Ferdinand R. Hassler SBET Processing
Standard Operating Procedures
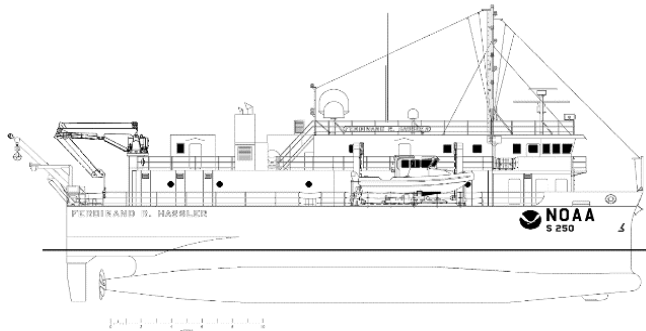
Revision History

| DATE	DESCRIPTION	VERSION	AUTHOR
2015.07.06	Creation	1.0	Stone (TJ)
2016.07.11	Updates to MarineStar Workflow	1.1	Marshall
2017.01.11	Updates MarineStar Workflow	1.2	Marshall
2017.08.31	Updates MarineStar Workflow	1.3	Sharr
2019.08.23	Updated to RTX Workflow	1.4	Swart
05/23/2021	Updated for POSPac 8.5, general edits	1.5	ST Tigges
07/08/2021	Updated file paths	1.6	Stewart / Douglas
3/27/2022	Update Procedure and File path	1.7	PS Finn
7/10/2023	Reviewed	1.8	LT Debroisse

SBET Processing

   This document details how to manually create and export an SBET in POSPac MMS. An SBET, or a smoothed best estimate of trajectory, is created from the POS data that is collected during acquisition and is applied to MBES data during Charlene processing or during manual Caris processing.

   You can set up Charlene to make an SBET for you, which is nice and easy when it works. However, sometimes Charlene inexplicably fails to produce an SBET and you have to go in and do it yourself. You can also make an SBET manually as one of the first steps before setting up Charlene, and you can choose and apply this SBET with Charlene. If you are manually processing in Caris, you'll have to make an SBET somehow. It's up to you how you do all of this, but this document will get you through SBET creation.

# 1. Project Creation in Applanix POSPac MMS

1.1 Open POSPac MMS.
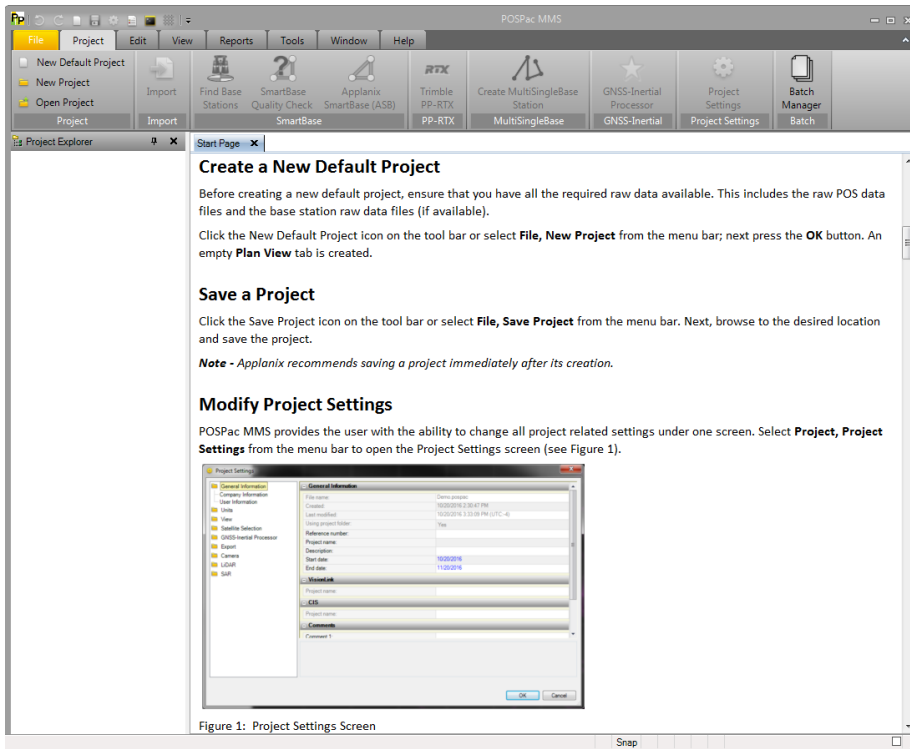
1.2 Create a new project: Select Project Tab →   New Project.
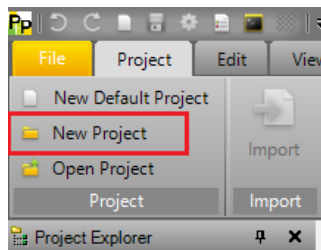
1.3 **If you are using the FH PROC1 workstation**, you can double click the FH_YYYY template to use it (shown below). This template should set up your POSPac project with all of the correct settings.

