SonarWiz 5 - Basic post processing work-flow for sidescan sonar data

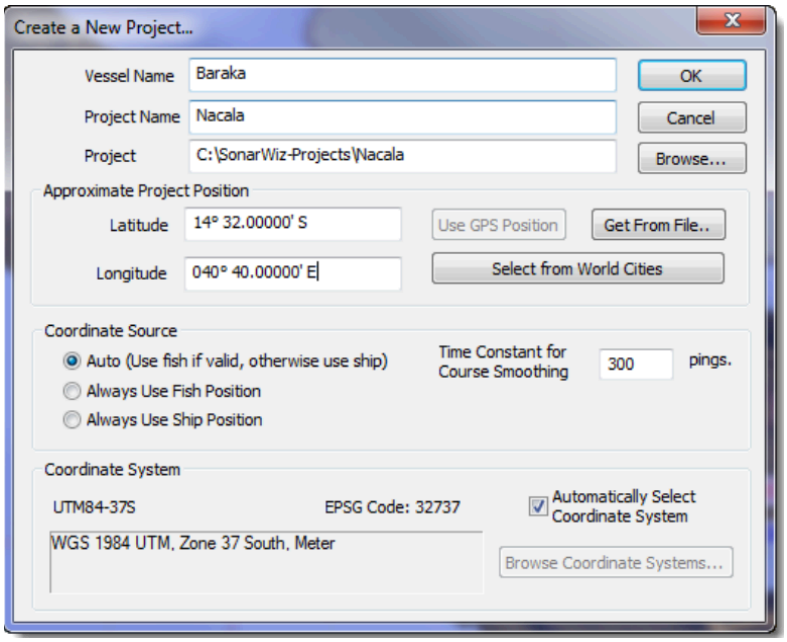
This is a short guide for simple processing of sidescan sonar data in SonarWiz 5. As you will notice, there are several options and settings in the programme that is not included in this guide. Usually the default settings will then be OK, and you can get more detailed information in the SonarWiz5 User Guide*.*

Content

1. Create new SonarWiz Project

When SonarWiz first starts it will either open the last editet project, or it will start with the **Open Existing Project** dialog. If the latter, click the **Cancel** button to close this dialog. Then press the **Create a New Project** button, which is either in the middle of the window, and/or in the upper left corner in the **Quick Access Toolbar** (the blank sheet icon).

Next the **Create a New Project…** dialog will open:



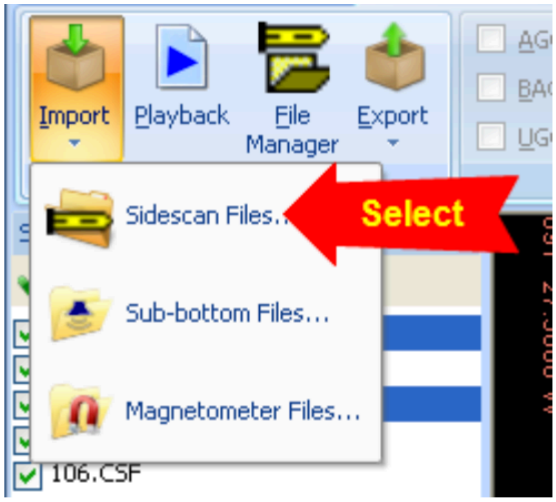
The most important fields here are:

- **Project Name.** Enter a name for the new project here. It is not possible to change the project name after the project has been created, so be aware of what you are naming it initially.
- **Project folder.** Specifies the root folder for the project. By default, the name of the project typed in above will be inserted here, but you may browse to an existing folder or enter a new folder. If the folder doesn't exist, SonarWiz will create it, with all the needed sub-folders and files. You should not delete, remove og rename any of these folders and files, but if necessary you can move the entire project folder to a new location.
- **Approximate Project Position.** SonarWiz requires an initial approximate position, in order to set up the coordinate system correctly. You set this information either by entering the position in the **Latitude** and **Longitude** fields (Latitude and longitude coordinates for Trondheim are approximately 63° and 10°), or press the **Select from World Cities** button in order to find your location.
- **Automatically Select Cooridnate System.** Make sure this check-box is turned on.

