

Standard Operating Procedure (SOP) 11: Quality Control and Record Processing, Version 3.0

Weather and Climate Monitoring Protocol

Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks

Change History

Previous Version #	Revision Date	Revised By	Changes	Justification	New Version #
1.00 (SOP 21 – Data Access and Archiving)	12/20/2006	P. Sousanes	Added last line to 1 st paragraph	Incorporated comments from peer review	1.01
1.01 (SOP11)	March 2017	K. Hill B. Johnson M. Bower P. Sousanes S. Miller	Update quality control procedures.	New software. Changes in data archive procedures.	2.0
2.0	March 2018	K. Hill B. Johnson M. Bower P. Sousanes S. Miller	Update quality control and data export procedures.	Clarification for data corrections with redundant air temperature sensor. Included multiple data export options.	2.01
2.01	March 2021	K. Hill P. Sousanes T. Ziomek A. Bliss S. Miller	Update quality control and data export procedures.	Updated software. Changes in data export procedures	3.0

Please cite this Standard Operating Procedure as:

Hill, K., W. Johnson, P. Sousanes, M. Bower, A. Bliss, T. Ziomek, and S. Miller. 2021. Standard Operating Procedure (SOP) 11: Quality Control and Record Processing, Version 3.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2285235>.

Note: This SOP outlines procedures for storing, processing, and exporting continuous climate records after raw data files have been successfully downloaded from the datalogger (SOP 9). The

Arctic, Central Alaska, and Southeast Alaska Inventory and Monitoring Networks have successfully used Aquarius NG (formerly Aquarius Time-Series) software to meet its record processing needs, but its use does not constitute an endorsement by the U.S. Government.

Required Training: Overview documentation and tutorials of Aquarius Software are available at https://nrss.sharepoint.nps.gov/div/wrd/data/Pages/Aquarius_NG_Learning.aspx. All training should be completed before attempting to follow steps outlined in this SOP specific to climate data processing.

Overview

This SOP outlines basic rulesets for quality control of climate data and provides examples on how to accomplish these guidelines using Aquarius software. The National Park Service Water Resources Division (WRD) purchased and supports the Aquarius Software produced by the Aquatic Informatics (AI) Company in Vancouver, British Columbia. The software streamlines the climate data record processing. It should be noted that Aquarius software may not directly meet every need, and future development of data management tools is likely.

Aquarius software has a significant learning curve and will continue to improve and change. This SOP is not a complete guide for learning Aquarius. The most comprehensive method for learning how to operate Aquarius is by using the training videos and user manual. Aquatic Informatics Support is online at <http://aquaticinformatics.com/support/>. To log into the Aquarius 360 Support site, however, you'll need a username and password which can be obtained without charge via an email request to support@aquaticinformatics.com. Once you can log into the AI website, click the Knowledgebase button to get started. The NPS also has documentation and tutorials for Aquarius Software at https://nrss.sharepoint.nps.gov/div/wrd/data/Pages/Aquarius_NG_Learning.aspx

Getting Started with Aquarius NG

The NPS has a limited number of licenses to support named users of Aquarius NG. The licenses are allocated upon request by the System Administrator (dean_tucker@nps.gov). To request a license, follow the instructions "Getting Started Aquarius NG" from the NPS overviews at https://nrss.sharepoint.nps.gov/div/wrd/data/Pages/Aquarius_NG_Learning.aspx. The Aquarius NG client software will need to be installed in order to run some of the software tools. Detailed instructions are provided in the NPS overviews linked above.

To start Aquarius Time Series you must be on the DOI/NPS Network. Open your browser and go to <https://aquarius.nps.gov/aquarius>. At the 'Sign In' screen, click the 'Windows Authentication' button. Authentication is controlled by your NPS active directory password which governs your access to the DOI/NPS Network.

Once you are signed in, you will be taken to Aquarius Springboard and shown the last locations and time series that were saved in your browser's cache. After completing an Aquarius session, it is best

practice to explicitly log out of Aquarius in order to free up the license for another user. Click the Setting gearbox icon on the upper left to logout and exit.

General Aquarius Workflow

Aquarius is used to manage continuous time series data. The software organizes data by geographic location. Each location (weather station) contains unique continuous “data sets” (time series), typically one data set for each parameter measured over all years. New data are appended to these time series from raw data files. It should be noted that once imported, raw data are never deleted in Aquarius. All edits are logged in the software and any changes are stored in an audit log.

1. Site setup. Each location (weather station) is configured with basic geographic information. Within each location, time series are configured as data set containers to accept raw data. Each data value has an associated timestamp reflecting when it was measured.
2. Thresholds. Automated quality control is established by configuring “thresholds”. Values that exceed thresholds are suppressed when they are imported (appended) into the data set containers.
3. Appending (importing) data. Raw data files are uploaded to the data set containers. Values that exceed defined thresholds are automatically suppressed.
4. Data Corrections. All data are reviewed manually. Additional flags and corrections are made as needed.
5. Notes and Qualifiers. Additional information can be assigned to selected data for specified time periods. For example, a ‘Note’ can be assigned to wind speed/direction values when it is suspected that the sensor may have been experiencing riming conditions. These notes/qualifiers are carried forward in the time series metadata along with any other changes.
6. Data grading. All data are graded as good, suspect, or unusable. Data that have been corrected may still be considered “Good” depending on the type of corrections.
7. Data approvals. After all data corrections are complete, data values can be designated as “Working”, “In Review”, or “Approved”.
8. Data export. Corrected data values may be exported from Aquarius with associated quality grades and approvals.

Site Setup

This section describes procedures for setting up site information in Aquarius. Before attempting to use Aquarius, the documents and tutorials noted in the Overview should be reviewed.

1. To create a new site location, log in to the software in your browser and click ‘New Location’ at the bottom left. A new tab will open to enter location details. Note: to open the location details on an existing location, click the ‘hamburger button’ (≡) next to the site name.

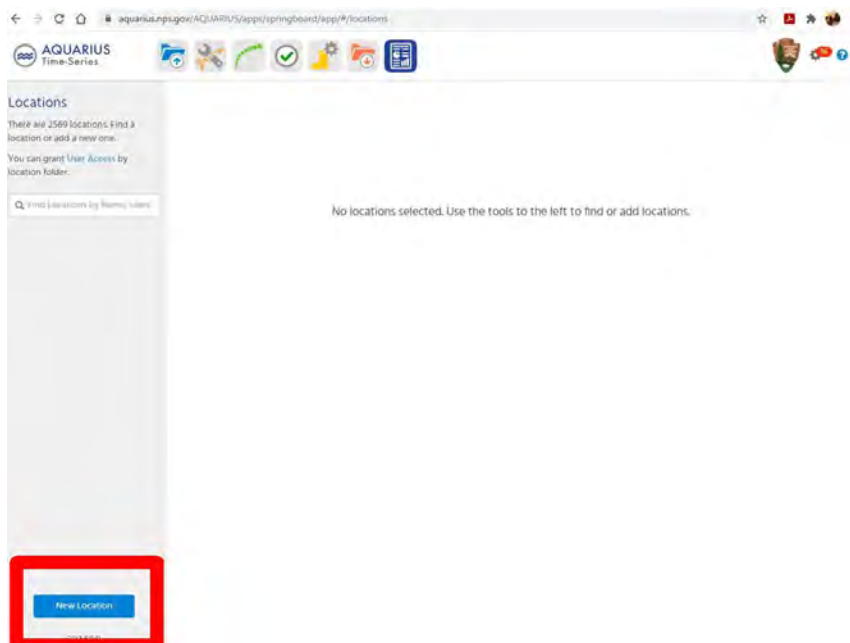


Figure SOP 11-1. Setting up a new location in Aquarius.

2. Location Details

- a. Location Identifier: The NPS WRD standard for naming sites includes both the park code and the site name (e.g., KOVA_SRWA2 for Salmon River in Kobuk National Park). For site name use the NWS identifiers from SOP 2 Appendix A.
- b. Name: Use the NWS identifiers from SOP 2 Appendix A.
- c. Type: Meteorological Station
- d. Location Folder: Key in and select the appropriate folder from the options below (more details are available in the NPS tutorials).
 - i. National Park Service.Arctic Network.AK_Climate
 - ii. National Park Service.Central Alaska Network.AK_Climate
 - iii. National Park Service.Southeast Alaska Network.SEAN_Climate
- e. Description: Not required. This can be used to describe the location's setting or elaborate on other distinctive characteristics or features of the monitoring location.
- f. Latitude, Longitude, and Elevation fields: Use decimal degrees in WGS84 datum.
- g. Select the time zone. This is the default time zone that will be displayed throughout the Aquarius graphs and tables for this location. It is suggested that the default display time zone stay consistent throughout sites within a monitoring network (e.g. for ARCN the default time zone is UTC -08:00 AKDT).
- h. Publish: Select 'Yes' to make data available to external systems via Aquarius' Publish API.
- i. Tags: This field is used for search purposes to find locations in Aquarius. For pre-existing locations, tags have been migrated from the previous version of Aquarius. For new locations, add the relevant tags below.
 - i. Arctic Network: 1) National Park Service, 2) Arctic Network, 3)AK_Climate

- ii. Central Alaska Network: 1) National Park Service, 2) Central Alaska Network, 3) AK_Climate
- iii. Southeast Alaska Network: 1) National Park Service, 2) Southeast Alaska Network, 3) SEAN_Climate
- j. Additional Attributes: Select the ‘Park Name’ and the ‘Make Location Visible in Aquarius WebPortal’ fields. The ‘Make Location Visible in Aquarius WebPortal’ is currently (as of v.2020.1) a required specification. If set to ‘1’, the location (but not necessarily its datasets) will be visible in WebPortal. This attribute will disappear in a subsequent release when publishing a location to the Aquarius WebPortal is controlled by a location’s Publish attribute (see above) in concert with the Publish attributes on the location’s time series.

The screenshot shows the 'Location Details' page for 'KOVA_SRWA2 - Salmon River' in the Aquarius web portal. The interface includes a left sidebar with navigation links: Location Details, Sub-Locations, User Roles, Attachments, Reference Datums, Reference Points, Location Notes, and Upload. The main content area is titled 'Location Details' and contains the following fields:

- Location Identifier:** KOVA_SRWA2
- Type:** Meteorological Station
- Name:** Salmon River
- Source:** AQUARIUS Location
- Location Folder:** National Park Service/Arctic Network/AK_Climate
- Location Unique ID:** 6a2270ccbd4a4d57b7bb75f9067ee43
- Description:** Salmon River
- Latitude (WGS 84):** 67.458900
- Longitude (WGS 84):** -158.841300
- Elevation:** 1262,000
- Units:** ft
- UTC Offset:** -08:00
- Publish:** Yes (selected), No
- Tags:** AK_Climate, Arctic Network, National Park Service
- Additional Attributes:**
 - Park Name:** Kobuk Valley National Park
 - Sensitivity:**
 - Status:**
 - Waterbody Code:**
 - Waterbody Name:**
 - Gage Number:**
 - Date Established:**
 - Travel Directions:**
 - Make Location Visible in Aquarius WebPortal (1=Yes; 0=No):** 1

Figure SOP 11-2. Location Details

3. Creating New Time-Series and Importing Data: Aquarius defines *time-series* as dataset containers. Before importing (or appending) new data, a time-series must be created in Aquarius. The attributes of the time-series are defined prior to appending data.

- a. Creating a new time-series
 - i. Find an Aquarius location, select the hamburger icon () next to the site name, and click New Basic Time-Series.
 - ii. Fill in the attributes following the fields below in Table SOP 11-1. When naming the datasets follow these guidelines:
 - 1. The string “WC_G” must be somewhere (anywhere) in the dataset name. When exporting the corrected data from Aquarius (SOP10 Appendix B), only datasets with this string will be included. Datasets without the “WC_G” tag will not be included in the export.
 - 2. The WFMI parameter ID (e.g., RNIN) must start after the first period (“.”) and end at the next punctuation mark of any sort.
 - 3. The NWS station ID (e.g., SRWA2) is taken as the string between the last underscore (“_”) encountered and the end of the dataset name.
 - iii. The long identifiers will auto-fill to the Aquarius default as “Parameter.Label_WC_G@PARK_SITE” (Figure SOP11-3).
 - iv. Select the Parameter by keying in and selecting the name (Table SOP 11-1).
 - v. Select the appropriate units (Table SOP 11-1).
 - vi. Select the Measurement Method (or choose None if options are not relevant).
 - vii. Set the Gap Tolerance to 61 minutes. This will make Aquarius define a gap for any missing data beyond the sampling interval of 60 minutes. For more information on gap processing, consult the Aquarius help.
 - viii. Select the time zone (typically UTC -08:00 AKDT).
 - ix. If you would like the time-series visible in the Aquarius Web Portal, select “Yes” under Publish in the Time-Series Attributes field and enter “1” in the Extended Attributes.
- b. For each location, continue creating basic time-series for all the parameters listed in Table SOP 11-1.