Once you select the FH template, you can skip ahead to section 2. Import Raw GNSS Position Data and proceed from there.
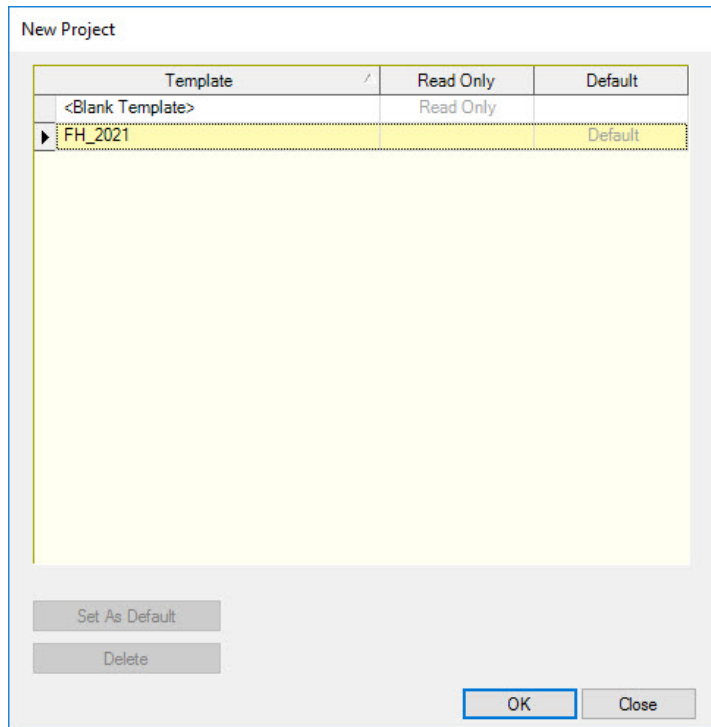

If you are NOT using FH Proc1 workstation or if for some reason you have to set up a new project template, continue on and follow steps 1.4-1.6 before moving on to section 2.

