

I. Data Set & Research Descriptors

1) Principal Investigator(s) & contact persons

Contact Persons:

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2) Entry Verification

System I: CR1000, CR10X

The initial weather station and CR10X program was installed in late October 2003. The old program (ner30.csi) was revised (NERR_4.CSI) to standardize the program for all sites. The revision was necessary to meet new data reporting requirements of CDMO to eliminate instantaneous data sample reporting, add cumulative daily rainfall and additional sensors.

Starting July 12, 2006 at 17:45, WQBNERR weather station was changed from the CR10X Datalogger to a CR1000 Datalogger and associated software program. The sensors for Air Temperature (C), Relative Humidity (%), Barometric Pressure (mb), Wind Speed, Wind Direction, Total Precipitation (mm), Total Photosynthetically Available Radiation (PAR), and Total Solar Radiation (SoRAD) remain the same. See section 9: Sensor specifications, operating range, accuracy, date of last calibration for sensor specifications.

On February 10th, 2005, a new EPLAB© Black and White Pyranometer was installed. It was mounted on the same structure as the PAR instrument approximately within one meters distance. This Pyranometer is an Eppley 10-and 50-junction 180° pyrliometer originally introduced by Kimball and Hobbs in 1923. The detector is a differential thermopile with the hot-junction receivers blackened and the cold-junction receivers whitened. The element is of radial wire-wound-plated construction with the black segments coated with 3M black and the white segments with Barium Sulfate. Built in temperature compensation with thermistor circuitry is incorporated to free the instrument from the effects of ambient temperature. A precision ground optical glass hemisphere of Schott glass WG295 uniformly transmits energy from 285 to 2,800 millimicrons. This hemispherical envelope seals the instrument from the weather, but is readily removable for instrument repair. The cast aluminum case carries a circular spirit level and adjustable leveling screws. Also supplied is a desiccator, which can be inspected readily. See section 9 for most recent calibration dates.

Although the Eppley pyranometer was installed in 2005 and collected data until 2014, in October 2014 research staff at Waquoit Bay realized the sensor was collecting total solar radiation data in Watt-hours per meter-squared (a measure of maximums within a 15 minute period). CDMO (Central Database Management Office) protocols require the total solar radiation data to be displayed in Watts per meter-squared (a measure of 5-second averages over a 15 minute period). Because of the discrepancy, these data have been removed from the national database but are available by request. Please contact Chris Weidman or Jordan Mora for total solar radiation data series (contact information on page 1 of this document).

The meteorological information is sampled every 5 seconds from each instrument on the weather station and stored on a Campbell Scientific CR1000 data logger. Data are output to a file in three file formats: CR1000_A5Min.dat stores 5 minute data; CR1000_GOESout.dat stores 15 minute averages that are transmitted hourly for Satellite upload; and CR1000_SWMP.dat files stores the 15 minute average data that is submitted to CDMO on a quarterly basis for primary QAQC review. The CDMO Data Logger (NERR_4.CSI) was loaded into the CR1000 and controls the sensors.

Data are uploaded from the CR1000 data logger to a Personal Computer (IBM compatible). Files are exported from or 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.

Jordan Mora, Research Associate, error checked and compiled the meteorological data in 2014.

3) Research objectives

The principal objectives are to record meteorological information for the Waquoit Bay NERR's site that can be used: 1) as a vital reference of atmospheric data for various research projects at the reserve -- an integral part of our general NERR mission is to provide a platform for estuarine research; 2) to give meteorological context (atmospheric-forcing) for our fifteen minute SWMP water quality data, and other long-term environmental monitoring programs at the Reserve (including nutrients and shoreline change); 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

The Campbell Scientific weather station samples every 5 seconds continuously throughout the year. These data are used by the CR1000 to produce 15 minute, hourly and daily averages of those measurements of air temperature, relative humidity, barometric pressure, wind speed, and wind direction. Precipitation and PAR are recorded as totals for each interval. As mentioned above, we generally upload data from the CR1000 storage module about once a month. CR1000

raw data are currently stored on one data storage module capable of storing about 3 months of data. The CR1000 is also cabled directly to a desktop PC where the instantaneous 5 sec data are displayed (in a LoggerNet window) and can be viewed at any time. All collected data is quality checked immediately after the monthly downloads. The error/anomaly reports and all monthly parameter graphs are printed and reviewed. Any error/anomaly messages are further investigated and the data is either corrected/deleted (if necessary) or commented on and left unchanged.

