How to find Calibration Sites for seabed ID Data

By Joe Burnett

A seabed ID system is used to determine the types of bottom classifications by graphing the characteristics of the first and second echo returns from a singlebeam sonar or stand-alone seabed ID system. The first echo (e1) is used to determine the roughness of the bottom and the second echo (e2) is used to determine the Hardness of the bottom.

By graphing the combination of the e1 and e2 values, polygons can be created to depict different types of bottom classifications. Creating these Polygons can be a tedious and somewhat difficult task. Here is an approach to simplify this procedure.

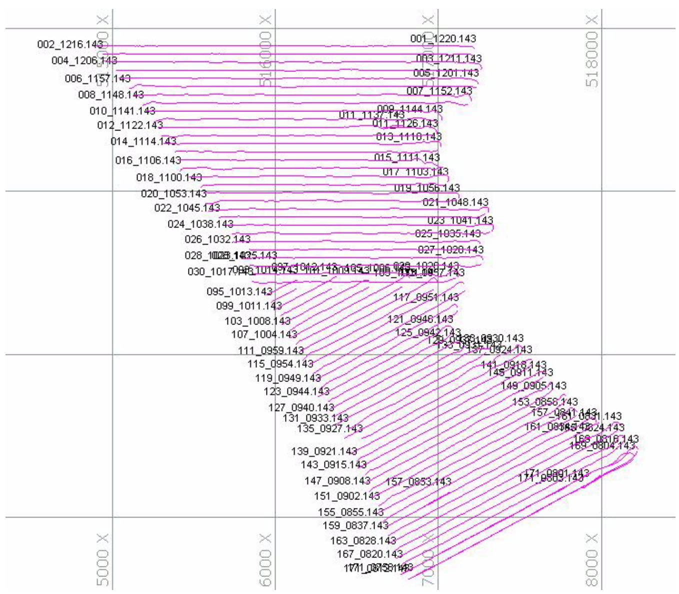
Once you have setup your seabed ID system in HYPACK® HARDWARE, you are ready to collect some data, and then setup your seabed ID polygons that will be used to determine the bottom classifications. It sounds backwards, right? Well, it is. The thing is, because every sonar has its own frequency and may be used with different transducers, there are no set values or parameters for the seabed IDsystem. Therefore, these polygons have to be created for each system.

This approach requires a fair amount of data, over what you hope has multiple different bottom classifications. So go ahead and collect this data on a project site at which you already plan to collect seabed ID data.

PROJECT SETUP

1. Set up your Hardware.
2. Set up you runlines and matrix.
3. Collect your data.

***FIGURE 1.** Sample Run Lines*



DATA PROCESSING

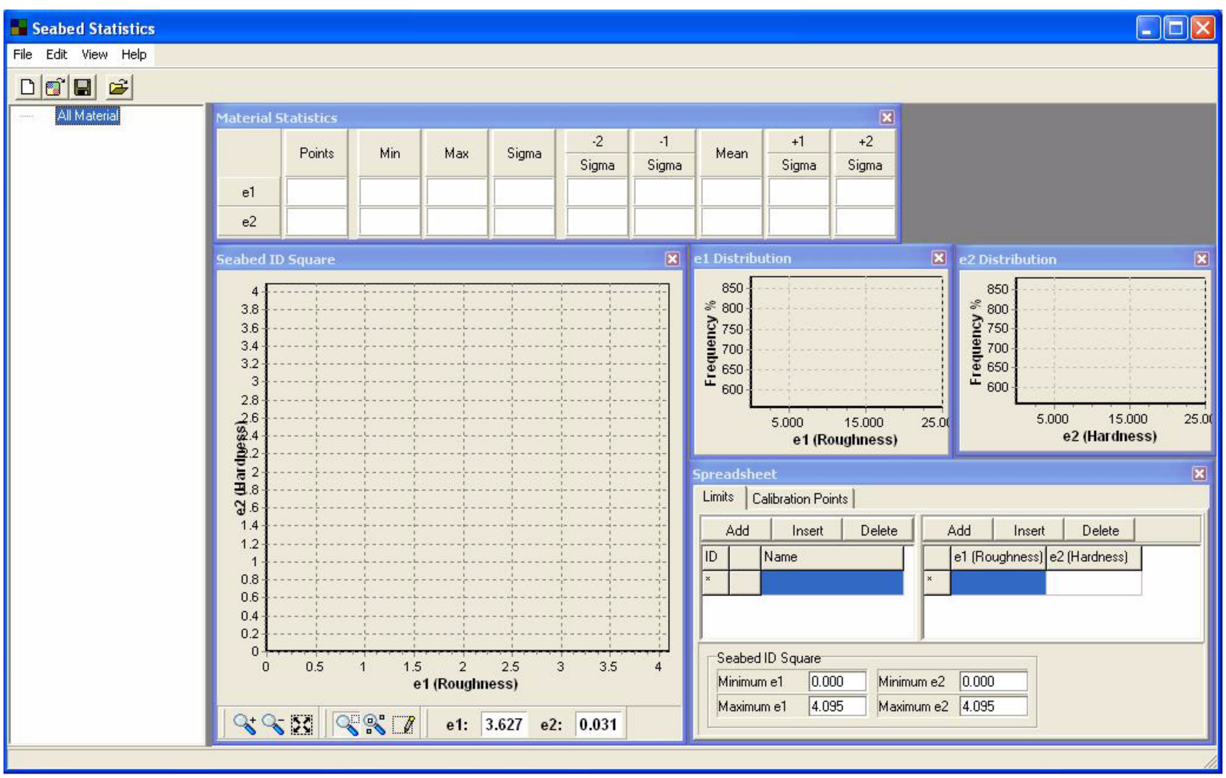
This will be very quickly and easily accomplished. Unlike your singlebeam sounding data, there is no editing necessary for your seabed ID data. The seabed ID data remains unchanged. However, you might as well edit your singlebeam and add some 3-dimensional character to your bottom classifications and because the SEABED STATISTICS program reads Edited All format files.

