NEON Standard Operating Procedure: SUNA V2 Nitrate Sensor Data Management Procedure

PREPARED BY	ORGANIZATION	DATE
Matt Haack	ENG	10/17/2019
Mike Pursley	ENG	10/17/2019
Madeline Cavileer	ENG	10/17/2019

APPROVALS	ORGANIZATION	APPROVAL DATE
Keli Goodman	AQU	01/03/2020
Frank Mocilac	ENG	12/31/2019

RELEASED BY	ORGANIZATION	RELEASE DATE
Anne Balsley	CM	01/03/2019

See configuration management system for approval history.

The National Ecological Observatory Network is a project solely funded by the National Science Foundation and managed under cooperative agreement by Battelle. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	01/03/2020	ECO-06299	Initial release.

TABLE OF CONTENTS

1 DESCRIPTION 1

1.1 Purpose 1

1.2 Scope 1

2 RELATED DOCUMENTS AND ACRONYMS 2

2.1 Applicable Documents 2

2.2 Reference Documents 2

2.3 External References 2

2.4 Acronyms 2

3 OVERVIEW 3

3.1 Components 3

3.2 Subsystem Location and Access 3

4 FIELD DATA MANAGAMENT PROCEDURE 3

4.1 Equipment 3

4.2 Connect to a SUNA: Communication Settings 4

4.3 DAT File Download Procedure 4

4.4 Delete DAT File Procedure 6

4.5 DAT File Upload Procedure 9

4.5.1 Automated Upload Procedure 9

4.5.2 Manual Upload Procedure 12

LIST OF TABLES AND FIGURES

Table 1. Equipment Table 3

Figure 1. How to Connect to the SUNA with the SUNA Y-Cable - Order of Operations 4
Figure 2. Navigate to This PC and Click on USB Drive 5
Figure 3. Open DAT Folder in USB Drive 5
Figure 4. The DAT folder is the folder that contains the SUNA .CSV Data Files 6
Figure 5. Open the UCI Software and Select Transfer Files 7
Figure 6. Select the .CSV Data File with your Curser and then Select Delete 8
Figure 7. Click Close to Close the File Manager Pop-up Window 8
Figure 8. Disconnect the SUNA from the UCI Software FIRST, and then Disconnect the SUNA Physically 9

Figure 9. Select the “Utilities” tab and click on “AIS SUNA DAT file rename” button 10
Figure 10. Click the Small Folder Icon next to the Path Field 11
Figure 11. Click the “Current Folder” Button 11
Figure 12. Successful Rename and Upload Confirmation Window 12
Figure 13. N:\Science\Sensor Swap 13
Figure 14. CVAL Files Only and MFG Files Only Folder 13

1 DESCRIPTION

1.1 Purpose

The purpose of this document is to provide standard instructional guidance on how to download, store and transfer data for the Sea-Bird Scientific SUNA V2 Nitrate Sensor. This document applies to Field Science, Manufacturing (Repair Lab), and the Calibration, Validation and Audit Laboratory (CVAL).

1.2 Scope

The operating procedures herein apply to managing data for the Sea-Bird Scientific SUNA V2 Nitrate Sensors at stream, lake and river Aquatic Instrument Sites (AIS). Data management procedures include data transmission and storage (downloading the DAT files and transferring them to the network drive) using the Sea-Bird Scientific UCI software.

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

The following applicable documents (AD) contain mandatory requirements and/or supplementary information that are directly applicable to the topic and/or procedures herein. Visit the NEON Document Warehouse for electronic copies of these documents.

AD [01]	NEON.DOC.002716	NEON Preventive Maintenance Procedure: AIS Nitrate Analyzer
AD [02]	NEON.DOC.004613	NEON Preventive Maintenance Procedure: AIS Buoy

2.2 Reference Documents

The reference documents (RD) listed below may provide complimentary information to support this procedure. Visit the NEON Document Warehouse for electronic copies of these documents.

RD [01]	NEON.DOC.000008	NEON Acronym List
RD [02]	NEON.DOC.000243	NEON Glossary of Terms
RD [03]	NEON.DOC.001570	NEON Sensor Command, Control and Configuration - Submersible Ultraviolet Nitrate Analyzer (SUNA)
RD [04]	NEON.DOC.003808	NEON Sensor Command, Control and Configuration (C3) Document: Buoy Meteorological Station and Submerged Sensor Assembly
RD [05]	NEON.DOC.004713	AIS SUNA Nitrate Analyzer Formal Verification Procedure
RD [06]	NEON.DOC.004419	Stream or Lake Water Level Formal Verification Procedure
RD [07]	NEON.DOC.003880	NEON Preventive Maintenance Procedure: AIS Stream Infrastructure
RD [08]	NEON.DOC.004886	NEON Preventive Maintenance Procedure: Aquatic Portal & AIS Device Posts
RD [09]	NEON.DOC.005037	AIS Buoy Infrastructure Design Drawings and Schematics
RD [10]	NEON.DOC.004608	AIS Buoy Verification Procedures

2.3 External References

The external references (ER) listed below contains supplementary information relevant to this procedure. These documents are external to the NEON program and Battelle.

ER [01]	Sea-Bird Scientific. UCI Software for HydroCAT, HyroCAT-EP, SUNA, SeaFET V2 Reference. Document No. UCIref180726, Version A, July 26, 2018. https://www.seabird.com/asset-get.download.jsa?id=54712835755
ER[02]	Sea-Bird Scientific. SUNA V2 User Manual. Document No. SUNA180725, Version F, July 26, 2018. https://www.seabird.com/asset-get.download.jsa?id=54627862534

2.4 Acronyms

.CSV	Comma Separated Values
A/R	As Required
AIS	Aquatic Instrument Site

CVAL	Calibration, Validation and Audit Laboratory
LC	Location Controller
P/N	Part Number
S1	Upstream
S2	Downstream
SCI	Science

3 OVERVIEW

3.1 Components

This document includes components from the following sensors and parts:

- **0329950000** Sensor, SUNA Nutrient with Integrated Wiper
- **0329950100** Sensor, Buoy, SUNA Nitrate with Integrated Wiper, Titanium Housing
- **0329950005** Sensor, 5 mm pathlength SUNA Nitrate with Integrated Wiper

3.2 Subsystem Location and Access

SUNA V2 Nutrient Sensors reside at both core and relocatable AIS sites. Access to AIS sites require Aquatic PPE and may require a boat. At wadeable stream sites, the SUNA sensors are part of the downstream sensor set (S2) or single station sensor sets. At river and lake sites, the SUNA mounts from the AIS buoy in an enclosure 0.5 meters below the water surface.

