**Woman Creek** (OWC) **NERR Meteorological Metadata**

**January – December 2024**

**Latest Update:** 01/29/2025

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](mailto: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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Old Woman Creek NERR

2514 Cleveland Road East

Huron, Ohio 44839-9724

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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.

Steven McMurray is responsible for data management.

**3) Research objectives –**

The objective of this work is to record weather data over a long period of time for Old Woman Creek watershed to capture long-term trends and seasonal variability in weather conditions. Variation in weather that occurs throughout the watershed is captured by two weather stations, one located near the estuary mouth ("Old Woman"; owcowmet), and the other, a secondary SWMP site, near the Old Woman Creek headwaters (“Western Reserve”; owcwrmet). Weather conditions can be related to long-term trends and spatiotemporal variability in estuary water quality. An added function is to provide the weather data so that researchers can examine the impact of changing weather conditions on the ecology of the estuary. Weather information is critical when studying the estuary because the estuary is a storm-driven system and the source of water in the estuary is a function of both storm activity in the watershed and on the lake proper.

**4) Research methods –**

Campbell Scientific data telemetry equipment (TX-325 transmitter) which transmits data to the NOAA GOES satellite, was installed at the owcowmet (NESDIS ID #3B017310) and owcwrmet (NESDIS ID #3B012DBE) stations on 05/25/2021, and 11/18/2022, respectively. Transmissions are scheduled hourly at 00:00:00 for the Old Woman site and at 00:05:30 after the hour for the Western Reserve site and contain four (4) data sets reflecting fifteen-minute data sampling intervals. The time zone for Local Standard Time is Eastern Standard Time. Upon receipt by the CDMO, the data undergo 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. Secondary SWMP stations do not undergo tertiary review. Provisional and authoritative data are available at <https://cdmo.baruch.sc.edu>.

At both the owcowmet and owcwrmet stations, the Wind Sentry, temperature and relative humidity sensor, barometric pressure sensor and the PAR sensor are located on a 10 m tower following the descriptions outlined in the CDMO Manual V 4.1. For both stations, sensors are wired to the CR1000X following the protocol in the CDMO Manual. At owcowmet, the heated tipping bucket rain gauge is located 3 m southeast of the tower. The tipping bucket rain gauge at owcwrmet is located 3 m east of the tower, but is not heated. Old Woman is 184 m above sea level, which makes the barometric pressure offset value for owcowmet equal to 522. The Western Reserve Local Schools campus is 270.3 m above sea level, which makes the barometric pressure offset value for owcwrmet equal to 532.

Data collection information:

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

Averages from 5-second data:

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

Maximum and Minimum 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.)

Calibration information:

Once a month, the sensors on the weather station are inspected for damage and cleaned, if necessary.

Calibration frequency is as follows:

- Temperature/Humidity- yearly recalibration

- Precipitation Gauge- yearly recalibration

- Wind Speed/Direction- every 2 years nose cone replacement

- Barometric Pressure- every 2 years recalibration

- PAR- every 2 years recalibration

- CR1000X- every 5 years

Data quality checks:

Ongoing checks of data quality include comparing data from nearby weather stations with owcowmet and owcwrmet weather data approximately weekly. Precipitation data are also compared to data collected by a manual (OH-ER-49) and digital gauge on site and other local rain gauge monitors (OH-ER-11, OH-ER-18) through [CoCoRaHs](https://www.cocorahs.org/ViewData/StationPrecipSummary.aspx). When the data are downloaded monthly, a handheld Kestrel 5000 is used to provide a general check of the sensors.

**5) Site location and character –**

The Old Woman Creek State Nature Preserve and National Estuarine Research Reserve is located on the southern shore of Lake Erie east of the City of Huron, Ohio. The reserve lies within the Lake Erie Biogeographic Region. Old Woman Creek drains a primarily row-crop agricultural watershed, with corn, soybeans, and winter wheat being the most predominant crops. Long-term weather monitoring at the reserve began in 2002 with the construction of a weather station (owcowmet) near the Visitor Center and was expanded in 2022 with the construction of a second station (owcwrmet) near the southern extent of the Old Woman Creek watershed (Table 1).

