

Sapelo Island (SAP) NERR Meteorological Metadata
Months and year the documentation covers: January – September 2025
Latest Update: 10/16/2025

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 –

Dylan Bedortha, SWMP Manager
Email: dylan.bedortha@dnr.ga.gov
Phone: 412-370-1428

Rachel Guy, Research Coordinator/Reserve Manager
Email: rachel.guy@dnr.ga.gov
Phone: 912-485-2251

Address:
Georgia Department of Natural Resources
1 Long Tabby Lane
Sapelo Island, GA 31327
Phone: 912-485-2251

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. Dylan Bedortha (SWMP Manager) is responsible for all data collection and management.

3) Research objectives –

The principal objectives of this research are to record meteorological information for the Sapelo Island NERR's site that can be used 1) as a reference for meteorological data for research projects on the reserve, 2) to give meteorological context for our 15-minute SWMP water quality data, and other long term environmental monitoring projects at the Reserve, 3) to observe and characterize important events such as storms, heat and cold waves, droughts, and heavy rainfalls, and 4) to detect trends and characterize climate variability over the long-term.

4) Research methods –

Campbell Scientific data telemetry equipment was installed at the Marsh Landing station on 02/15/2007 and transmits data to the NOAA GOES satellite, NESDIS ID #3B036592. (Where 3B036592 is the GOES ID for that particular station.) The transmissions are scheduled hourly at **04m:40s** after the hour and contain four (4) data sets reflecting fifteen minute data sampling intervals. All data are reported in Eastern Standard Time. 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 from the station via laptop monthly. A log is filled out at each collection to check station data against local conditions to ensure quality, document any changes in sensors, and complete and document regular maintenance of the station.

Include the following or similar 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.)

Sensors are visually inspected on a monthly basis and are removed, replaced, and recalibrated by the manufacturer (except for the precipitation gauge) following the recommended frequency as laid out below:

Recommended calibration frequency for the MET station sensors:

- Temperature/Humidity- yearly recalibration
- Precipitation Gauge- yearly recalibration (calibration done in-house)
- Wind Speed/Direction- every 2 years recalibration
- Barometric Pressure- every 2 years recalibration
- PAR- every 2 years recalibration
- CR1000X - every 5 years recalibration

5) Site location and character –

The site is located at 31°25'04.3" N, 81°17'43.4" W, approximately 15 feet above sea level. All sensors are mounted on a 10m-aluminum tower located in the northern corner of the Marsh Landing parking lot on the southwest corner of the island. The parking lot surface is approximately one meter above the surrounding marsh. The site is bordered with salt marsh to the north and south with transition into pine forest occurring 1/2 mi to the east. To the immediate west lies the Duplin River and the ferry dock, which is also the location of our Lower Duplin Water Quality sampling site. The meteorological station is well exposed to all winds and weather with little blockage and no shading. This region is subject to multiple severe weather events partially due to its proximity to the ocean. These events include severe summer thunderstorms, which can cause drastic, localized drops in pressure, temperature, and heavy rains; powerful fall and winter frontal systems carrying prolonged strong winds (usually NNE), drastic and sudden drops in temperature and pressure, and long, steady rains; and finally, the late summer and early fall hurricanes. It must be noted that due to the remote location and proximity to the ocean our weather patterns can vary greatly from those on the mainland, particularly temperatures which tend to moderate due to our being surrounded by water. The nearest National Weather Service/NOAA sites for comparison are the Grays Reef

NOAA weather Buoy located about 20nm east of Sapelo Island, Glynco airport located approximately 14 miles to SW, and St. Simon's Island Airport located approximately 16 miles SSW. St. Simon's Airport data is used as the check source for monthly logs.

Station measurements

Tower and sensor heights	Height (<i>meters</i>)	Notes
Tower	10m	
Platform (<i>if applicable</i>)	N/A	
Temperature/Relative Humidity	2m from ground	
Barometric Pressure	1.2m height in the enclosure	sensor opening $\frac{3}{4}$ m from ground via tube
Wind	10m from ground	
PAR	2.5m from ground	$\frac{3}{4}$ m distance from the tower
Precipitation gauge	2m from ground	$\frac{3}{4}$ m distance from the tower

SWMP station timeline

Station code	SWMP status	Station name	Location	Active dates	Reason decommissioned	Notes
ML	P	Marsh Landing	31°25'04.3" N 81°17'43.4" W	2/15/2007 - present	NA	NA

6) Data collection period –

File Start Date and Time	File End Date and Time
01/01/2025 00:00	10/01/2025 09:45

Below is a breakdown of raw files that were combined to form this dataset.

Raw File Start Date and Time	Raw File End Date and Time
12/06/2024 11:15	01/03/2025 10:45
01/03/2025 11:00	02/04/2025 13:30
02/04/2025 13:45	03/04/2025 09:30
03/04/2025 09:45	04/01/2025 09:00
04/01/2025 09:15	05/02/2025 09:15
05/02/2025 09:30	06/02/2025 09:45
06/02/2025 10:00	06/17/2025 10:00
06/17/2025 10:15	07/02/2025 09:45
07/02/2025 10:00	08/04/2025 10:45
08/04/2025 11:00	09/03/2025 11:00

All data reported in Eastern Standard Time (EST).

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 2025.