4 FIELD DATA MANAGAMENT PROCEDURE

IMPORTANT: This procedure requires UCI Software Version 1.2.5. Download UCI via **N:\Common\CVL\Field_Calibration\UCI**. If you are still using SUNACom, stop, and download UCI. Completely read this section before conducting any procedure in the field. This procedure also requires the IS Control and Monitoring Suite to rename the files: **N:\Common\CVL\Field_Calibration\Required Directory\Test_Data\Current Executables\IS Control and Monitoring Suite**. (*Side Note: This document does not include an enable or disable logging section because configuration of the sensor already includes logging.)*

4.1 Equipment

Table 1. Equipment Table

Part Number (P/N)	NEON P/N	Description	Quantity
N/A	HB09780000	USB-Power-SUNA Cable (known as the Y-Cable)	1
	NEON IT	Laptop with UCI Software	1
	NEON ENG	IS Control and Monitoring Suite Software	1

PRO TIP: *Recommend downloading the UCI software on a loaner laptop to use in the field to prevent damaging the laptop you use daily for the NEON program. This procedure may require FTDI Drivers if you are using a loaner or new laptop. Download the drivers here http://www.ftdichip.com/FTDrivers.htm or via* ***N:\Common\CVL\Field_Calibration\Drivers\FTDI****.*

4.2 Connect to a SUNA: Communication Settings

To connect to the SUNA, plug into the SUNA sensor and USB into the Laptop, **THEN** plug the cable into the power supply or Grape (See AD [01] or AD [02], as applicable, for additional information). Follow the order of operations provided in Figure 1. Ensure the PoE Power Cable (Cable that connects to the Grape to the Comm Box) is disconnected from the Grape before plugging and unplugging sensors or the Y-cable into it.

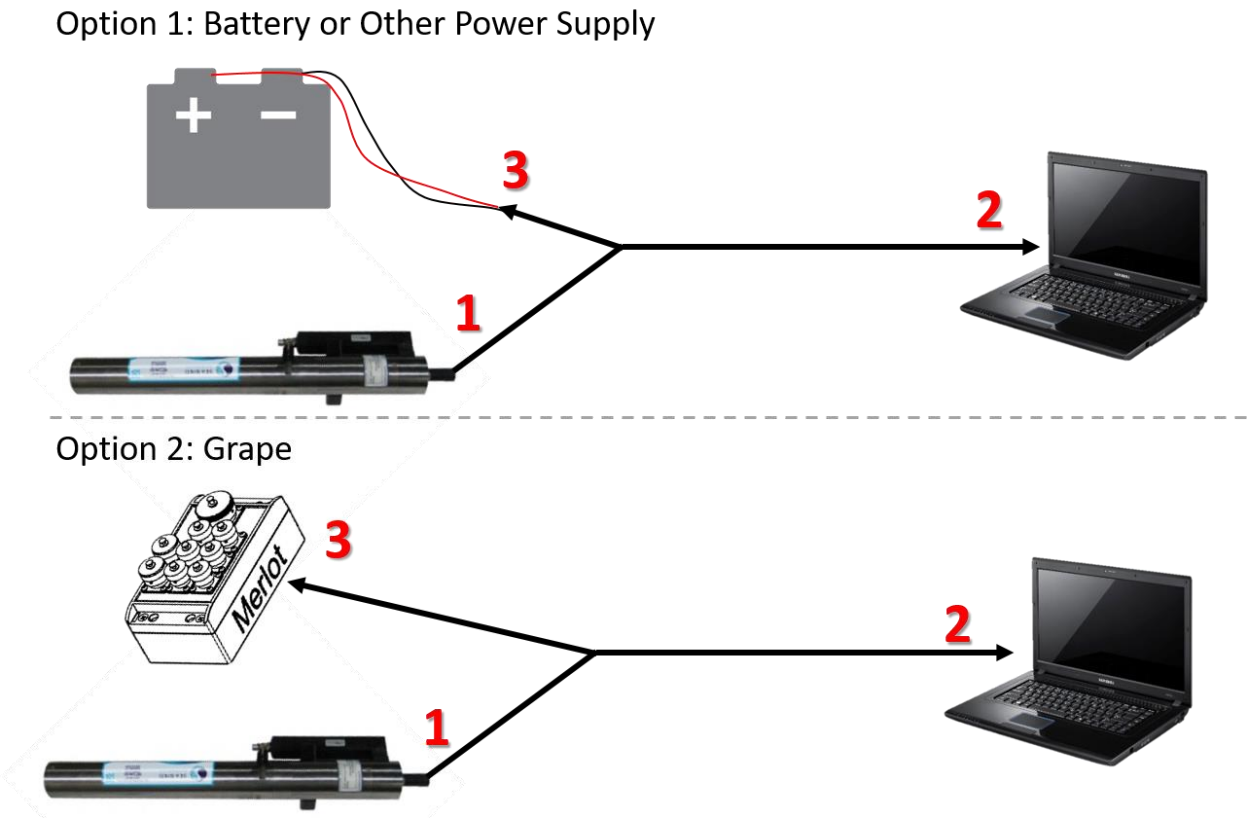

Figure 1. How to Connect to the SUNA with the SUNA Y-Cable - Order of Operations

4.3 DAT File Download Procedure

Download the SUNA DAT files onto a laptop to transfer them to the network drive for AQU SCI on a quarterly cycle, meaning every three (3) months (or 12 weeks) ± 2 weeks. This is subject to change depending on information gleaned from implementation, such as the time it takes to transfer the log files from the sensor or issues resulting from environmental/site variables. **If utility/main power is unavailable or down onsite, download the SUNA data during biweekly PM bouts.**

1. After connecting to the SUNA in accordance with Section 4.2 (Figure 1), open your laptop and open a **File Explorer** window. Navigate to **This PC** and click on the **USB Drive** (Figure 2). Note that your Drive letter may be different on your laptop.