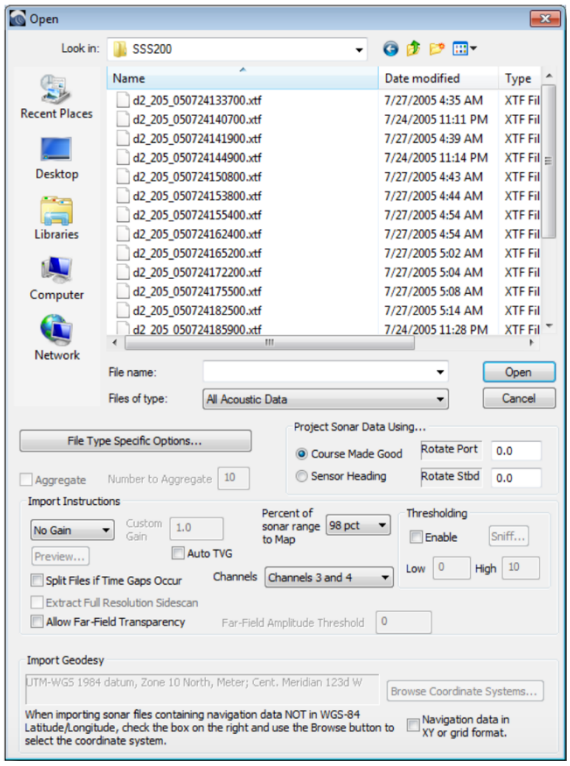
Finally, press **OK** to create your project.

2. Import data

To import sonar data from existing files, click the **Import** button in the **Post Proccesing** menu. Then click the **Sidescan Files…** button, as shown in the figure below.



Now the following **Open** dialog will appear:



In this dialog, there are several import settings available. You can read more about these in the *SonarWiz5 User Guide* on page 308. Normally the default settings are okay to use. If the files to be imported contains navigation data stored as WGS-84 Latitude/Longitude (most common), make sure that the check-box for **Navigation data in XY or grid format** under Import Geodesy is turned off.

Browse to the desired folder, and highlight the file(s) to be imported and press **Open**. The sonar files will now be read into the system, and listet under **Sidescan Files** in the **Project Explorer.**

3. Basic sonar file management

3.1 File Manager

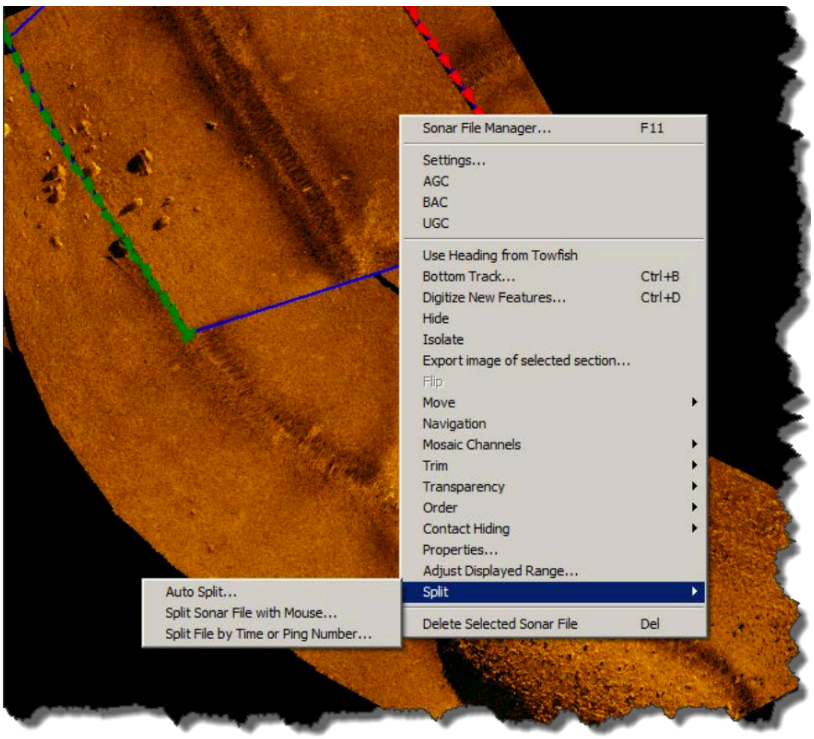
The data imported to SonarWiz are listed in the **Sonar File Manager**. This is opened by clicking the **File Manager** button in the **Post Proccesing** menu (showed to the right) or by pressing the **F11** hot key.