Sensors on the weather station are inspected monthly for damage or debris. See section 9 for most recent calibration dates. Also, once a month on upload day, we use a compass and utilize a Weather Station monitoring system (with a wind sensor) to run a comparative set of observations as a general check on the Campbell station sensors.

Real-time Data Methods:

In July 2006, our meteorological station was linked to a NOAA GOES[®] satellite system, which allowed near real-time access to our meteorological data over the internet. Campbell Scientific data telemetry equipment is used at this station to transmit to the NOAA GOES satellite, NESDIS ID #3B022462. The transmissions are scheduled hourly and contain four (4) datasets reflecting the fifteen minute data sampling interval. 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 CR1000:

Air Temperature (C)

- 15 minute average (averages from 5-second data over previous 15 minutes)
- Maximum (over previous 15 minutes)*
- Minimum (over previous 15 minutes)*
- Time Maximum (from 5-second data)*
- Time Minimum (from 5-second data)*

Relative Humidity (%)

- 15 minute average (averages from 5-second data over previous 15 minutes)

Barometric Pressure (mb)

- 15 minute average (averages from 5-second data over previous 15 minutes)

Wind Speed

- 15 minute average (averages from 5-second data over previous 15 minutes)
- Maximum (over previous 15 minutes)
- Time Maximum (over previous 15 minutes)

Wind Direction

- 15 minute average (averages from 5-second data over previous 15 minutes)
- Standard Deviation (over previous 15 minute period)

Total Precipitation (mm)

- previous 15 minute total

Cumulative precipitation

- running total of daily precipitation - sum of 15 minute totals

Total Photosynthetically Available Radiation (PAR)

- previous 15 minute total (millimoles/m²)

**Available from the Waquoit Bay Reserve (see contact information on page 1). Not a standard CDMO parameter.*

Recommended calibration frequency for the MET station sensors:

- Temperature/Humidity – yearly calibration
- Rain Gauge – yearly calibration
- Wind speed/direction – yearly or every 2 year inspection (depending on sensors)
- Barometric Pressure – every 2 years recalibration
- PAR – every 2 years recalibration
- CR1000 – every 5 years (required beginning of 2014, one year initial grace period)

5) Site Location and Character

The weather station is located on a 24-acre parcel of Reserve land that includes the Reserve headquarters at 41° 34'54.12 N, 70° 31' 30.36 W. Wind (speed and direction), temperature and relative humidity sensors are mounted on a 10-m aluminum tower next to the Carriage House, which houses our grounds facilities, classroom and laboratory. The tower is surrounded on three sides by an open parking area; its attached probes stand approximately 2.5 m above the roof peak of the adjacent building and are separated from any trees by at least 30 m. A crushed shell parking area (bleach white in color) is located directly to the south and west of the tower, with the building and its roof peak to the northeast. The tower base is 10.39 m above sea level (NGVD), approximately 100 m north from Waquoit Bay's northern shoreline. The location is most well exposed to winds from the west and south (southeast clockwise to northwest). The EPLAB Pyranometer is mounted about 10 m away on an extended aluminum arm at a height of 3 m above the ground level and is well exposed at all times to the sun in both winter and summer. The air pressure sensor, which is mounted next to the CR1000 in the laboratory, is approximately 1.5 meters in height above ground level. The rain gauge is located in an open field away from trees about 55 m northwest of the laboratory and tower and 11.2 m above sea level (NGVD). The top of the gauge is 1 meter above ground.

As for its general setting, the Waquoit Bay National Estuarine Research Reserve (WQBNERR) is located in the northeastern United States on the southern coast of Cape Cod, Massachusetts. Climatically, this region is considered temperate maritime, and experiences relatively mild winters and cool summers relative to the rest of New England because of its exposed oceanic location. Typical of the mid-latitudes (41° N), prevailing winds are from the southwest, while storm winds tend to be from the east.

The area is adjacent to one of the world's most active regions for cyclogenesis (extra-tropical cyclone formation) off the East coast of North America. These generally winter season storms are most frequent (almost weekly) from late October until late April and are locally called Nor'easters because of the NE wind direction typical to the area during the period of peak wind speeds. These storms generally develop rapidly as secondary lows off the mid-Atlantic coast (Carolinas to New Jersey) and track northeastward passing Cape Cod either directly overhead, or to the southeast or northwest. These winter season storms are important agents of coastal erosion and shoreline alteration in the region, particularly for easterly facing coasts.

