Office of Coast Survey

National Oceanic & Atmospheric Administration

SOP: Manual Bathymetry Processing

Revision History			
Rev	**Description of Change**	**Author & Unit**	**Date**
1	Created	LT Taylor Krabiel, FA	26JUN2024
2	Updated: light reformatting and updating for 11.4. Added .all	Harper Umfress, HSTB	3FEB2025

Contents

Purpose & Applicability

This SOP covers:

- Using CARIS 11.4
- Converting .kmall & .all multibeam to HDCS
- Importing .000 POS MV data
- Importing SBETs

This SOP describes the process of manual CARIS HIPS & SIPS bathymetry processing. The first course of action is to transfer all files created during acquisition into their appropriate folders on the network per your vessel's organization. Then, the raw data will be imported into CARIS. After the import of the raw data, auxiliary data will be applied to the imported raw files. SBETS and RMS files may need to be manually created if they do not exist already. Georeferencing the data will be the final step in CARIS.

For the purpose of this SOP:

- RD = Raw storage location
- PD = Processed Storage location
- TD = Transfer Drive
- VV_VESSL_EMXXX = Vessel Initals_Platform name_Sonar ex: FA_2806_EM2040 or TJ_2902_EM2040

Data transfer and concatenation

Files created during acquisition that are stored on the transfer drives will need to be transferred onto the network. Then, SVP files will need to be combined or concatenated.

1. Copy files from transfer drive into raw and processed folders on the network. Use the table below as a rough guide, but refer to your unit practice and the HSSD for details.

File	From	To
Kongsberg (SIS) (*.kmall)	TD:\OPR-XXXX-VV-YY\HXXXXX\Data\MB\VV_VESSL_EMXXX\YYYY-DDD	RD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Raw\MB\VV_VESSL_EMXXX\YYYY-DDD
GNSS Data - POSMV files (*.000-*.00#)	TD:\OPR-XXXX-VV-YY\HXXXXX\Data\Positioning\VV_VESSL_EMXXX\YYYY-DDD	RD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Raw\Positioning\VV_VSSL_EMXXX\YYYY-DDD

Sound Velocity Raw (*.m1 for the ship, *.HEX and *.cnv for the launches)	TD:\OPR-XXXX-VV-YY\HXXXXX\Data\SVP\VV_VESSL_EMXXX\Raw\YYYY-DDD	RD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Data\Raw\SVP\VV_VSSL_EMXXX\Raw\YYYY-DDD
Sound Velocity NODC files (*.nc Files)	TD:\OPR-XXXX-VV-YY\HXXXXX\Data\SVP\VV_VESSL_EMXXX\NODC\YYYY-DDD	RD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Data\Raw\SVP\VV_VSSL_EMXXX\NODC\YYYY-DDD
Sound Velocity (*.svp files)	TD:\OPR-XXXX-VV-YY\HXXXXX\Data\SVP\VV_xxxx_EM2040\SVP\YYYY-DDD	PD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Processed\SVP\VV_VSSL_EMXXX\SVP\YYYY-DDD
Acquisition Logs to (excel file)	TD:\OPR-XXXX-VV-YY\HXXXXX\Data\Acquisition_Logs\VV_VESSL_EMXXX\YYYY-DDD	PD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Data\Raw\SVP\VV_VSSL_EMXXX\NODC\YYYY-DDD

2. OPTIONAL: concatenate Sound Speed Casts
    a. Charlene concatenates individual SVP files into a single text file. When manually processing, this is a labor intensive process with few benefits. I recommend just leaving SVP data as individual files in the SVP directory, and selecting the SVP top level directory when georeferencing (e.g., PD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Processed\SVP).
    b. If you'd really like to concatenate the daily files, open the daily .svp file and the master vessel file in edit notepad. Then, simply copy and paste the daily file's casts to the end of the master vessel file. It should look something like what is shown below. Notice the headers that separate each cast from each other. This part of the header is all that is needed out of the daily file.

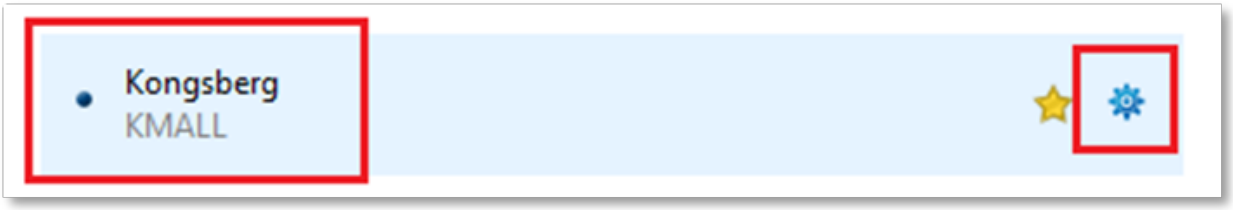
```
5498.570000 1551.277525
5499.570000 1551.277525
5500.000000 1551.277525
Section 2024-138 07:28 57:07:32 -150:58:15
2.780000 1472.760000
2.880000 1472.780000
3.070000 1472.790000
```