The **Sonar File Manager** gives you information about the files, and lets you manage different settings (explained later) to the files. You can choose which files to be displayed in the **Map Window** by check/un-check the **Enable** boxes in the file list. This can also be done in **Project explorer (**to the right of the **Map Window**), in the **Sidescan File** list.

3.2 Split

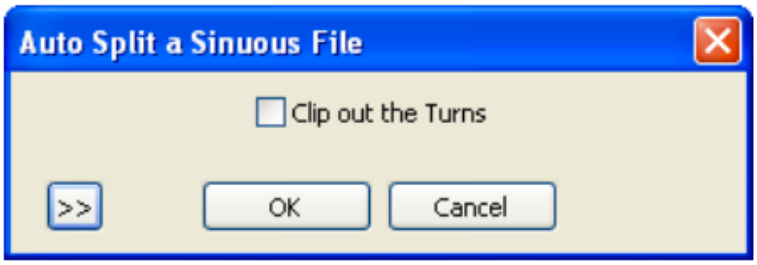
Sidescan sonar files may be split into several files, such that the files can be treated differently. This is mostly needed if the original file is too large to be manipulated easily, or if the original file overlaps itself with multiple passes over the same seafloor.

To split a sonar file, you first need to select the file you want to split, by left-clicking it in the **Map Window.** Then right-click, and press **split**.



This will give you different split-options:

- **Auto Split…** This function is recommended when the file is complex and overlaps itself. The function analyzes the selected sonar files and determines where the turns occur in the file. Once the turnes are identified, the file will be broken up into seperate files. When selecting the Auto Split function, the following dialog will open:



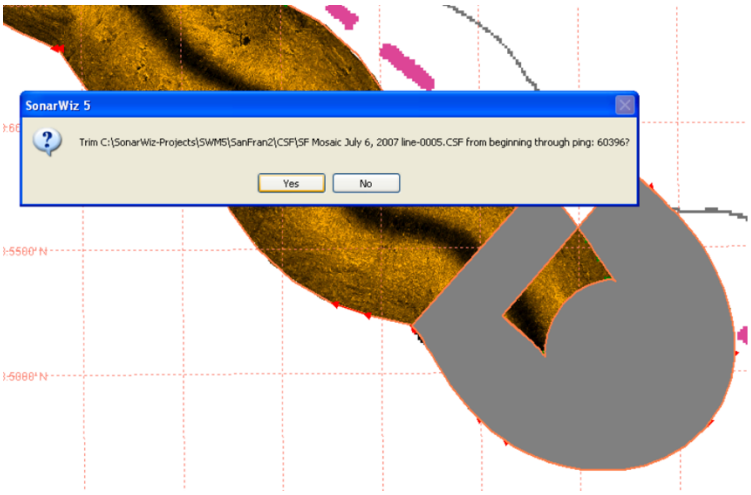
  When this box is checked, all sub-files determined to be turns will be deleted.