KOVA_SRWA2 - New Basic Time-Series

Time-Series Attributes

Label * ATF_WC_G

Parameter * Air Temp

Units * °F

Measurement Method * None

Interpolation * Preceding Constant

Define Gaps

☒ Define a gap when data points are distant from one another.

Gap Tolerance (mins) 61

☐ No gap tolerance

Sub-Location

UTC Offset - 08:00

Computation

Extended Attributes

* Required field

Save Changes Cancel

Figure SOP 11- 3. Creating Basic Time-Series. Time-Series attributes should be configured for all parameters before raw data are (imported). Note that the text string “WC_G” should be added to the Label name in order to be identified for export to a deliverable.

Table SOP 11-1. Specifications for creating time-series and appending in Aquarius. *Rainfall values are transmitted as a cumulative total as required by the National Interagency Fire Center. However, both cumulative and hourly rainfall totals are stored in the datalogger. Only hourly totals should be appended into Aquarius. **For parameters that need to be exported in the final data deliverable, the Label name needs to be identified by ending with the text string “_WC_G”.

Element	Measurement (hourly)	Aquarius Parameter Name	Units	Gap Tolerance	Aquarius Label Name**	Aquarius Interpolation Type	Aquarius Grade
Rainfall*	Hourly Total	Precip Total	in	61	RNIN	Preceding Total	0- UNDEF
Wind Speed	Vector Average	Wind Vel	mph	61	WSM	Preceding Constant	0- UNDEF
Wind Direction	Vector Average	Wind Dir	deg	61	WDD	Preceding Constant	0- UNDEF
Air Temperature	Average	Air Temp	F	61	ATF	Preceding Constant	0- UNDEF
Relative Humidity	Sample	Rel Humidity	%	61	RHP	Instantaneous Values	0- UNDEF
Battery Voltage	Average	Battery Voltage Under Load	V	61	BVV	Preceding Constant	0- UNDEF
Wind Direction (of gust)	Direction of Peak Gust	Peak Wind Dir	deg	61	WDDP	Preceding Constant	0- UNDEF
Wind Speed (of gust)	Speed of Peak Gust	Peak Wind Vel	mph	61	WSMP	Preceding Constant	0- UNDEF
Solar Radiation	Average	Solar Rad	W/m2	61	SRW	Preceding Constant.	0- UNDEF

Snow Depth	Sample	Snow Depth	in	61	SDI	Preceding Constant	0- UNDEF
Air Temperature	Minimum	Air Temp	F	61	AT1L	Preceding Constant	0- UNDEF
Air Temperature	Maximum	Air Temp	F	61	AT1H	Preceding Constant	0- UNDEF
Soil Temperature (10 cm)	Average	Soil Temp	F	61	STF	Preceding Constant	0- UNDEF
Soil Temperature (20 cm)	Average	Soil Temp	F	61	STF2	Preceding Constant	0- UNDEF
Soil Temperature (50 cm)	Average	Soil Temp	F	61	STF3	Preceding Constant	0- UNDEF
Soil Temperature ()	Average	Soil Temp	F	61	STF4	Preceding Constant	0- UNDEF
Soil Temperature ()	Average	Soil Temp	F	61	STF5	Preceding Constant	0- UNDEF
Barometric Pressure_inHg	Sample	Atmos Pres	inHg	61	BP	Instantaneous	0- UNDEF

Thresholds: Automated Quality Control

This section describes the procedures for setting up “thresholds” in Aquarius. Aquarius uses thresholds to automatically suppress data based on predefined values.

Note that the previous versions of this SOP employed *notifications* for semi-automated quality control. Notifications were part of Aquarius v.3.10 but have been discontinued in the latest version of the software (Aquarius NG). Additionally, system generated flags (i.e. flags generated via “notifications”) did not migrate from v.3.10 to Aquarius NG. Lastly, the ability to automatically qualify/flag data based on rates of change, spikes, or flat lines (no net change in value over a specified time range) is no longer possible in Aquarius NG. Thus, some of the previous workflow for the semi-automated quality control of climate record processing has been changed in accordance with software updates.

To configure a new threshold, click the hamburger icon (☰) next to a Location and click New Threshold. A new dialogue box will open. The below example is to configure a threshold for the AT1H parameter. All values greater than 110°F are suppressed.

1. Time-Series: Begin keying in the name of the time-series you would like to configure (e.g. “AT1H”). The software will recognize potential time series based on your key strokes. Select the time-series of interest.
2. Name: Create a name for the threshold (e.g. AT1H_high).
3. Start Date: To create a threshold for the entire period of record, select “Beginning of Record”.
4. End Date: To create a threshold for the entire period of record, select “End of Record”.
5. Value: Enter the threshold value from Table SOP 11-2.

6. Suppress Data: Activate the check box to suppress data.

Note that thresholds cannot be configured upon previously *approved* data. **This is because all approved data are locked to editing.** To apply threshold corrections to previously approved time-series, data approval levels must be downgraded from *approved* to a lower level such as *working*. For more information on approval levels, see section near the end of this SOP.

Continue configuring thresholds for all parameters based on Table SOP 11-2. Low and high thresholds should be set for each variable. Thresholds are listed and can be configured from the main frame of the site location page (Figure SOP 11-5).

The screenshot displays the 'New Threshold Value' configuration interface in the AQUARIUS Time-Series system. The sidebar on the left lists various locations, with 'KOVA_SR...' (Salmon River) selected. The main form includes a 'Time-Series' dropdown menu, a 'Type' dropdown set to 'ThresholdAbove', a 'Name' field set to 'ATH_high', and a 'Check for Behavior' dropdown set to 'Threshold Above'. Below these, the 'Threshold Periods' table is visible, with columns for 'Start Date (UTC-08:00)', 'End Date/Time (UTC-08:00)', and 'Value (°F)'. The 'Start Date' is set to 'Beginning of Record', the 'End Date/Time' is set to 'End of Record', and the 'Value' is set to '120.0'. A 'Suppress Data' checkbox is checked. The 'Display Color' is set to red. At the bottom, there are 'Save Changes' and 'Cancel' buttons, along with a note 'You have unsaved changes'.

Figure SOP 11-4. Automated quality control can be configured based on high and low thresholds.

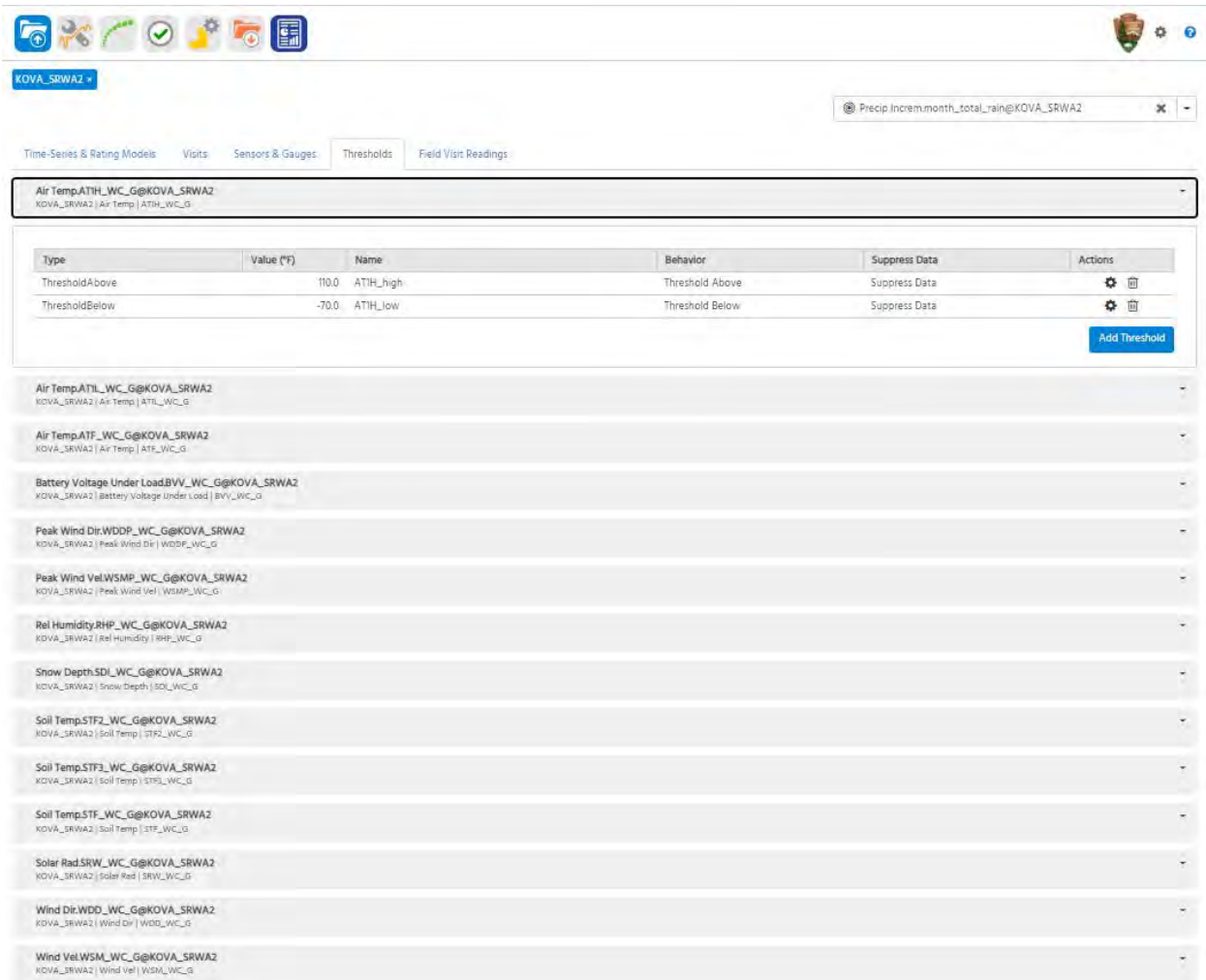


Figure SOP 11-5. Typical list of thresholds for a site location. This example shows configured thresholds at Salmon River in Kobuk Valley National Park.

Table SOP 11-2. Notification thresholds for all parameters. Parameter short names are listed in Table SOP 11-1.

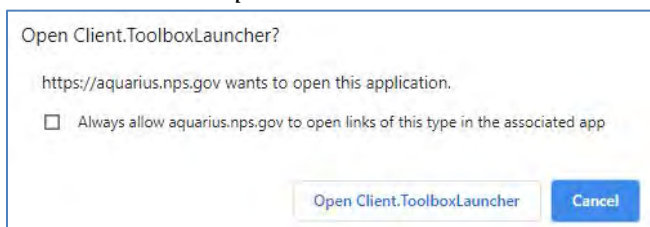
Parameter	Low	High
WSM	0 mph	120 mph
WDD	0°	360°
ATF	-70° F	110° F
RHP	0%	100%
BVV	0.1 V	16 V
WDDP	0°	360°
WSMP	0 mph	120 mph
SRW	0 W m-2	1400 W m-2
SDI*	0 inches	Sensor Height
AT1L	-70° F	110° F
AT1H	-70° F	110° F

STF	-65° F	110° F
STF2	-65° F	110° F
STF3	-65° F	110° F

Appending (importing) Data

This section describes the procedures for appending (importing) raw data. After general site information has been added, data time-series containers have been configured, and thresholds have been defined, Aquarius is ready to accept raw data. All columns in the raw data file need to be defined before Aquarius can accept data.

1. Click on the Append To Logger toolbox.
2. Aquarius will require you to open the Client.ToolboxLauncher. See the above section *Getting Started with Aquarius* for more details.