Converting Multibeam Data to CARIS HDCS

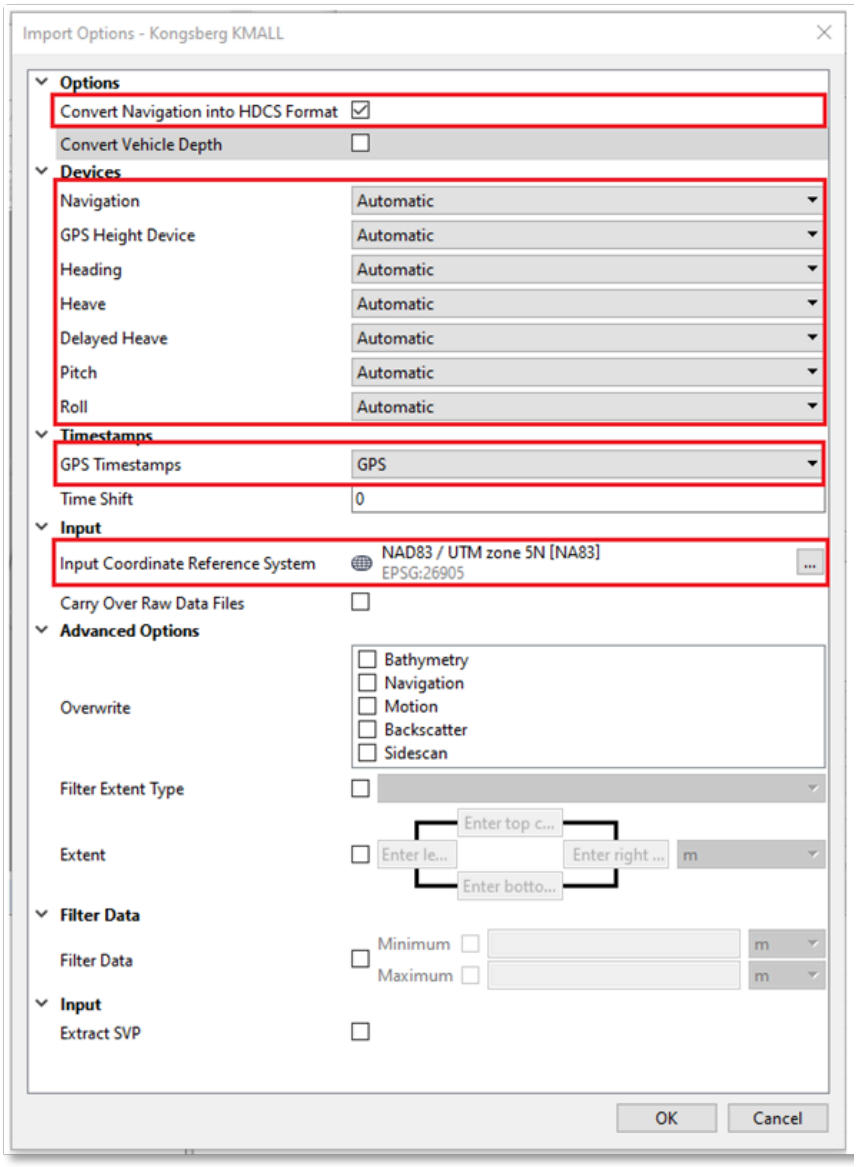
1) Open CARIS HIPS and SIPS 11.x.

If this is the first time opening CARIS 11.x, you will likely need to set up the correct mapping environment. See the following SOP:
WORKING_OCS SOP CARIS 11.X First Time Setup.docx

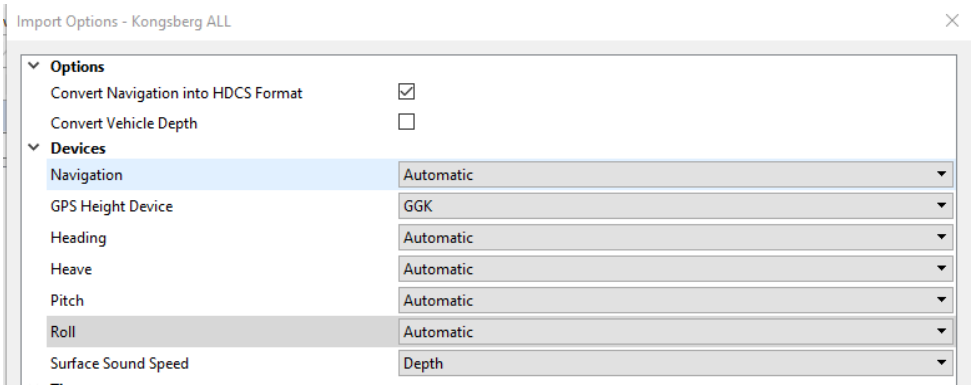
2) Import raw data
    a) Select File > Import > Sensor Data
    b) In the Import Sensor Data window, select Kongsberg KMALL (or Kongsberg ALL if applicable, see step d) and the blue settings button:



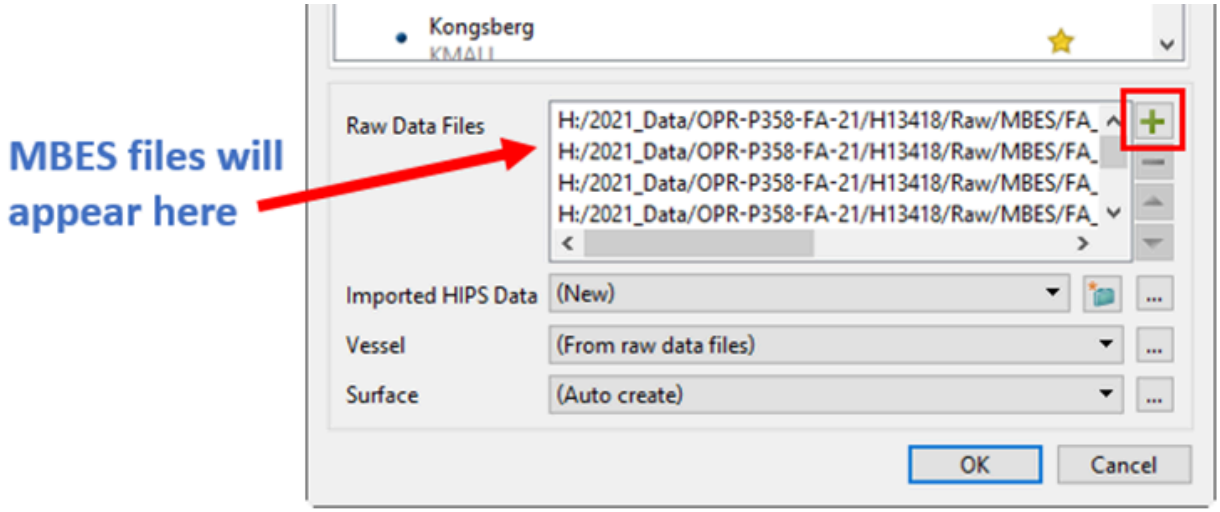
    c) For the Import Options – Kongsberg KMALL window, ensure the following settings are correct:



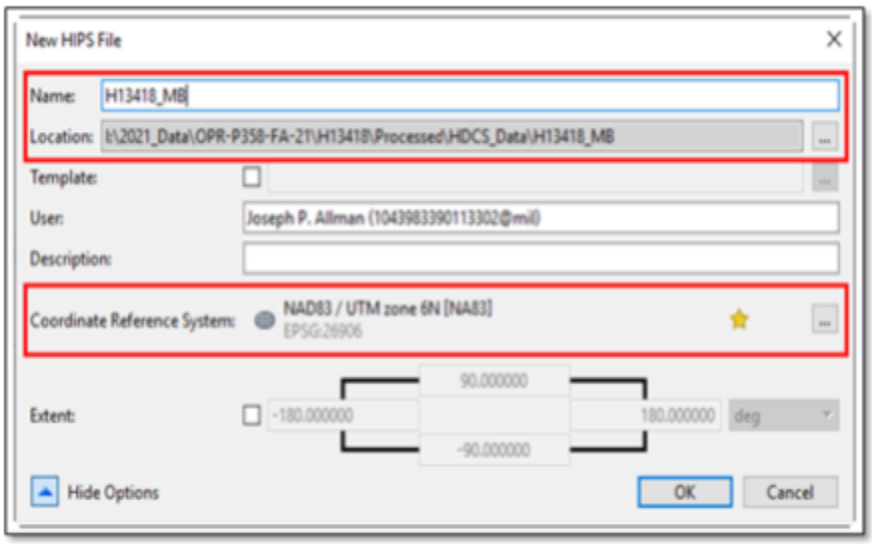
d) If using Kongsberg .all, all remains the same as .kmall except for the device configuration. See image below. For GPS Height Device and Surface Sound Speed, Automatic is not an option for .all



e) In the Import Sensor Data window, next to Raw Data Files select the green plus sign and add all of your raw MBES files that you want to process.



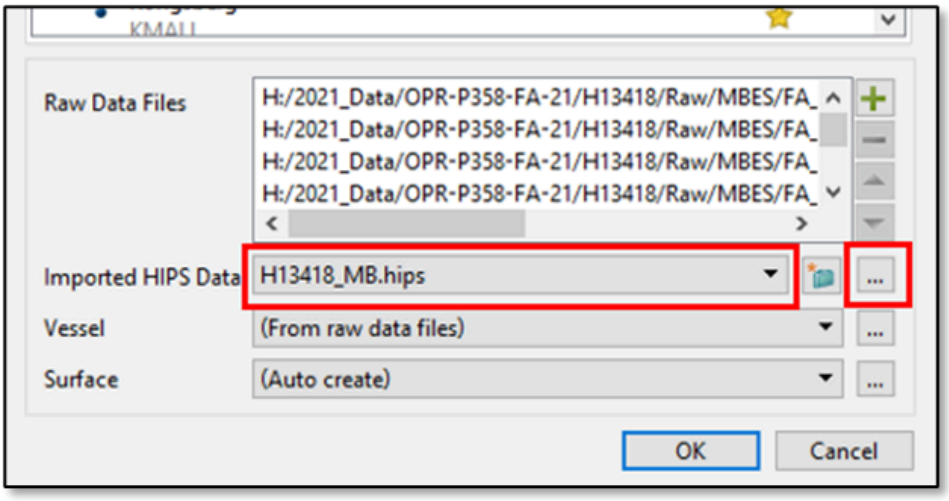
f) In the Import Sensor Data window, next to Imported HIPS Data, <u>create a new project if it is the first day of processing (</u>  <u>)</u>. If it is not the first day of processing, skip this step and go to the next step to select the .hips file already created. Select the Show Options dropdown in the left corner and adjust the following settings:



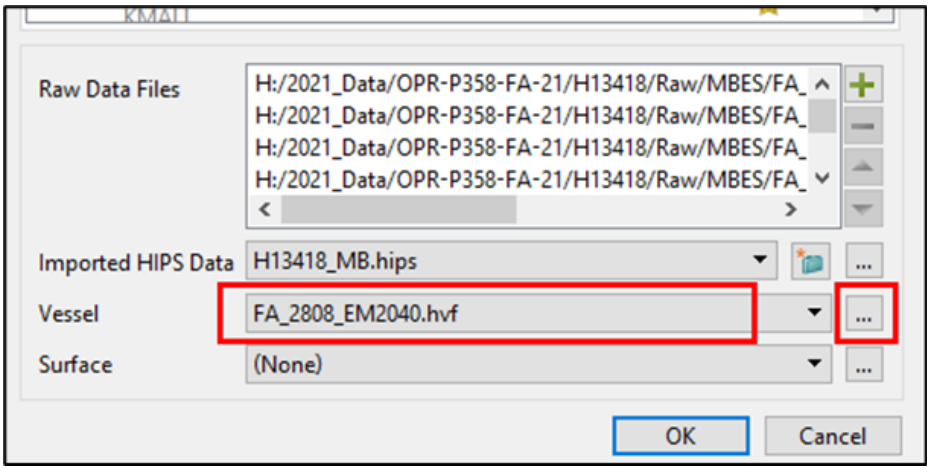
Name: HXXXXX_MB

Coordinate Reference System: Check project instructions

g) Skip this step if you did not already have a .hips file and generated one in step e. If it is not the first day of processing and a .hips file was already created, in the Import Sensor Data window, next to Imported HIPS Data, select the three dots button and navigate to the .hips file.



h) In the Import Sensor Data window, next to Vessel, navigate to the following location and select the correct HVF for that launch or ship used.
Example HVF location: PD:\20YY_Data\ VesselConfig

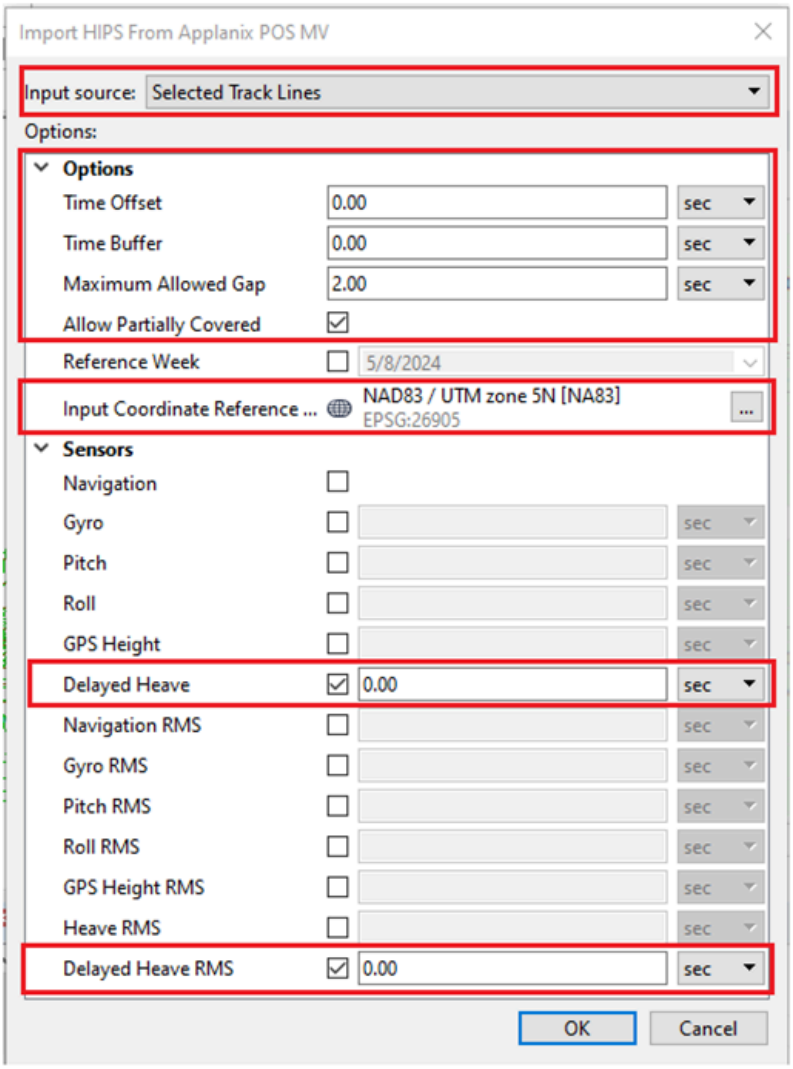


i) If you have additional processing to do (importing SBETs, SVC, etc), select surface None. If you want to a preliminary surface computed, there's no harm in creating one at this step, other than the fact that it will take longer to process.

Importing Auxiliary Data

At this point in the process you will need to apply correctors or "auxiliary data" to the soundings. Auxiliary data includes delayed heave, smoothed best estimate of trajectory (SBET), and (root mean square) RMS.

