SAMM

Stand Alone Mosaicking Module

User Manual

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Acronyms and Abbreviations

cm	centimeter
CPU	central processing unit
ENC	Electronic Navigational Chart
FLS	forward-looking sonar
GIS	geographic information system
GPU	graphics processing unit
GUI	graphical user interface
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
OIC	Oceanic Imaging Consultants, Inc.
PPI	plan position indicator
SAMM	Stand Alone Mosaicking Module
SLS	side-looking sonar
TIFF	Tagged-Image File Format
UTM	Universal Transverse Mercator

1 Welcome to SAMM

There was a time not too long ago when the interface to a sonar was a printer. The sonar would ping, echoes would return, be converted to voltage, and a stylus on a moving belt would cross a scroll of paper, burning images proportional to the echo strength. Now many sonars come with perfectly adequate graphical user interfaces that create a waterfall or PPI (plan-position indicator) view of the data. These are fine, but often lack context, i.e. they don't show the data in reference to each other, or the world. SAMM changes all this.

SAMM (Stand Alone Mosaicking Module) is Oceanic Imaging Consultants Inc.'s (OIC) software program for real-time and playback mosaicking of underwater imagery. SAMM automatically creates mosaics of your sidescan, forward-look (FLS) and mechanical scanning sonar data over your co-registered charts or imagery, while logging the raw data for playback and post-processing. Whether in real-time or playback, SAMM will show where you've been and what you saw.

This manual documents SAMM's features and functions. Information is presented in the order that you need it for out-of-the-box playback or data acquisition. It discusses each process in the SAMM workflow and how to accomplish it. Selected sections conclude with a table of commands relevant to the workflow process described in that section, which serves as a review of the commands available in SAMM and how to execute them. Selected sections also include an interactive tutorial for demonstrating some of the features. Test data are provided with the software for use with the tutorial instructions. The sections are as follows:

- System Requirements and Setup
- The Graphical User Interface (GUI)
- Configure SAMM
- Charts and Background Images
- Add Files or Begin Acquisition
- Display and Processing Settings
- Working with Contacts
- Additional Features
- End Acquisition and Close Project.

We use the following typographical rules throughout this manual for emphasis and clarity:

- **Boldface** indicates onscreen buttons, commands, fields, or icons from a toolbar, menu or window.
- `Courier New` indicates user input or SAMM output. This includes all of the text in the SAMM interface that your actions can change.
- Grey shading of text or columns in a table indicates specific tutorial instructions. Follow these directions to check your work against the figures in this manual.
- Key names are written as they appear on the keyboard. Key combinations are indicated with a plus sign between them, e.g., to press Alt+F, press Alt and F simultaneously.
- Click means to press the left mouse button. Double-click means to quickly press the left mouse button twice. Right-click means to press the right mouse button.

For further assistance using the SAMM program, we encourage you to contact us.

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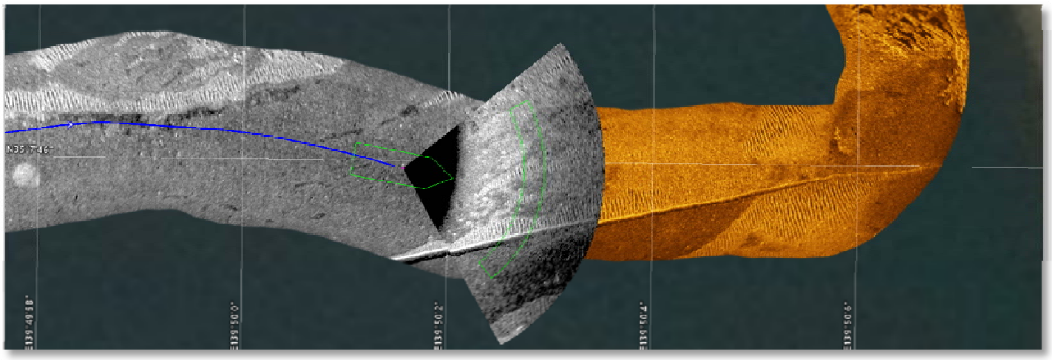
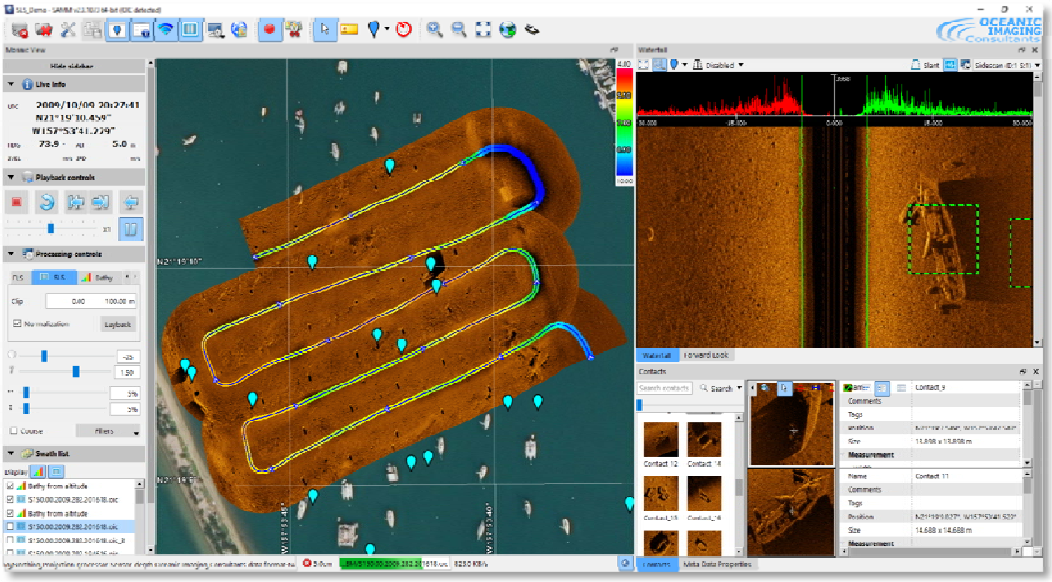
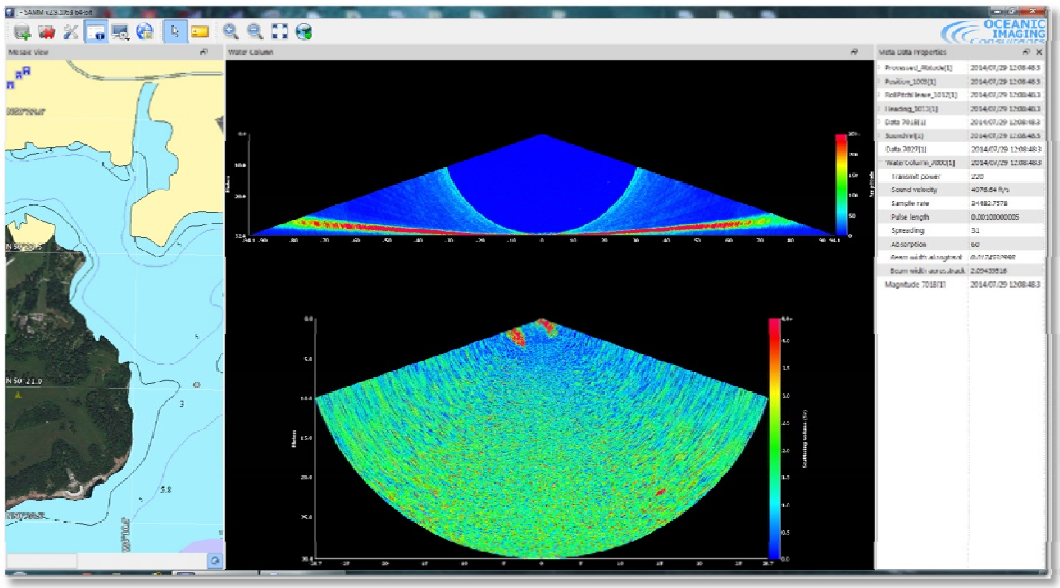






2 System Requirements and Setup

This section describes the sensor and system requirements for computers hosting SAMM, and how to install, launch, and create/open a project in the software.