1.4 Click OK when prompted to create template.

1.5 Now set some basic project parameters that should always be selected unless directed otherwise by or FOO. Go to Project Tab →Project Settings.
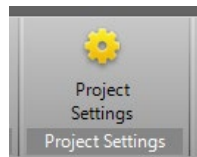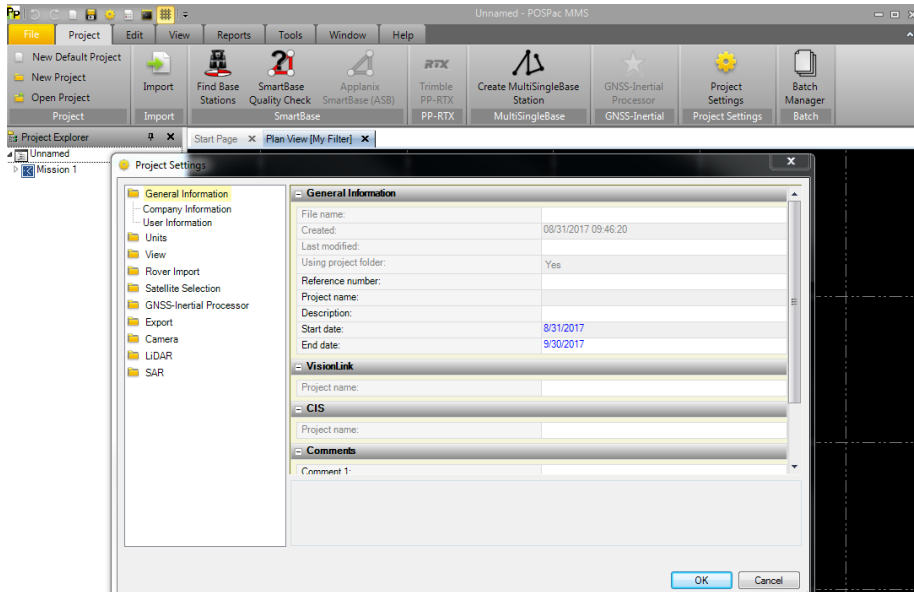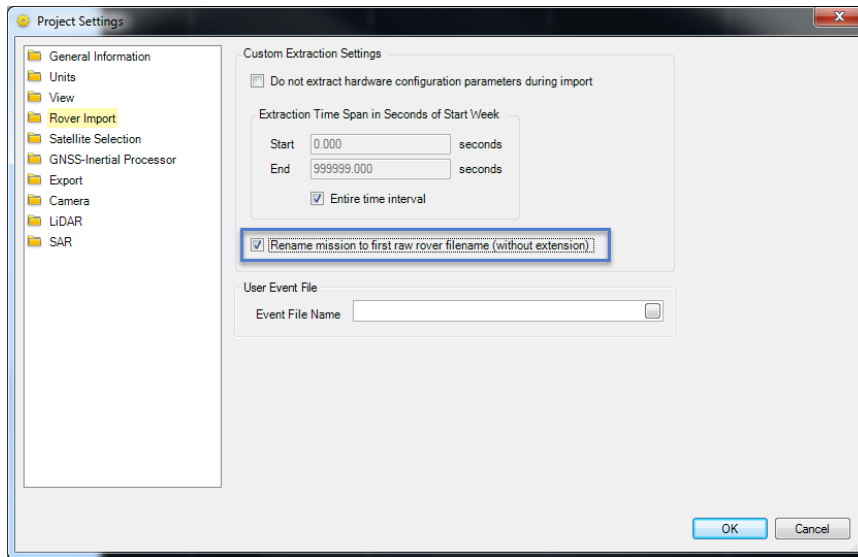
Go to *Satellite Selection* and uncheck "Force GPS".
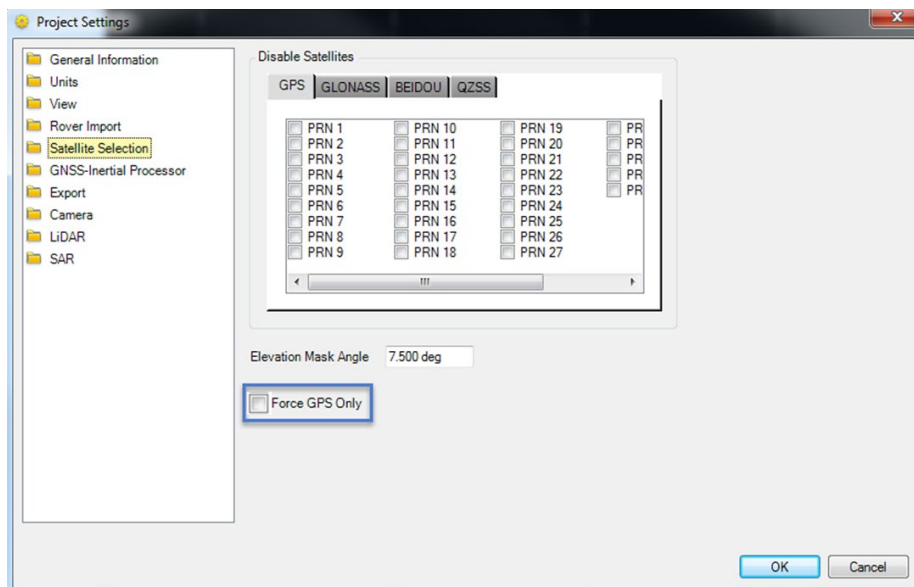
Next go to *Rover Import* and ensure that "Rename mission to first POS file name (without extension)" is checked.