Hurricanes are also important phenomena in the region. Most years, during the period from July to November, the Cape experiences some interaction with a passing tropical storm. About once every decade the area experiences a nearby landfall, with winds exceeding hurricane threshold (>33 m/s), usually from the southerly quarter. Hurricanes are particularly important agents of change for the Cape's southern coastal areas, and can have profound effects on local estuaries, including Waquoit Bay. Typically, barrier beach over-wash (with salt marsh burial) and breaching (with new tidal inlet formation) occur during these extreme events.

Provincetown is on a very small peninsula a couple of miles wide, surrounded by colder (in Summer) Gulf of Maine waters, while Waquoit Bay is closer to the mainland of New England and is bathed by the warmer shelf waters of southern New England. The last two decades, in particular, have been known to be among the warmest recorded (last 150 years), though that may be compensated in part by the historically cold periods of mid-1960s and mid-1970s.

Meteorological data from Waquoit Bay NERR can also be compared to that from other nearby meteorological stations. These stations are located at Otis Air Force Base (10 km to the north), Falmouth Water Department-Long Pond (8 km to the west), Woods Hole Oceanographic Institution-Quisset Campus (13 km to the southwest), Hyannis Airport (23 km to the northeast), and Buzzards Bay Texas Tower (41 km to the southwest) – this latter station being a particularly valuable reference site because it is offshore and southwest with at least 15 km of unobstructed open water around it and it also records other useful sea surface parameters (wave height and direction, and ocean temperatures).

Other stations which are also used for reference include the Menauhant Yacht Club weather station operated and maintained by Dr. Richard Taylor as a Local National Weather Service Reporting Station (Data Garrison <https://datagarrison.com/>). Since December 2002, the National Weather Service Reporting Station has been recording daily observations at 0700 and 1900 for the following weather parameters: Temperature ($^{\circ}\text{F}$; minimum and maximum), Precipitation (inches; rain and melted snow, snow fall, initial and endpoint times of events), Sky Conditions and Wind Direction (mph; gusts).

6) Data Collection Period

Weather data has been collected at the Waquoit Bay NERR Carriage House since December 2001. The current weather station has been operational since this date. No downloads occurred during the first quarter of data collection, January to March 2014. Weather data was downloaded from the station for the following periods 2014:

START	END
12/20/2013, 20:15	05/22/2014, 12:15 (dates missing*:12/22/2013-03/28/2014)
05/22/2014, 12:30	07/03/2014, 13:15
07/03/2014, 13:30	07/10/2014, 14:45
07/10/2014, 15:00	08/07/2014, 09:00
08/07/2014, 09:15	09/04/2014, 10:00
09/04/2014, 10:15	10/16/2014, 10:45
10/16/2014, 11:00	11/10/2014, 11:15
11/10/2014, 11:30	12/09/2014, 11:15
12/09/2014, 11:30	01/20/2015, 11:00

** The missing data during period from 12/22/2013, 1:30, to 03/28/2014, 18:00, was retrieved from telemetry data off the CDMO website.*

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 process 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 2012.

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

The Waquoit Bay Meteorological Station located at the Carriage House satisfies the weather data collection requirement of a broader nationwide program, the System-Wide Monitoring Program (SWMP). Within the SWMP, additional required parameters include water quality and nutrient monitoring.

- 1) Water quality monitoring involves continuous measurements of water temperature, specific conductivity, salinity, dissolved oxygen (percent saturation and concentration in mg/L), depth, pH, turbidity, and chlorophyll fluorescence. These measurements are taken every 15 minutes and stored on a submersible YSI multi-parameter sonde (i.e., data logger). Sondes are rotated every 2-3 weeks for cleaning and calibration.
- 2) To meet the nutrient sampling requirements of the SWMP, monthly grab samples, in tandem with a 24-hour ISCO water sampler, are collected and processed for various nutrient compounds. The chemical analyses mainly focus on levels of nitrogen, phosphorous, and carbon in the water column.

The water quality monitoring and nutrient sampling occur at four water quality stations located throughout the Waquoit Bay Estuary: Childs River (tidal riverine system with high nitrogen load), Menauhant Yacht Club (closest proximity to ocean influence from Vineyard Sound), Sage

Lot Pond (tidal pond surrounded by polyhaline salt marshes), and Metoxit Point (open water location inside Waquoit Bay).