Note: Your laptop may not immediately recognize the SUNA as a hard drive due to its super capacitor, especially if the order of operations on connecting to the SUNA was not followed (see Figure 1

from the previous section). If you do not see the SUNA USB Drive, power down the sensor for approximately 15 minutes and try again, reconnecting the sensor in the order of operations in Section 4.2.

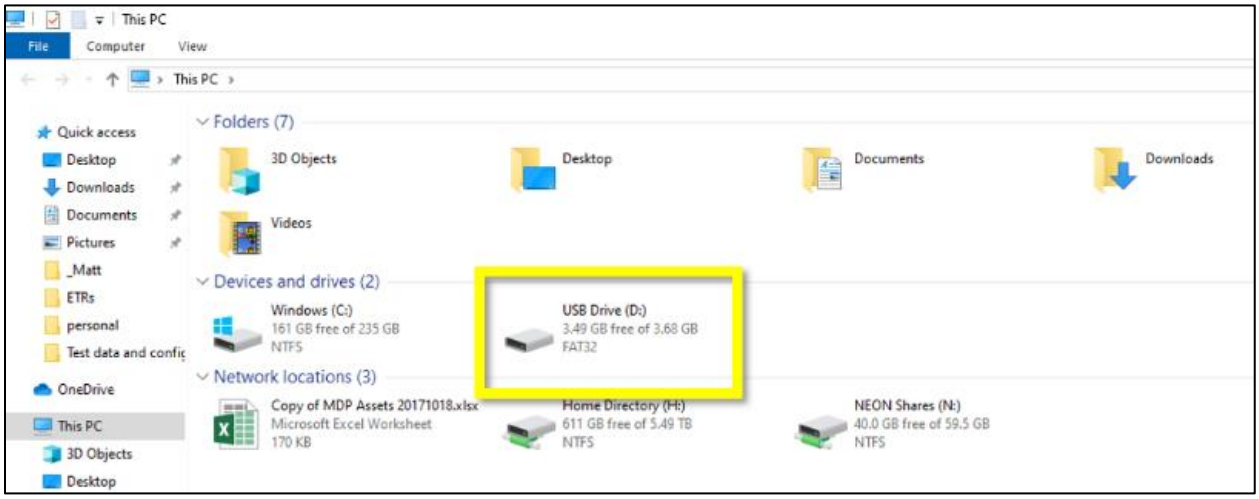

Figure 2. Navigate to This PC and Click on USB Drive

2. Open the **DAT** folder (Figure 3).

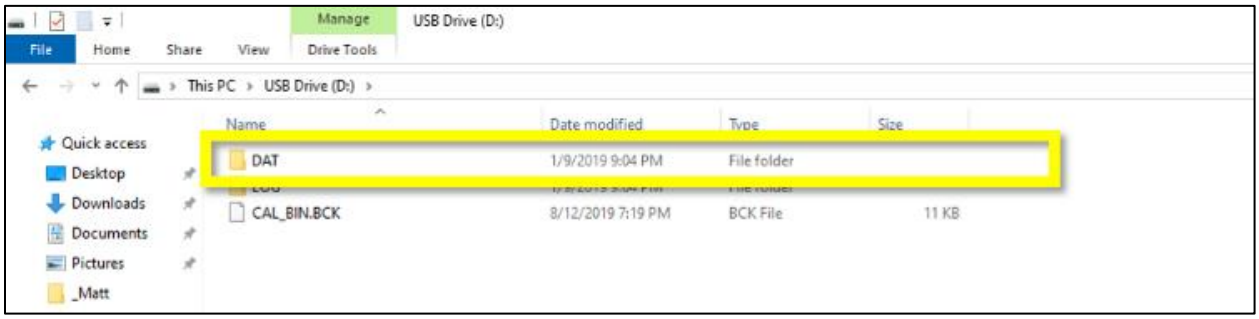

Figure 3. Open DAT Folder in USB Drive

3. The DAT folder is the folder that contains the SUNA .CSV Data Files (Figure 4). The SUNA saves the data file by the year (2019) and the day of the year (1-365). Drag and drop the **DAT** files onto your laptop in a new folder labeled "**AssetTag_SITE_YYYY-MM-DD**" (*the full 14-digit asset tag*), as you would with any computer operating system. **This process requires monitoring. The file transfer process can time-out and require you to restart the process. The upload process will break if the folder naming convention is not followed.**

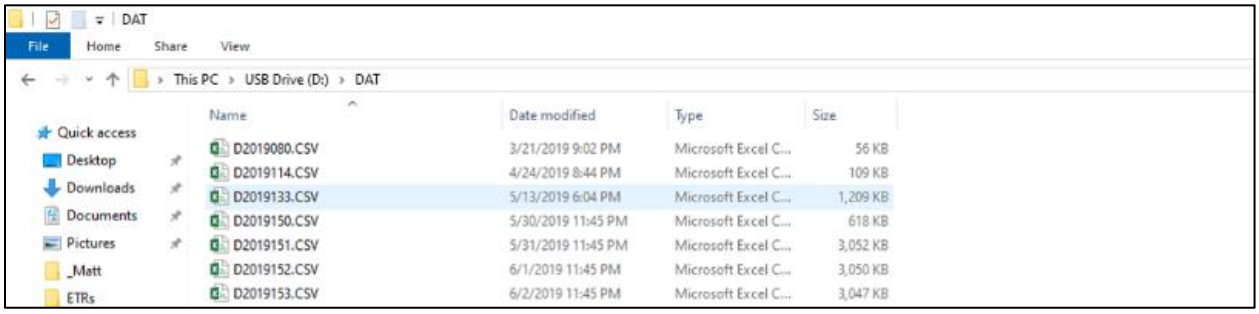

Figure 4. The DAT folder is the folder that contains the SUNA .CSV Data Files

IMPORTANT: DO NOT DELETE FILES FROM THIS FOLDER; IT CAN CAUSE THE SUNA TO ACT FINICKY. To properly delete DAT files, follow the instructions in Section 4.4.