Select *Export* > Settings and set it up as follows (see images below):

- Output Format: Custom Smoothed BET

- Height Options: Ellipsoid

- Output rate: All Records

- Uncheck Default Mapping Frame

    o Click the Mapping Frame button

        ▪ Datum: NAD83 (2011)

        ▪ Target Epoch: Mission Date

NOTE: THIS STEP IS VERY IMPORTANT! If the export mapping frame isn't changed to NAD83 (2011), SBETs will export in the default datum WGS84. When applied to your MBES data, you will notice a 1m offset in the lines to which the WGS84 SBET was applied. **MAKE SURE THAT THIS SETTING IS CORRECT BEFORE EXPORTING YOUR SBET!**

If you're ever looking for the source of a ~1m offset in your lines, open up the POSPac project and check

this setting first. You can always change the setting and then re-export the SBET and reapply it in Caris to solve the problem.

Project Settings

General Information
Units
View
Rover Import
Satellite Selection
GNSS-Inertial Processor
Export
— Lever Arms and Misalignments
— Settings
Camera
LiDAR
SAR

Output Format
Custom Smoothed BET

Height Options
- Ellipsoid   Geoid Model
- Orthometric   EGM96
- [ ] WGS84

Output Rate
All Records

Timing
Start ?   [x] Entire time interval
End   ?   [ ] Seconds of start week

Solution In Use   None available

Default Mapping Frame [ ]

Mapping Frame   NAD83 (2011) 2010.000

OK   Cancel

Mapping Frame Parameters

Datum
NAD83 (2011)

Target Epoch
- Mission Date
- Custom Date
  Sunday , May 23, 2021
  Decimal Date 0

Datum

Datum
Datum   NAD83 (2011)   Type   14 Parameters
Name   NAD83 (2011)

Ellipsoid
Ellipsoid   GRS 1980
Major Axis   6378137   Inverse Flattening 298.257222101

Datum Parameters
dX = 0.9956   (m)   Rx = -25.915   (mas)
dY = -1.9013   (m)   Ry = -9.426   (mas)
dZ = -0.5215   (m)   Rz = -11.599   (mas)
f = 0.62   (ppb)   From Datum   ITRF00

Transformation Parameters
Transformation Epoch   1997   To Datum   NAD83 (2011)
dX = 0.7   (mm/year)   Rx = -0.067   (mas/year)
dY = -0.7   (mm/year)   Ry = 0.757   (mas/year)
dZ = 0.5   (mm/year)   Rz = 0.051   (mas/year)
f = -0.18   (ppb/year)

Sequence of Rotation R1*R2*R3
1st = x
2nd = y   Frame Epoch   2010
3rd = z   Direction   Counter-Clockwise

Custom Datums
Add   Edit   Delete

OK   Cancel

Once all of the Project Settings have been set correctly, select OK.

1.6 Save the POSPac project to the FH Processed drive (S:) in the following subdirectory folder: "S:\YYYY\OPR-XXXX-FH-YY\HXXXXX\POSPac_Projects". Save the project as YYYY_DDD_VSSL. Additionally a "_b" or "_XM" may be required if there is more than one SBET for a given day number. For example a valid project name would be *2016_195_S250_b*.

At this point, the project can be saved for one time use, or as a template for frequent use. NOTE** make sure the projection is correct for specific project when using a template.

2. Import Raw GNSS Position Data

2.1 Import the raw .000 POS files. There are two ways to do this:

- Under the Project tab, select Import. A window will appear on the right side of the screen. Select the folder location for all the raw files and they will populate below. Highlight all the raw files and click 'Import' at the bottom of the window.