3. Logger File: click the upper ellipsis (...) icon and select the raw data file (WC_F; SOP 10).
4. Click the Config Settings... button to define all columns in the raw data file (Figure SOP 11-6). Import from File Wizard will open.

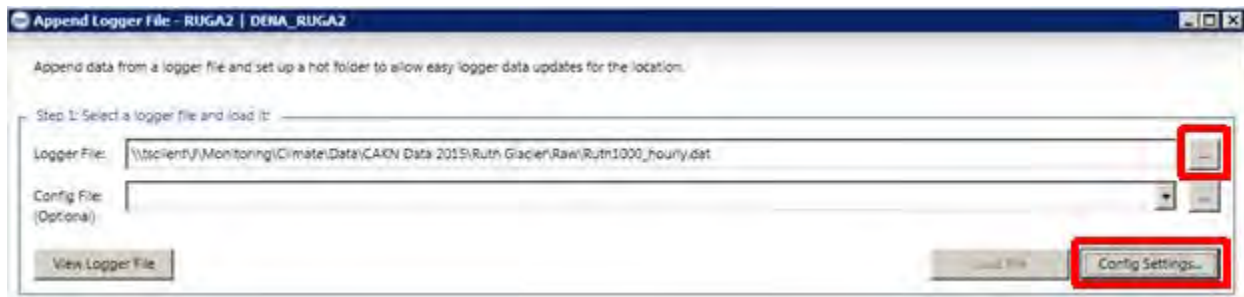


Figure SOP 11- 6. The Append To Logger Toolbox. The upper red box indicates how to select the raw data file to import. The lower box is used to define all column headers in the raw file.

- a. In step 1 of the wizard, select Text File as the type of Time Series file to import (Figure SOP 11-7).



Figure SOP 11-7. Import from File Wizard, Step 1.

- b. In step 2 of the wizard, edit the number of headers and define which row holds the first data record (Start import at row:). These values may vary with the data file, but under the current datalogger program there are four headers. Data records begin on the fifth row (Figure SOP 11-8). Confirm that the file is Comma delimited.

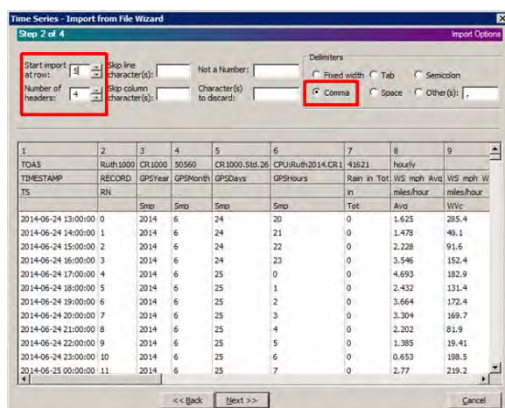


Figure SOP 11-8. Import from File Wizard, step 2.

- c. Step 3 of the wizard requires that all columns in the raw data file are defined. Columns can be defined as Date/Time or Data. Columns that do not need to be imported into Aquarius can be skipped. Data to be imported should be configured according to Table SOP 11-1. As datalogger programs evolve, the configuration of data files may change.

- i. The first column contains the Date/Time (Figure SOP 11- 9). To configure the date/time, select the first column by clicking on the grey header fields. The column should become highlighted. Select the Date/Time Format from the drop-down menu. If the correct option is not available, manually type in the appropriate date/time format (i.e. yyyy-mm-dd HH:MM:SS). Select the time zone. Important: this is the time zone in which the data were collected and should match the time zone configured on the CR1000 datalogger. All datalogger programs should be configured to ADT.

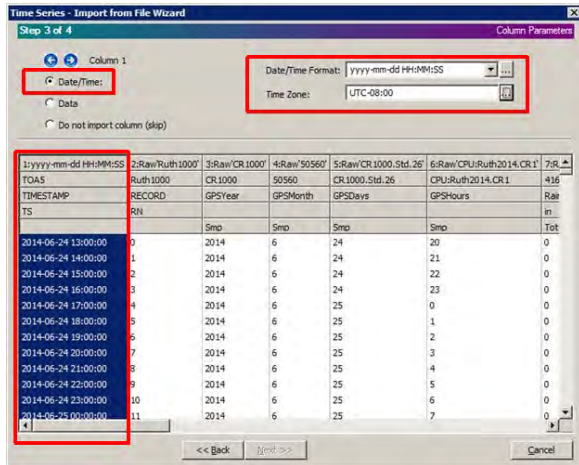


Figure SOP 11-9. Import from File Wizard, step 3. Define the timestamp.

- ii. The current datalogger program contains numerous columns with additional date/timestamp information (Figure SOP 11-10). The additional information is recorded as a backup in case the datalogger clock malfunctions. If the datalogger has recorded the correct timestamp, these columns can be “skipped” because they do not need to be imported to Aquarius. Select these columns by clicking on the grey header rows, and select “Do not import column (skip)”.

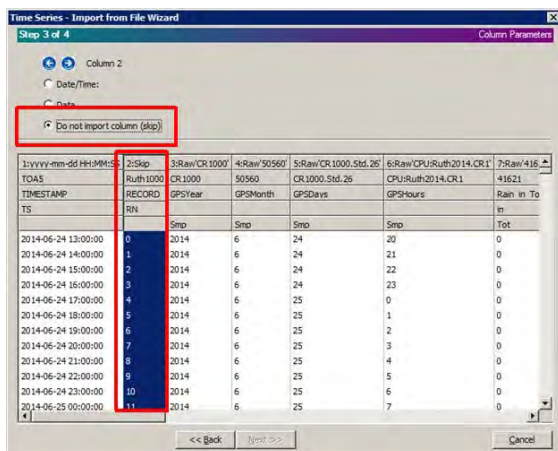


Figure SOP 11-10. Import from File Wizard, step 3 (cont.). Skip columns that do not contain data.

- iii. Continue configuring each column in the raw file. For each column containing data for import, the parameter, units, gap tolerance, label, interpolation type, and grade should be defined according to Table SOP 11-1. Parameters are chosen from a list of preset options in Aquarius. The interpolation type defines how the software displays data in graphics and tables. More information is available in the help manuals.

1. Rainfall is logged as both a cumulative total (reset on October 1 of every year) and as an hourly total (Table SOP 11-1). The cumulative total does not need to be imported into Aquarius and can be “skipped”. An example for the hourly total precipitation (RNIN) is shown in Figures SOP 11-11 and 11-12.

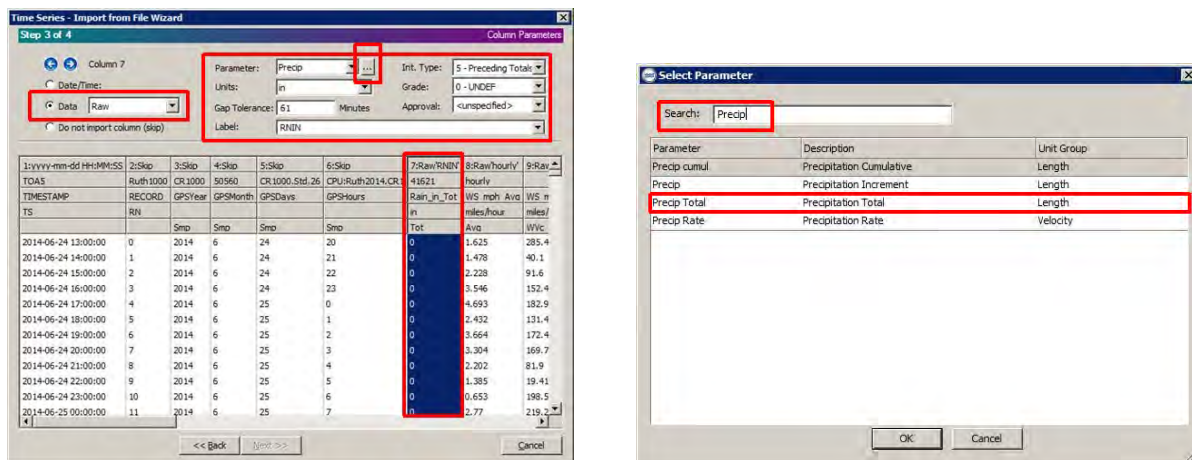


Figure SOP 11-11. Import from File Wizard, step 3 (cont.). Column 7 contains hourly rainfall totals. The parameter, units, label, interpolation type, grade, and gap tolerance are defined according to Table 1. The Parameter list (at right) is opened by clicking the (...) button. The search bar can be used to find relevant parameters.

2. Each column needs to be defined or skipped before step 3 of the wizard is complete (Figure SOP 11-12). Continue defining the columns of the raw data file according to Table 1. When all columns have been configured, click Next.

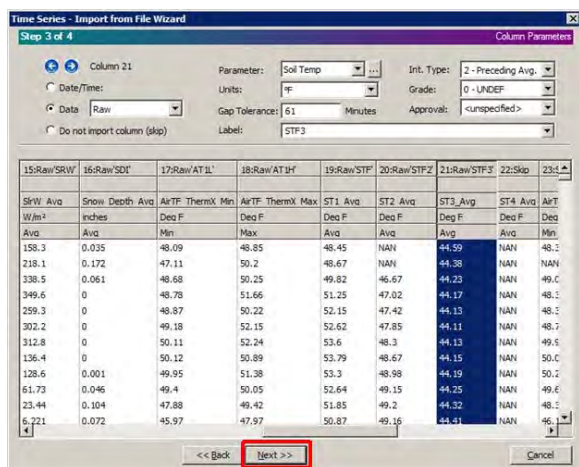


Figure SOP 11-12. Import from File Wizard, step 3 (cont.). After each column has been defined, the Next button becomes available.

- d. Complete step 4 of the wizard (Figure SOP 11-13). Save the configuration file. The configuration file can be selected and used (Figure SOP 11-6) for all raw data files with identical column structure. Confirm that gap processing will be applied, and click Finish.



Figure SOP 11-13. Import from File Wizard, step 4.

5. After the import wizard has finished, the data are loaded into the Append Logger File toolbox (Figure SOP 11-14). Complete Step 2 of the toolbox by first selecting “Append to selected data set” in the Action column. Next, in the “Append To” column begin typing the name of the time-series (e.g. “RNIN”) and then selecting the appropriate data container as it appears. After all parameters have been selected, click Append. The bottom frame of the toolbox (History) will update and display the number of data points that have been appended to each data set. Note that a parser can be created from the selected data sets, which allows future data files to be appended via a drag and drop feature. It’s reasonable to use this feature only if

the structure of the data files remains the same. Because datalogger programs can change over time, use the parser feature with caution.

Append Logger File - Glacier Bay Fuel Dock | GLBA_BLT2

Append data from a logger file and set up a parser to allow easy logger data updates for the location.

Step 1: Select a logger file and load it:

Logger File: ...

Config File: ...

(Optional)

Step 2: Choose the target data sets and append:

Append the data from the logger file selected above to an existing data set or create a new data set.
When creating a new data set, attributes from Step 1 above will be used to describe the data parameter, label and units.

Label	Parameter	Units	# Points	From	To	Action	Append to	Status
WSM	WSpd Avg	mph	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Wind Vel.WSM_WC_G GLBA_BLT2 Wind Vel WS	
WDD	Wind Dir	deg	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Wind Dir.WDD_WC_G GLBA_BLT2 Wind Dir WC	
ATF	Air Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Air Temp.ATF_WC_G GLBA_BLT2 Air Temp ATF	
RHP	Rel Humidity	%	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Rel Humidity.RHP_WC_G GLBA_BLT2 Rel Humidity	
BVV	Battery Volta	V	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Battery Voltage Under Load GLBA_BLT2 Battery Voltage	
WDDP	Peak Wind Di	deg	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Peak Wind Dir.WDDP_WC_G GLBA_BLT2 Peak Wind Dir	
WSMP	Peak Wind Ve	mph	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Peak Wind Vel.WSMP_WC_G GLBA_BLT2 Peak Wind Ve	
SRW	Solar Rad	W/m^2	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Solar Rad.SRW GLBA_BLT2 Solar Rad SR	
SDI	Snow Depth	in	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Snow Depth.SDI GLBA_BLT2 Snow Depth	
AT1H	Air Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Air Temp.AT1H_WC_G GLBA_BLT2 Air Temp AT	
AT1L	Air Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Air Temp.AT1L_WC_G GLBA_BLT2 Air Temp AT	
STF	Soil Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Soil Temp.STF GLBA_BLT2 Soil Temp ST	
STF2	Soil Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Soil Temp.STF2 GLBA_BLT2 Soil Temp ST	
STF3	Soil Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Soil Temp.STF3 GLBA_BLT2 Soil Temp ST	
STF4	Soil Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Do not append	Do not append	
STF5	Soil Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Do not append	Do not append	
BP	Atmos Pres	inHg	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Atmos Pres.BP GLBA_BLT2 Atmos Pres B	
RNIN	Precip Total	mm	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	rnin	
ATF_Backup	Air Temp	degF	21629	2018-04-19 12:00:00	2020-10-07 18:00:00	Append to selected dat	Precip Total.RNIN_WC_G GLBA_BLT2 Precip Total RNIN_WC_G	

History:

Figure SOP 11-14. The final step of the Append Logger File Toolbox.