- **Split Sonar File with Mouse…** This function allows you to select exactly where the file is to be splitted. By clicking the file on your desired position, the file is simply split into two new files.

3.3 Trim

Sonar files may contain data at the beginning or the end of the file that show the vessel in a turn or maneuvering to get on track. This data may cover other good sonar data, and can also make the mosaic look untidy. The **Trim** function allows you to select a part of a sonar file that is not to be displayed.

To trim a sonar file, you first need to select the file you want to split, by left-clicking it in the **Map Window.** Right-click and press **Trim,** then press **Trim Ends of Sonar File with Mouse...** Now the cursor will turn into a cross. To mark the parts to be hidden, place the cursor at the start of the desired area. Left-click and hold while dragging the cursor to the end of the section. The following confirmation dialog will appear, press **Yes** to complete the trimming.



To undo trimming, select the trimmed file (left-click), then right-click and select either **Undo Trimming on this File** or **Undo Trimming on All files.**

N.B. After a sonar file is trimmed, it is no longer possible to split it. Make sure to finish the splitting before you trim a file.

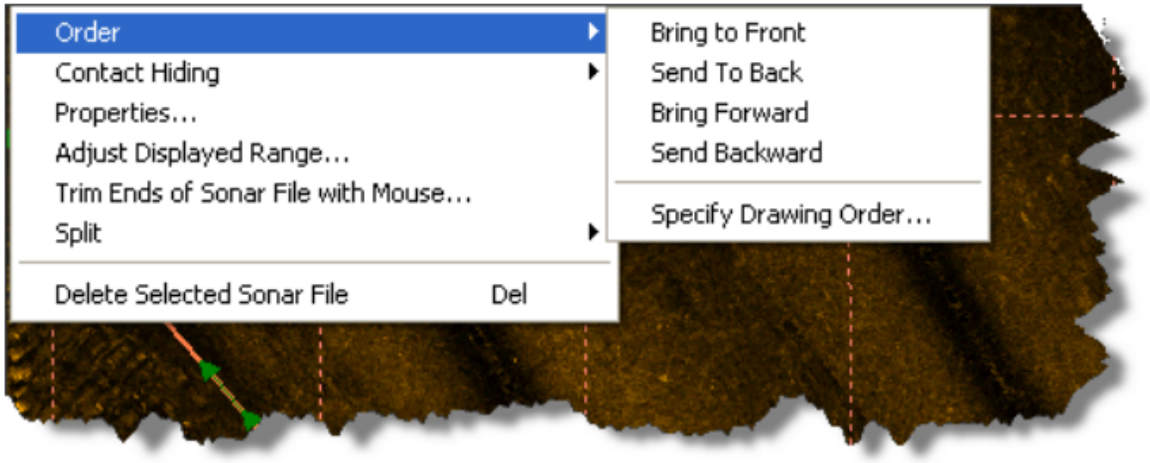
3.4 Delete

Unwanted sonar files may be deleted from the project, by selecting the file (left-click), then right-click and press **Delete Selected Sonar File**. Neither the original file nor the CSF file are deleted with this action. The selected file is only removed from the SonarWiz Project.

3.5 Order

Sonar files are drawn in the **Map Window** in the order that the files are listed in the **Sonar File Manager** dialog. The last file drawn is the last file listed in this dialog, and will be displayed on top of the other files obscuring them in areas where there is overlap.

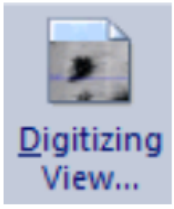
This order is easily changed, by selecting a sonar file (left-click), then right-click it, and press **Order**.



This will give you different options:

- **Bring to Front**. Makes the selected file on top of all other lines. This will move the file to the bottom of the file list in the **Sonar File Manager**.
- **Send to back**. Makes the selected file on the bottom of all other lines. This will move the file to the top of the file list in the **Sonar File Manager**.
- **Bring forward**. Moves the selected file on top of the next drawn file. This will move the file down one row in the file list.
- **Send backward**. Moves the selected file under the previously drawn file. This will move the file up one row in the file list.