2.1 Sensor and Input Requirements

SAMM is designed to read sonar data, position and sensor heading, and produce a mosaic. SAMM can do this for forward-look, sector-scan and side-look (sidescan) sonars. SAMM can read this data in real-time from the sensor, or from files in playback mode. In forward-look mode, SAMM is compatible with Kongsberg Mesotech M3/Flexview, Teledyne BlueView 2D imaging, Tritech Gemini, Marine Electronics Dolphin SeaView, Blueprint Subsea Oculus, Haiying Marine HY1645 and the R2Sonic 202x in forward-looking mode. SAMM can also interface with scanning sonar such as Kongsberg Mesotech MS1000 and Imagenex 881L-GS/882L. In sidescan mode, SAMM is compatible with Edgetech (all supported sonars), Klein (all supported sonars), Blueprint Subsea StarFish, Kongsberg PulSAR, Imagenex YellowFin/BlackFin and OIC's GeoDAS (all supported sonars). SAMM also supports reading of C-Max .cm2, Humminbird .dat, Sonadyne Solstice .swf and Triton .xtf data. Contact OIC for other sonar formats. SAMM requires input of sensor position (longitude/latitude) as well as true heading. SAMM assumes your GPS receiver is set to the WGS 1984 reference datum, but supports user configuration of datum.

SAMM directly interfaces to the Tritech Gemini 720, the R2Sonic 202x, the Marine Electronics Dolphin SeaView, the Blueprint Subsea Oculus FLS and StarFish and the Imagenex YellowFin/BlackFin, effectively replacing any native sonar software and providing all control, display and logging functions. For these sonars, SAMM requires:

- the sonar software not be run concurrently with SAMM; and
- navigation and heading sensors must be supplied to SAMM directly, as they will not be included with the sonar data

For the Edgetech, Klein, Kongsberg PulSAR and OIC sidescan systems and the Kongsberg M3/MS1000, BlueView, Imagenex 881L-GS/882L and HY1645 sonars, SAMM interfaces with the manufacture's software, leaving all control and processing to the native sonar software, and providing display, target marking and mosaicking capabilities. For these sonars, SAMM requires:

- the sonar software must be run concurrently with and connected to SAMM; and
- navigation and heading sensors must be supplied to the sonar software, so that SAMM can receive position and heading included with the sonar data. Metadata can be supplied to SAMM directly. This will override the metadata included with the sonar data.

At the time of this writing, SAMM does not interface in real-time to Sound Metrics ARIS/DIDSON sonar, Reson 7128/7130 and Norbit forward-looking sonar systems. However, their recorded data files (.aris/.dds and .s7k) can be loaded or played back in SAMM to generate mosaic imagery if they are logged with position and heading data.

2.2 System Requirements

SAMM is a Windows-based application and *compatible with Windows Vista through Windows 10 .* The minimum system requirements and recommended specifications are presented in Table 1.

Table 1. System Requirements

Component	Minimum	Recommended
Processor	Dual core	Quad core
RAM	2 GB	4 GB
Graphics	CPU	OpenGL 3.1+ compatible GPU and up-to-date video driver
Display	1024x768 (32 bit color)	1920x1080 (32 bit color)
Disk Space	Install is approximately 300MB, but more space is needed for logging data. Please be aware that some systems may log close to 1 GB/min.	
Ports	USB port for dongle, Ethernet port for sonar connection and serial port(s) if using NMEA inputs	

The computer that is running SAMM does not require a dedicated graphics processing unit (GPU), but a GPU does provide better performance. SAMM will automatically offload computation-intensive tasks such as mosaicking and high-quality rendering to the GPU when the GPU supports OpenGL 3.1+. In practice, most recent Intel central processing units (CPU) come with an integrated GPU that meets this requirement, as well as most recent mobile/desktop GPUs from AMD/NVIDIA. You must keep your video driver updated, however. To ensure that you have the most updated driver for your system, please go to the manufacturer's Web site:

For AMD/ATI:
http://support.amd.com/en-us/download

For NVIDIA:
http://www.nvidia.com/Download/index.aspx

For Intel HD 3000/4000/5000 series:
https://downloadcenter.intel.com/

In order to run the SAMM software, an OIC-provided dongle must be attached to the workstation, with up-to-date dongle drivers installed. Dongle drivers are present in the installation media provided by OIC (see Section 2.3).

2.3 Installing SAMM

SAMM installs by default to an OIC folder in the Program Files folder on the local drive. The installation package comes with a dongle, which looks like a USB stick, and a disc including three folders: demo_data, documentation, and install. The demo_data folder contains charts, a demo project, and demo data files in the native SAMM format. The documentation folder contains the playback tutorial, acquisition tutorial, and this user manual. The install folder contains the installation files (64-bit and 32-bit). If you do not have an optical drive on your computer, the downloadable installation package can be provided over the Web, or via USB drive. Please contact OIC if you prefer this option.

If you have a limited feature demonstration version, the demo_data folder may contain additional folders for different sensor data. The limited feature version only plays the included data files, does not need a dongle to run, and cannot acquire data.

To install SAMM:

1. Put the disc in your disc drive and navigate to the install folder.
2. Create a folder on your local (C:) drive named `SAMM_DEMO`, for continuity with OIC training materials.
3. Copy the demo_data folder to the SAMM_DEMO folder. SAMM performs better when data are saved locally.
4. Insert the OIC dongle into a USB port.
5. Double-click on SAMM-2.x.xxx.exe (file name is not exact).
6. SAMM will present you with the licensing terms agreement page. To accept the terms and default installation directory, check the “I agree…” statement, and select “Install”. To configure installation directory other than the default location, select the “Options” button. The Setup Options dialog, shown center below, allows you to specify an alternative installation location. Select “OK” when satisfied or “Cancel” to return. On successful installation SAMM will inform you of success and offer to launch the software. Select “Launch” or “Close”

Figure 1. SAMM installation process and dialogs

First time users will also be presented with a language selection dialog, SAMM is currently available in English, Japanese and Chinese. Additional language support is being developed. Please contact OIC for details.

2.4 Launch SAMM

SAMM launches using standard Window commands, except for the dongle. The dongle must be in a USB port or you will receive an error message. After securing the dongle, either:

- double-click on the **SAMM** desktop icon;
- from Windows Explorer, navigate to the install folder in the Program Files folder, and double-click on the SAMM.exe; or
- click on the **Start** Windows icon, click on the Oceanic Imaging Consultants folder in All Programs, then click on the program folder, and finally click on SAMM.

If SAMM has detected multiple crashes, it may present you with the option of switching to software mode upon launch. You might find it beneficial to test if SAMM performs better in software mode on your system. SAMM also presents you with the option of sending a crash detection report if the software crashes. Please fill out this report if you would like our developers to investigate the cause of your crash.

SAMM comes in English, Japanese and Chinese. Upon launch, pick the desired language from the dropdown menu. This dialog only displays on first launch, or when reset from the Configuration window (see Section 0).

2.5 Create or Open a Project

A SAMM project is a working directory that stores files for the program such as contacts, cached files, raw data and processed swath and mosaic data. The project folder contains results obtained from mosaicking the project data, including swath files and exported mosaic data (you may choose to save exports elsewhere).

The project folder is stored in the workspace, or working directory. For continuity with OIC training materials, we suggest that you use the SAMM_DEMO folder that you copied the data to earlier. The default directory is <my documents>\samm_projects, which works just as well. If you do not choose one of these locations, choose another location, but not one in which you have installed SAMM executables (i,e., other than C:\Program Files\OIC).

Upon launching OIC's SAMM, choose between creating a new project or opening an existing project in the select project window (Figure 2). Project type dropdown menu allows you to select project types between mosaic, mission analysis and water column analysis.

Figure 2. SAMM opening dialog, allowing creation of new project or opening existing

Follow the instructions in Table 2 to create a new project or open an existing project. Note that the “Mission Analysis” option allows one to open a “mission package” consisting of sonar, camera, chart, navigation and waypoint data and create a SAMM project for this data in post mission analysis (PMA) mode. For details on Mission Analysis please see Appendix A, “Mission Analysis”. SAMM now supports water column analysis. Please see Appendix B, "SAMM Water Column Analysis Tools" for details.

At the end of this process, you should have the SAM GUI open, either ready to acquire, load or playback data, review an existing project or perform post-mission data analysis.

Table 2. Create or Open Project

To create a new project:	To open an existing project:	To open a recent existing project:
1. Click **New project** tab. 2. Select "Mosaic" for the project type. 3. Enter a name in the **Name** field: `Test`. 4. Click **Browse path...** to open the Select Folder window. 5. Change the path to C:\SAMM_DEMO 6. Click **Create**. SAMM's GUI displays.	1. Click **Open existing project...** to open the Open window. 2. Navigate to the location where the project is saved (C:\SAMM_DEMO \demo_data\Gemini_HawaiiKai). 3. Click the geomosaic.xml file to select it. 4. Click **Open**. SAMM's GUI displays.	1. Click **Recent projects** tab. 2. Click the project name. SAMM's GUI displays. OR 1. Enter the name of the project in the **Name** field in the **New project** tab. 2. Click **click to open**. SAMM's GUI displays.