The owcowmet weather station is located within the boundaries of the Reserve, 60 m due east of the Visitor Center at the Michael Dewine Center for Coastal Research in a field that is maintained in early succession (Table 2). This ensures that no tall vegetation will interfere with the weather station. The tower is located within a 5 m square fenced (1.8 m tall fence) enclosure with a gravel base. The weather station is located within 1 km of three of the SWMP water quality data logger sites (WM, OL, and DR) and within 5 km of the fourth water quality data logger site (BR). The site is 184 m above sea level.

The owcwrmet weather station is located outside of the Reserve boundaries on the Western Reserve Local Schools District campus in Collins, Ohio (Table 2). It is located 15.3 km south southeast of the OWC Visitor Center and is 1.5 km east of the southernmost extent of Old Woman Creek’s watershed boundary. The weather station is SSE from the OWC Visitor Center and existing SWMP stations. Specifically, it is 12.5 km from BR (owcbrwq), 14.0 km from DR (owcdrwq), 15.3 km from the OW weather station (owcowmet), and 16.0 km from OL (owcolwq) and WM (owcwmwq). The owcwrmet station is 270.3 m above sea level.

**Table 1:** Location of meteorological stations that are part of the Old Woman Creek System-Wide Monitoring Program (SWMP). Station Code refers to seven-letter site notation used by the CDMO while Station Name is the short-hand name for each site.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Station Code** | **SWMP Status** | **Station Name** | **Location** | **Active Dates** | **Reason Decommissioned** | **Notes** |
| owcowmet | P | Old Woman | Latitude 41° 22’ 42” N, Longitude 82° 30’ 30” W | 2002 – current | NA | NA |
| owcwrmet | S | Western Reserve | Latitude 41° 14’ 48” N, Longitude 82° 27’ 12” W | 11/18/2022 13:15 – current | NA | NA |

**Table 2:** Tower and sensor heights for the OW and WR Meteorological stations.

|  |  |  |  |
| --- | --- | --- | --- |
| **Tower and sensor heights** | **OW Height (m)** | **WR Height (m)** | **Notes** |
| Tower | 10 | 10 |  |
| Temperature/Relative Humidity | 1.90 | 1.8 |  |
| Barometric Pressure | 1.7 | 0.8 | Barometer is contained within the instrument box and is vented to the outside through a hole in the bottom of the box |
| Wind | 10 | 10 |  |
| PAR | 2.5 | 2.7 |  |
| Precipitation gauge | 1.3 | 1.6 | OW located 3 m SE from the tower; WR located 3 m W from the tower |

**6) Data collection period –**

Reported weather data for owcowmet began 01 January (00:00 EST) 2024 and ended 20 December (13:45 EST) 2024 (Table 3). Reported weather data for owcwrmet began 01 January (00:00 EST) 2024 and continued through the end of the year (Table 3).

**Table 3:** File start and end dates for meteorological files uploaded to the Centralized Data Management Office (CDMO) for Old Woman (OW) and Western Reserve (WR) stations in 2024. Upload date refers to the day when each downloaded file was uploaded to the CDMO.

|  |  |  |  |
| --- | --- | --- | --- |
| **Site** | **File Start Date / Time** | **File End Date / Time** | **Upload Date** |
| OW | 12/21/2023 15:15 | 01/30/2024 11:00 | 01/30/2024 |
| OW | 01/30/2024 11:15 | 03/07/2024 10:15 | 03/07/2024 |
| OW | 03/07/2024 10:30 | 04/18/2024 14:45 | 04/18/2024 |
| OW | 04/18/2024 15:00 | 05/21/2024 08:30 | 05/22/2024 |
| OW | 05/21/2024 08:45 | 06/28/2024 08:30 | 06/28/2024 |
| OW | 06/28/2024 08:45 | 08/02/2024 09:45 | 08/02/2024 |
| OW | 08/02/2024 10:00 | 08/27/2024 08:00 | 08/27/2024 |
| OW | 08/27/2024 08:15 | 10/09/2024 12:15 | 10/09/2024 |
| OW | 10/09/2024 12:30 | 10/30/2024 07:45 | 10/30/2024 |
| OW | 10/30/2024 08:00 | 12/20/2024 13:45 | 12/20/2024 |
| WR | 12/06/2023 08:15 | 01/03/2024 07:30 | 01/03/2024 |
| WR | 01/03/2024 07:45 | 02/07/2024 08:00 | 02/07/2024 |
| WR | 02/07/2024 08:15 | 03/20/2024 06:30 | 03/20/2024 |
| WR | 03/20/2024 06:45 | 04/03/2024 07:15 | 04/03/2024 |
| WR | 04/03/2024 07:30 | 05/08/2024 06:30 | 05/08/2024 |
| WR | 05/08/2024 06:45 | 06/05/2024 07:15 | 06/05/2024 |
| WR | 06/05/2024 07:30 | 07/02/2024 08:45 | 07/02/2024 |
| WR | 07/02/2024 09:00 | 08/02/2024 08:30 | 08/02/2024 |
| WR | 08/02/2024 08:45 | 08/27/2024 09:45 | 08/27/2024 |
| WR | 08/27/2024 10:00 | 09/11/2024 10:30 | 09/11/2024 |
| WR | 09/11/2024 10:45 | 10/09/2024 13:45 | 10/09/2024 |
| WR | 10/09/2024 14:00 | 11/01/2024 10:00 | 11/01/2024 |
| WR | 11/01/2024 10:15 | 11/05/2024 08:45 | 11/05/2024 |
| WR | 11/05/2024 09:00 | 11/22/2024 13:30 | 11/22/2024 |
| WR | 11/22/2024 13:45 | 12/18/2024 12:00 | 12/18/2024 |
| WR | 12/18/2024 12:15 | 01/24/2025 12:15 | 01/24/2024 |