3.6 Digitizing View



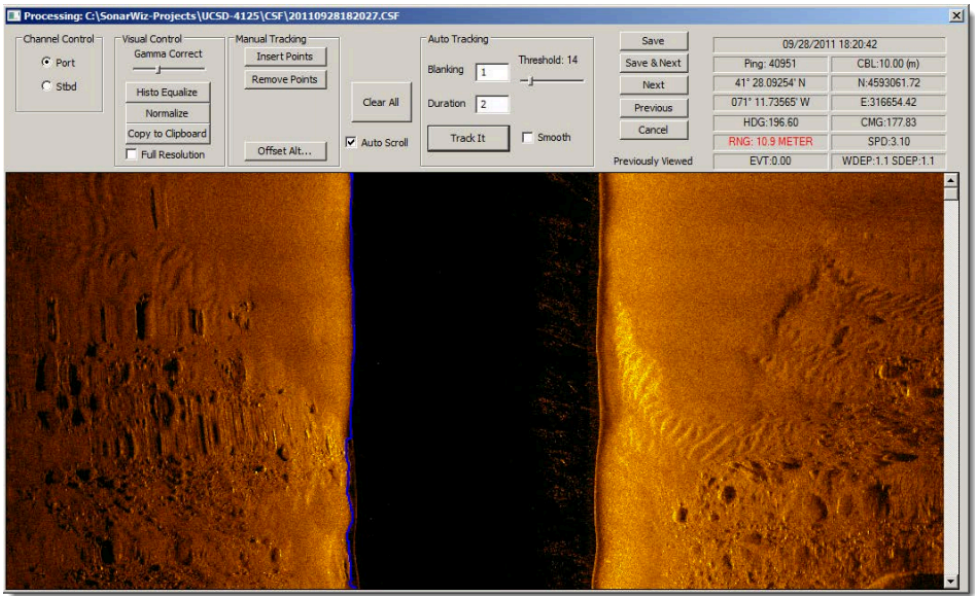
To have a closer look at a specific Sonar file, you may open the Digitizing window. Select the desired sonar file (left-click), and then press the **Digitizing View…** button (showed to the right) in the **Post Proccesing** menu.

Here it is possible to scroll through your entire file, which is often useful when you are looking for a specific object. As you move the mouse over the file in the **Digitizing View**, a blue cross in the **Map Window** shows where the mouse is pointing. You may also split the sonar file with mouse in this view, by pressing the **Split** button and then click the file where you want to split it.

4. Bottom Tracking

The Bottom Tracker is opened by selecting a sonar file (left-click), and then press the **Bottom Track…** button (showed to the right) in the **Post Processing** menu. You can also use the hot keys **Ctrl + B.**

The **Bottom Tracker** dialog will appear:



This shows the sidescan in a port/starboard view. There are two ways to do the bottom tracking, either manually or automatically. The Auto Tracking is the less timedemanding option, but will vary in quality.

Auto Tracking

There are some different controls that allow you to configure the bottom tracker to the environment the sonar was operating in:

- **Blanking.** This parameter is used to set the point in the acoustic signal at which SonarWiz will begin to detect the bottom. The value is entered in meters, and can include a decimal. A general range of values for blanking is 1-4 meters.
- **Threshold**. This coefficient is used as a multiplier to the median value for the sonar pings over the selected samples. If the sonar value exceeds the product of the median and the threshold coefficient, that sample will be a candidate for the tracked bottom sample. In order to find a suitable threshold value, the best way is to trial and error.
- **Duration**. This parameter specifies the number of samples that must exceed the threshold computation above. Typical values for duration are 3-12.

When the controls are set, press the **Track It** button to run the automated bottom tracker at the sonar file. If the bottom tracking looks wrong, you can adjust the controls above and try again.