3 The Graphical User Interface

Before viewing or acquiring data, take a moment to familiarize yourself with the SAMM GUI (Figure 3). The SAMM interface has a main toolbar, a mosaic window, a status bar, ancillary windows with controls which will appear in the sidebar, and dockable windows (waterfall, forward look, contacts and meta data properties windows). Some elements are specific to the acquisition or playback modes. Each element of the GUI is described in a section below.

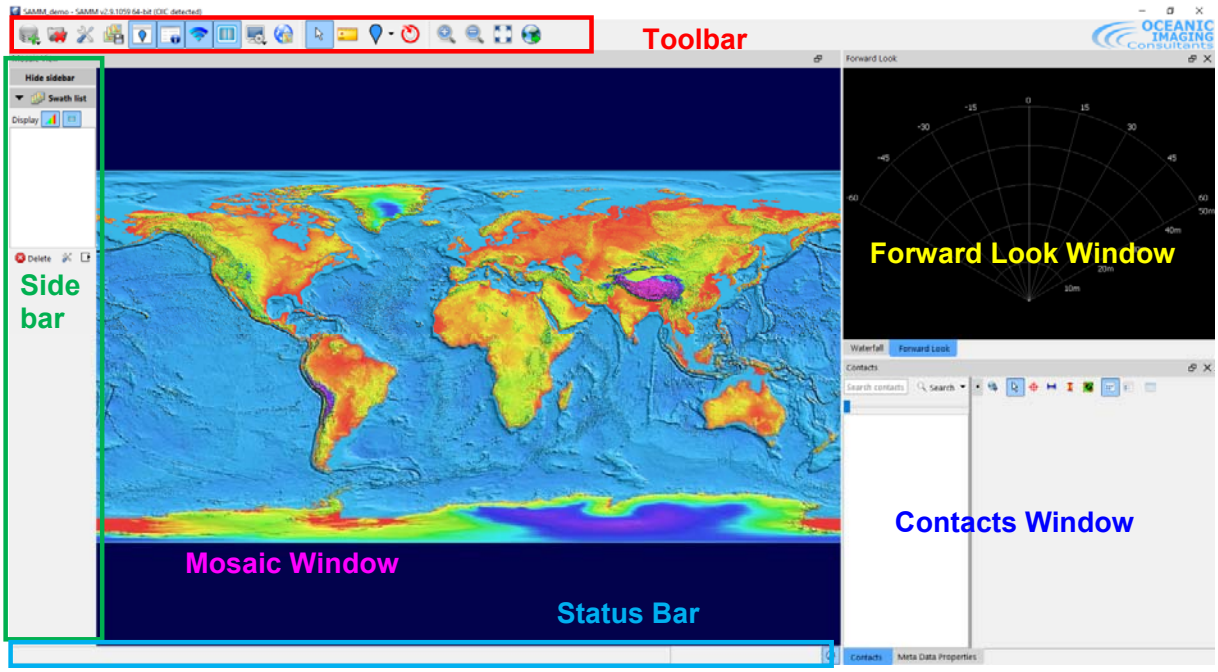


Figure 3. Graphical User Interface

3.1 Mosaic Window

The multilayer interactive mosaic window shows a geocoded graphic of the geocoded data, plus any loaded background charts and images. SAMM layers processed sonar data over a background (navigational chart or aerial imagery) as raw data are collected or loaded. Sections of the survey track that have been processed from the raw data are referred to as **swaths**. All of the swaths from a survey are referred to as the **mosaic**, or the processed dataset. The procedure of drawing the swaths in the mosaic window is called mosaicking the swaths. SAMM only logs or records data when in acquisition mode, not in playback mode, but SAMM mosaics swaths in both acquisition and playback mode.

In playback and acquisition mode, a green outlined polygon represents the vessel. For sidescan systems the scan should appear to either side or aft of the vessel, adjusted for any offsets. For forward look systems a section of the sonar data shown in the plan position indicator (PPI) will appear. The PPI is a pie-shaped “flashlight” view of the sonar data, also found in the Forward Look window. Pink outlined crosshairs represent the positions of the GPS antenna and the sonar head, using the offsets provided by the user.

- To see the vessel, data, GPS and sonar head positions, zoom out by rolling your mouse wheel toward you, clicking the **Zoom out** icon on the toolbar, pressing the - key, or using a two finger scroll away from you on a laptop track pad.

3.2 Toolbar

The toolbar is a collection of icons that open dialog boxes or directly execute commands when clicked. The toolbar icons are pictured and described in Table 3, in the order that they appear from left to right on the toolbar.

Table 3. Toolbar Icons

Icon	Icon Name	Function
	Add data menu	Displays the dropdown Add Data menu
	Close project	Closes the current project
	Configuration	Opens Configuration window
	Export	Opens Export Data window
	Contacts	Opens Contacts window
	Metadata properties	Opens Metadata Properties window (only available in playback/acquisition mode)
	Display the forward look window	Opens the Forward Look window
	Display the sidelook waterfall window	Opens the Sidelook Waterfall window
	Display options	Displays the dropdown swath display options
	Chart background options	Opens the Chart Display Options dialog box
	Record toggle	Begins or ends raw data recording to file in acquisition mode or mosaicking in playback mode
	New swath	Breaks mosaicking without pause in acquisition or playback mode
	Select tool	Allows user to select swaths or contact markers in the mosaic window

	Measure tool	Activates the measure tool
	Mark contact tool	Activates the mark contact tool
	Mission tools	Opens the Kenautics Mission Tool window
	Zoom in	Zooms in to the center of the mosaic window
	Zoom out	Zooms out from the center of the mosaic window
	Reset the view to the entire survey	Resets the mosaic view to the entire survey
	GoTo button	Launches the Go To Dialog, allowing users to specify a starting location on a map, and zoom in. Used in mission planning mode. See Apendix A for more detail.
	Auto adjust the display to follow the sensor	Automatically centers the mosaic view on the sensor

3.3 Sidebar

The sidebar appears by default to the left of the SAMM mosaic window. It contains various panels depending on the mode, and can be minimized by clicking the “Hide sidebar” button.

3.3.1 Swath List

The **Swath list** lists the swaths in the project (Figure 4). As the survey or playback progresses, SAMM lists swaths by name in this list and paints them in the mosaic window. The user can enable or disables swaths to show or hide, and re-order them. Section 7.2 describes how to use this list to manage swaths.

- To hide the Swath list, click the **Swath list** title bar.

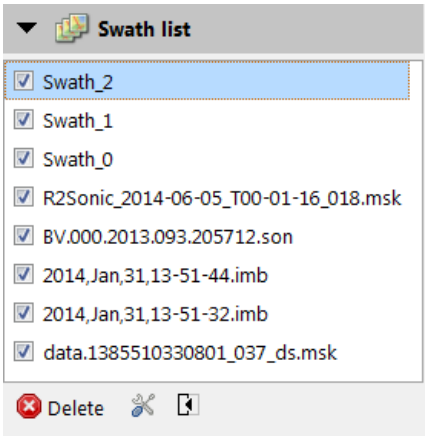


Figure 4. Swath List

3.3.2 Live Info

The **Live info** panel, visible during acquisition and playback, displays continuously updated values for date, time, position, heading, and if available, altitude, sound velocity, and speed. These metadata appear on the sidebar in playback and acquisition mode (Figure 5). SAMM retrieves these metadata feeds from the sonar software or navigation/heading sources (depending on your survey setup).

- To hide the metadata, click the **Live info** title bar.

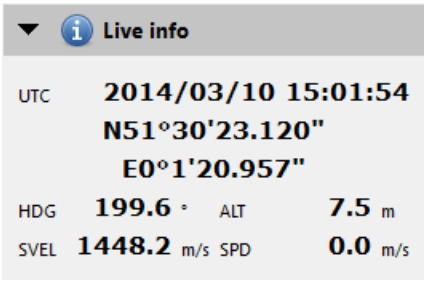


Figure 5. Live Info

3.3.3 Playback Controls

Playback controls appear on the sidebar in playback mode. The playback controls include stop playback, restart from first file, previous file, next file, seek start of file, start/pause buttons and a slider bar to speed up or slow down playback (Figure 6). Playback of *.son (BlueView data) files includes a Sound Velocity input box in the BlueView *.son file controls to allow user to change the sound velocity value with which the data are presented.

- To hide the controls, click the **Playback controls** title bar.