Field Visits

Enter basic information for field visits in the Field Visits portion of Aquarius. This information is particularly useful for selecting time periods between visits when reviewing and approving data. In Aquarius springboard, select the hamburger icon next to a site and click New Visit. The visit summary page opens in a new window. Enter the party, start date/time, and end date/time.

Important: The start time of the field visit should be later than the last record in the raw data file. This is important so that the data selection period will cover all records when approving data between field visits. For example, if the last record in the raw data file is 8/1/2020 14:00, the field visit start time should be 8/1/2020 15:00.

Other information can also be entered including field tasks, weather, and comments. Although not part of the SOP at this time, additional information can be included such as site photos, calibration data, etc.

The screenshot displays the 'Visit Summary' form in the Aquarius Time-Series application. The interface includes a left-hand navigation menu with options like 'Visit Summary', 'Readings', 'Inspections', 'Calibrations', 'Hydrology Activities', 'Location Activities', 'Automatic Corrections', 'Images and Video', 'Attachments', and 'Upload'. The main content area is titled '2019-06-01 DENA_RuthGlacier_test - RuthGlacier' and features a 'New Activity' button. The form fields are as follows:

- Party:** Hill
- Agency Collecting Data:** NPS
- Approval Level for Visit:** 800 Working (dropdown menu)
- Start Date *:** 2019-06-01
- Time (UTC+00:00) *:** 00:00
- End Date *:** 2019-06-01
- Time (UTC+00:00) *:** 23:59
- Identifier:** d4ef270c-76ea-436c-b847-cl
- Completed This Visit:**
 - ☐ Ground water levels
 - ☐ Water quality sample
 - ☐ Biological sample
 - ☐ Sediment sample
 - ☐ Other sample
 - ☒ Recorder data collected
 - ☐ Conducted Level survey during this Visit
 - ☐ Safety inspection performed
- Weather:** Partly cloudy, SE winds 5-10 mph.
- Comments:** See site visit worksheets for field visit details.

Buttons for 'Summary Report' and 'Save' are located at the top right of the form.

Figure SOP 11-15. Entering Field Visits in AquariusNG.

Data Corrections and Data Quality Grading

Many stations operate under extreme environmental conditions which cause a variety of challenges. The most common problems are caused by wildlife and/or icing. Wildlife (often bears and/or ground squirrels), can damage sensors, cables, hardware, or the power supply. Icing can obstruct free-air movement on naturally aspirated radiation shields, build up on wind sensors, or block incident solar radiation sensors. Blowing snow or corrosion of snow depth transducers can lead to false snow depth measurements. This SOP describes some of these issues, and how to view, edit, grade, and approve data in the Aquarius software. Numeric codes for grades, interpolation types, and approval levels are summarized in Table SOP 11-3. Interpolation types are assigned at data import (Table SOP 11-1).

These codes describe how the raw data were collected and are not related to any corrections or edits in the quality control phase.

Table SOP 11-3. Codes for quality grades, interpolation types, and approval levels.

Type	Description	Code
Grade	Good	31
Grade	Suspect	6
Grade	Unusable	-2
Interpolation	Preceding Average	2
Interpolation	Preceding Total	5
Interpolation	Instantaneous Values	1
Approval	Working	800
Approval	In Review	900
Approval	Approved	1200

Data values that exceed defined thresholds are automatically suppressed when new data are appended (Table SOP 11- 2, Figure SOP 11-4). To begin reviewing the data, select the location and time-series

of interest, then click on the Data Review Toolbox. 

By default, the toolbox will display a graph of the data. Raw data are shown in green and corrected data are blue. These can be toggled on/off by clicking on the icons above the parameter name. Notice the carpet below the graph which shows current approvals, grades, qualifiers, and notes. Hover over specific sections to see overview details. Click on the Time-Series tab at right to view the associated numerical data (Figure SOP 11-16). The timestamp, raw values, corrected values, grades, and approval ratings will be displayed on the numeric table. Data can be selected using the selection tool. Selected time periods are highlighted in light orange in the graph and within the numeric table. Revisions and edits can be displayed by clicking on the tabs on the right side of the page (see below sections).

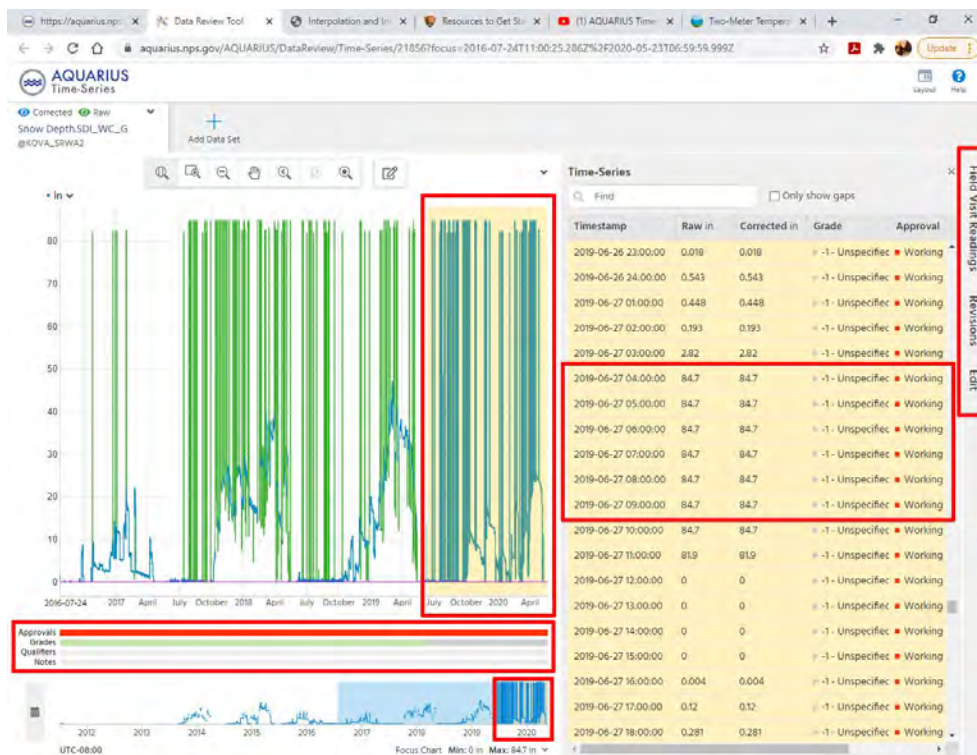


Figure SOP 11-16. Data Review Toolbox example displaying snow depth at Salmon River.

Rainfall

The tipping bucket measures liquid precipitation and is primarily used to monitor summer (June-August) rainfall. Rainfall measurements during time periods with air temperatures near or below freezing should be reviewed. Snow that collects in the tipping bucket and melts will record a false-positive measurement for rainfall. This is most common during the spring snowmelt period or during midwinter if air temperatures rise above freezing. Mixed (rain-snow) precipitation is also common during the shoulder seasons and may produce false-positive measurements. As advancements in quality control procedures are made, techniques will evolve. The current process for quality controlling rainfall data includes:

- 1- Manually reviewing hourly rainfall observations by graphical inspection. Based on expert opinion, erroneous measurements during the summer months are deleted (see Figure SOP 11-20). The most common reason for erroneous measurements fitting these criteria is a damaged sensor.
- 2- Set quality grades for values outside the summer season as “suspect”. It should be noted that there may be many time periods in non-summer months with reasonable rainfall data, especially in areas/networks with relatively warmer temperatures. However, at this time all non-summer months are considered suspect.

To set quality grades on rainfall data outside the summer season using Aquarius software, select the RNIN dataset and open the Data Review Toolbox.



1. Use the selection tool  to select the non-summer period (September-May). Click the mouse in the graphical display and drag and drop to select the period of interest. Fine-tune the selection period by manually typing in the start and end points in the Edit frame (e.g. 2019-09-01 00:00:00 to 2020-05-31 23:00:00). The selected area will be highlighted in light orange.
2. Under the edit type, choose “Grade”.
3. Select the Grade as “6 - SUSPECT”.
4. Under the comments section, optionally add a comment such as “Rainfall outside of summer season”.
5. Click Apply. You can validate that your changes have been applied by clicking the Revisions tab at right. Any revisions that have been applied during the time period are shown. You can click or hover over the revisions to see details (Figure SOP11-18).

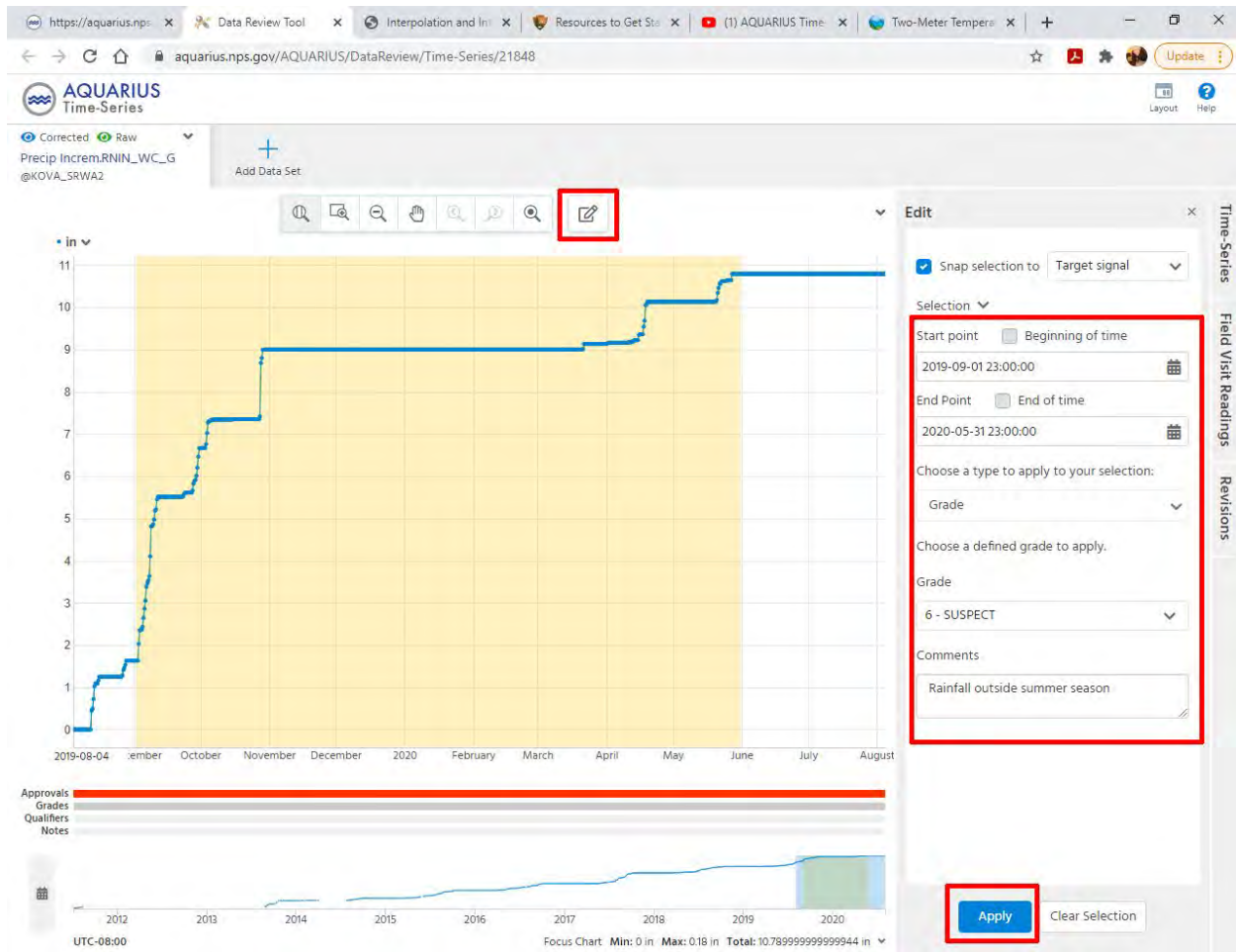


Figure SOP 11-17. Setting a data quality grade in the data corrections toolbox.