4. Delete the **DAT** files from two quarters ago (the data for these timeframes should already have been uploaded to the N Drive) using the UCI software. This redundancy is to prevent losing data in the event a laptop is lost, dropped into a stream or lake or otherwise compromised. If you only have one or two quarters of data collected, then leave the files on the SUNA until you have two prior quarters of data to delete. If you have two quarters of data to delete, move onto the next section, Section 4.4.
5. Disconnect from the SUNA software, and then physically disconnect from the SUNA (reference Section 4.4).

WARNING: DO NOT REMOVE THE CABLE FROM THE SUNA WITHOUT DISCONNECTING FROM THE UCI SOFTWARE FIRST! In addition, for sites using a Grape, remember to disconnect the PoE Cable (RJF/Eth to Comm) that connects to the Grape **FIRST** when disconnecting/reconnecting sensors. This prevents hot-swapping connections. Wait at least 5 minutes after physically disconnecting the SUNA from the Grape after conducting maintenance using the UCI software and before reconnecting the SUNA to the Grape at stream sites. This resets the Grape communication protocols to reinitialize with the SUNA together. Failure to reset the Grape's communication protocol prevents the SUNA data from streaming to the LC (location controller). This does not apply to the SUNA on the AIS Buoy or SUNAs in the HQ Repair Lab or CVAL.

6. Field Science: Reconnect the SUNA to its onsite location (stream anchor or buoy) and verify the SUNA is back up on the network streaming data.
7. Update the DAT file naming convention on your laptop. You can complete this step anywhere (onsite or offsite). Use the following naming convention for your .csv DAT files that you upload to the **Sensor Swap** under the **SUNA DAT Files** folder: **SITE_ASSET TAG_DYYYYDDD**. Reference Section 4.5 for additional information on uploading these files to the N drive. There is a separate folder for Field Science, HQ Repair Lab, and CVAL.
8. Field Science: For sites with power and have a network connection, monitor the data for at least 24 hours to verify there are no issues derived from conducting this procedure. If so, submit an incident ticket immediately to AIS SCI and Advanced Engineer via ServiceNow.

4.4 Delete DAT File Procedure

Only delete the SUNA DAT files from two quarters ago (the data for these timeframes should have been already uploaded to the N Drive) using the UCI Software to free up memory space on the sensor. If the

SUNA runs out of memory, it creates blank files with 0 kilobytes, which become difficult to remove from the sensor, and may cause other functional issues. The SUNA has 2 GB of memory and one day of data is approximately 3 MB. If you only have one or two quarters of data collected, leave the files on the SUNA until you have two prior quarters of data to delete (assuming the data you are deleting was downloaded and uploaded onto the N Drive).

1. Connect to the SUNA in accordance with Section 4.2. Skip this step if you are already connected to the SUNA.
2. Open the UCI Software and Select **Transfer Files** (Figure 5).

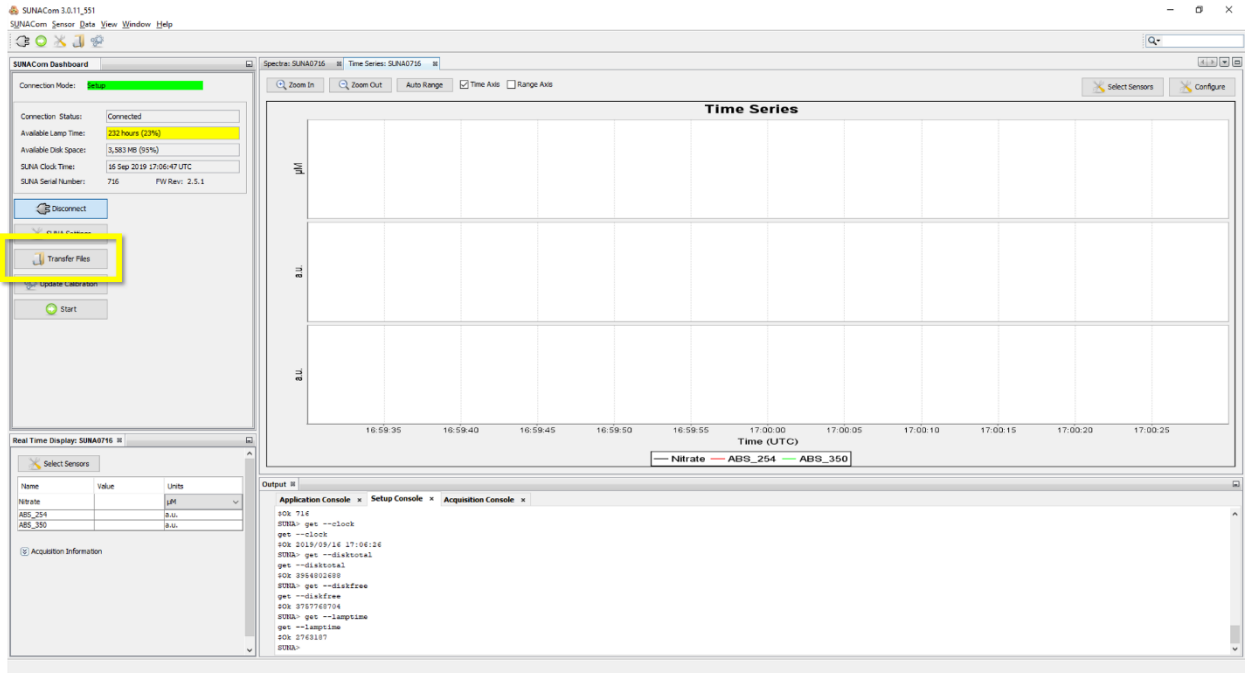

Figure 5. Open the UCI Software and Select Transfer Files

3. In the **File Manager** pop-up window, delete the files that are from two quarters ago in the **Instrument Filesystem** section/box. Select the .CSV data file with your curser, and then select **Delete** (Figure 6). Select and delete 10 files at a time and repeat until all files are deleted. This prevents the SUNA from acting up due to its small microprocessor.