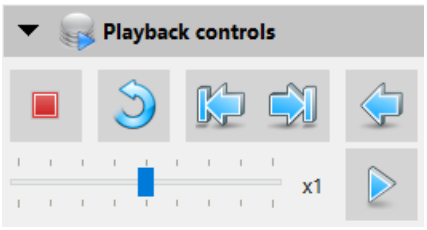


Figure 6. Playback Controls

3.3.4 Sonar Controls

Sonar controls appear on the sidebar in acquisition mode, for the Tritech Gemini, Marine Electronics Dolphin SeaView, Blueprint Subsea Oculus and StarFish, Imagenex YellowFin and BlackFin and R2Sonic sonars (Figure 7) See Section 6.4.126.4.12 for details of each setting. These controls do affect the raw data. For other sonar users, sonar controls are implemented directly in the native software.

- To hide the sonar controls, click the **Sonar controls** title bar.

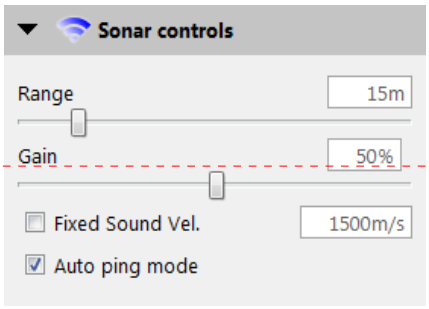


Figure 7. Sonar Controls

3.3.5 Processing Controls

Processing controls appear on the sidebar in playback and acquisition mode and have 4 tabs: FLS, SLS, Bathy and Grid (Figure 8). By default, SAMM only shows the tabs of detected data types. These controls enable the user to change how SAMM mosaics the data. See Section 7.4.1 for details of each setting.

- To hide the processing controls, click the **Processing controls** title bar.

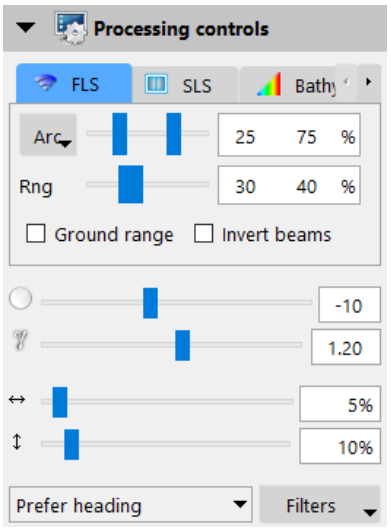


Figure 8. FLS Processing Controls

3.4 Forward Look Window

The Forward Look PPI window shows the forward-look sonar data in a pie-shaped window (Figure 9). The numbers on the sides mark the slant range in meters from the sonar head. Numbers on the arc side of the PPI mark the angle in degrees from the pointing direction the sonar head Use this window to mark contacts and monitor your image quality.

The mosaic is generated from the data within the area outlined in green in the Forward-Look window, This is set by adjusting Arc/Rng-x and range (Rng) on the FLS Processing Controls panel

- If you close the Forward Look window, reopen it by clicking on the **Display the forward look window** icon in the toolbar.

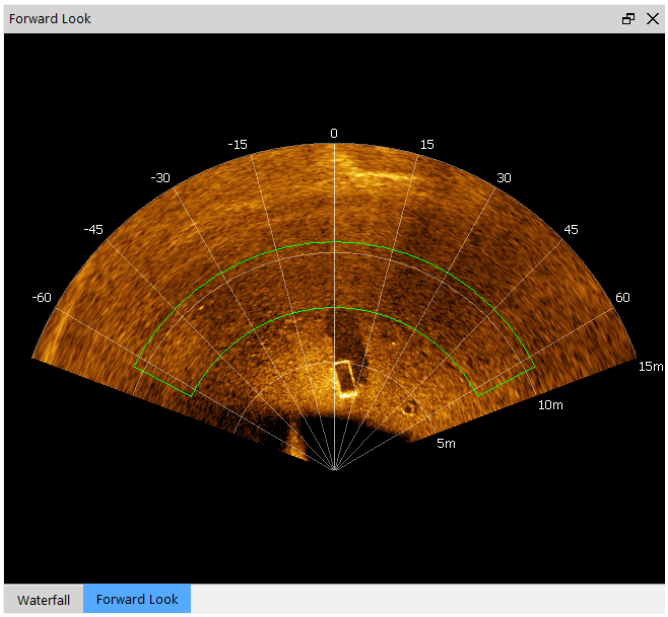


Figure 9. Forward Look Window

3.5 Waterfall Window

The waterfall window provides a configurable view of sidescan data, which supports zooming, slant- and ground-range display, bottom tracking and target marking. The oscilloscope panel located above sidescan waterfall displays the raw sidescan data in a wiggle-trace, port data on the left in red, starboard data on the right in green (Figure 10).

- If you close the Waterfall window, reopen it by clicking on the **Display the sidelook waterfall window** icon in the toolbar.

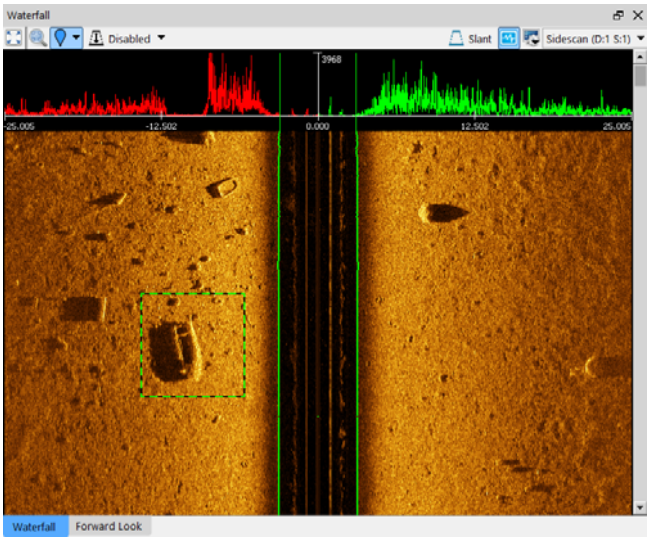
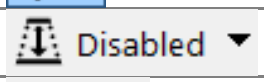
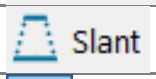
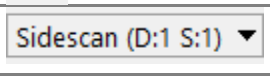


Figure 10. Waterfall Window

3.5.1 Waterfall Toolbar

Waterfall toolbar is located above oscilloscope panel. The toolbar icons are pictured and described in Table 4. Waterfall Toolbar Icons~~Table 4. Waterfall Toolbar Icons~~, in the order that they appear from left to right on the toolbar.

Table 4. Waterfall Toolbar Icons

Icon	Icon Name	Function
	Reset zoom	Resets the waterfall view to the entire range
	Zoom	Drag a box in waterfall window to zoom in the section
	Contact Marker Tool	Activates the contact marker tool
	Bottom Track	Activates the bottom track tool
	Range Toggle	Toggles slant/ground in the waterfall view
	Oscilloscope Display	Toggles oscilloscope display on/off
	Waterfall Display options	Displays the dropdown waterfall display options
	Device and Source	Lists available device and data source

3.6 Meta Data Properties

The Metadata Properties window allows you to view the header and packet information for the current sonar ping and the current navigation message. Open the desired section to monitor the message of interest in real time (Figure 11).

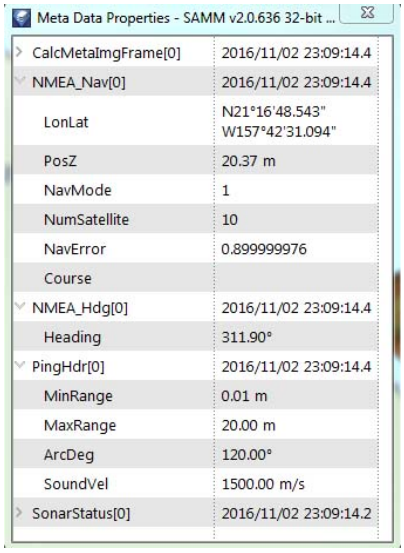


Figure 11. Meta Data Properties

3.7 Contacts

The Contacts window stores and displays marked contacts (Figure 12). Contacts window is discussed in Chapter ~~8~~8.