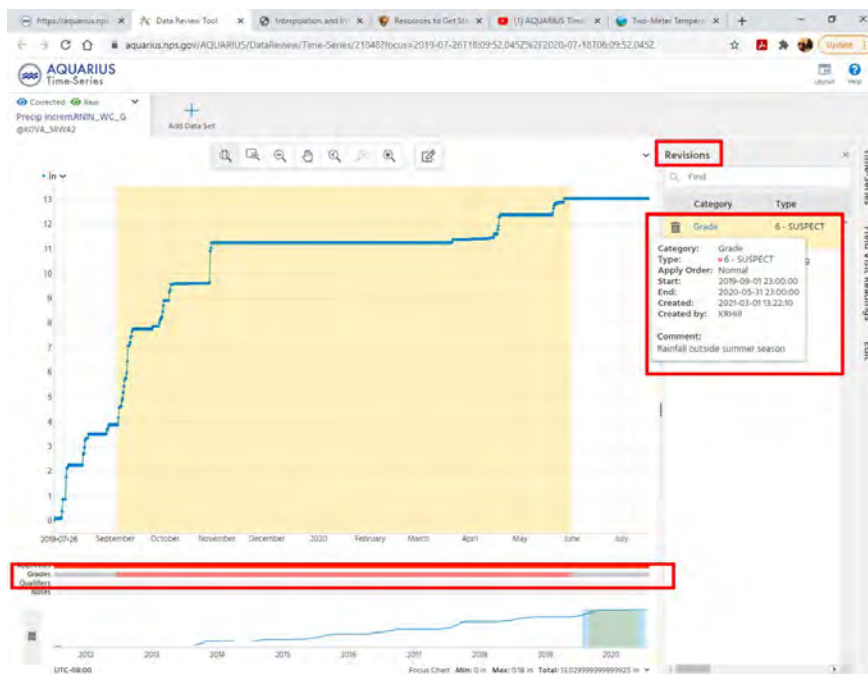


Figure SOP 11-18. Revision log in the Data Review Toolbox verifying rainfall graded as suspect.

6. Review the summer rainfall data. Consult the site visit worksheets to check for a record of damaged or out-of-level sensors. Delete data for time periods when data were collected by a damaged sensor (SOP11-19).
7. Inspect the data for long time periods when no rainfall was measured or time periods with anomalously intense rainfall events. For rainfall values during the summer season that appear valid, set the grade to “31- Good” using the same procedure as above. Note that double-clicking on the Grade carpet will select a specific time period. Save all changes before exiting the Data Review toolbox. All changes are logged within the software and can be seen in the Revisions tab.

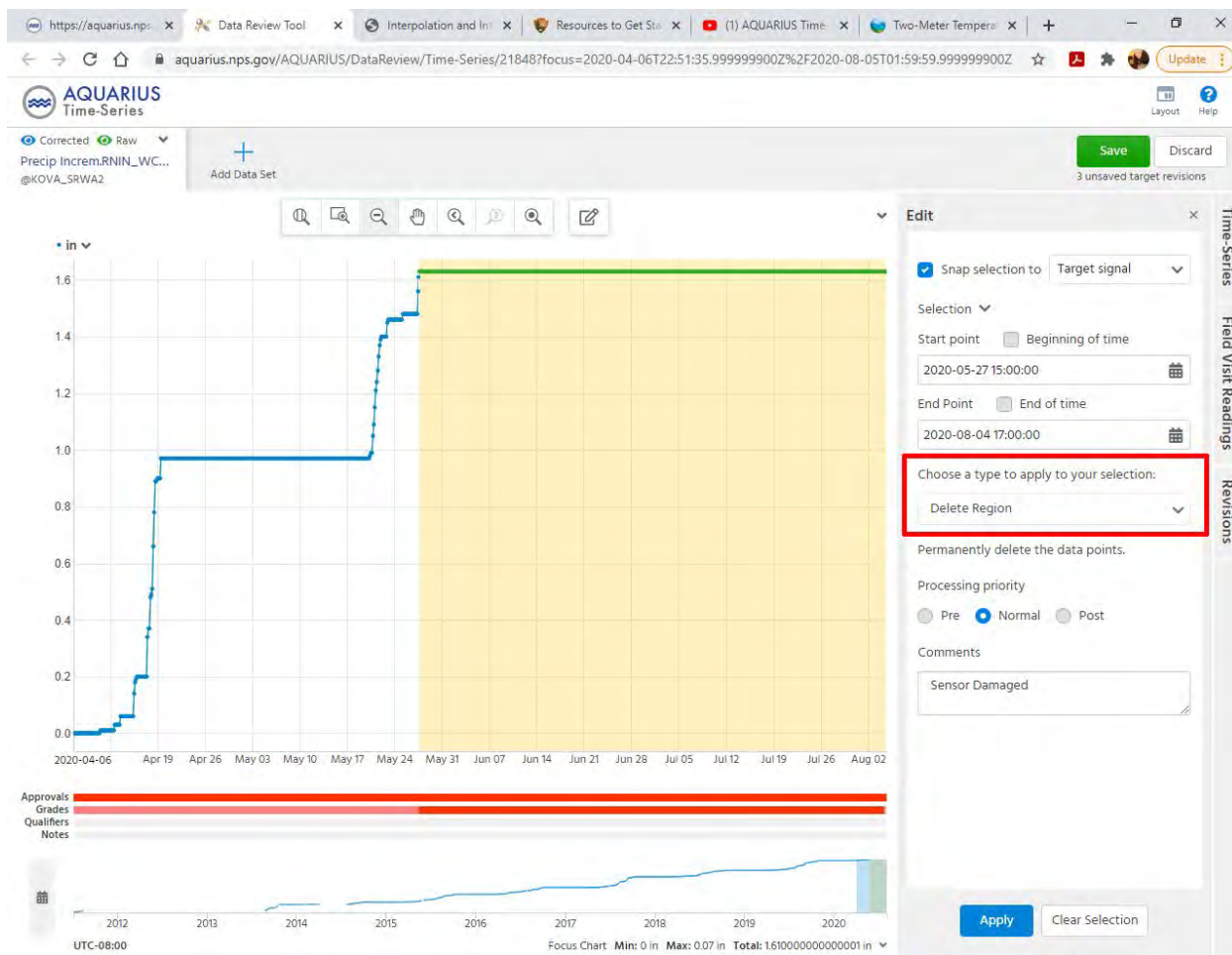


Figure SOP 11-19. Precipitation data quality grading. The sensor was damaged by wildlife on 5/27/2020 as suggested in the site visit worksheet. Data beginning on this date were selected, deleted, and graded as unusable.

Wind Speed and Direction

The most common problem related to wind measurements is icing. Icing can affect both speed and direction measurements simultaneously or each parameter may be affected separately. In extreme cases, icing could affect other parameters such as solar radiation and air temperature.

Most NPS climate stations are located where calm winds are rare, thus the easiest way to identify periods of icing is to visually review the wind speed measurements and look for periods of zero wind speed. Typically, suspected icing warrants data to be graded as “suspect”, although expert opinion could be used to keep the data as “good”. Alternatively, extensive icing could warrant suppressing the data and grading the period as “unusable”. Raw data are never deleted and all changes are logged in the revision history.

Note that in previous versions of Aquarius, values when wind speed and/or direction did not change for a specified time period could be flagged automatically. In the latest version of AquariusNG, this “flat line” feature is no longer available.

1. Select the WSM (wind speed) time-series at your location and open the Data Review Tool.
2. Zoom into a period of interest. Icing can typically be identified by reviewing two weeks at a time.
3. If a period of potential icing is identified by an extended period of zero values, use the selection tool to select the data. Zoom in to adjust the start/end times as needed.
4. Grade the data accordingly. A typical workflow is to grade time periods with potential icing as “Suspect” and add a note to the action such as “Possible Icing” (SOP11-20).

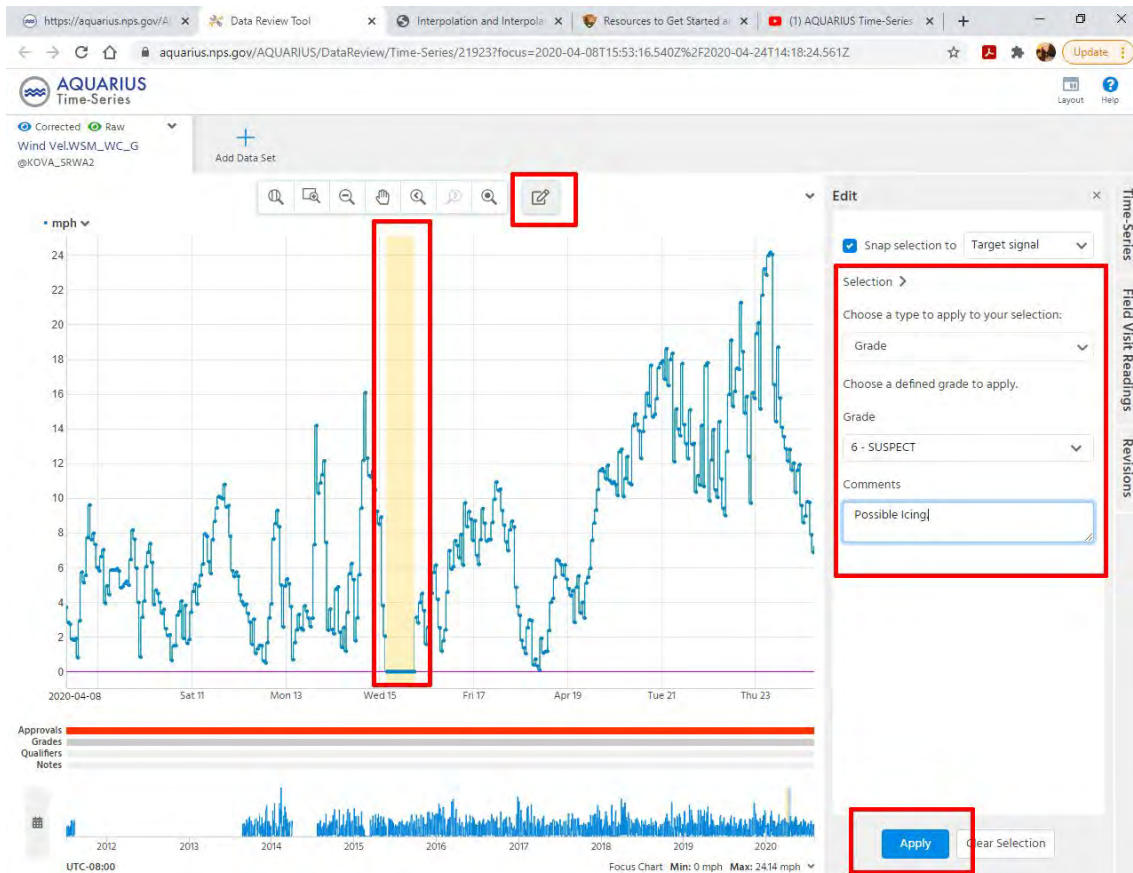


Figure SOP 11-20. Quality grading example for wind speed measurements.