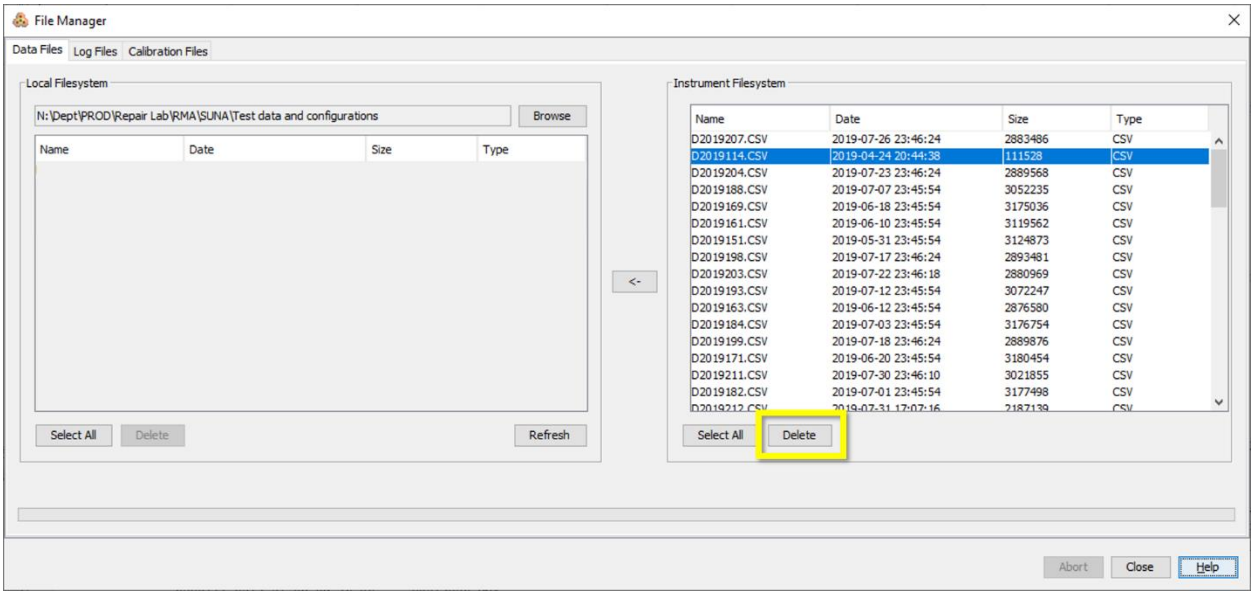

Figure 6. Select the .CSV Data File with your Curser and then Select Delete

4. When complete, click **Close** to close the **File Manager** pop-up window (Figure 7).

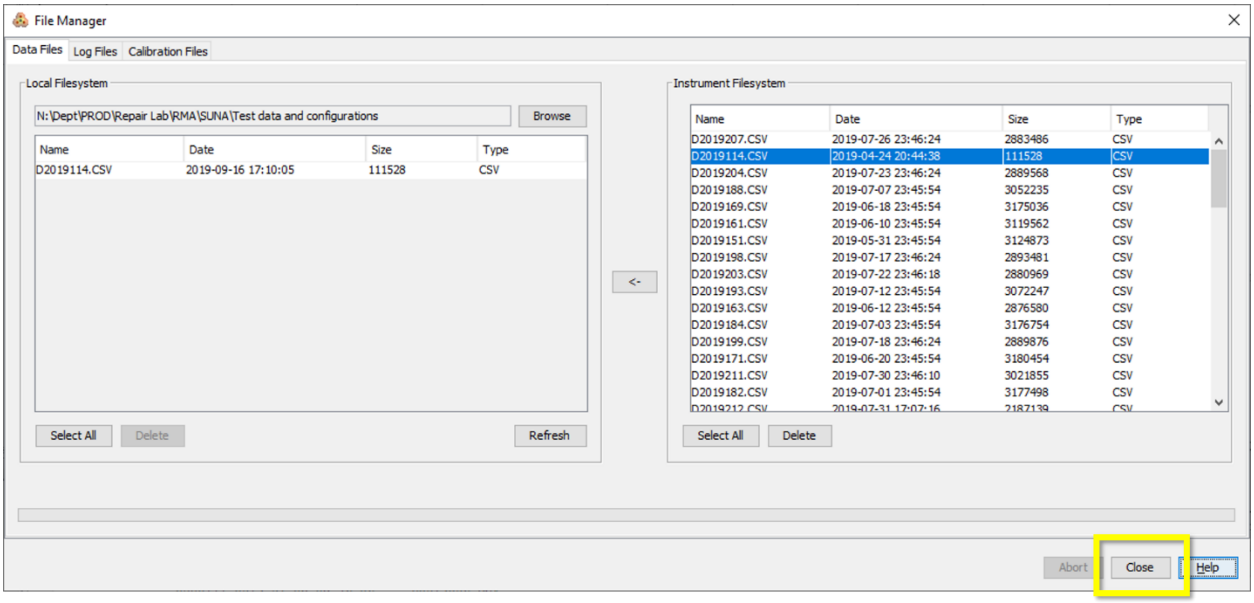

Figure 7. Click Close to Close the File Manager Pop-up Window

5. Disconnect from the SUNA software (Figure 8), and then physically disconnect from the SUNA.

WARNING: DO NOT REMOVE THE CABLE FROM THE SUNA WITHOUT DISCONNECTING FROM THE UCI SOFTWARE FIRST! In addition, for sites using a Grape, remember to disconnect the PoE Cable (RJF/Eth to Comm) that connects to the Grape **FIRST** when disconnecting/reconnecting sensors. This prevents hot-swapping connections. Wait at least 5 minutes after physically disconnecting the SUNA from the Grape after conducting maintenance using the UCI software and before reconnecting the SUNA to the Grape at stream sites. This resets the Grape communication protocols to reinitialize with the SUNA together. Failure to reset the Grape's communication protocol prevents the SUNA data from streaming

to the LC (location controller). This does not apply to the SUNA on the AIS Buoy or SUNAs in the HQ Repair Lab or CVAL.