**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 and the State of Ohio do not assume liability to the Recipient or third persons, nor will the Federal government or State of Ohio 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 2023.

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 –**

As part of the SWMP long-term monitoring program, OWC 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](http://www.nerrsdata.org). 15-minute water level data are collected at the DR water quality station and adjacent to the WM water quality station. Four of the five current SWMP water quality stations (WM, OL, RR, DR) and one former station (SU) are located within 1 km of owcowmet station, while the fifth water quality station (BR) is located within 5 km and is adjacent to a USGS water gauge. The owcwrmet station is located 1.5 km east of the southernmost extent of the Old Woman Creek watershed. It ranges from 12.5 km to the closest SWMP water quality station (BR), to 16.0 km to the SWMP water quality station that is furthest away (WM). The five water quality sites (WM, OL, RR, DR, BR) were established to determine the role of the estuary in mitigating storm flow through the system and the impact of Lake Erie on the estuary. Periodic vegetation and habitat data and maps also exist and are available from the reserve.

**II. Physical Structure Descriptors**

**9) Sensor specifications –**

Parameter: Temperature

Sensor type: PT100 RTD, Class A, with calibrated signal conditioning

Model: EE181 Temperature and Relative Humidity Probe

Operating Temperature: -40°C to +60°C

Range: -40°C to +60°C

Accuracy: ±0.2°C at 23°C

Serial Number 201816000716C (owcowmet)

Date of Last Calibration: 03/20/2023

Dates of Sensor Use: 03/20/2023 (14:45) – 03/19/2024 (13:45)

Serial Number: 20021600052164 (owcowmet); 22201600328048 (owcwrmet)

Date of Last Calibration: 03/19/2024 (owcowmet); 11/07/2023 (owcwrmet)

Dates of Sensor Use: 03/19/2024 (14:00) – 07/31/2024 (09:15) (owcowmet); 11/07/2023 (13:15) – 11/08/2024 (13:45) (owcwrmet)

Serial Number: 22201600326856 (owcowmet)

Date of Last Calibration: 07/31/2024 (owcowmet)

Date of Sensor Use: 07/31/2024 (09:30) – current

Serial Number 201816000716C (owcwrmet)

Date of Last Calibration: 03/28/2024

Dates of Sensor Use: 11/08/2024 (14:00) – 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: ≤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%

Serial Number 201816000716C (owcowmet)

Date of Last Calibration: 03/20/2023

Dates of Sensor Use: 03/20/2023 (14:45) – 03/19/2024 (13:45)

Serial Number: 20021600052164 (owcowmet); 22201600328048 (owcwrmet)

Date of Last Calibration: 03/19/2024 (owcowmet); 11/07/2023 (owcwrmet)

Dates of Sensor Use: 03/19/2024 (14:00) – 07/31/2024 (09:15) (owcowmet); 11/07/2023 (13:15) – 11/08/2024 (13:45) (owcwrmet)

Serial Number: 22201600326856 (owcowmet)

Date of Last Calibration: 07/31/2024 (owcowmet)

Date of Sensor Use: 07/31/2024 (09:30) – current

Serial Number 201816000716C (owcwrmet)