Note that multiple parameters can be edited simultaneously. This is a new feature in Aquarius NG. A useful method is to grade all wind parameters (WSM, WSMP, WDD, and WDDP) as suspect during periods of potential icing. In extreme cases of icing, review other parameters that may have been affected (SRW, SDI, AT1L, AT1H, ATF). In practice it is often difficult to determine if these other parameters were affected by icing. However, if expert opinion dictates a change in quality grade these parameters could also be graded as suspect. To edit multiple parameters simultaneously follow these steps (Figure SOP 11-21):

1. Select the primary parameter of interest and open the Data Review Tool. In this example case, select WSM because icing is often most visible when reviewing wind speed data.

2. Inspect the data and find a period of zero values which indicates possible icing. Use the selection tool to select the period of interest.
3. Press the “+” button near the top of the screen to add a data set. Choose the location and begin typing the name of the time series to add. For possible icing, add the WSMP, WDDP, and WDD parameters.
4. Open the Edit tab at right and grade choose “Grade” to change the grade of the selected time period.
5. Check the boxes for each time series to apply the changes to each parameter.
6. Change the grade to Suspect and add a comment.
7. Apply and save the changes.

Note that this method of selecting multiple parameters simultaneously is also very efficient if multiple sensors on a station have been damaged. Data from multiple sensors can be selected and edited simultaneously.

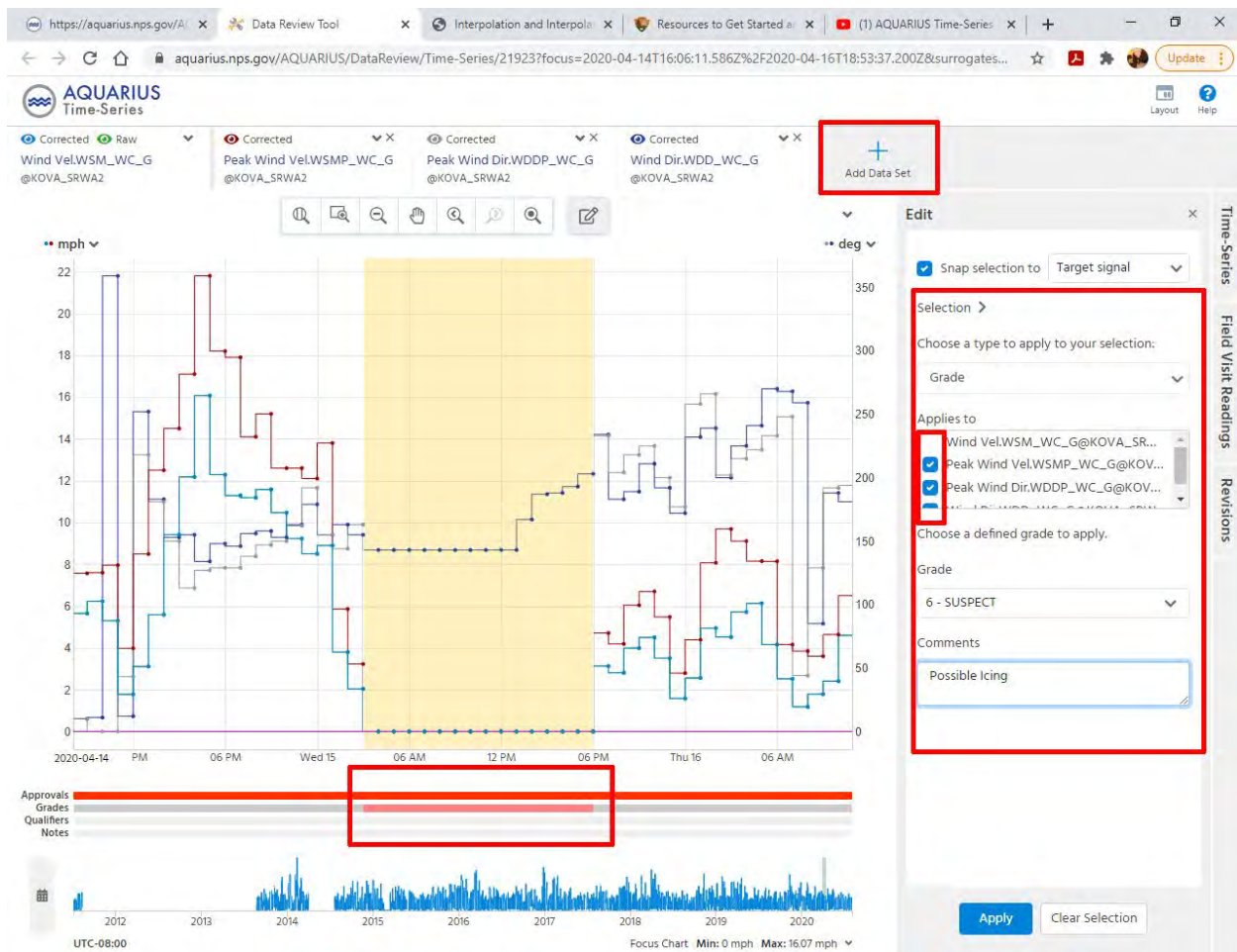


Figure SOP 11-21. Editing multiple parameters simultaneously.

Air and Soil Temperature

Air temperature measurements may be affected by (1) sensor/cable damage due to wildlife or corrosion, (2) reduced air flow due to obstruction by ice or snow, and (3) if not secured correctly, sensors may also fall out of the radiation shield, exposing them to solar heating. Wildlife can also pull the sensors out of the radiation shield. The most common problems with soil temperature sensors are (1) cable damage caused by wildlife, and (2) sensor placement altered from freeze-thaw processes or wildlife. If soil sensors are found on the ground surface during a site visit, this is noted in the field visit data sheet (SOP 9).

Erroneous temperature measurements are automatically suppressed based on thresholds (Table SOP 11- 2). Additional quality control may include:

1. Data corrections. Visually inspect the data and delete regions with erroneous measurements caused by damaged sensors.
2. Data grading. An example of data retrieved from a damaged air temperature sensor is shown in Figure SOP 11-22.
3. Note the type of air temperature sensor. Each location may have multiple air temperature sensors for redundancy. The primary sensor is typically a stand-alone thermistor (SOP 4). The combination air temperature-relative humidity sensor is used as a backup measurement if the primary thermistor fails. The type of sensor used in the final data series should be noted by using the Action – Set Note instruction in the Data Review Tool (Figure SOP 11-23).

As described above for wind measurements, editing all air temperature parameters (AT1H, AT1L, ATF) and/or soil temperature (STF, STF2, STF3) simultaneously is an efficient method for data grading.



Figure SOP 11-22. An example of data retrieved from a damaged air temperature sensor. Erroneous measurements on June 8. The “Delete Region” correction action deleted all values during the selected time period. A custom comment (“Sensor damaged”) was added to describe the delete region action. For damaged sensors, the quality grade for the time period should also be set to “-2- Unusable” with a descriptive note added to describe the reason for grading.

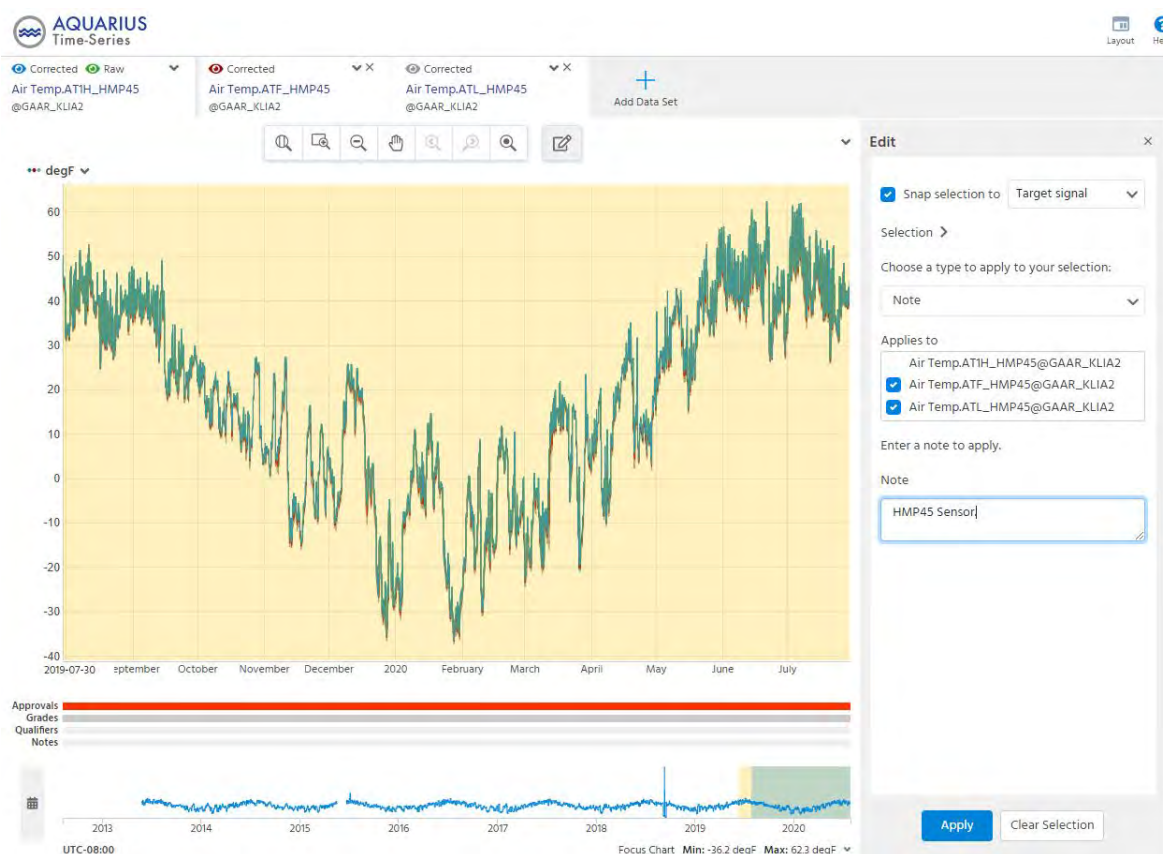


Figure SOP 11-23. An example showing how to note the type of air temperature sensor used to collect the measurements. After selecting a time period of interest, the Set Note action is accessed in the Data Review toolbox under the Edit tab.

Relative Humidity

Erroneous relative humidity measurements are suppressed based on the automatic thresholds outlined in Table SOP 11-2. In rare cases, damaged or uncalibrated sensors may report erroneous values within the threshold range (0%-100%). Sensor malfunction is most easily recognized by identifying a time period with measurements consistently below expected values (e.g., <20%). Based on the opinion of data reviewers, these values should be edited and graded as needed in Aquarius.

Solar Radiation

The pyranometer measures incoming shortwave radiation. In Aquarius, erroneous data are automatically suppressed based on the thresholds outlined in Table SOP 11-2. The bubble level of the sensor is checked in the field and noted in the site visit worksheets. Data from potentially out-of-level sensors should be reviewed and corrected as needed.

Snow or ice build-up on solar radiation sensors may require the need for additional data corrections. For example, after icing periods are identified, solar radiation values can be graphed in conjunction with wind speed (e.g. SOP11-21). Suspect values can be downgraded or suppressed as determined based on expert opinion.

Future techniques and software enhancements may include comparing measured values to ideal clear-sky conditions.

Snow Depth

The snow depth sensor determines the distance to the ground surface by emitting an ultrasonic pulse and measuring the elapsed time between the emissions and the return of the pulse. Snow depth is calculated by subtracting measured distance from the known height of the sensor. The measurements, to some degree, could be used to infer plant growth in the summer, and thus measurements are collected year round. Beyond general system problems (wildlife damage, power failure, etc.), erroneous measurements may be caused by:

1. Icing of the transducer. This often returns a snow depth value equal to the sensor height (i.e., the measured distance is equal to zero).
2. Blowing snow.
3. Shifting of the sensor height or angle.
4. Alteration of the ground surface.

Erroneous data are suppressed by Aquarius software according to the thresholds configured in Table SOP 11-2. Values are suppressed if measurements are less than zero or greater than the (user-entered) height of the sensor (Figure SOP 11-4). The upper threshold for automatic suppression is site specific and should be set at or near (below) the height of the sensor. The datalogger program sets negative snow depth values to zero. Thus, these observations could be due to sensor error and should be examined carefully while reviewing the data. Erroneous observations should be deleted, graded, and approved based on expert opinion.