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 –

Sapelo Island has a long history of maintaining research. In 1953, the University of Georgia Marine Institute (UGAMI) was formed on Sapelo and the island became a working laboratory for many. The research continues today with SAP NERR and UGAMI creating a unique partnership with much of the current research being done facilitated by SAP NERR and UGAMI together. Given UGAMI's long history on Sapelo, a bibliographic list of over 800 articles of current and previous research can be found on the UGAMI website: <http://www.uga.edu/ugami> and on the Sapelo Island NERR site: <http://www.sapelonerr.org>.

As part of the SWMP long-term monitoring program, SAP 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: PT100 RTD, IEC 751 1/3 Class B, with calibrated signal conditioning

Model #: HC2-S3 Temperature and Relative Humidity Probe

Operating Temperature: -40°C to +60°C

Range: -40°C to +60°C

Accuracy: ± 0.1 °C @ 23°C

Serial number, dates of calibration and use:

SN: 20072700

Last calibration: 10/14/2024

In service: 12/6/2024 - present

Parameter: Relative Humidity

Units: Percent

Sensor type: ROTRONIC® Hygromer IN-1

Model #: HC2-S3 Temperature and Relative Humidity Probe

Range: 0-100% non-condensing

Accuracy at 23°C: $\pm 0.8\%$ RH with standard configuration settings

Temperature dependence of RH measurement $\pm 3\%$ (-40°C to 60°C)

Serial number, dates of calibration and use:

SN: 20072700

Last calibration: 10/14/2024

In service: 12/6/2024 - present

Parameter: Barometric Pressure

Units: millibars (mb)

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: ± 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, dates of calibration and use:

SN: J0560059

Last calibration: 6/7/2024

In service: 8/15/2024 - present

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 Wind Monitor

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

Accuracy: ± 0.3 m/s or 1% of reading

Multiplier: 0.0980

Serial number, dates of calibration and use:

SN: WM171993

Last calibration: 7/19/2024

In service: 9/20/2024 - present

Parameter: Wind direction

Units: degrees

Model #: R.M. Young 5103 Wind Monitor
Sensor type: balanced vane, 38 cm turning radius
Range: 360° mechanical, 355° electrical
Accuracy: ± 3 degrees

Serial number, dates of calibration and use:

SN: WM171993
Last calibration: 7/19/2024
In service: 9/20/2024 - present

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: CS310 (SQ-500)

Light spectrum waveband: 389 to 692 nm

Temperature dependence: $-0.11 \pm 0.04\%/^{\circ}\text{C}$

Stability: $< \pm 2\%$ change over a 1-year period

Operating temperature: -40 to 70°C

Cosine Response: $\pm 5\%$ at 75° zenith angle

Sensitivity: 0.01 mV per $\mu\text{mol}/\text{m}^2/\text{s}$

Multiplier: 0.5 (this does not change) – *include*

Serial number, dates of calibration and use:

SN: CS310_4074
Last calibration: 2/26/2024
In service: 4/29/2024 - present

Parameter: Precipitation

Units: millimeters (mm)

Sensor type: Tipping Bucket Rain Gauge (non-heated)

Model #: TE525

Rainfall per tip: 0.01 inch

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

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

Serial number, dates of calibration and use:

SN: 70981-1016
Last calibration: 9/4/2024
In service: 9/5/2024 – 9/3/2025

SN: 91816-0822

Last calibration: 8/28/2025

In service: 9/3/2025 - present

For a list of historical sensor information, calibration history, and deployment, please reach out to the reserve.

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.

Serial number: 64733

Date CR1000X installed: 11/20/2024

Date CR1000X calibrated: 10/29/2024

CR1000X firmware version (s): CR1000X.std.08.01

CR1000/CR1000X/CR1000Xe program version(s):

sapmlmet_CR1000X_6.0.1_112224.CR1X → in use from 11/22/2024 - present

GOES transmitter:

Model number: TX325

Serial number: 300003041

Date installed: 11/20/2024

10) Coded variable definitions -

Sampling station:	Sampling site code:	Station code:
Marsh Landing	ML	sapmlmet

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 $\pm 3\%$ 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.**

Q1:

All negative PAR values in this dataset have been flagged as suspect. These small negative values (-0.1, -0.2) occur at night when the readings should be zero. These negative nighttime PAR values do not seem to affect regular data collection from this sensor.

Precipitation from 1/21 – 1/23/25 occurred with occasional freezing temperatures over the course of a few days. No data was flagged due to this event, but exact effects of these temperatures on precipitation data during this time is unknown. Reserve staff were unable to access island during this time.

On 3/28/25, the meteorological tower was lowered to adjust the wind sensor. The wind sensor had become slightly tilted (not quite perpendicular to the ground) as hardware holding the sensor began to fail. While adjusting the sensor, the mounting base was inadvertently moved off its heading. All wind direction data are rejected from 3/28/2025 11:00 – 4/2/2025 13:00 at which point the tower was lowered again and wind direction corrected.

Q2:

All negative PAR values in this dataset have been flagged as suspect. These small negative values (-0.1, -0.2) occur at night when the readings should be zero. These negative nighttime PAR values do not seem to affect regular data collection from this sensor.

On 6/2/25, after collecting data from the station, the temperature/relative humidity sensor shield was disassembled and cleaned between 10:00 – 10:30 eastern standard time. Data did not seem affected but flagged as suspect.

Q3:

All negative PAR values in this dataset have been flagged as suspect. These small negative values (-0.1, -0.2) occur at night when the readings should be zero. These negative nighttime PAR values do not seem to affect regular data collection from this sensor.

Precipitation gauge was replaced on 9/3/2025 between 11:15 – 12:00 eastern standard time. Precipitation data from this period is flagged as rejected.