1) Apply Delayed Heave. With your lines selected, select File > Import > Auxiliary Data > Applanix POSMV and browse to your POS files:
   Example POSMV Location:
   RD:\20YY_Data\OPR-XXX-VV-YY\HXXXXX\Raw\Positioning\VV_VESSL_EMXXX\20YY-XXX



Be sure to select only the lines to which delayed heave is applied

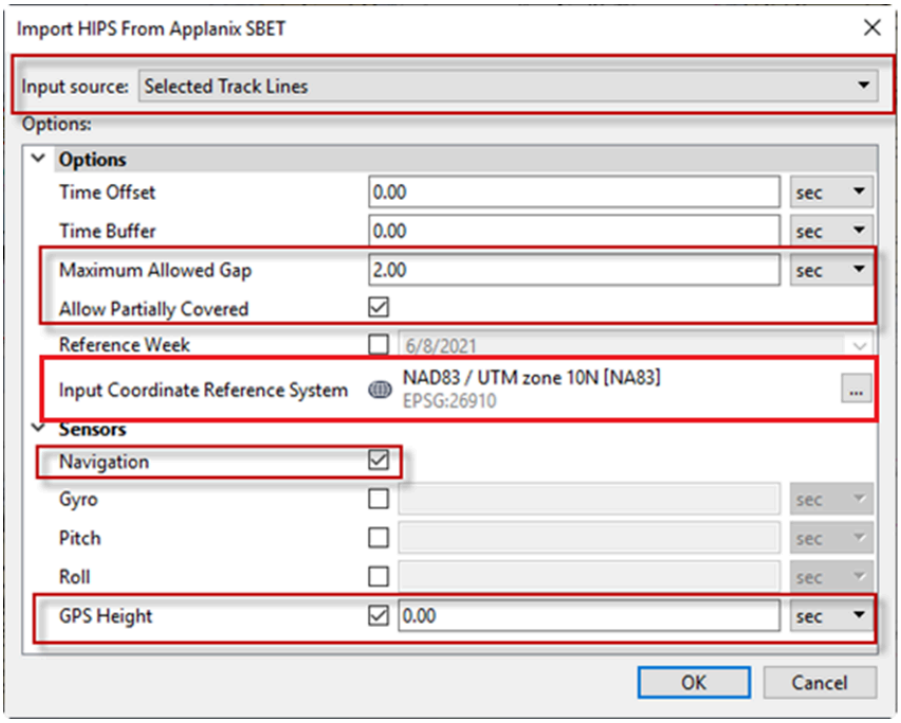
Check the Project Instructions for the correct coordinate system

2) Apply SBETs and RMS
   a) To complete this step, you will need to an SBET and RMS file. SBETS/RMS are created using another program (POSPac). If you need to create an SBET/RMS file, follow the steps in the POSPac_RTX_SOP located here: WORKING OCS SOP Manual POSPac 9.1 SBET Creation. Once you have created the SBET, you may continue onto the next step in this SOP.
   b) Select *only* the tracklines to which you intend to apply an SBET. This will likely be a single vessel and single day of data.
   c) Import SBET

i) Click File > Import > Auxiliary Data > Applanix SBET

ii) Navigate to the location of the processed SBET. The SBET file will probably look like this: **HXXXXX _SBET _VV_VESSL_EMXXX_ YYYY_DDD _NAD83(2011).out**

iii) Fill out the parameters in the window. Remember, for Input Source, select only the lines to which you wish to apply SBETs.

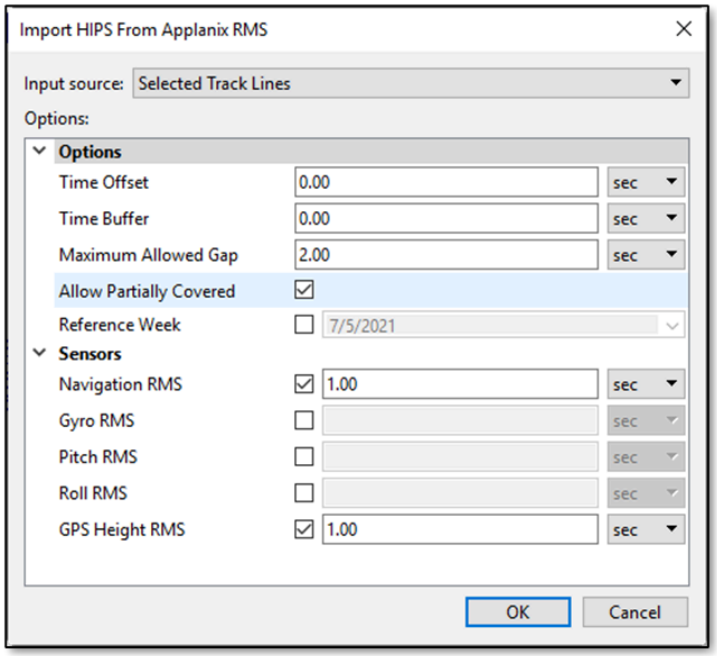


j) Import the associated RMS

i) Click File > Import > Auxiliary Data > Applanix RMS

ii) Navigate to the location of the processed RMS. The RMS file will look something like this: **HXXXXX _smrmsg _VV_VESSL_EMXXX_ YYYY_DDD _NAD83(2011).out**