In general, quality control of snow depth measurements requires extensive manual inspection. Multiple methods for data correction are possible in Aquarius and tutorials are available online through both the software support portal and NPS WRD. A typical workflow for reviewing snow depth data is outlined below.

1. Select the snow depth (SDI) parameter for a Location. Open the data review toolbox.
2. Select the time period of interest.
3. Expand the Edit tab and select Adjustable Trim edit option.
 - a. Note that the current version of Aquarius will not allow Adjustable Trim edits for time series defined as a Preceding Constant interpolation type. This bug should be fixed in future versions of the software. If the adjustable trim edit is not available, consult with the Aquarius software manager to change the interpolation type in order to gain access to the adjustable trim tool.
4. Click within the selected area to add pivot points (Figure SOP 11-24). Drag and drop the pivot points for fine-tuning.
5. Click apply and add a comment if desired (e.g. “sensor error”).
6. Continue reviewing data using other edit actions as needed. Zoom in on specific time periods to review shorter time periods with suspect data.

7. When all edits are complete, grade the selected time period. Time periods with limited errors should be graded as Good. Time periods with excessive sensor errors could be graded as Suspect. All actions are logged in the revisions pane (Figure SOP 11-25).

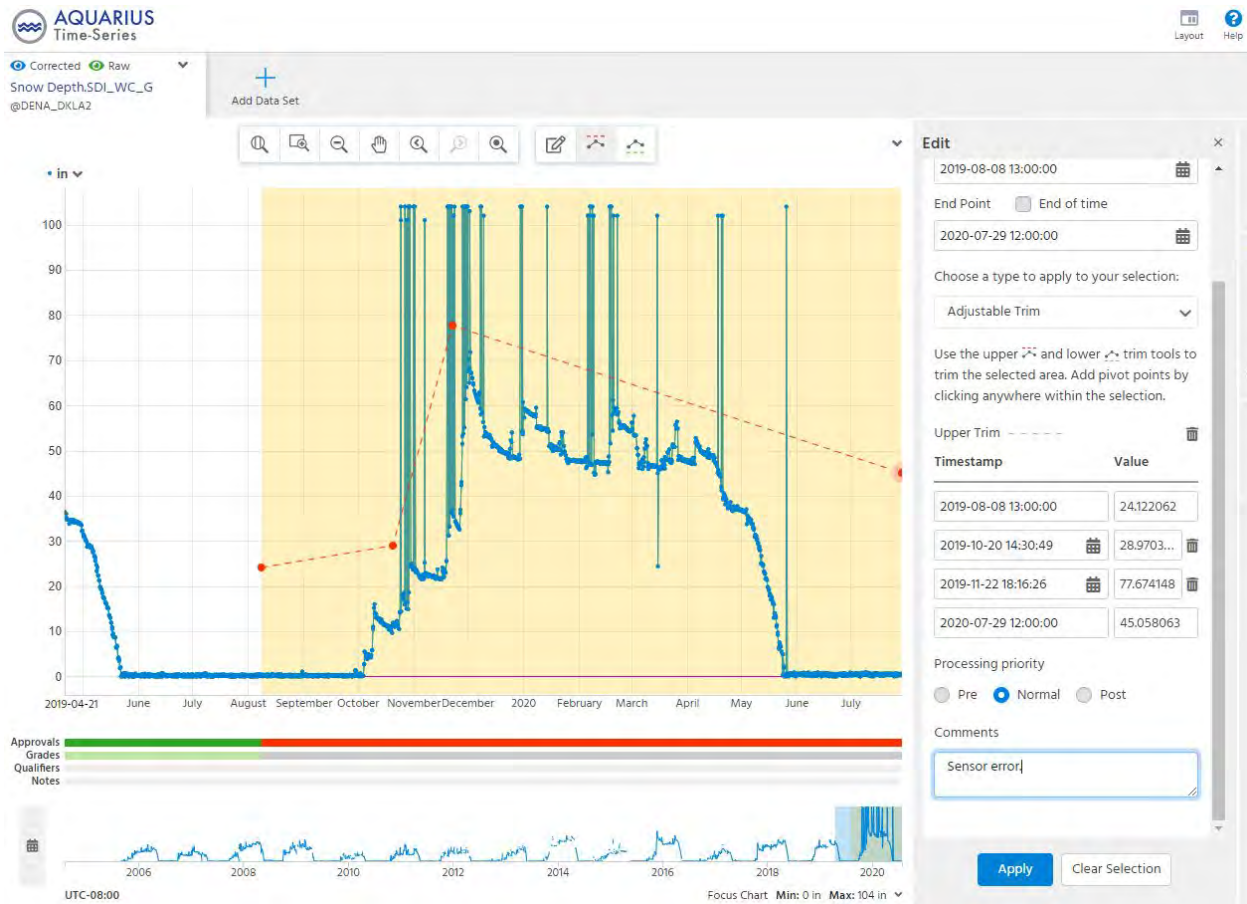


Figure SOP 11-24. Data corrections for a snow depth time series. The adjustable trim edit action suppresses all values above the user-defined pivot points.

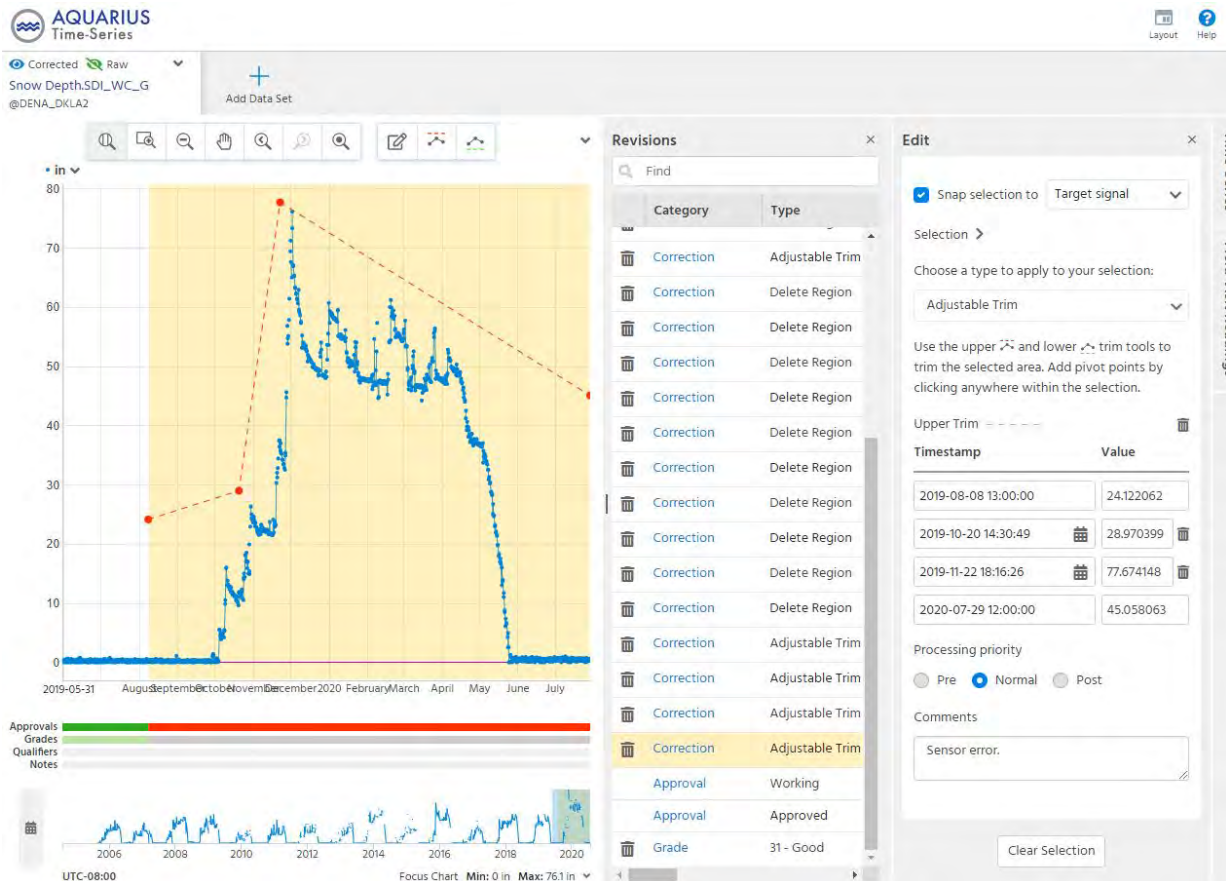


Figure SOP 11-25. After all edit actions are applied, sensor errors are suppressed. Not that all corrections are logged in the revisions tab of the data review toolbox.

Data Approvals

In addition to data grading, time series approval levels can be designated as working, in review, or approved. The suggested workflow is to include data approval levels for all time series. After all corrections have been implemented and data grades have been assigned, approval levels are set by the following steps:

- 1- For a location, select all time series for which you want to set approval levels. Often, this includes any time series with WC_G in the label.
- 2- Click the green box with a circled check mark to open the Approval Levels toolbox (Figure SOP11-26). Each time series will open in a new window.
- 3- On the drop-down at upper right, choose a longer time period (e.g. 24 months)
- 4- Select a time period on the Field Visits ribbon to approve the latest time period between field visits. **Important: If the start time entered for the most recent field visit is before the last record in the timeseries, the last record will not be selected and approved.** Therefore, verify and/or edit the start time entered so that it is after the last record in the timeseries. See *Field*

Visits section above for more information. Alternatively, the selection period can be entered manually by clicking the Choose Date toggle.

- 5- On the drop-down at bottom, choose Approved
- 6- Save changes and exit (Figure SOP 11-27).

Figure SOP 11-26. An example of setting approval levels at YUCH_CLCA2. All time-series are selected before opening the Approval Level toolbox. Each time series will open in a new window.

Figure SOP 11-27. The approval levels toolbox for a rainfall time series. The approval is set after selecting a time period using the Field Visits ribbon.

Data Export

After all time-series have been reviewed and corrected, the approved data can be exported. There are numerous export options using Aquarius Springboard, the Aquarius Reporting Toolbox, and the Aquarius API. However, the custom generator application developed by SEAN ensures that all final deliverables meet the required data quality standards from SOP 10.

The most recent version of SEAN's web-based generator application is available at http://sean-dm.glba.nps.gov/WC_G_generate5_DM.aspx. A detailed explanation of the export process is outlined in Appendix SOP 10-B and copied here for completeness:

The WC_G Generator is a custom application developed to extract final quality-controlled data for a station from the Aquarius facility, validate it meets all mandatory criteria, and create a CSV file that meets the specifications in Appendix SOP-10A. One file per station is generated, but each contains all data for the period of record.

Prerequisites must first be met:

- The station whose WC_G is to be generated must have completed the entire quality control process.
- Aquarius datasets associated with the station that are to be included in the WC_G product must be named following the rules specified in SOP 11.
- The generator employs objects in a SQL Server database built for the purpose. Descriptive database tables should be current. These include items such as formal dataset citation, Protocol/SOP references, names of those responsible for creating the WC_G, and allowable WFMI parameter codes.

Detailed steps

Enter the URL http://sean-dm.glba.nps.gov/WC_G_generate5_DM.aspx into your browser to start the application. The startup screen, below, should appear.

National Park Service Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior

DATA MANAGEMENT

Instance: INPGLBAFS05\SQL_SEAN_2014 Database: SEAN_Staging_2014

Data Management » Climate » Generate WC_G Basis

Generate WC_G from Aquarius

This builds a database object (the "basis") that contains all underlying data needed for producing the WC_G Corrected Data deliverable. Once the basis is complete, then the WC_G ASCII CSV file can be downloaded onto your workstation through the browser. The basis can only contain data for one single weather station. By concentrating on one at a time, the process should be more manageable than trying to simultaneously deal with multiple stations in various states of completeness. The basis is usable only after all mandatory validation criteria in the current protocol/SOP set are met. The processing goes through these stages:

1. Extract all Aquarius data for a specified location/station.
2. Audit Aquarius data to validate it all meets the WC_G mandatory criteria.
3. Reshape the validated data into a database object that may be downloaded as a CSV file.
4. Download the CSV.

Network to Use
(select) A

Location to Use
▼

First Date (leave blank for earliest) Last Date (leave blank for latest)

Calendars...