Manual Tracking

If the Auto Tracking did not work, you can do the tracking manually. The manual bottom tracking tools allows you to define the location of the bottom along the sonar record by adding and removing points using the mouse.

- **Insert Points.** Pressing this button causes the left-mouse button to insert points with a single click, and the right-mouse button to delete points within a rectangle that is right-click dragged to size.
- **Remove Points.** The opposite of the above; pressing this button causes the right-mouse button to insert points with a single click, and the left-mouse button to delete points within a rectangle that is left-click dragged to size.
- **Clear All.** Pressing this button will eliminate any existing tracking information.

Often it is most efficient to do a combination of the **Auto Tracking** and the **Manual Tracking.** This is done by first track the file automatically, and then do any necessary adjustments manually.

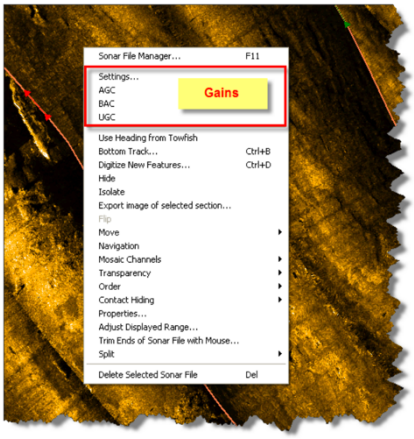
When the bottom tracking is done, press **Save** in order to save and close the **Bottom Tracking Window,** or press **Save & Next** in order to continue the bottom tracking on the next file.

All sonar data should be bottom tracked before proceeding to the signal processing.

5. Signal Processing

Signal Processing in SonarWiz involves a variety of methods to apply gain to sidescan files in order to present the best possible image. In short it is image enhancement. SonarWiz offers several levels of signal processing. Some of them are discussed below, and you can read more about them in the *SonarWiz5 User Guide* on page 452.

Signal processing functions are applied on the files individually, each file having independent settings. To specify settings for a file, select the file (left-click), then right-click and press **Settings.**



This will open the **Gain Settings Control,** which controls all sidescan signal processing functions available in SonarWiz. Note the following buttons at the bottom of the dialog:

- **OK**. Applies the current gain setting to the sonar file and closes the dialog.
- **Apply.** Applies the current gain settings to the sonar file and re-draws it without closing the dialog.
- **Save.** Saves the current gain settings to a file so that they can be recalled in the future, for example in another project.
- **Load.** Loads gain settings from an existing file.

Beam Angle Correction (BAC)

This function is supposed to compensate for a non-linear response characteristics of the sonar transducers. There are two available settings for this function:

- **Average.** Controls the amount of overlap between adjacent processing blocks.
- **Pings.** Number of sonar pings on which the averaging function will work. This value should usually be set quite high, in the 200-300 range, in order to keep the sonar file as clear as possible.

The BAC function is more intensive than the other gains, and it often makes the mosaic blurry. Therefore, it is often best to process the mosaic with this option turned off initially.

Automatic Gain Control (AGC)

In order to get a clear image, the amplitude of a reflected signal should imply small-scale details on the ocean floor, such as corals, rocks and man-made objects. To make this possible, the large-scale effects caused by the incidence angle and propagation distance on

the amplitude of a signal's reflection must be eliminated. This is the purpose of the auto-gain control. There are two available settings for this function:

- **Intensity**. This slider regulates the overall brightness of the image. With greater intensity values, the image will be darker.
- **Resolution**. This slider determines the size of the gain sampling window in the across track direction. Lower values will decrease the resolution.