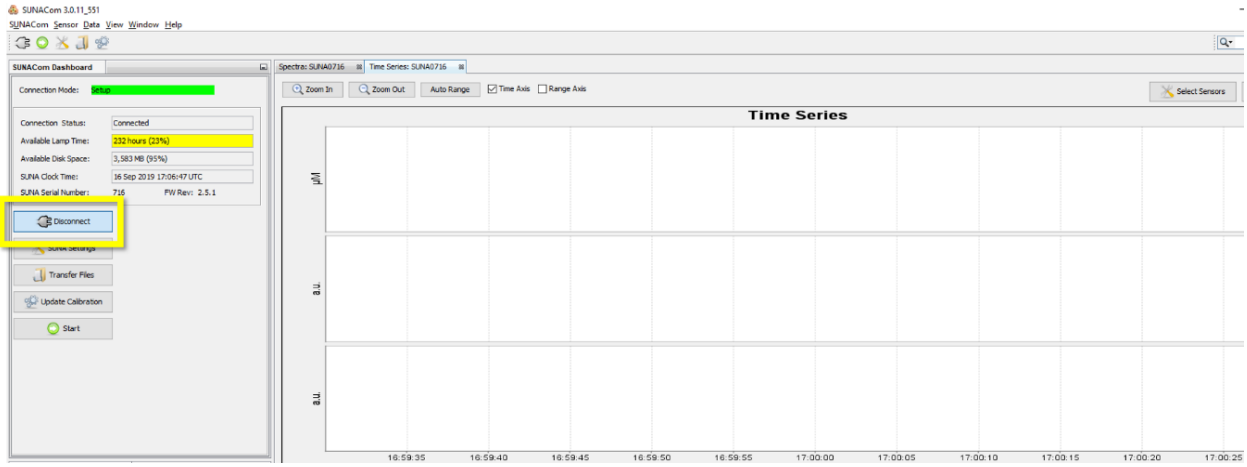

Figure 8. Disconnect the SUNA from the UCI Software FIRST, and then Disconnect the SUNA Physically

6. Field Science: Reconnect the SUNA to its onsite location (stream anchor or buoy) and verify the SUNA is back up on the network streaming data.

4.5 DAT File Upload Procedure

4.5.1 Automated Upload Procedure

This procedure requires the IS Control and Monitoring Suite software. It renames the SUNA DAT files to "**SITE_ASSET TAG_DYYYYDDD.csv**" and uploads the files to the SUNA DAT Files folder in the Sensor Swap folder. Ensure the files are pulled from the folder you created in Section 4.3: "**AssetTag_SITE_YYYY-MM-DD"** (*Using the full 14-digit asset tag.*)

1. Open the IS Monitoring Suite.
2. Click the **RUN** arrow.
3. Select the "**Utilities**" tab and click on "**AIS SUNA DAT file rename**" button (Figure 9).

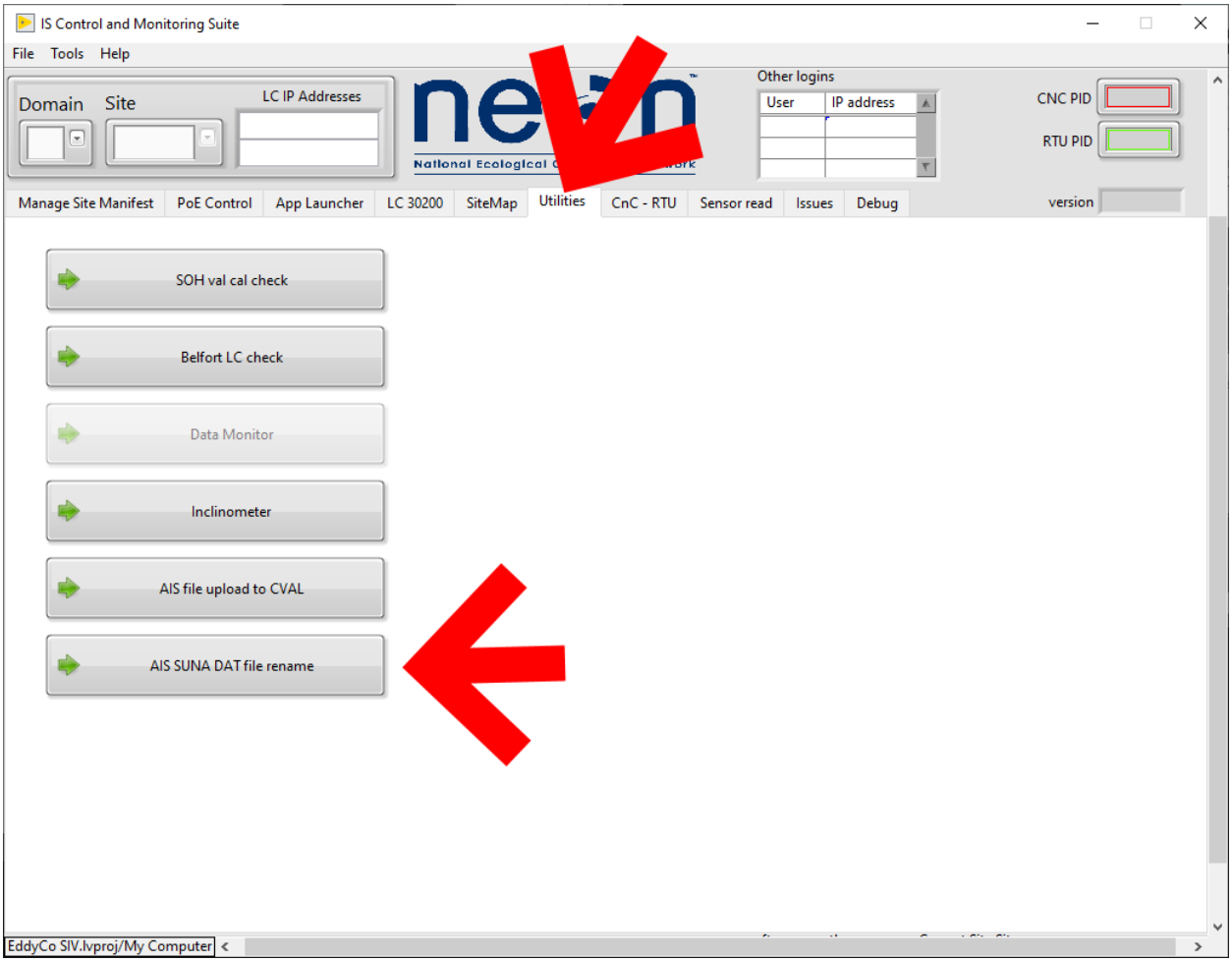

Figure 9. Select the "Utilities" tab and click on "AIS SUNA DAT file rename" button