9) Sensor specifications, operating range, accuracy, date of last calibration

Temperature

Units: Celsius
Sensor Type: Platinum Resistance Thermometer (PRT), Thermistor (100k Ω @ 25°C)
Model #: HMP35C
Operating Temperature: -35 to +60°C
Temperature Measurement Range: -35 to +55°C
Temperature Accuracy: $\pm 0.4^\circ\text{C}$
Date of last calibration: 6/27/2012
Dates of Sensor Use: 6/27/2012 - current as of 12/31/2014
S/N: A4940008

Relative Humidity (RH)

Units: Percent
Sensor Type: Sensor Type: Vaisala capacitive polymer H chip
Model #: HMP35C
Relative Humidity Measurement Range: 0 to 100%
RH Accuracy:
 $\pm 2\%$ RH (0 to 90%)
 $\pm 3\%$ RH (90-100%)
Stability: 1% per year
Uncertainty of calibration: 0.3% RH
Date of last calibration: 6/27/2012
Dates of Sensor Use: 6/27/2012 - current as of 12/31/2014
S/N: A4940008

Photosynthetically Active Radiation (PAR)

Units: millimoles/m² (total flux)
Sensor Type: LiCor Quantum Sensor (PAR)
Model #: LI-L1190SZ
Stability: $< \pm 2\%$ change over a 1 year period
Operating Range
Temperature: -40°C to 65°C
Humidity: 0 to 100%
Sensitivity: typically 5 μA per 1000 $\mu\text{moles s}^{-1}\text{m}^{-2}$
Light spectrum wavelength: 400 to 700 nm
Date of last calibration: 09/09/2011
Multiplier: -264.77 (millivolt adapter)
S/N: Q45963
Dates of Sensor Use: 9/9/2011 - current as of 12/31/2014

Wind Speed

Units: meter per second (m/s)
Sensor type: 18 cm diameter 4-blade helicoids propeller molded of polypropylene
Model: RMY 05103

Range:

0-60 m/s (134 mph)

gust survival 100 m/s (220 mph)

Direction Range: 360° Threshold Sensitivity: 0.5 m/s (1.1 kts) at 10° displacement

Accuracy: +/- 0.3 m/s

Date of last calibration: 8/1/2011, new bearings 6/27/2012

Dates of Sensor Use: 6/27/2012 - current as of 12/31/2014

S/N: NA

Wind Direction

Units: degrees

Sensor type: balanced vane, 38 cm turning radius

Model: RMY 05103

Direction Range: 360° Threshold Sensitivity: 0.5 m/s (1.1 kts) at 10° displacement

Date of last calibration: 8/1/2011, new bearings 6/27/2012

Dates of Sensor Use: 6/27/2012 - current as 12/31/2014

S/N: NA

Barometric Pressure

Units: millibars (mb)

Sensor Type: Vaisala Barocap © silicon capacitive pressure sensor

Model #: CS 105 Vaisala PTB101B

Operating Range:

Pressure: 600-1060 mb

Temperature: -40 to +60°C

Humidity: non-condensing

Accuracy: ±0.5 mb @ +20°C

Stability: ± 0.1 mb per year

Date of last calibration: 6/27/2012

Dates of Sensor Use: 6/27/2012 - current as of 12/31/2014

S/N: P5240006

Precipitation

Units: millimeters (mm)

Sensor Type: Heated Tipping Bucket Rain Gauge

Model #: 385L

Rainfall per tip: 0.01 inch

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

Accuracy:

±0.5% @ < 0.5" (1.25 cm)/hr rate

±2.0% @ < 3.0" (7.50 cm)/hr rate

Date of last calibration: 9/9/2011

Dates of Sensor Use: 9/9/2011 - current as of 12/31/2014

S/N: C1521

The CR1000 has two MB Flash EEPROM that are 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) is 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. This station was installed on 7/12/2006. Additional CR1000 specification can be found at: http://www.campbellsci.com/documents/lit/s_cr1000.pdf.