   **OR**

- Drag and drop the raw position data from the POS into the project. These files are located on the FH Raw (Q:) drive under "**Q:\YYYY\OPR-XXXX-FH-YY\HXXXXX\Raw\Positioning\Hassler_2040_Dual\YYYY-XXX**"
Note - be sure to select only the files that will make up one set of SBET data. Any files named differently from the same day of POS acquisition should not and will not process together.   Ex: If there are YYYY_DDD_VVVV_A.000, YYYY_DDD_VVVV_B.000, YYYY_DDD_VVVV_C.000 files, each of those groups will need to be processed separately from one another using three (3) different POSPac projects.

It doesn't matter which way you do this. Just pick one and import all of the raw files that you would like to use to make the SBET. Be patient-- this may take several minutes to complete, depending on the volume of data being imported. Take a break and go get some ice cream.

2.2 After the import is finished, two additional boxes will appear with some checkboxes and percentages. <u>**Wait**</u> - do not close them down. They will complete and close on their own.

2.3 A "Rover Antenna Specification" window will appear. Select Other, set the Manufacturer to Trimble, set the Type to GA830, and select OK.
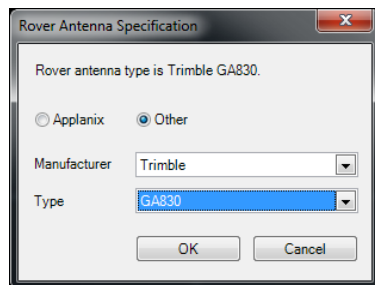
2.4 Finally, you should now see the map window filled with position data logged by the POS MV.
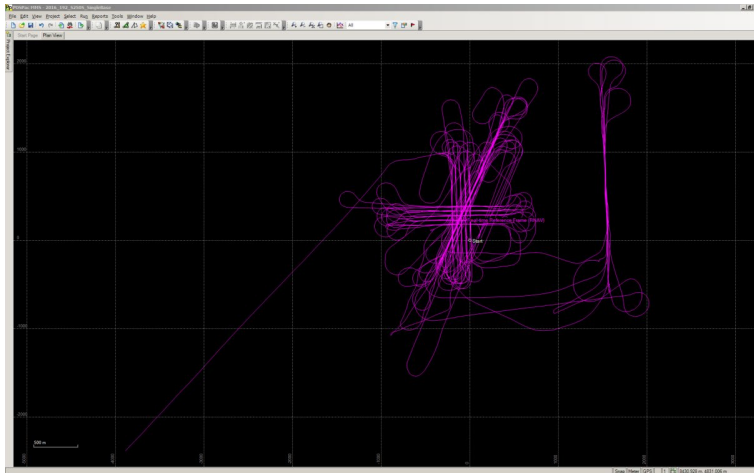
If it doesn't look like all the data collected by the survey vessel for the given period of time, something went wrong. The pink color indicates that this data has yet to be fully processed.
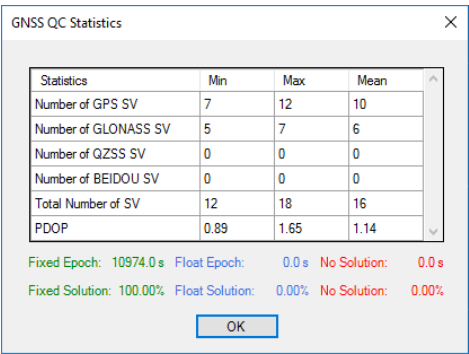
3. Trimble Post-Processed RTX

Trimble PP-RTX- RTX is a processing method that provides positioning accuracies on the order of a few decimeters without needing a reference station.