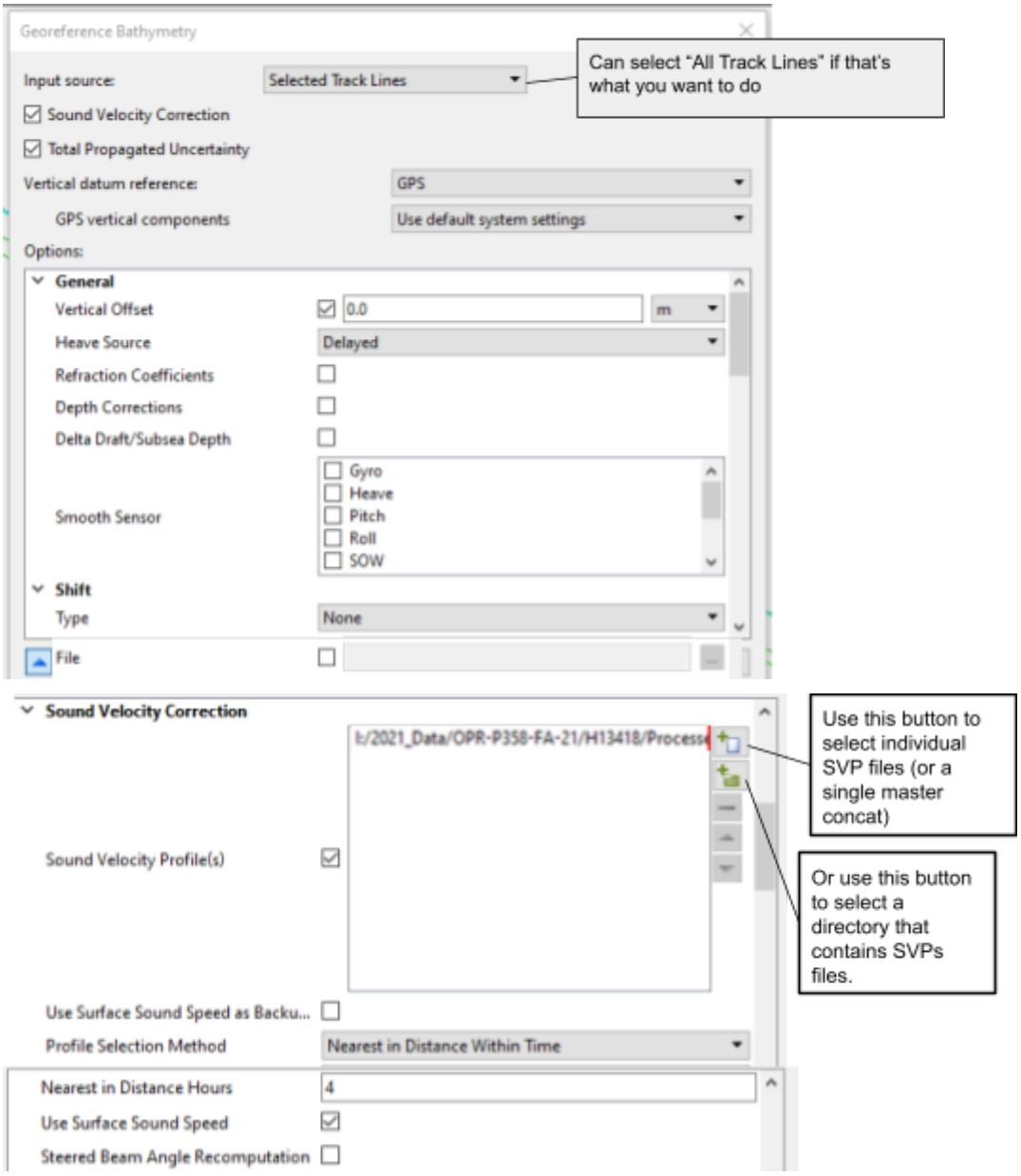
iii) Fill out the parameters in the window. Remember, for Input Source, select only the lines to which you wish apply SBET RMS data.