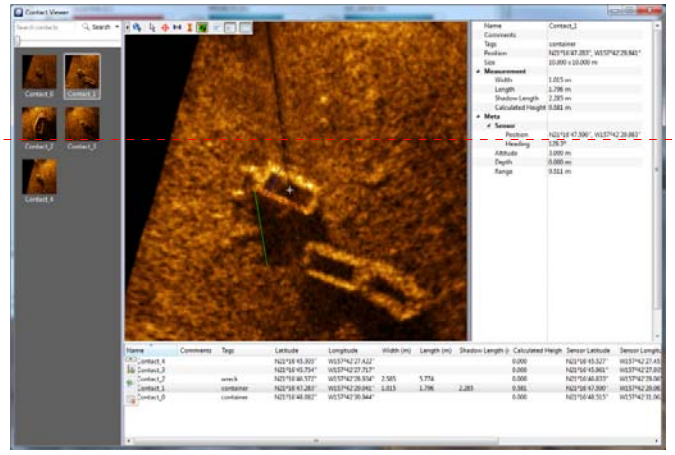
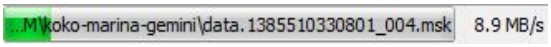
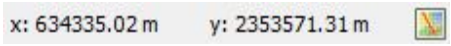


Figure 12. Contacts Viewer

3.8 Status Bar

The status bar is located at the bottom of the main window. It displays operational mode and sensor status; reports errors and the position of the mouse cursor in the mosaic window; and hosts several buttons. The definition for each status bar element is supplied in Table 5, in the order that they appear from left to right on the status bar.

Table 5. Status bar

Icon/Output	Definition	Mode
	New version available	All
	Sensors connected, shows data rate	Acquisition
	Sensors not connected	Acquisition
	An error occurred	All
	Scrolling Event Log bar, click to open the Event Log window.	All
	Button to cancel file acquisition/ playback/loading, also indicates current mosaic resolution	All
	File acquisition/playback/loading progress	All
	Position of cursor in mosaic window in GPS coordinates, click toggle button for XY	All
	Position of cursor in mosaic window in UTM coordinates, click toggle button for Degrees	All

4 Configure SAMM

Before loading or acquiring data in a SAMM project, the user should set up the project in the Configuration dialog, accessed from the **Configuration** icon on the main toolbar (Figure 13). The user has the option to specify survey projection and offsets, units of measure, profiles, mosaic resolution and logging details, contact messaging and review of dongle and license properties. All of the options are saved as application settings. This section describes each tab in the Configuration dialog, and provides a tutorial.

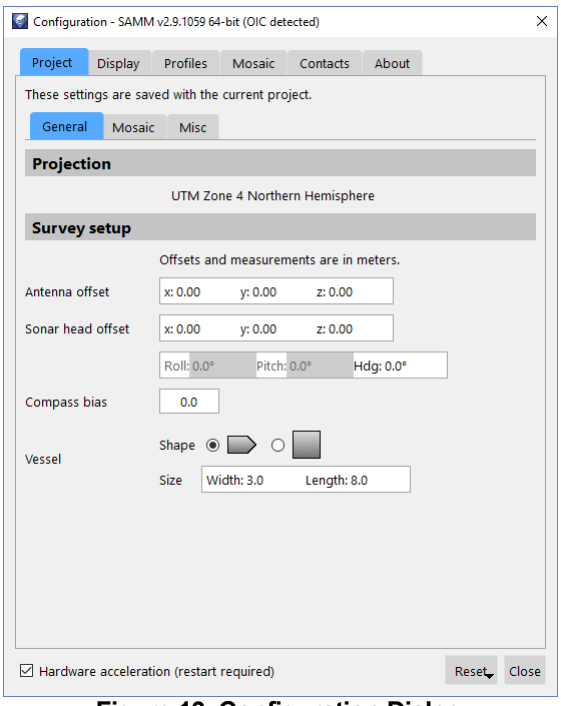


Figure 13. Configuration Dialog

4.1 Project Tab

The project tab contains General, Mosaic and Misc tabs to configure various survey settings..

4.1.1 Projection

The projected coordinate system for the mosaic display and exported mosaic images can be set in the Projection panel in the General tab of the Configuration window, before data are added to the project through acquisition, playback, or file loading (Figure 14).

SAMM expects a navigation positioning message in degrees latitude/longitude in the WGS 1984 datum (i.e. standard NMEA GPS message). By default, (with the “Auto Select” option) SAMM projects the GPS navigation input to Universal Transverse

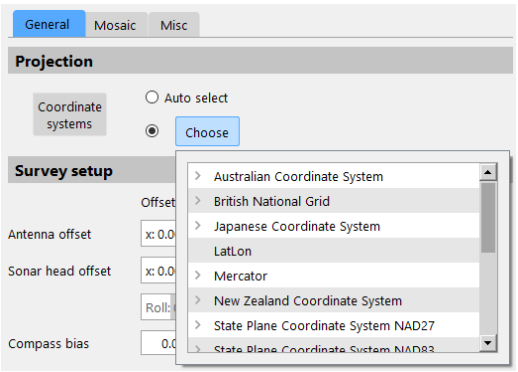


Figure 14. Projection Panel

Mercator (UTM) zones (WGS84 datum), performs calculations in UTM meters, and projects the background charts to the UTM zone to produce the aligned map.

Note: UTM zones cover six degrees of longitude, run from 80° S to 80° N, are numbered from 1 to 60, and are lettered N or S according to the northern or southern hemisphere. Zone numbering starts at -180 degrees longitude (Midway Island, and the International Dateline) and increase to the east. Hawai'i, for example, is mostly in Zone 4, while the US East Coast is around Zone 18, and the United Kingdom is Zone 30, at Greenwich. The UTM zones are also available on the NAD27 and NAD83 datums.

The following projected coordinate systems are also supported in SAMM: Australian Coordinate System, British National Grid, Japanese Coordinate System, Geodetic (lon/lat WGS 1984), Mercator (Equator), New Zealand Coordinate System, and the U.S. State Plane Coordinate System (NAD27 and NAD83). The list also includes User Defined coordinate system. However, the tool necessary to create user defined coordinate system is not available at the moment. SAMM will support this in the future. If you would like to use a projection that is not supported, please contact OIC.

SAMM will project the sonar image and background charts on-the-fly to the coordinate system set in the Configuration window. You may only set the projection ***before*** data are added or acquisition begins. Please keep this in mind when creating projects. To manually change the mosaic display projection from the default UTM WGS84:
Click the **Configuration** icon.
Select the Project tab in the Configuration window.
In the Projection panel, choose the coordinate system by clicking on one in the **Choose** dropdown menu.
Click outside of the **Choose** menu to hide the menu.
Click **Close**.
As soon as data acquisition begins, the projection and UTM zone are locked for that project. If you would like to use a different projection or zone, please create a new project.

4.1.2 Survey Setup

Unless the sonar is co-located with the navigation source, SAMM must approximate the actual sensor position in order to produce the sonar image and mosaic. The Survey setup panel in the Project tab in the Configuration window provides input fields for the vessel dimensions and translational and rotational offsets associated with the sonar, navigation, and heading sensors (Figure 15).

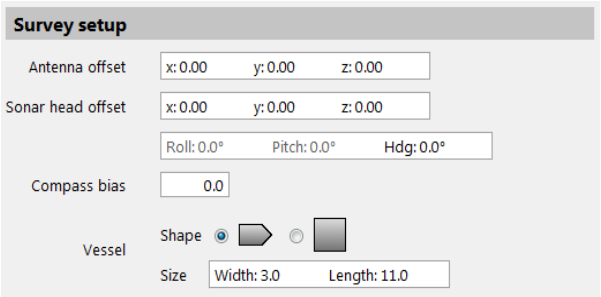


Figure 15. Survey Setup Panel

The fields are defined as follows.

- Antenna offset: the distance of the GPS receiver antenna from a reference point in common with the sonar head offset. The numbering convention is:
  X = Port / Starboard (positive number = starboard, negative number = port).
  Y = Fore / Aft (positive number = fore, negative number = aft).
  Z = Height (positive number = above reference point, negative number = below reference point).
- Sonar head offset: the distance of the sonar head from a reference point in common with the antenna offset. The same numbering convention is used as for the antenna offset.
- Sonar heading offset: the sonar mount bias, i.e., the angular difference between the centerline of the boat and the actual pointing direction of the sonar.
- Pitch and roll offsets: *The pitch and roll offsets are not relevant to 2D imaging sonar, and as such are not yet available.*
- Compass bias: the heading source mount bias, i.e. the difference between the reported pointing direction of the heading source and the actual pointing direction of the heading source. If you have a magnetic compass and know the declination (the difference between north and magnetic north) for the survey, add it to this bias field. *(Automatic magnetic declination based on lon/lat is not available at this time.)*
- Vessel: the shape, width, and length of your vessel. These fields define how the vessel outline is drawn in the mosaic window.