4. In the pop-up window, click the small folder icon next to the **Path** field (Figure 10).

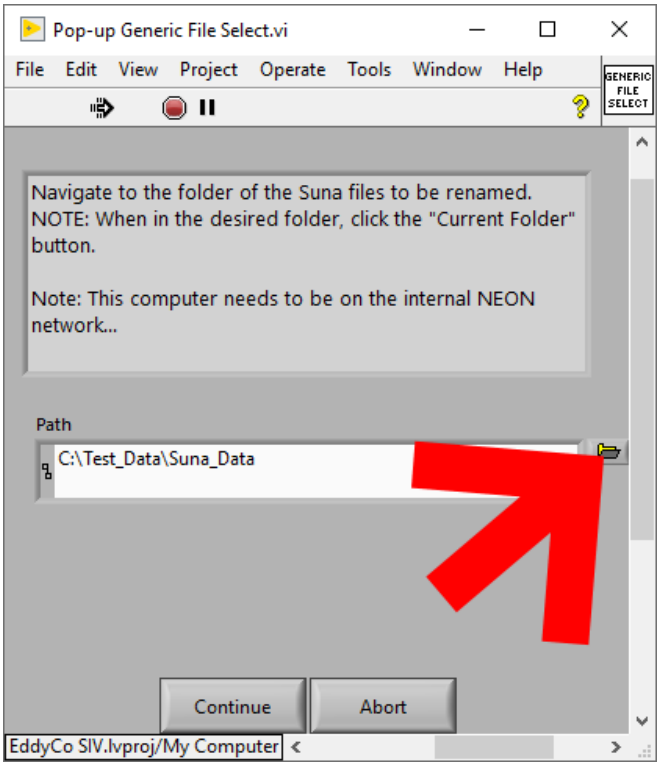

Figure 10. Click the Small Folder Icon next to the Path Field

5. Navigate to the folder with the current files and click the "**Current Folder**" button.

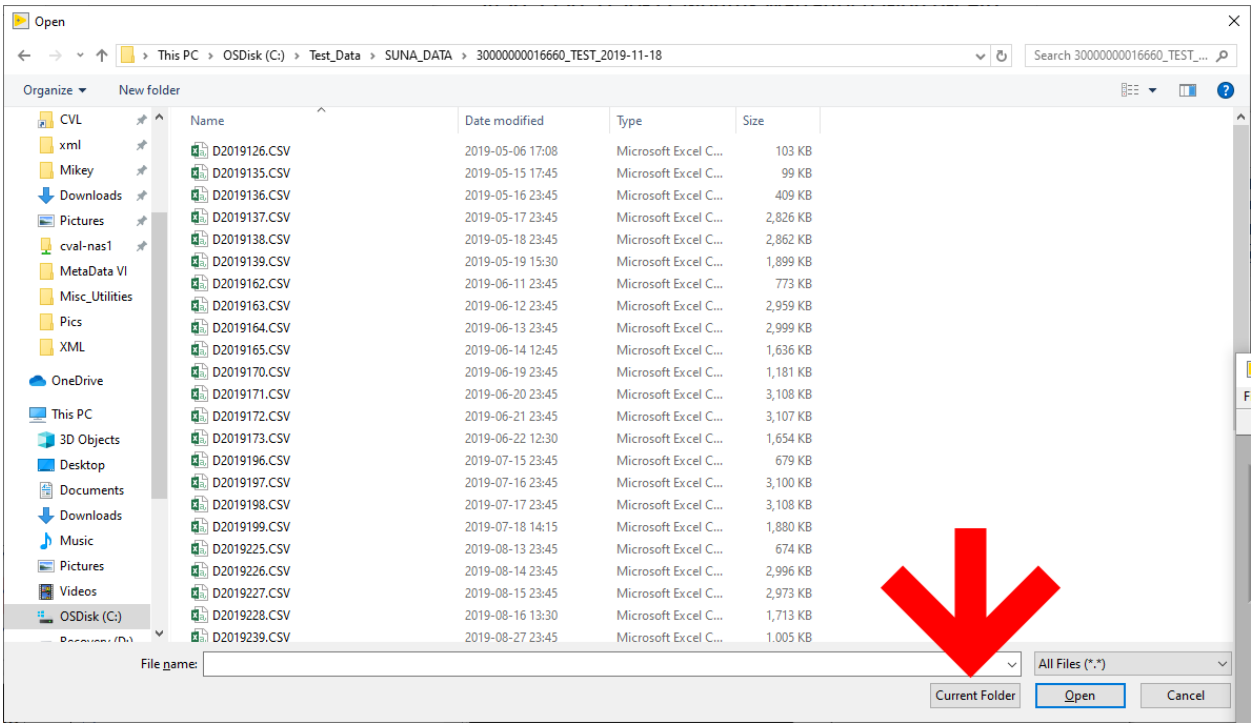

Figure 11. Click the "Current Folder" Button

6. If all goes well, a similar dialogue window to the one in Figure 12 will appear. Click "**OK**".

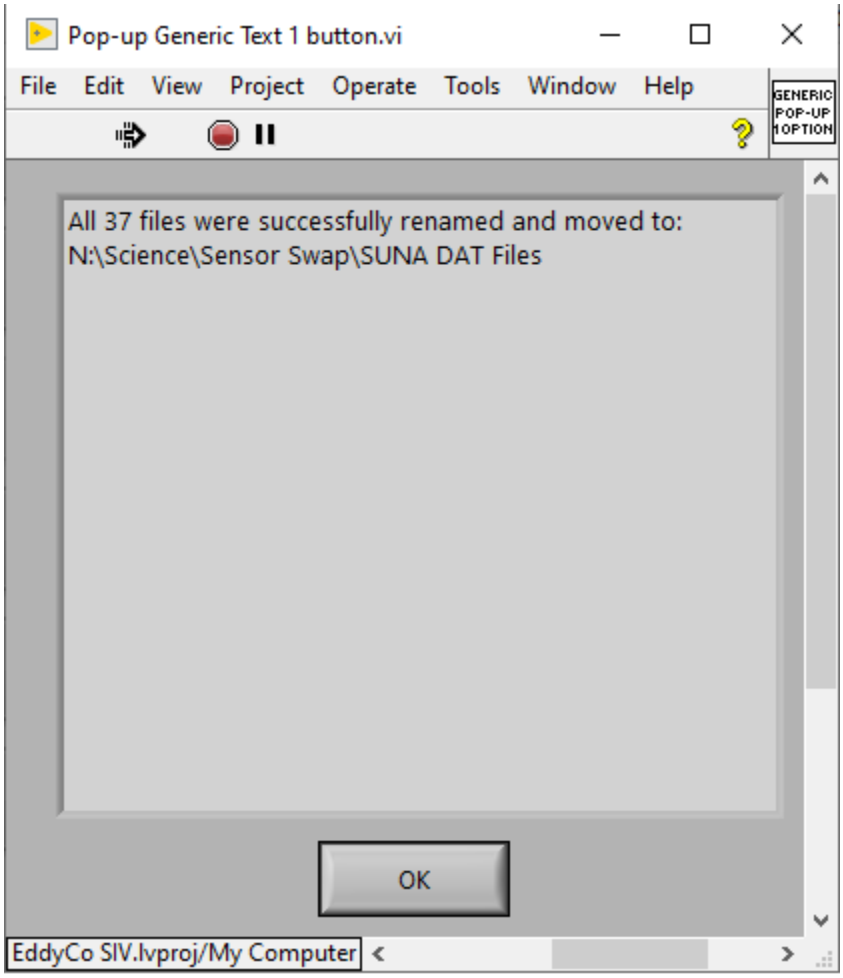

Figure 12. Successful Rename and Upload Confirmation Window

7. Verify the files are in the SUNA DAT File Folder by navigating to **N:\Science\Sensor Swap\SUNA DAT Files**.

4.5.2 Manual Upload Procedure

If you do not have access to the IS Control and Monitoring Suite software, or in the event it is not working, upload the SUNA data files manually to HQ Aquatic Science via the Network Drive using the instructions below.