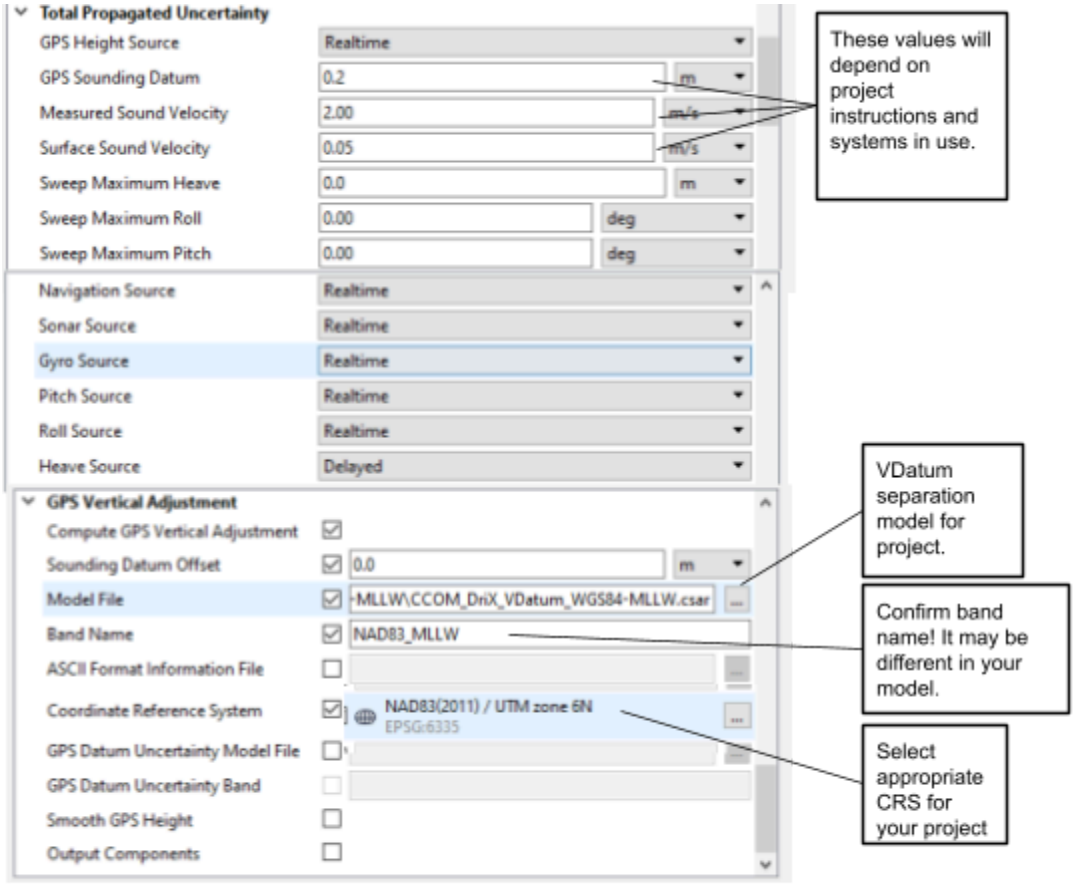


Georeference Bathymetry

1) In the Active Track Lines window, select the Track Lines you want to georeferenced. This will just be the Day's data for whichever vessel you are processing. Then, select the Georeference Bathymetry button: 

2) In the Georeference Bathymetry window that pops up, set the following parameters



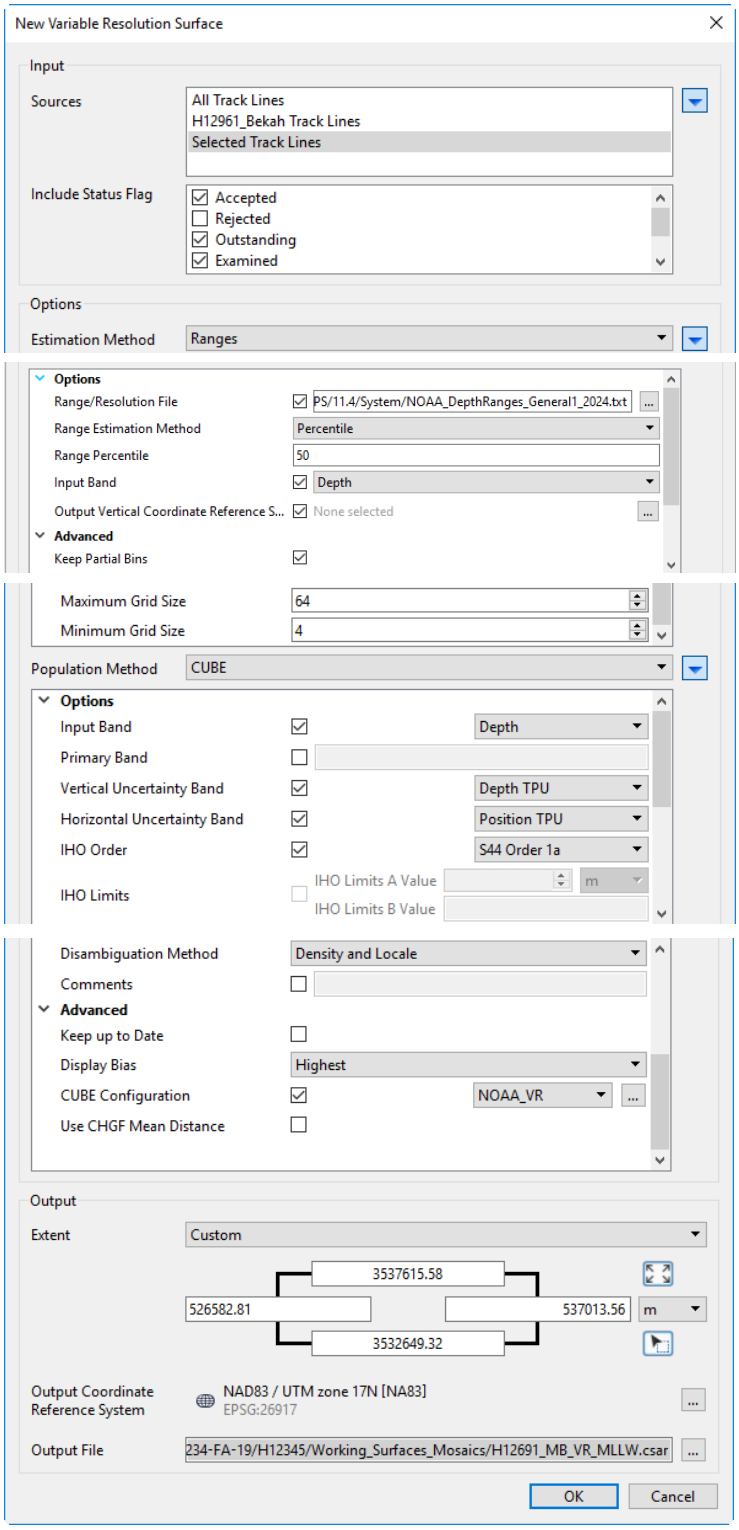


Typical VDatum Location
PD:\20YY_Data\OPR-XXXX-VV-YY\HXXXXX\Processed\ Vertical_Datum_Correction \ERTDM or VDATUM

3) Once Georeferencing is complete, check the Output log in CARIS. Take note of any lines with any issues and/or error messages.