Date of Last Calibration: 03/28/2024

Dates of Sensor Use: 11/08/2024 (14:00) – current

Parameter: Barometric Pressure

Units: millibars (mb)

Sensor type Vaisala Barocap© silicon capacitive pressure sensor

Model # Vaisala PTB110 Barometer (PTB110 1B0CA)

Operating Range: Pressure: 500 to 1100 mb

Temperature Range: -40° to + 60°C

Accuracy: + 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

Stability: + 0.1 mb per year

Serial Number: G4870077 (owcowmet)

Date of Last Calibration: 5/24/2022 (owcowmet)

Dates of Sensor Use: 5/24/2022 (09:15) – 05/21/2024 (10:00) (owcowmet)

Serial Number: J2060017 (owcowmet); U2331097 (owcwrmet)

Date of Last Calibration: 5/21/2024 (owcowmet); 11/18/22 (owcwrmet)

Dates of Sensor Use: 6/07/2024 (10:30) – current (owcowmet); 11/18/2022 (13:15) – 11/18/2024 (09:15) (owcwrmet)

Serial Number: S0840164 (owcwrmet)

Date of Last Calibration: 11/18/2024 (owcwrmet)

Dates of Sensor Use: 11/18/2024 (09:30) – current (owcwrmet)

Parameter: Wind speed

Units: meters per second (m/s)

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

Model: R.M. Young Model 05103 Wind Monitor

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

Accuracy: +/- 0.3 m/s

Serial Number WM75736 (owcowmet); WM186828 (owcwrmet)

Date of last calibration: 5/21/2024 (replaced nose cone; owcowmet); none (owcwrmet)

Dates of sensor use: 11/02/2006 – current (owcowmet); 11/18/2022 – current (owcwrmet)

Parameter: Wind direction

Units: degrees

Sensor type: balanced vane, 38 cm turning radius

Model: R.M. Young Model 05103 Wind Monitor

Range: 360° mechanical, 355° electrical (5° open)

Accuracy: + 5%

Serial Number WM75736 (owcowmet); WM186828 (owcwrmet)

Date of last calibration: 5/21/2024 (replaced nose cone; owcowmet); none (owcwrmet)

Dates of sensor use: 11/02/2006 – current (owcowmet); 11/18/2022 – current (owcwrmet)

Parameter: PAR (Photosynthetically Active Radiation)

Units: mmoles m-2 (total flux)

Sensor type: Quantum Sensor, High stability silicon photovoltaic detector (blue enhanced) in anodized aluminum case with acrylic diffuser

Model: #SQ-500-SS Apogee Full-Spectrum Quantum Sensors

Light spectrum waveband: 389 to 692 nm

Temperature dependence: –0.11 ± 0.04%/°C

Stability: <2% change over 1 year

Operating Temperature: -40° to 70° C; Humidity 0 to 100%, Can be submerged up to 30m

Cosine Response: ±5% at 75° zenith angle

Sensitivity: 0.1 mV per µmoles m-2 s-1

Serial Number: 3942 (owcowmet)

Multipliers: 0.5

Date of Last Calibration: 05/24/2022 (owcowmet)

Dates of Sensor Use: 05/24/2022 (11:30) – 05/21/2024 (10:00) (owcowmet)

Serial Number: 4355 (owcowmet); 4235 (owcwrmet)

Multipliers: 0.5

Date of Last Calibration: 05/21/2024 (owcowmet); 11/28/2022 (owcwrmet)

Dates of Sensor Use: 05/21/2024 (11:00) – current (owcowmet); 11/18/2022 (13:15) – 11/18/2024 (09:15) (owcwrmet)

Serial Number: 3942 (owcwrmet)

Multipliers: 0.5

Date of Last Calibration: 11/18/2024 (owcwrmet)

Dates of Sensor Use: 11/18/2024 (09:30) – current (owcwrmet)

Parameter: Precipitation

Units: millimeters (mm)

Sensor Type: Tipping bucket with electric heater (owcowmet)

Model: Met One Model 385 Heated Rain Gauge

Sensitivity: 0.2 mm

Rainfall per tip: 0.01 inch (0.254mm)

Operating range: Temperature: -20° to 50°C, Humidity: 0 to 100%

Accuracy: + 0.5% < 0.5 in/hr rate, + 2.0% < 3 in/hr rate

Serial Number: A11740

Date of Last Calibration: 9/27/2024

Date of Sensor Use: 10/01/2021 – current

Sensor Type: Tipping bucket with magnetic reed switch (owcwrmet)

RainVUE 20 (not heated)

Rainfall per tip: 0.004 in (0.004 mm)

Operating Temperature Range: 1° to 70°C (liquid precipitation only); -40 to +70°C (including melting snow)

Accuracy: 1% at 0 to 19.7 in/hr (0 - 500mm/hr) intensity

Serial Number: 230709

Date of Last Calibration: new 2022, 06/20/2024

Date of Sensor Use: 11/18/2022 - current

**Datalogger:**

**CR1000:**

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.