1. After returning to the Domain Support Facility or via VPN, change the name of the DAT files to "**SITE_ASSET TAG_DYYYYDDD.csv**" and save a copy of each .csv data files to the Network drive in the following folder (Figure 13): **N:\Science\Sensor Swap\SUNA DAT Files**

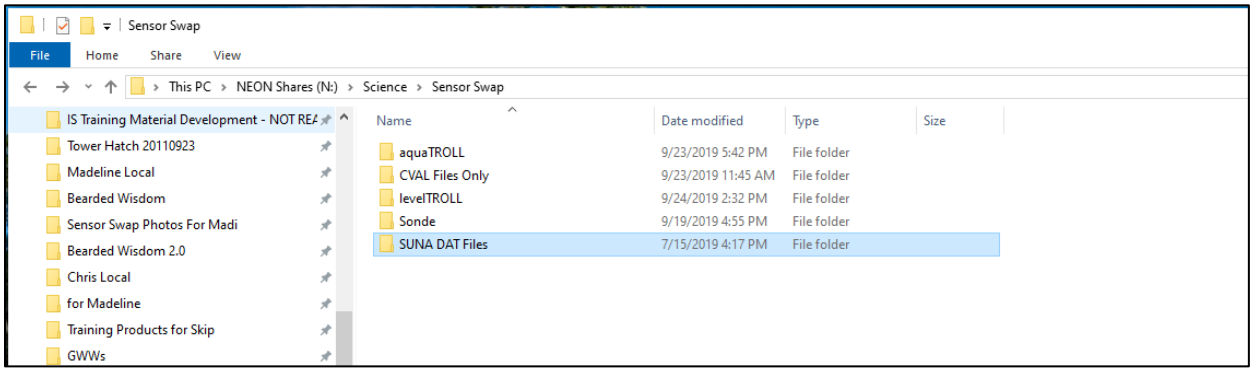

Figure 13. N:\Science\Sensor Swap

2. Field Science must drop the files in the **SUNA DAT Files** folder shown in Figure 13 under the prescribed naming convention above. CVAL files go into the **CVAL Files Only** folder and Manufacturing files go into the **MFG Files Only** folder (Figure 14).

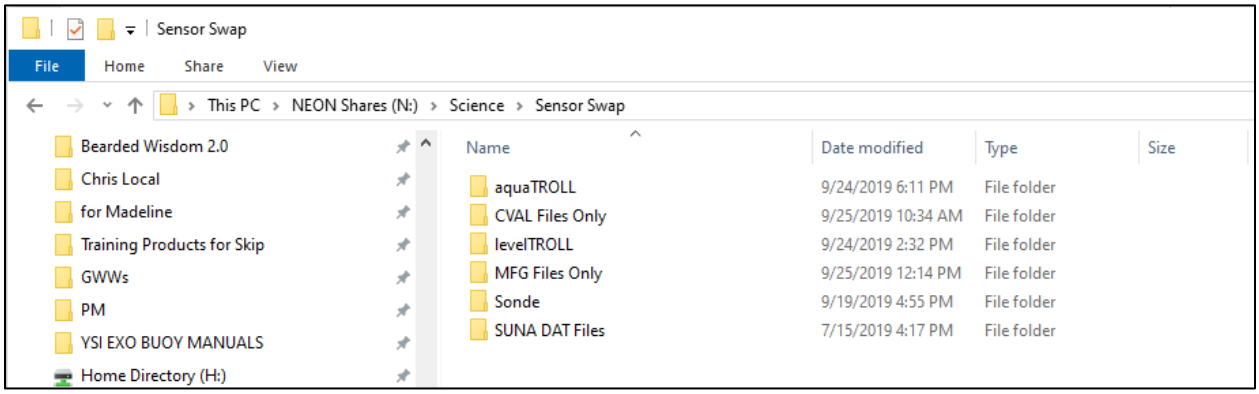

Figure 14. CVAL Files Only and MFG Files Only Folder

Note: If you are unable to upload files to this folder, request access through ServiceNow.

3. Field Science: Maintain a local copy of the files for at least two (2) years to have backup files in the event of an emergency (if AQU SCI requires files are to be re-uploaded to another or same location).