S/N: 5287

Manufacture Year: 2006

Date CR1000 Installed: 07/12/2006

Date CR1000 Calibrated: NA

CR1000 Firmware Version: CR1000.Std.14 (date: 070619)

CR1000 Program Version: wqbchmet_V5_120921.cr1

Campbell Charger for CR1000: Model # CH 100, 12 V

10) Coded variable indicator and variable code definitions

Site definitions: CH = Carriage House

Station code: wqbchmet

11) QAQC flag definitions

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is above or below sensor range, or missing. All remaining data are then flagged 0, as passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

- 5 Outside High Sensor Range
- 4 Outside Low Sensor Range
- 3 Data Rejected due to QAQC
- 2 Missing Data
- 1 Optional SWMP supported Parameter
- 0 Passed Initial QAQC Checks
- 1 Suspect Data
- 2 *Open - reserved for later flag*
- 3 *Open - reserved for later flag*
- 4 Historical Data: Pre-Auto QAQC
- 5 Corrected Data

12) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the CR1000, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

GIM	Instrument Malfunction
GIT	Instrument Recording Error, Recovered Telemetry Data
GMC	No Instrument Deployed due to Maintenance/Calibration
GMT	Instrument Maintenance
GPD	Power Down
GPF	Power Failure / Low Battery
GPR	Program Reload
GQR	Data Rejected Due to QA/QC Checks
GSM	See Metadata

Sensor Errors

SDG	Suspect due to sensor diagnostics
SIC	Incorrect Calibration Constant, Multiplier or Offset
SIW	Incorrect Wiring
SMT	Sensor Maintenance
SNV	Negative Value
SOC	Out of Calibration
SQR	Data rejected due to QAQC checks
SSD	Sensor Drift
SSN	Not a Number / Unknown Value
SSM	Sensor Malfunction
SSR	Sensor Removed

Comments

CAF	Acceptable Calibration/Accuracy Error of Sensor
CCU	Cause Unknown
CDF	Data Appear to Fit Conditions
CML	Snow melt from previous snowfall event
CRE*	Significant Rain Event
CSM*	See Metadata
CVT*	Possible Vandalism/Tampering
CWE*	Significant weather event

13) Comments/Remarks

General Comments:

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 sensor and are due to normal errors in the sensor and the CR1000 Datalogger. The Maximum signal noise error for the LiCOR sensor is +/- 2.214 mmol/m² over a 15 minute interval. **Please see note below regarding rejected PAR data.**

Relative Humidity data greater than 100 are within range of the sensor accuracy of +/-3%. Data exceeding 100% are within sensor accuracy but are flagged as suspect as part of QAQC.

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.**

Specific 2014 Notes (CSM):

ALL PAR data for 2014 were rejected. These data were collected as averages instead of 15 minute totals. Although the data were rejected, users interested in PAR averages for 2014 may still find the data useful when looking at trends.

The weather station started to overwrite data during the period between 12/20/2013 to 5/22/2014 such that a period of about three months (12/22/2013 to 3/28/2014) was lost in the downloaded .dat file. However, most of this missing data was retrieved from telemetry readings made available on the CDMO website. The data was downloaded from the site and adjusted for raw data submission so each column could be properly flagged. Missing data represent non-standardized parameters that are not included in the CDMO quality assurance/quality control protocols. Although maximum wind speed values were recorded, their times were not. There were intermittent data losses during this period coded as [GIT] indicating that the weather station or telemetry hardware connections were disrupted, likely due to ice interference or corrosion. Although cumulative precipitation data had gaps with missing values, it looks as if the cumulative totals were keeping up with the accumulating precipitation. All data from 01/01/2014 00:00 - 3/28/2014 18:00 are coded as telemetered.

All precipitation data from 1/1/2014 through 12/31/2014 are considered suspect due to being collected with an out of calibration sensor. Data from 1/1/2014 - 3/28/2014 18:00 are coded as telemetered but are still considered out of calibration. Data from 3/28/2014 18:15 - through 12/31/2014 are coded with SOC. The precipitation gauge was last calibrated on 09/11/2011.

Air temperature and RH values from 6/27/2014 - 12/31/2014 are considered suspect and coded as out of calibration due to being collected with an out of calibration sensor. The ATemp/RH gauge was last calibrated on 6/27/2012

During the monthly maintenance check on 08/07/14, the rain bucket gauge was accidentally tipped at 9:50 (EST). The data points associated with this interference within total and cumulative precipitation columns have been flagged as "Corrected Data" (5). These data are still considered suspect and out of calibration.

During rain gauge maintenance (removing mesh screens for better snow measurements) on 11/13/2014 at 15:30, the rain gauge accidentally tipped. The data points associated with this

interference within total and cumulative precipitation columns have been flagged as “Corrected Data” (5). These data are still considered suspect and out of calibration.