1. In SEABED STATISTICS, extract the Seabed ID Data.
2. Use TIN MODEL to map the roughness (e1) and hardness (e2) data to show areas of each e1 and e2 value.
3. Geo-reference your TIN Model and load it as a chart in HYPACK®
4. Define calibration areas and bottom-truthing sites based on the areas seen in the TIN models.

EXTRACTING THE SEABED ID DATA

1. In the Main HYPACK® Shell, select **Utilities**>**Seabed**>**Seabed ID** to launch the SEABED STATISTICS program.

   FIGURE 2. *SEABED STATISTICS Program*

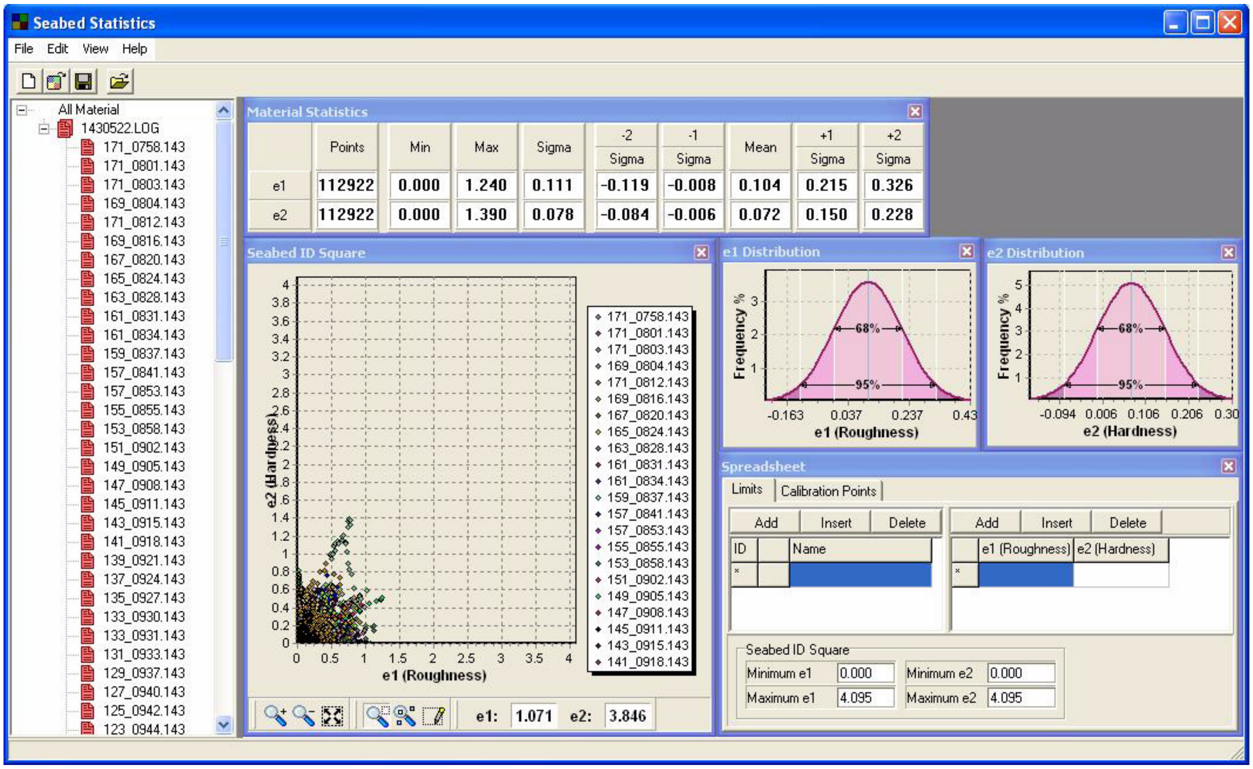


2. Click on **File**, then **Add Material** and select the *. LOG file that contains all the RAW files from the Raw Directory. Now you will see all the data loaded into the SEABED STATIS-

TICS Window. At this stage, this window does not mean that much, other than, you can see the minimum and maximum readings of the e1 and e2 values.

IMPORTANT: Make note of these values for each e1 and e2.

FIGURE 3. Seabed ID Data Displayed in SEABED STATISTICS