Protocol/SOP ID Updated by

B

Soil Sensor Depths - change as needed but only one depth per sensor per station is supported

STF	STF2	STF3	STF4	STF5
10	20	50	100	150

Waiting for a location that has available datasets

☒ Include metadata preamble ☒ Include column headings

Waiting for WC_G Basis to be recreated

U.S. Department of the Interior Accessibility Freedom of Information Act Privacy Policy Disclaimer USA.gov NPS Home Contact Us

Site last updated: November 16, 2012 | Email: Webmaster
Please download the latest version of Adobe Reader - Free Download
This site is best viewed in Internet Explorer

Define the content desired in the WC_G

At bullet A select the network to work with. It is possible to work with multiple networks in multiple browser windows at the same time. However, within a network only one station may be generated at a time. Attempts to simultaneously generate multiple stations in one network, even using different workstations, will lead to undefined file content.

Notice the dropdown box at bullet B contains the formal Protocol/SOP ID that will get stamped on every record produced. The default value is the most recent version for the network chosen but more choices may be selected from.

It may take a few seconds for the app to respond to your network selection. Notice that a wait cursor (⌛) may appear. Be patient and wait for the normal cursor to return. (There are several other places in the app where a wait cursor may appear – possibly for up to ten minutes duration when dealing with very large datasets.)

After the network has been selected, the current content of the WC_G Basis for the network is shown at bullet C, below.

The D dropdown now reflects names of those recognized as possible generators of the product. Pick yours. All WC_G records for the station chosen will be stamped with this name

The E dropdown box also gets filled with all locations defined in Aquarius for that network. Select one and wait briefly.

Generate WC_G from Aquarius

This builds a database object (the "basis") that contains all underlying data needed for producing the WC_G Corrected Data deliverable. Once the basis is complete, then the WC_G ASCII CSV file can be downloaded onto your workstation through the browser. The basis can only contain data for one single weather station. By concentrating on one at a time, the process should be more manageable than trying to simultaneously deal with multiple stations in various states of completeness. The basis is usable only after all mandatory validation criteria in the current protocol/SOP set are met. The processing goes through these stages:

1. Extract all Aquarius data for a specified location/station.
2. Audit Aquarius data to validate it all meets the WC_G mandatory criteria.
3. Reshape the validated data into a database object that may be downloaded as a CSV file.
4. Download the CSV.

Network to Use
 ARCN ▼ The WC_G Basis for ARCN currently contains a complete version of NOAT_SSIA2 having 52913 sampling events built by K-Hill on 4/12/2018 9:16:57 AM according to specifications defined in SOP UPDATES.

Location to Use
 (select) ▼ Waiting for a location to be selected

First Date (leave blank for earliest) **Last Date** (leave blank for latest)
 [] []

Calendars...

Protocol/SOP ID ARCN_PIP-2017_SOP-2018.1 ▼ **Updated by** K-Hill ▼

Soil Sensor Depths - change as needed but only one depth per sensor per station is supported

STF	STF2	STF3	STF4	STF5
10	20	50	100	150

Waiting for a location that has available datasets

☒ Include metadata preamble ☒ Include column headings

Waiting for WC_G Basis to be recreated

After selecting a location (Aquarius-speak for “station”), the app will find all datasets associated with that location. During QC a number of datasets may be produced for various purposes covering the same location and parameter. Only those whose name includes “WC_G” will be included in the final WC_G product. Those datasets get listed in F for your approval. If no datasets are displayed, then that station has not completed the final QC process.

One may limit the amount of data extracted by specifying a date range in G. If no first date is specified data will be brought in starting at the earliest observation in the datasets. If no last date is specified it will use observations through the most recent.

The protocol/SOP package ID must be selected from the dropdown at H. Also, the person creating the new deliverable must be specified. These are stamped on every record and are mandatory. The app examines the datasets and determines which, if any, soil temperature depth levels are recorded. It assigns the standard depths in cm to those as default (see I). If you know that other depths were employed at the station, then adjust the figures to match. It is not practical at this time to assign different depth values to, say, STF2 for different records made at the same station. Only one depth is supported per sensor.

When enough information has been provided on the screen for a WC_G to be produced, the button at J is enabled. Review the screen specifications and press J to create the “Basis” database object.

Generate WC_G from Aquarius

This builds a database object (the "basis") that contains all underlying data needed for producing the WC_G Corrected Data deliverable. Once the basis is complete, then the WC_G ASCII CSV file can be downloaded onto your workstation through the browser. The basis can only contain data for one single weather station. By concentrating on one at a time, the process should be more manageable than trying to simultaneously deal with multiple stations in various states of completeness. The basis is usable only after all mandatory validation criteria in the current protocol/SOP set are met. The processing goes through these stages:

1. Extract all Aquarius data for a specified location/station.
2. Audit Aquarius data to validate it all meets the WC_G mandatory criteria.
3. Reshape the validated data into a database object that may be downloaded as a CSV file.
4. Download the CSV.

Network to Use
 ARCN ▼ The WC_G Basis for ARCN currently contains a complete version of NOAT_SSIA2 having 52913 sampling events built by KHill on 4/12/2018 9:16:57 AM according to specifications defined in SOP UPDATES.

Location to Use
 NOAT_ASIA2 ▼ These datasets will be considered

PPRHN_WC_G@NOAT_ASIA2	RW.SRW_WC_G@NOAT_ASIA2
SO.SOI_WC_G@NOAT_ASIA2	TA.ATH_WC_G@NOAT_ASIA2
TA.ATH_WC_G@NOAT_ASIA2	TA.ATF_WC_G@NOAT_ASIA2
TS.STF_WC_G@NOAT_ASIA2	TS.STF2_WC_G@NOAT_ASIA2
TS.STF3_WC_G@NOAT_ASIA2	UD.WDD_WC_G@NOAT_ASIA2
UP.WSMP_WC_G@NOAT_ASIA2	UR.WDDP_WC_G@NOAT_ASIA2
US.WSM_WC_G@NOAT_ASIA2	XR.RHP_WC_G@NOAT_ASIA2
YBL.B/V_WC_G@NOAT_ASIA2	

First Date (leave blank for earliest) **Last Date** (leave blank for latest)
 11-01-2016 10-31-2017

Protocol/SOP ID **Updated by**
 ARCN_RIP-2017_SOP-2018.1 J061

Soil Sensor Depths - change as needed but only one depth per sensor per station is supported

STF	STF2	STF3	STF4	STF5
10	20	50	100	150

Click to generate a new WC_G basis covering only NOAT_ASIA2

☒ Include metadata preamble ☒ Include column headings

Waiting for WC_G Basis to be recreated

Audit Aquarius data to validate it all meets the WC_G mandatory criteria

The app extracts all relevant data from Aquarius and then validates it against all mandatory criteria specified in Appendix SOP10-A. This may take a while.

If anything fails validation, a report will appear on the screen reporting the offending records.

Corrections must be made in Aquarius before attempting another generation process.

If validation is successful, those possible parameters for which no data were found are listed in the report and the app proceeds to build the Basis.

Reshape the validated data into a database object that may be downloaded as a CSV file

All data and screen entries are gathered together and woven into a single database table whose content mirrors that specified for WC_G.

The content is presumed to be Accepted because it was generated from the final approved QC'd data in Aquarius. Separate approval is not required.

Once a Basis build attempt finishes, a report is generated of the results. A successful execution report is illustrated, below, at L. An audit trail of these executions is retained for future reference at the UNC listed at the bottom of the report.

Click to generate a new WC_G basis covering only NOAT_ASIA2

Execution Log Started for NOAT_ASIA2 at 4/27/2017 2:33:10 PM

Step 1 - Extract relevant datasets from Aquarius -----

Working on dataset PP.RNIN_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset RW.SRW_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset SD.SDI_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset TA.AT1H_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset TA.AT1L_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset TA.ATF_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset TS.STF_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset TS.STF2_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset TS.STF3_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset UD.WDD_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset UP.WSMP_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset UR.WDDP_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset US.WSM_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset XR.RHP_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Working on dataset YBL.BVV_WC_G@NOAT_ASIA2. 35,038 records were extracted.

Extraction complete. 15 datasets were brought in. -----

Step 2 - Validate that extracted data conform to all mandatory criteria -----

Any errors reported list the parameter and timestamp of the problematic Aquarius record.

This station has no Aquarius data sets for WFM elements: STF4 STF5.

The extracted data are all valid. -----

Step 3 - Build WC_G Basis from the validated data -----

Adding parameter AT1H - success.

Adding parameter AT1L - success.

Adding parameter ATF - success.

Adding parameter BVV - success.

Adding parameter RHP - success.

Adding parameter RNIN - success.

Adding parameter SDI - success.

Adding parameter SRW - success.

Adding parameter STF - success.

Adding parameter STF2 - success.

Adding parameter STF3 - success.

Adding parameter STF4 - success.

Adding parameter STF5 - success.

Adding parameter WDD - success.

Adding parameter WDDP - success.

Adding parameter WSM - success.

Adding parameter WSMP - success.

These data contain 35038 sampling events.

The prior WC Basis generation for NOAT_ASIA2 contained 35038 events.

This WC_G Basis has been validated against all mandatory QC criteria in SOP SET 2017.1 and is determined to be of ACCEPTED quality.

The WC_G Basis has been successfully created. It now reflects station NOAT_ASIA2. -----

Execution Ended 4/27/2017 2:36:49 PM

This Execution Log is being saved under file name \\npg\lbf\503\data\SEAN_Data\staging\WC\WC_G\ARCN\WC_G_LOG_17-27-04_1436.htm.

☒ Include metadata preamble
☒ Include column headings

Download the Basis to your workstation as a CSV file

Download the CSV

Once the basis is successfully built, its content may be downloaded over your browser. The CSV file may optionally include a preamble that cites the data, protocol package, date of creation, and other useful metadata (M). A one-line column heading may also be included (N).

SOP 11-36

YWC_0_ASIA211.XLSY - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ACROBAT

Clipboard Font Alignment Number Styles Cells

P8

1 National Park Service Arctic Network (ARCN)
 2 Weather station data downloaded on April 27 2017
 3
 4 Station NWSID: ASIA2
 5 Date range: 07/14/2012 through 07/12/2016
 6 Sampling events: 35038
 7 Protocol in effect when data was accepted out of quality control: WC-2017.1 / SOP SET 2017.1
 8
 9 The SOP SET 2017.1 document contains a detailed data dictionary covering this content and may be found at: (in review).
 10
 11 Please cite this dataset as: K. Hill and P. Sousanes. WC_G ARCN RAWs corrected data. <https://irma.nps.gov/DataStore/Reference/Profile/2239061>. (accessed 04/27/2017).
 12
 13 For additi browse <https://science.nature.nps.gov/im/units/ARCN/>.
 14
 15

station_id	timestamp_utc	rnin	rnin_quality	wsm	wsm_quality	wdd	wdd_quality	atf	atf_quality	rhp	rhp_quality	bvv	bvv_quality	wddp
ASIA2	2012-07-14 01:00	0	31	10.1	31	189	31	51.67	31	89	31	13.2	31	200
ASIA2	2012-07-14 02:00	0.01	31	8.1	31	194	31	51.01	31	90	31	13.2	31	203
ASIA2	2012-07-14 03:00	0.02	31	7.7	31	198	31	50.41	31	96	31	13.2	31	209
ASIA2	2012-07-14 04:00	0.03	31	7.5	31	212	31	49.63	31	94	31	13.2	31	223
ASIA2	2012-07-14 05:00	0	31	7	31	213	31	49.58	31	98	31	13.1	31	219
ASIA2	2012-07-14 06:00	0.01	31	7.5	31	217	31	49.17	31	97	31	13.1	31	226

If the intent is to subsequently concatenate several stations together into one file, it may be convenient to leave the preamble off of all except the first file by unchecking box O. Similarly, if the one-line column header is not desired, uncheck the box at P to suppress it. Press the green Q button at the bottom of the page to begin the download. You will be asked to save the file under a default name. An alternate name may be given. The opportunity to directly open it may be possible depending on the model and configuration of your browser. But the final product will be loaded onto your workstation one way or another.

☐ O ☒ Include metadata preamble ☐ P ☒ Include column headings

Download the current Basis to your workstation as a CSV file