SAMM draws the vessel, GPS antenna and sonar head in the mosaic window in reference to the center of the boat. Please note that the antenna and sonar head crosshairs will be incorrectly placed in relation to the vessel outline if you choose to use the location of either the GPS unit or the sonar head as the reference point. The mosaic is otherwise unaffected. The unit of measure for the x, y, and z offsets must match the unit for distance and vertical distance in the Display subpanel of the Configuration window (see Section 4.2.3).

4.1.3 Bathymetry From Altitude

SAMM can generate low-cost bathymetry map with contours from sidescan altitude data. In the Project / Mosaic tab, check the box to turn on bathymetry from altitude and set a sampling rate. To add contour lines, check the box for Contour and set contour properties (Figure 16).

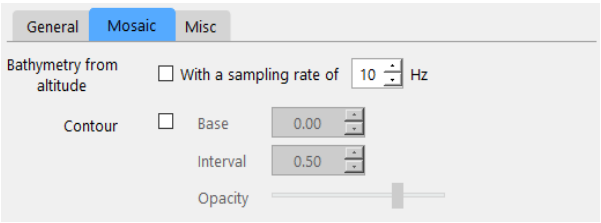


Figure 16. Bathymetry From Altitude Panel

4.1.4 Stationary System Override

When surveying with a stationary sonar system such as mechanical scanning sonar or FLS on a tripod, it is common that position and initial heading information is not recorded to sonar control software or even if it is provided, GPS drift might cause that the stationary system appears to move around. SAMM allows the user to provide or override the position and heading information (Figure 17).

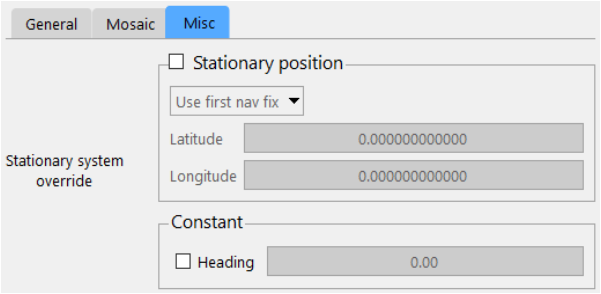


Figure 17. Stationary System Override Panel

To enable stationary system override:

1. Click the Configuration icon.
2. In the Project / Misc tab, check the box for Stationary position and select either Use first nav fix or User defined. Provide sonar location information in decimal lat/lon when User defined is selected.
3. Check the box for Heading to specify initial heading in degree.
4. Connect to sonar or load data files to start

Note that SAMM will not play or generate mosaic without position and/or heading data. Stationary system override must be turned on/off before connecting to sonar or loading data files. When the sonar is moved to or loading files from a new scan location, new position and heading information needs to be provided.

4.2 Display Tab

Display tab contains General, Swath colormap, and Units of measure panels.

4.2.1 General

The General panel in the Display tab in the Configuration window allows the user to change UI appearance between normal and dark UI mode (Figure 18).

Figure 18. General Panel

To change the UI appearance:

1. Click the **Configuration** icon.
2. In the General panel in the Display tab, check/uncheck the **Dark UI** box.
3. Click **Close**.

4.2.2 Swath Colormap

The Swath colormap panel in the Display tab in the Configuration window enables the user to change the swath display colors of completed and mosaic in progress (Figure 19). During processing, SAMM displays imagery data in the mosaic window and PPI/waterfall by matching pixel values to screen colors using the colormap. Changing the colormap may highlight different objects in the subsea environment.

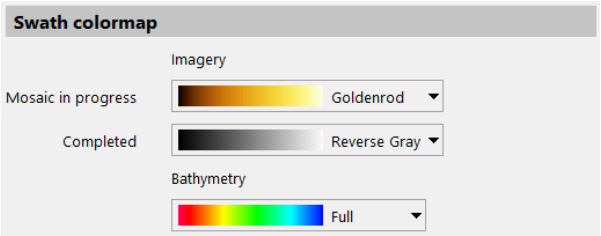


Figure 19. Swath Colormap Panel

The “Mosaic in progress” swath refers to the swath that SAMM is currently mosaicking. The ”Completed” swaths are those swaths that are completely mosaicked. SAMM has nine built-in colormaps for imagery: goldenrod, copper, reverse gray, grayscale, bone, cool, green, hot, and jet (rainbow) and five for bathymetry: full, step, contour, legacy and non-linear. Each colormap brings out different features of the data.

To change the colormap for swaths:

4. Click the **Configuration** icon.
5. In the Swath colormap panel in the Display tab, click the dropdown menu for the swath type and click the desired colormap.
6. Click **Close**.

4.2.3 Units of Measure

Display units may be changed from the Units of measure panel in the Display tab in the Configuration window (Figure 20). Mosaic data will be exported using the selected units.

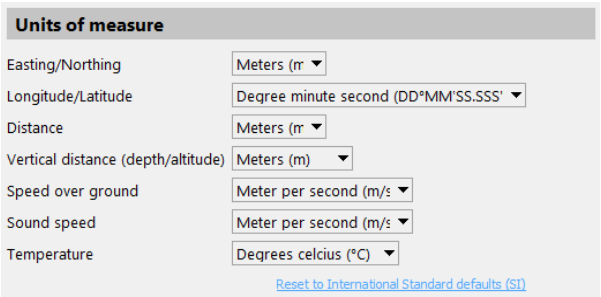


Figure 20. Units of Measure Panel

Table 6 shows the parameter, available units, and affected display area.

Table 6. Parameters and Units

Value	Units	Affected Display Area
Easting/Northing	Meters Feet Yards	Status bar
Longitude/Latitude	Degree minute seconds Degree decimal minutes Decimal degrees	Live Info Status bar Contacts
Distance	Meters Feet Yards	Contacts Measure Tool *(not yet available)* Survey Setup subpanel of Configuration window

Value	Units	Affected Display Area
Vertical Distance (depth/altitude)	Meters Feet Yards Fathoms	Live Info Contacts
Speed over ground	Meters per second Feet per second Knots	Live Info
Speed of sound	Meters per second Feet per second	Live info
Temperature	Degrees Celsius Degrees Fahrenheit Degrees Kelvin	Properties

To change the units of measure:

1. Click the **Configuration** icon.
2. In the Units of measure subpanel in the Display tab, click the dropdown menu for any field and click the desired unit.
3. Click **Close**.

4.3 Profiles Tab

Profiles tab allows the user to create new profiles that store window size, position, and layout profiles (Figure 21).

In order to save to a profile, click the New profile button, then adjust window size, positions and layout. Click the Rename button or double click on a new profile in the list to give a name to the profile. Select a profile from the list and click the Switch to button to change profiles.

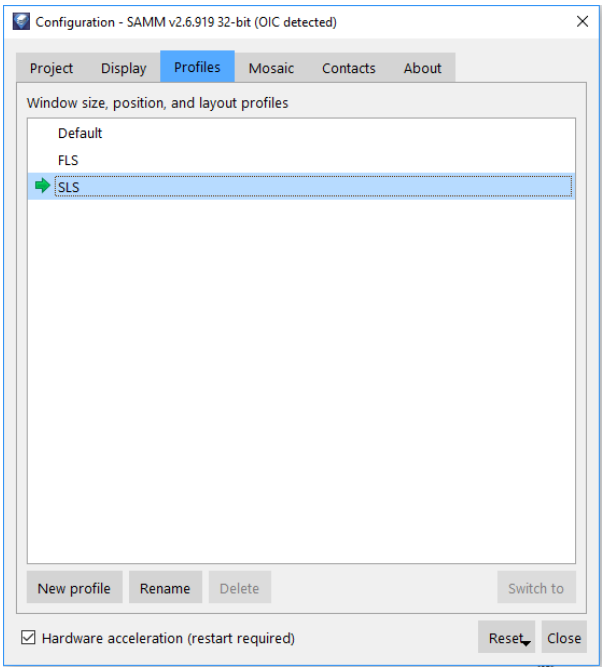


Figure 21. Profiles Tab

4.4 Mosaic Tab

Mosaic tab provides options how SAMM creates mosaic and data files.

4.4.1 General

General panel allows the user to change the default resolution of the mosaic and how SAMM starts a new swath (Figure 22). This sets the highest resolution of the mosaic, but does not change the logged data. In this section you can also direct SAMM to generate a new swath automatically if time gap between successive pings is greater than the user specified limit. This can be useful for automatically creating new swaths in file playback or loading. Dynamic tabs option hides tabs of undetected data types in the Processing controls on the sidebar.