3. Now, we are going to generate some files that will allow us to see where specific bottom characteristics are located, and how we can use them to find calibration and bottom sample areas that will help create the seabed ID polygons.
   a. Select **FILE**>**EXPORT MATERIAL.** Now, the XYZ/Id Export window appears.

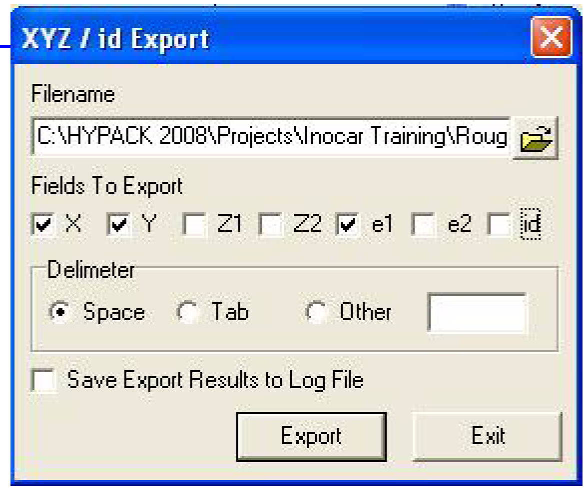


FIGURE 4. XYZ ID Export Dialog

b. In the **Fields to Export** area, select **X**, **Y**, and **e1.**

c. **Name your output file.** Click on theFile Open icon (circled in **RED**) and enter a name. In this example, since the **e1 values** represent the roughness of the first echoes, enter ’**Roughness**’ under ’File Name’ and under ’Files of Type’, select ’XYZ Files (*.xyz)’. Click [Save].

NOTE: The Roughness.xyz file is being saved, by default, in the project folder. Select an Alternative Directory if you so choose.

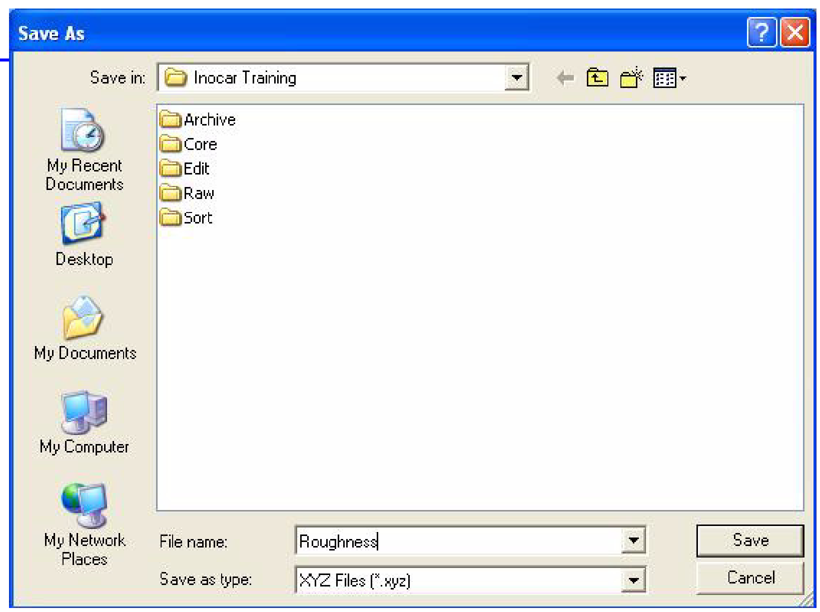
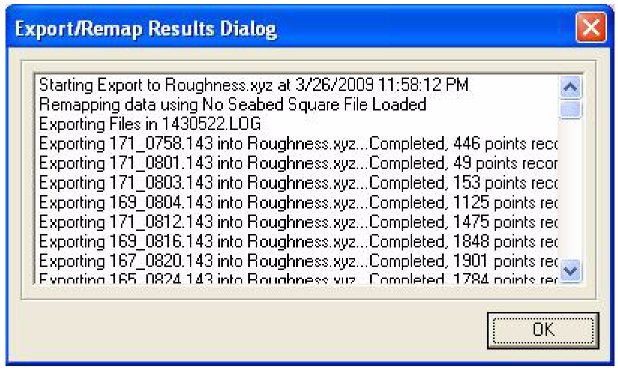