**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.

CR1000 Serial Number 58337 (mislabeled as 57851 from 2013 – 2017), (Retired)

Site: owcowmet

Date installed: 09/05/2013

Date calibrated: 08/22/2013

Date removed: 09/12/2018 14:45

CR1000 Serial Number 72109 (Retired)

Site: owcowmet

Date installed: 09/12/2018 15:45

Date calibrated: 07/23/2018

Date removed: 10/18/2018 15:15

CR1000 Serial Number 58337 (Retired)

Site: owcowmet

Date installed: 10/19/2018 08:30

Date calibrated: 09/28/2018

Date Removed: 05/25/2021

CR1000X Serial Number: 23354 (owcowmet); 43560 (owcwrmet)

Date installed: 5/25/2021 (owcowmet); 11/18/2023 (owcwrmet)

Date Calibrated: 12/16/2020 (owcowmet); 8/30/2022 (owcwrmet)

Date Removed: Current as of present

OW Data Logger Firmware and Program Versions:

CR1000 Firmware Version (s): OS 26

CR1000x Firmware Version(s):

05/25/2021 (13:45) – 04/10/2023 (13:45): 6.01

04/10/2023 (14:00) – current: 6.02

CR1000 Program Version(s):

12/18/2017 (16:30) – 12/02/2019 (13:15): owcowmet\_5.5\_091317\_2.CR1

12/02/2019 (14:00) – 06/25/2020 (08:30): owcowmet\_5.5\_120219.CR1 (updated with new PAR multiplier)

06/25/2020 (10:45) – 11/09/2020 (10:15): owcowmet\_6.1.2\_062520.CR1

11/09/2020 (14:00) – 05/25/2021 13:30: owcowmet\_6.1.2\_062520.110920.CR1

CR1000X Program Version(s):

05/25/2021 (13:45) – 08/05/2021 (07:30) OWCOCMET\_Cr1000x\_052521\_6.0.1.CR1X

*Never deployed:* OWCOCMET\_Cr1000x\_080421\_6.0.2.CR1X

*Never deployed:* OWCOCMET\_Cr1000x\_080421\_6.0.3.CR1X

08/06/2021 (08:45 – 08/06/2021 (15:00): OWCOCMET\_Cr1000x\_080421\_6.0.4.CR1X

08/06/2021 (15:15) – 05/23/2022: OWCOCMET\_CR1000x\_080621\_6.0.5.CR1X

05/23/2022 – 1/19/2023: OWCOCMET\_CR1000x\_052322\_6.0.6.CR1x

1/19/2023 – Current: OWCOCMET\_CR1000x\_011923\_6.0.6.CR1x

WR Data Logger Firmware and Program Versions:

CR1000x Firmware Version(s):

11/18/2022 – 04/12/2023 (10:00): 6.01

04/12/2023 (10:15) – 10/09/2024 (13:45): 6.02

10/09/2024 (14:00) – current: 8.01

CR1000X Program Version(s):

11/18/2022 – 01/19/2023 (17:00): OWCWRMET\_CR1000x\_111622\_6.0.7.CR1x

01/19/2023 (17:00) – 06/22/2023 (13:15): OWCWRMET\_CR1000x\_011923\_6.0.7.CR1x

06/22/2023 (13:30) – 11/22/2024 (13:30): OWCWRMET\_CR1000x\_061523\_6.0.8.CR1x

11/22/2024 (13:45) – current: OWCWRMET\_CR1000x\_111224\_6.0.9.CR1x

**GOES transmitter:**

Model number: TX325

Serial number: 300001673 (owcowmet); 300002218 (owcwrmet)

Date installed: 05/25/2021 (owcowmet); 11/18/2022 (owcwrmet)

**10) Coded variable definitions -**

Sampling station: Sampling site code: Station code:

Old Woman OW owcowmet

Western Reserve WR owcwrmet

**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. Because snow amounts are not accurate and times of snowfall were not always reflected in the precipitation recorded, all total and cumulative precipitation on the dates listed below were coded as CSM when the values were 0.0. Total precipitation and cumulative values are flagged and coded as suspect due to snowmelt, <1> GSM CML, for the timestamps when precipitation was recorded. Snow occurred on the following dates and were coded as <0>(CSM) unless another coding took precedence: 1/14, 1/19, 1/29, 2/16. Dates with total and cumulative precipitation readings flagged and coded as suspect for snow melt, <1> [GSM](CML), are: 1/22-1/23, 1/30, 2/18. These dates reflect snowfall and snowmelt; however, users should be aware that snow loss due to sublimation may have occurred. Local [CoCoRaHs](https://www.cocorahs.org/ViewData/StationPrecipSummary.aspx) stations (OH-ER-18, OH-ER-11, OH-ER-49) were referenced for snowmelt and for accuracy checks.

**Site specific events:**

Old Woman (OW)

The temperature/relative humidity sensor was replaced on 03/19/2024 at 14:00 and that timestamp was flagged <-3> [SMT] (CSM).

The PAR sensor and the nosecone of the wind monitor were replaced during station maintenance on 05/21/2024 between 10:00-11:00; those timestamps were flagged <-3>[SMT](CSM).

During station maintenance on 05/21/2024, the barometric pressure sensor was replaced with a nonfunctional sensor. The nonfunctional sensor was replaced 06/07/2024 at 10:00. Timestamps from 05/21/2024 at 10:00 to 06/07/2024 at 10:15 were therefore flagged <-3>[SSM](CSM).

The temperature/relative humidity sensor experienced malfunctions on the following timestamps: 07/11/2024 06:15, 06:45; 07/13/2024 06:30-07:00; 20:15-21:00; 07/14/2024 02:00, 06:00, 06:15; 07/15/2024 01:00, 04:30; 07/16/2024 05:45, 21:30; 07/17/2024 18:45, 19:15, 20:00, 22:00; 07/17/2024 23:30 to 07/31/2024 09:30; affected timestamps were marked <-3>[SSM](CSM).

The rain gauge was calibrated on 09/27/2024 between 14:15 to 14:30, and data was corrected from 5.08 back to 0.0, <5>[SMT](CSM).

A new operating system was uploaded to the datalogger on 10/09/2024; the affected timestamp at 12:30 was flagged <-3>[GPR](CSM). After this update, the station stopped telemetering data and the previous operating system was uploaded to the datalogger on 10/30/2024 at 8:00; this timestamp was therefore flagged <-3>[GPR](CSM).

Western Reserve (WR)

The rain gauge was calibrated on 06/20/2024 between 09:30 to 10:00, and data was corrected from 4.4 back to 0.0, <5> [SMT] (CSM).

A new operating system was uploaded to the datalogger on 10/09/2024; the affected timestamp at 14:00 was flagged <-3>[GPR](CSM).

During the update of the operating system on 10/09/2024, a previous program was inadvertently installed on the datalogger that made the rain gauge nonfunctional. The current program (i.e. OWCWRMET\_CR100X\_061523\_6.0.8.CR1X) was reinstalled to correct this issue on 11/05/2024, and the affected timestamp at 09:00 was flagged <-3>[GPR](CSM). Precipitation data from 10/09/2024 at 14:15 to 11/05/2024 at 08:45, as well as cumulative precipitation data on 11/05/2024, was flagged <-3>[SQR](CSM).

The temperature/relative humidity sensor was replaced on 11/08/2024 at 14:00 and that timestamp was flagged <-3> [SMT] (CSM).

The PAR and barometric pressure sensors and the nosecone of the wind monitor were replaced during station maintenance on 11/18/2024 at 9:30 and that timestamp was flagged <-3>[SMT](CSM).

The datalogger program was updated on 11/22/2024 at 1345 to correct the barometric pressure offset used to account for the station’s altitude. That timestamp was therefore flagged <-3>[GPR](CSM), and precipitation and data were corrected <5>[SMT](CSM). All barometric pressure data before 11/22/2024 at 1345 were flagged <1>[SDG](CSM).

Total precipitation data on 12/21/2024 at 10:45, and cumulative precipitation data from 10:45 on 12/21/2024 to 12/22/2024 at 00:00 were nonsensical, likely due to the thawing of frozen precipitation, and were flagged <-3>[SQR](CSM).