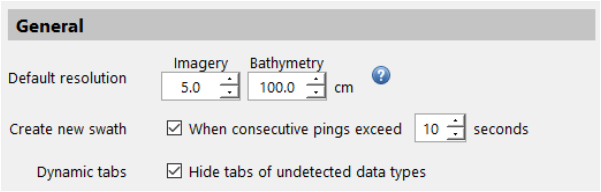


Figure 22. General Panel

4.4.2 MSK output (connected/live sonars)

SAMM provides three methods for creating a new file during data acquisition: manually, break by duration, and break by file size (Figure 23).

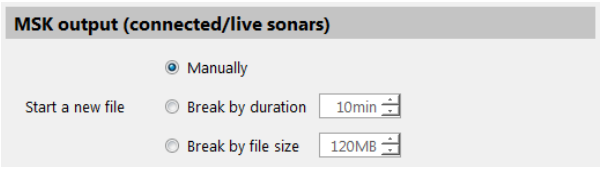


Figure 23. MSK output Panel

SAMM's default file break method is to break by file size when the size reaches 120 MB.
To change the file break method:

1. Click the **Configuration** icon.
2. In the MSK output panel in the Mosaic tab, click the radio button corresponding to the desired method.
3. Click **Close**.

When breaking manually, the user simply select the “New Swath” icon on the toolbar, or presses the “B” key on the keyboard. Raw data rates from modern sensors can easily exceed 100KB/sec. While workstations, media, and operating systems can handle large file sizes, please consider your workflow, memory, and file transfer limitations before deciding to break files manually. Please also consider that data loss due to corruption is significantly more catastrophic for single large files than single small files.

SAMM automatically names files by combining the time the file was created with an incremental number.

4.5 Contacts tab

SAMM can send contacts over the network or a serial connection. Each contact is sent as a proprietary NMEA sentence ($POIT) (Figure 24).

Figure 24. Contacts Tab

To send contacts:

1. Click the **Configuration** icon.
2. In the Contacts tab, click **Not configured** to configure the connections.
3. Open the Contact Viewer.
4. Select contacts.
5. Right click and select **Add contact(s) to staging table**.
6. In the staged toolbar, click on the **Send contact(s)** button.

4.6 About

The about tab provides dongle license information, SAMM version information, OpenGL information, and third party license information (Figure 25).

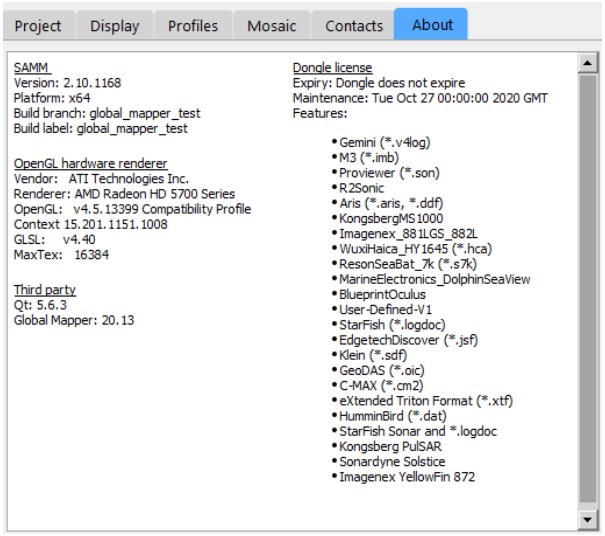


Figure 25. About Panel

If your license supports it, and if a newer version is available, it can be automatically downloaded from OIC's internet server by clicking the **Check for updates** button (Figure 26).

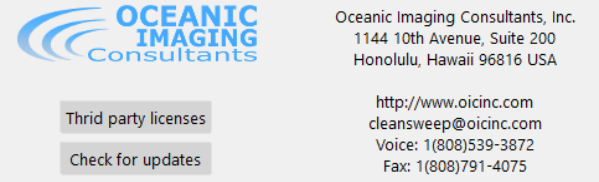


Figure 26. Update Panel

4.7 Rendering Method

SAMM either uses software or hardware to render swaths and perform computations. The method used depends on your available hardware, which SAMM auto detects. SAMM uses hardware rendering if you have a GPU, either integrated in the CPU or video card. SAMM's mosaic window and PPI have higher quality images when using a GPU to render the sonar data. If you do not have a GPU, SAMM uses software rendering. If SAMM detects multiple crashes, it will automatically ask if you want to switch to software rendering upon launch (Figure 27). You can select this via the check-box option at the bottom of the configuration dialog.

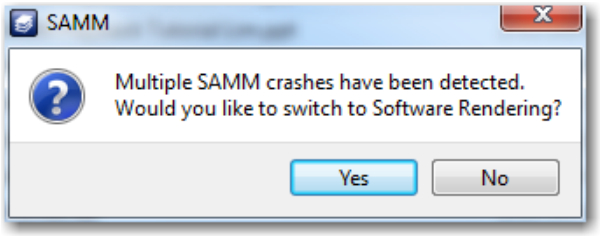


Figure 27. Crash Detection Prompt

Table 7 describes the two ways to change between software and hardware rendering, if you desire to override SAMM's detected method.

Table 7. Change the Rendering Method

After launching SAMM:	Upon the launch prompt:
1. Click the **Configuration** icon in the main toolbar. 2. Check/uncheck the **Hardware Acceleration** box. 3. SAMM requires to restart for the change to take effect. Follow the Restart SAMM dialog to restart the program. 4. Reopen the project.	1. Click **Yes** or **No** to switch to software rendering or keep hardware rendering, respectively.

4.8 Reset Button

The reset button enables you to reset the window locations and the language prompt. SAMM remembers the last location of its windows between sessions. Click **Window position and sizes** from the **Reset** button dropdown menu to reset the windows. After clicking the button, you must restart SAMM. When SAMM is restarted, the windows will be restored to their default location. Clicking the **Selected language (prompt at next launch)** command will display the language selection dropdown menu upon the next launch.

4.9 Configuration Tutorial

Table 8 provides instructions for configuring a project using the demo data and for data acquisition.

Table 8. Configure Project

To configure for playback mode with demo data:	To configure for data acquisition:
1. Click the **Configuration** icon. 2. Click the Project tab. 3. In the Projection panel, leave the UTM zone set to **Auto select**. 4. In the Survey setup panel: • in the **Antenna offset** field, enter x:`0.00` y: `0.00` z:`0.00`; • in the **Sonar head offset** field, enter x: `1.97` y:`-3.35` z: `-1.00`; • leave the **Hdg** field set at `0.0`; • leave the **Compass bias** field set at `0.0`; • do not change the boat shape; and • in the **Size** field, enter Width: `3.0` and Length: `8.0`. 5. Click the Display tab. 6. In the Swath colormap panel, • leave the **Mosaic in progress** field set to Goldenrod; and • leave the **Completed** field set to Goldenrod.. 7. In the Units of measure panel, visually confirm the **Distance** and **Vertical distance (depth/altitude)** fields are set to **Meters (m)**. 8. Click the Mosaic tab. 9. In the General panel, set the **Default resolution** to 5.0 cm. 10. The MSK output panel is not applicable in playback mode. Do not change the setting. 11. Check that your Configuration window	1. Measure your sensor offsets and look up the declination for your survey, if desired. 2. Click the **Configuration** icon. 3. Click the Project tab. 4. In the Projection panel, choose the desired projection for the mosaic display window. 5. In the Survey setup panel: • in the **Antenna offset** field, enter the distance of the antenna from the reference point in the unit set in the configuration window; • in the **Sonar head offset** field, enter the distance of the sonar head from the same reference point using the same numbering convention; • in the **Hdg** field, enter the heading bias in degrees; • in the **Compass bias** field, enter the heading mount bias plus the declination of your survey location in degrees; • choose your vessel shape; and • in the **Size** field, enter the length and width of the boat in the unit set in the configuration window. 6. Click the Display tab. 7. In the Swath colormap panel, choose the desired colormap for **Mosaic in progress** and **Completed**. 8. In the Units of measure panel, set the distance and vertical distance units to the unit of your measured antenna and sonar offsets. 9. Click the Mosaic tab.

To configure for playback mode with demo data:	To configure for data acquisition:
matches Figure 28.	10. In the MSK output panel, choose the desired method by which to break raw data files.