FIGURE 5. Naming your Output File

d. **Select the Delimiter** for the new file. A space is probably the best.

e. **Click [Export].** The Export/ Remap Results Dialog now appears, letting you know that the Roughness.xyz file is being generated. Once it is complete, click [OK].

FIGURE 6. Export/Remap Results



4. In the **XYZ/Id Export** Window, clear the **e1** box and check the **e2** box, and repeat the export process to generate 'Hardness.xyz'.
5. **Click [Exit]** to return to HYPACK®**.**

MAPPING THE SEABED DATA

Now that you have created these two files, **Roughness.xyz** and **Hardness.xyz**, you can take them into the TIN MODEL program to create the geo-referenced plots that will allow you to select areas for calibration lines and bottom sample/ground-truthing locations.

NOTE: Even though these are not truly XYZ files, they are in the format of an XYZ file and can be read and modeled within the TIN Model Program.

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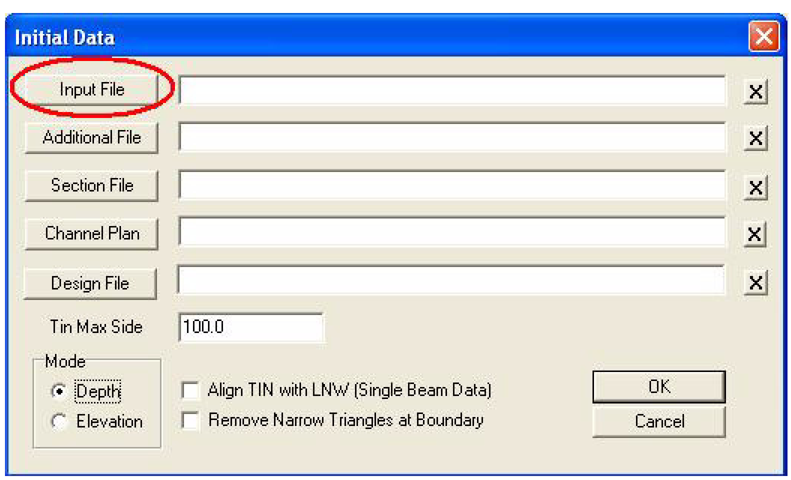
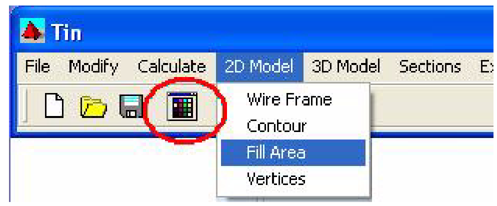
1. **Start the TIN MODEL program**.
2. **Select FILE-NEW.** The Initial Data window appears.

FIGURE 7. TIN MODEL Initial Data Dialog



3. **Build a TIN model of each data set**--Roughness.xyz and Hardness.xyz.
   a. Load one of the XYZ files as your Input File.
   b. Set the TIN Max Side to the proper distance to triangulate across all points.
   c. Set the Mode to Depth.
   d. Click on [OK] and the TIN MODEL program will generate a TIN model of the data.
4. **View the resulting model.** Select 2D MODEL-FILL AREA and the 2D Fill Area TIN appears in a separate window. You will likely see that the TIN is all one color. This is because that the "Z" values are actually the e1 values which are all very low numbers.