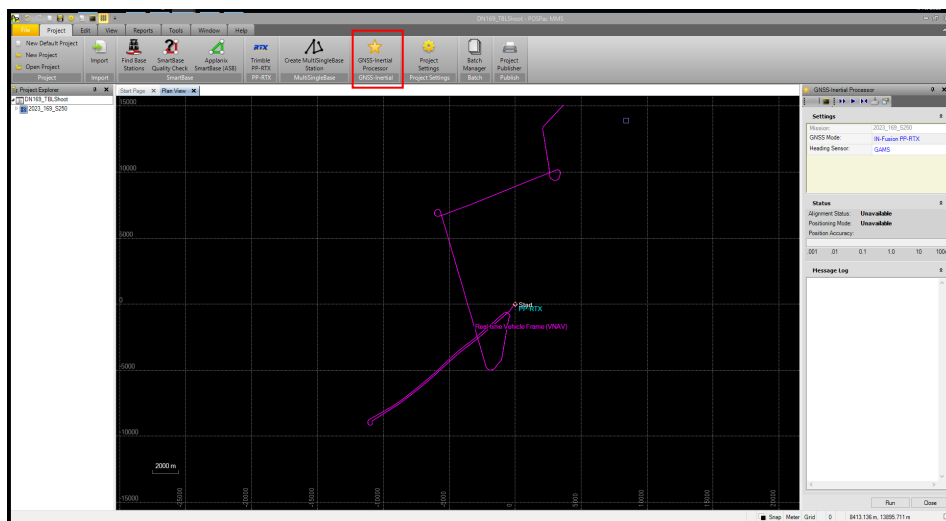3.1 To start, click the Trimble PP-RTX button in the Project toolbar.

3.2 When the process is done, you will see a GNSS QC Statistics window. Click *OK*.

4. GNSS Inertial Processing

4.1 Open the GNSS-Inertial Processor Menu by clicking on the gold star.

4.2 Select IN-Fusion PP-RTX. The Heading Sensor should be GAMS. Click Run.

4.3 Once processing is finished, all of the lines will turn from pink to green. There will be two pop-ups that you have to check for all the steps to occur, one at the beginning and one in the middle.
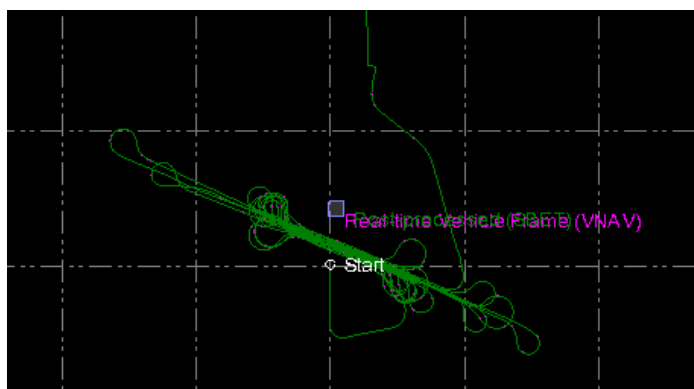
4.4 ***Save your project to the POSPac_Projects folder of your sheet in the Proc (S:) drive:***

- Create a new day number folder that corresponds to the POS file *(ex. 2022-085)*
- Keep the file name the same *(YYYY_DDD_Vessel#)*
- And save!
- Example folder location: *S:\YYYY\OPR-X###-FH-YY\HXXXXX\POSPac_Projects\YYYY-DDD*

5. Exporting the SBET

5.1 Export the SBET. Go to Tools →Export and select the export icon.

5.2 In the new window that pops up on the right hand side, verify that your export file path is mapped to the POSPac_Projects folder you just saved your project to.

5.3 In the same place, verify that the file name is formatted *export_YYYY_DDD_Vessel.out.* (An example filename would be *export_2022_085_S250_b.out.)*

