 05:15	02/04/2022 @ 04:45	02/05/2022 @ 00:00
03/31/2022 @ 15:15	04/01/2022 @ 13:30	04/02/2022 @ 00:00
04/07/2022 @ 08:45	04/08/2022 @ 05:45	04/09/2022 @ 00:00
04/18/2022 @ 20:15	04/19/2022 @ 07:30	04/20/2022 @ 00:00
05/15/2022 @ 01:15	05/15/2022 @ 18:45	05/16/2022 @ 00:00
05/16/2022 @ 05:00	05/16/2022 @ 16:00	05/17/2022 @ 00:00
06/09/2022 @ 02:45	06/09/2022 @ 07:15	06/10/2022 @ 00:00
09/05/2022 @ 03:45	09/06/2022 @ 22:30	09/07/2022 @ 00:00
10/04/2022 @ 05:45	10/05/2022 @ 13:00	10/06/2022 @ 00:00
10/13/2022 @ 11:45	10/14/2022 @ 03:15	10/15/2022 @ 00:00
10/24/2022 @ 06:00	10/25/2022 @ 04:30	10/26/2022 @ 00:00
11/30/2022 @ 10:45	11/30/2022 @ 17:15	12/01/2022 @ 00:00
12/06/2022 @ 11:00	12/07/2022 @ 04:15	12/08/2022 @ 00:00