Surface Creation (Variable Resolution)

1. Zoom out to make sure you can see in your display all the data you want to process.
2. Click the  icon in the toolbar.



Input: **Sources > All Track Lines or Selected Tracklines if you only want a subset of your data, depending on needs.**

Estimation Method > Ranges
Options: **Range/Resolution File** > navigate to the appropriate file based on survey requirements (General1, Exception)

Population Method > CUBE
Options: **Input Band > Depth**
Vertical Uncertainty Band > Depth TPU
Horizontal Uncertainty Band > Position TPU
IHO Order > S44 Order 1a
Disambiguation Method > Density and Locale

Advanced:
Uncheck **Keep up to Date (otherwise surface will try to update after every point cloud edit)**

Check CUBE Configuration > NOAA VR

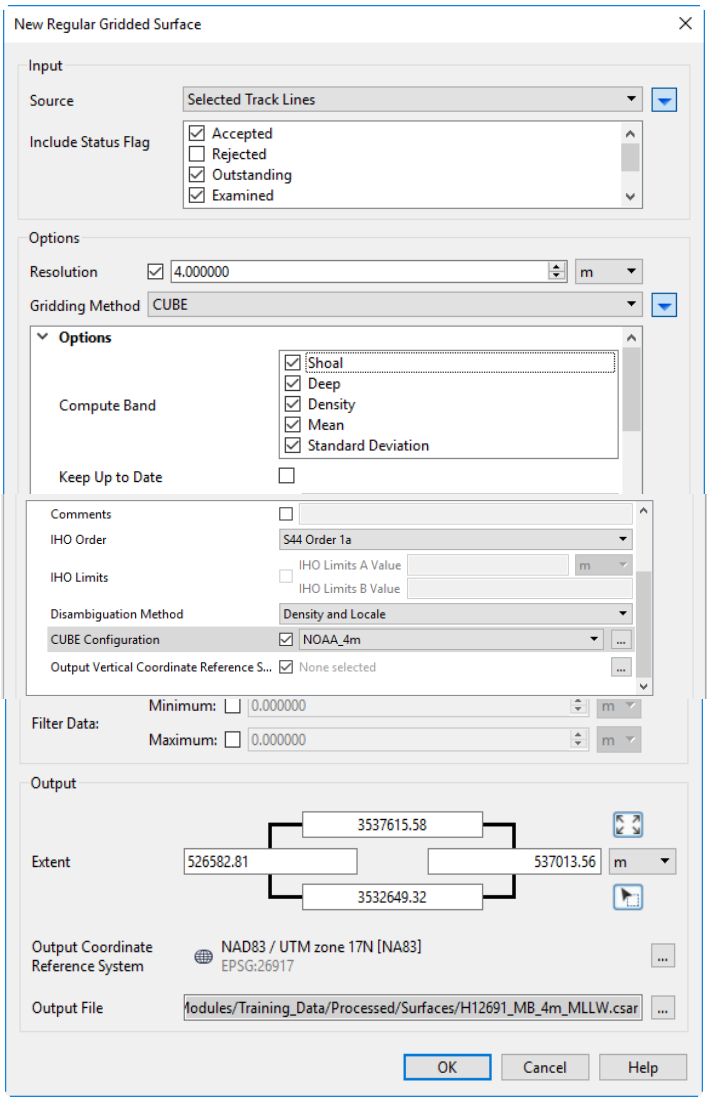
Output
Extents will default to whatever data is in view on your screen. Make sure you are zoomed out far enough to see all your data.

Output File > Select the Ellipsis, browse to S:\YYYY\OPR-XXXX-FH-YY\HXXXXX\Working_Surfaces_Mosaics\Bathymetry and save the surface as **HXXXXX_MB_VR_MLLW**.

Click ok and you're finished!

Surface Creation (Single Resolution)

1. Zoom out to make sure you can see in your display all the data you want to process.
2. Click the New Single Resolution Surface icon  in the main toolbar.



Input: **Sources > All Track Lines or Selected Tracklines if you only want a subset of your data, depending on needs.**

Set your resolution based on your depth.

Uncheck **Keep up to Date (otherwise surface will try to update after every point cloud edit)**

CUBE Configuration: Ensure it matches resolution and is drawing from NOAA Support files.

Output
Extents will default to whatever data is in view on your screen. Make sure you are zoomed out far enough to see all your data.

Output File > Select the Ellipsis, browse to S:\YYYY\OPR-XXXX-FH-YY\HXXXXX\Working_Surfaces_Mosaics\Bathymetry and save the surface as **HXXXXX_MB_VR_MLLW**.

Click ok and you're finished!

Resources & References

CARIS 11.4 manual, existing ship SOPs.