5.4 The Export File Format should be the Custom Smoothed BET.
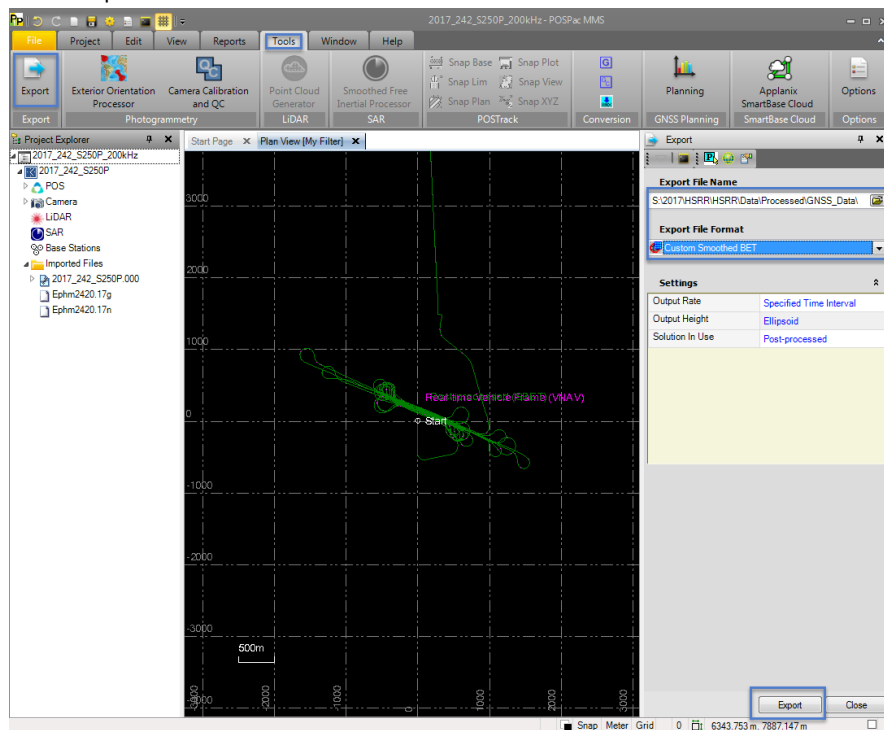

5.5 Click Export to finish.

5.6 Copy your SBET and RMS files to the SBET folder in your survey's Proc (S:) drive:
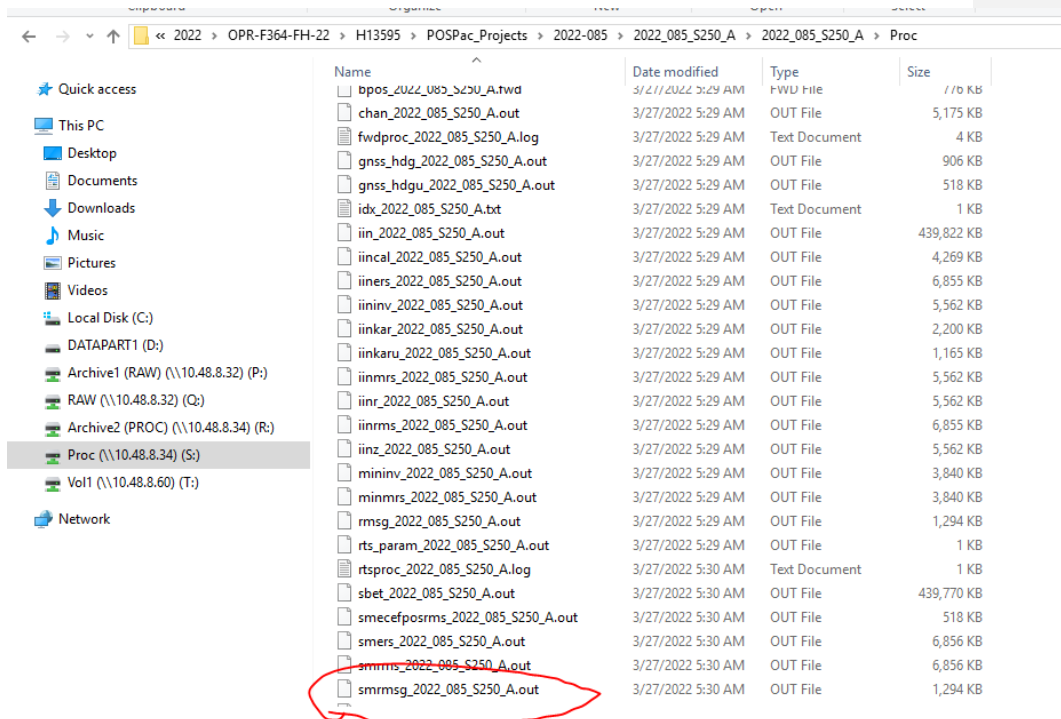
SBET File:
- Create a day number folder in your survey's SBET folder:
    a. Ex) *S:\2022\OPR-F364-FH-22\H13595\Processed\SBET\2022-085*
- Locate your *export_YYYY_DDD_Vessel.out* file, located in your survey's POSPac_Projects folder:
    a. *(S:\YYYY\OPR-X###-FH-YY\HXXXXX\POSPac_Projects\YYYY-DDD)*
   b. Click through the POSPac project folders until you reach the "Export" folder
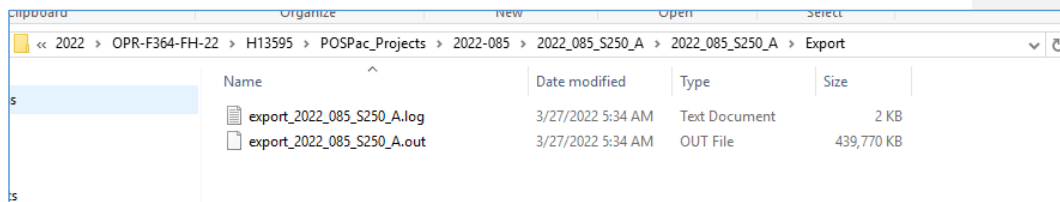
- c. The .OUT file is your **SBET**
- d. Copy ONLY the .OUT file to your survey's "SBET" Folder and give it the following suffix: *"_SBET"*
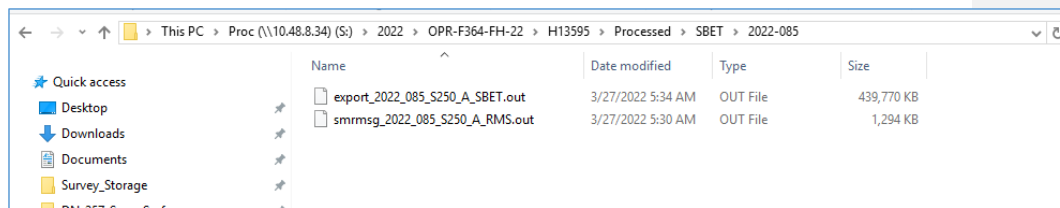
- Next, locate your *smrmsg_YYYY_DDD_Vessel.out* file, located in the "Proc" folder of your **POSPac Project**