5. **Click on the Color button (circled in red above) and modify your TIN colors to match the Minimum and Maximum range for the e1 and e2 readings** noted in SEA-BED STATISTICS. Set the Depth Band Colors to the Minimum and Maximum values of the e1 readings and use an Increment value that will provide you with at least 40 color shades.

FIGURE 8. Setting your Colors to match the E1 /E2 values

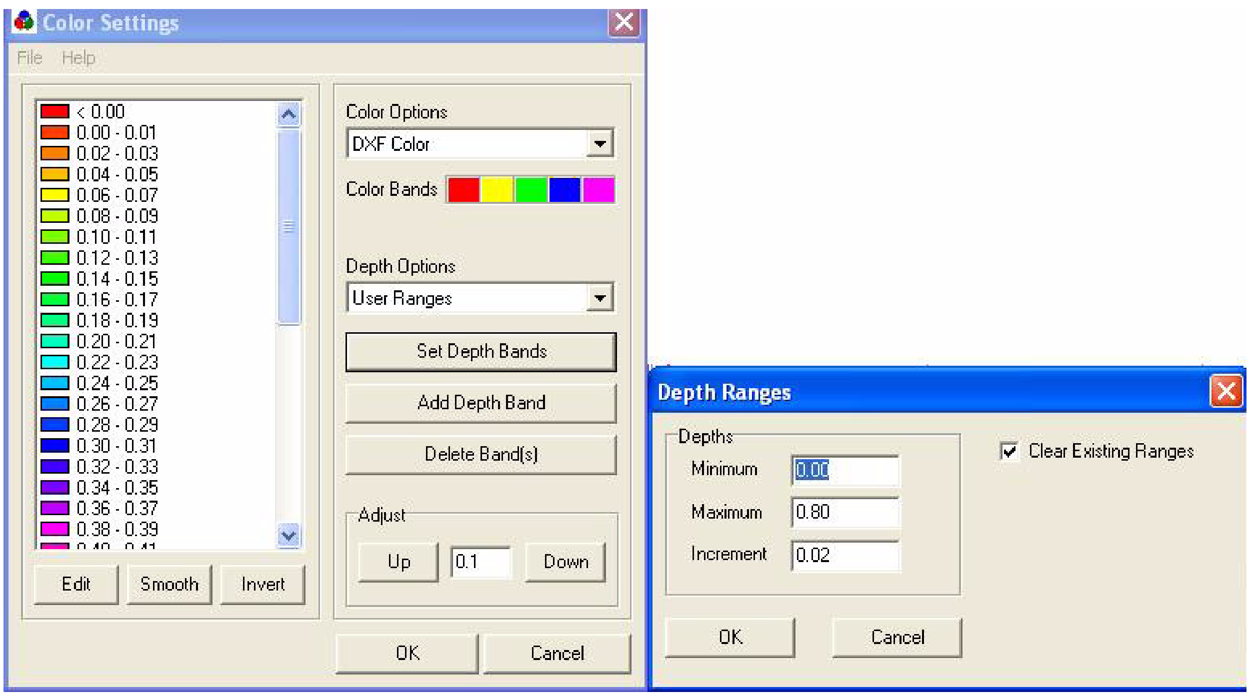
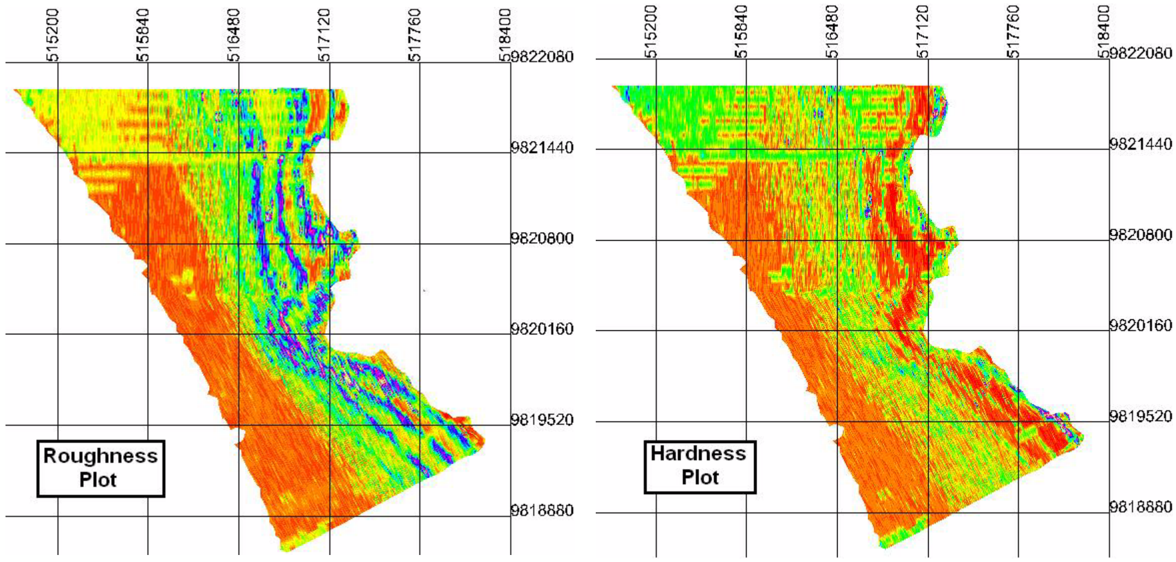