The AGC and BAC gains can also be turned on or off a file by selecting the file (left-click) then right-click to bring up the dialog window showed on the previous page, and then simply press the desired gain in order to turn it on or off. This can also be done from the **File Manager Window.**

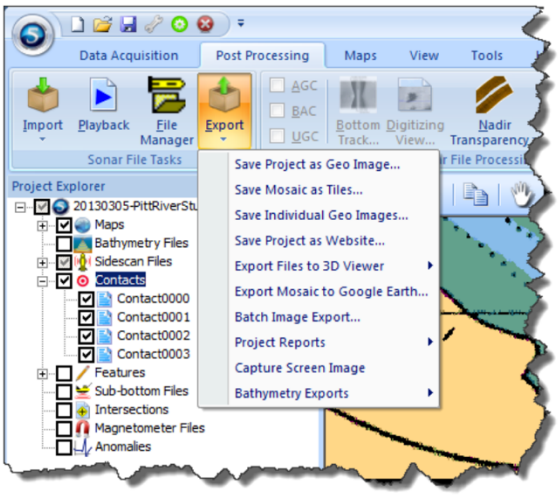
Automatic Time Varying Gain Control (Auto TVG)

This function attempts to create an even display of sonar data from the near ranges to the far, with an amplifier gain that is changed based on time. It divides the data into many parallell swaths, in order to equalize the backscatter of each swath by keeping the power of the signals in each swath constant over time.

The port/starboard controls may be used independently if necessary, or else check of the **Sync Port/Stbd Gains** box. The sliders operate from -100 to +100, where negative values produce attenuation and positive values produce gain.

6. Export final results

To export your final results from SonarWiz, click the **Export** button in the **Post Processing** menu.

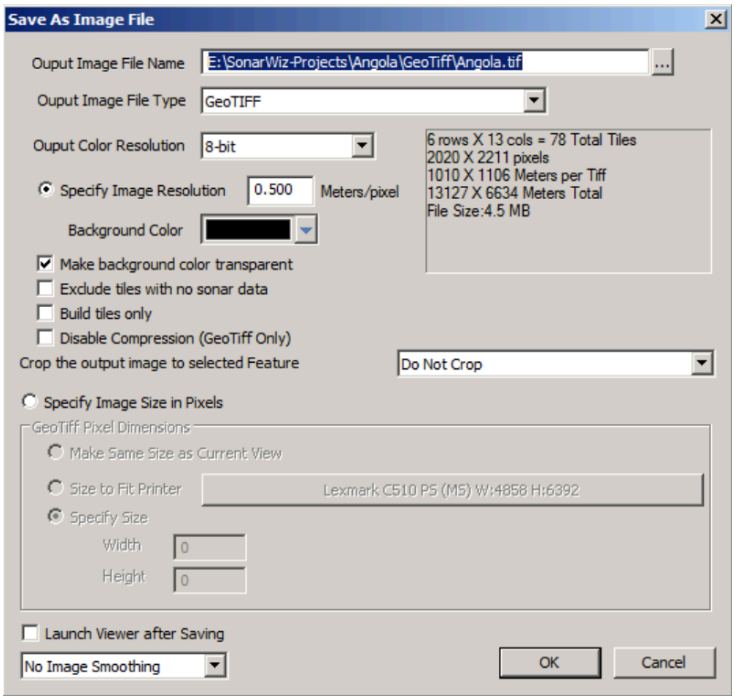


This will give you several different export options, which is described more in detail in the *SonarWiz5 User Guide* on page 400.

Save Project as Geo Image

When SonarWiz exports your image, it will export exactly what is framed in the **Map Window**. Therefore, you should be aware of which files are to be displayed, the display order of these files, the zoom level etc.

Select **Savne Project as Geo Image**… under the **Export** button . This will open the following dialog:



By default, the exported file is named the Project name, but this can be changed in the **Output Image File Name** field. The file type is chosen at the **Output Image File Type** field.

The File Size depends on the resolution, which can be set to your choice at the **Specify Image Resolution** field. Values between 0.1 and 0.5 Meters/pixel will often do good.

Finally press **OK** to save your project as an image file.