a. This is your **RMS** file
b. Copy this .OUT file to your survey's SBET day number Folder and give it the following suffix: **"_RMS"**

- You should now have two (2) .OUT files in your survey's SBET folder
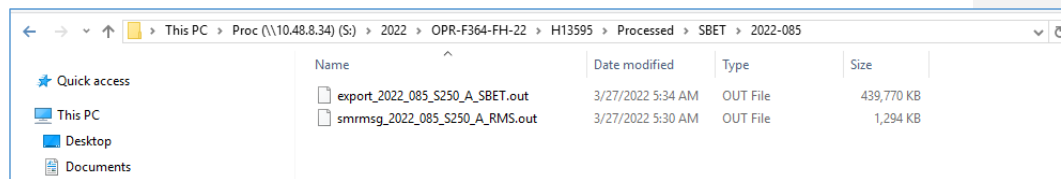
- Now you can delete the POSPac project from your DESKTOP

You can now apply your SBETs through Charlene:

***Proceed to the next SOP: **"2022_POSPac_AutoQC"**

It is usually best to have Charlene create, QC, and apply the SBET. If you've been following this SOP it's probably because Charlene was unsuccessful on its first attempt. In that case, you can have Charlene simply load the SBET and reprocess the lines. That way all the files will end up in the correct locations and named according to the HSSD. (Hint: The SBET will be in that Export folder but the smrmsg file will be in the Proc folder within POSPacProjects (S:\YYYY\OPR-HXXX-FH-YY\HXXXXX\POSPac_Projects\YYYY_DDD_S250\YYYY_DDD_S250\YYYY_DDD_S250\Proc).

Commented [SA1]: Hassler_2040_Dual_2021-245_NAD83_SBET
Hassler_2040_Dual_2021-245_NAD83_smrmsg