FIGURE 9. Roughness plot (left), Hardness plot (right)



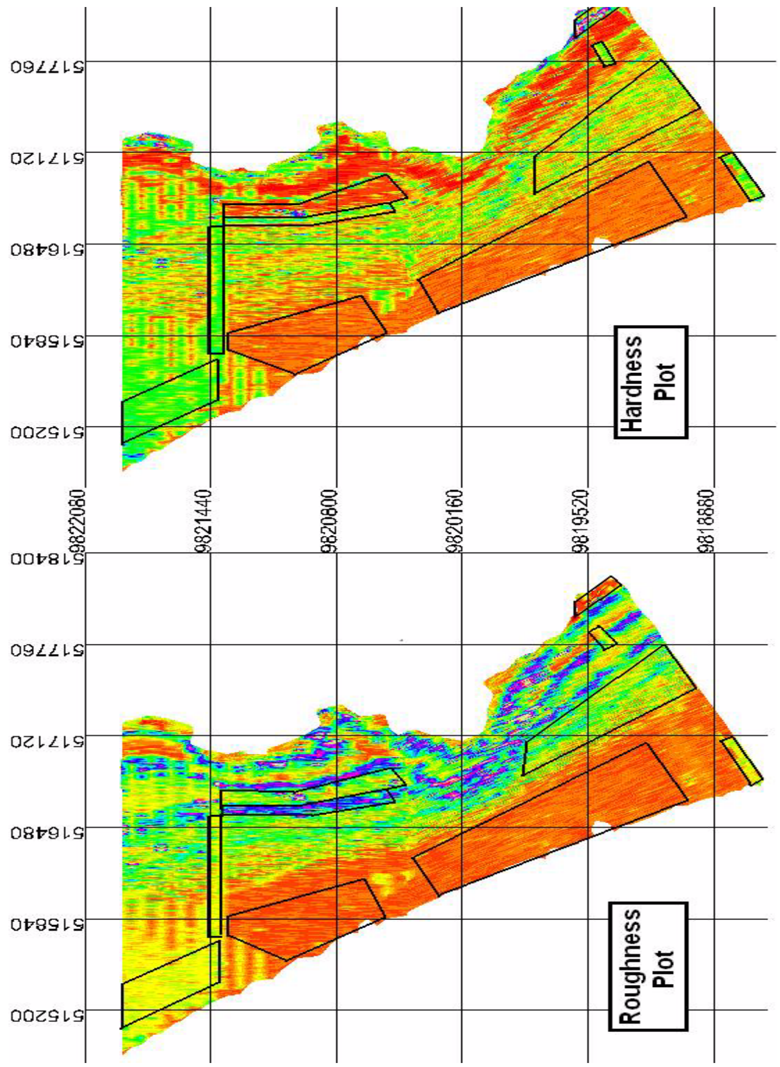
6. **Export your TIN Model to a Geo-referenced TIF file**. (In the 2D Model window, click the globe icon, enter a file name and output settings and click [OK].
7. **Repeat the process for the other XYZ file** from SEABED STATISTICS.

CHOOSING YOUR CALIBRATION AREAS

Now from these two geotif charts, you can define several areas in which calibration run lines and ground-truthing areas can be established. These areas can be seen within the plots below.

- Run these calibration run lines to collect data that will be tightly concentrated around specific e1 and e2 values.
- Collect bottom samples that will associate specific bottom classifications to these concentrated values.

FIGURE 10. e1 and e2 Calibration Areas



In the next issue, I will demonstrate how to create the polygons that define the areas where these tightly concentrated e1 and e2 values and create plots and charts that display where specific bottom classifications reside.