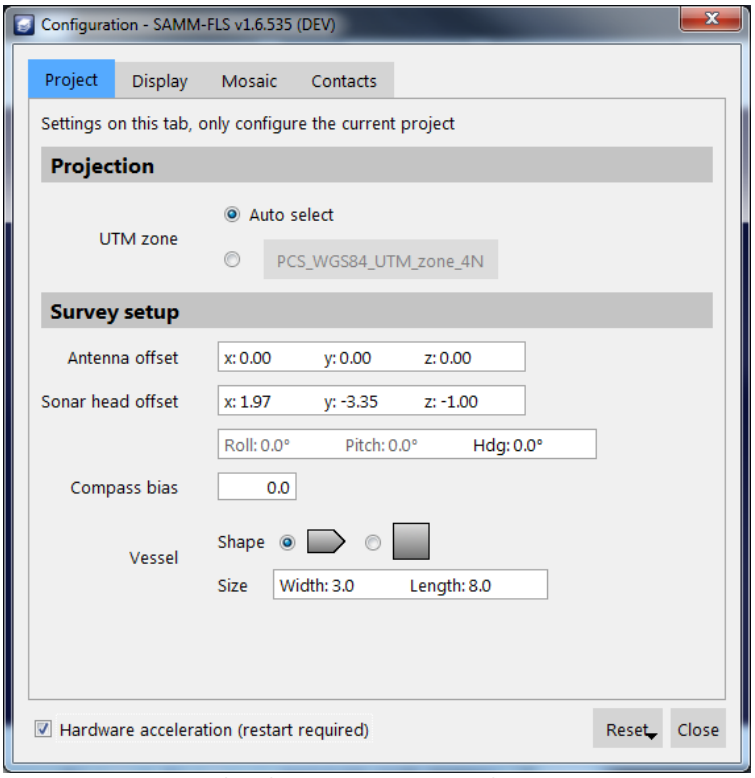


Figure 28. Configuration Window for Demo Data

5 Charts and Background Images

SAMM's robust chart module enables you to load a wide variety of charts and geospatial data files as background layers in the mosaic window. The Chart Display Options window interfaces to the chart module, which is integrated with Global Mapper™ software.

This section describes the basic and advanced interface in the charts module, the differences between raster and vector data formats, how to retrieve National Oceanic and Atmospheric Administration (NOAA) Electronic Navigational Charts® (ENCs) the elements of the basic Chart Display Options window and the elements of the advanced Chart Display Options window. It concludes with a tutorial on how to load charts to the advanced interface and a table of commands for customizing the chart display.

5.1 Basic vs. Advanced Interface

The Chart Display Options dialog has a standard and advanced interface. In the basic interface, charts are added by file to the project. This manual loading method is also available in the advanced interface. The chart module saves manually loaded files to the project, not to the application. In the advanced interface, users have the additional capability to add charts by folder to the charts database, which are saved to the application. Files added by folder are then available in any SAMM project. Both interfaces have the option of displaying the ArcGIS Web Mapping Service World Imagery basemap underneath locally added files. An Internet connection must be available for this option.

5.2 Raster vs. Vector File Types

Geospatial data are stored as two types: raster orand vector. Vector files have data stored in the files as features, i.e. as points, lines, polygons, and/or text. These features resize in SAMM when the mosaic window resolution is changed. Some common vector file types include NOAA ENCs (S-57 format), National Geospatial-Intelligence Agency Digital Nautical Charts® (VPF format), and ESRI shapefiles. Raster files, including NOAA Raster Navigational Charts® (BSB format) and GeoTIFFs, are image files with data stored as a grid of pixels. The text and other features are static, and grow with the zoom level.

While Global Mapper supports rendering many different types of files, SAMM has only been thoroughly tested with standard navigational chart types, shapefiles, and GeoTIFFs.

5.3 Retrieve NOAA Electronic Navigational Charts

If you do not have any nautical charts, follow these brief instructions to retrieve NOAA ENCs for your state. Web sites do change, so we cannot guarantee that these instructions are current. Skip to section 5.4 if you already have charts.

1. Go to the NOAA Office of Coast Survey Chart Downloader Web site (http://www.charts.noaa.gov/?Disclaimer=noaa%21nos%40ocs%23mcd&Submit=Proceed+to+Chart+Downloader).
2. Next to the second picture, click on the ENCs link.
3. Click on your state in the **ENCs by State** table.
4. Read the User's Agreement. Click **OK**.
    - The charts automatically download to your browser's default download folder.

5. Open the folder containing the charts.
6. Right-click on the charts folder ([State initials]_ENCs.zip) and select **Extract All**.
7. Click **Browse**.
8. Navigate to a local disk or network drive to save the folder. Be sure to note the location where you save the file so that you can find it in the next step. (This is the location of your chart database that you will point to in SAMM in the next section.)
9. Click **OK**.
10. Click **Extract**.

NOAA updates charts nationwide weekly via a notice to mariners. If you are using your charts for navigational purposes, make sure to get new charts or check for updates.

5.4 Elements of the Basic Chart Display Options Window

The basic chart display options window, launched by clicking the **Chart background options** icon in the toolbar, hosts the chart database list and several buttons. Figure 29 shows an empty chart database list in the basic window. The basic chart loader saves information on a per-project basis.

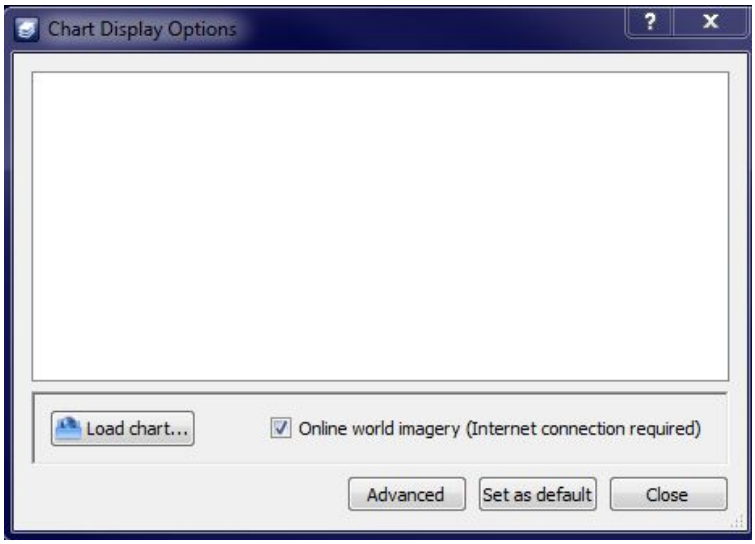


Figure 29. Empty Basic Chart Display Options Window

The basic chart display options window has a **Load chart...** button to load charts to the mosaic window, and provides the option to add the ArcGIS World Imagery basemap with an on/off checkbox. The **Advanced** button changes the chart display to the advanced interface, the **Set as default** button saves the current settings as the automatic chart display options to the application, and the **Close** button closes the Chart Display Options window. The next time the window is called, it will open to the last interface viewed.

To load charts or other geospatial data files to the chart database list:

1. Click the **Load chart...** button.
2. In the Manual Load Chart window, navigate to the file location of your saved charts (C:\SAMM_DEMO\demo_data\charts).
3. Click on a file to select it (you may select multiple files).
4. Click **Open**.

5.4.1 Basic Chart Display Popup Windows

The Manual Load Chart window enables you to select any file type present in the folder you are viewing. This is because Global Mapper supports many different file formats. Geospatial data are often stored in more than one file. If you select a support file, not the file that SAMM renders, you will be prompted to select the file format, as shown in Figure 30. This window appears whenever Global Mapper cannot tell what file type you have attempted to load.

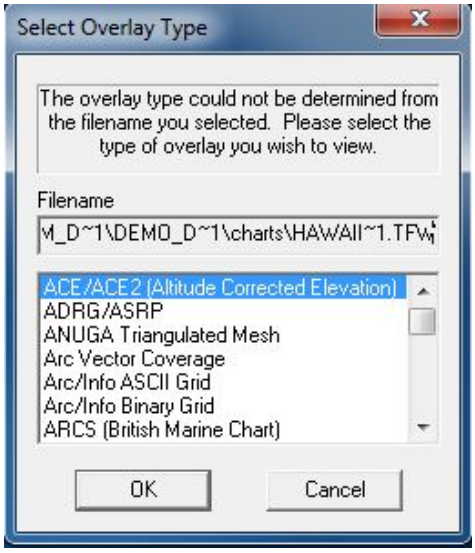


Figure 30. Select Overlay Type Error Message

If this window appears, you likely picked the wrong file type from a family of files sharing the same name, but with different file extensions. If you know you picked the correct file, then you can pick the file type from the list and click OK. If you are not sure,

1. Click **Cancel**.
2. In the chart database list, right-click on the orange Loading... file and click **Unload**.
3. Click the **Load chart...** button again.
4. Select all files of the same name in the family and click **Open**. SAMM will load the correct one, and try to load the incorrect ones.
5. You may get the Select Overlay Type window again for the support files. Click **Cancel.**
6. Give SAMM a moment to load the correct file (watch for one to turn green. The description will match the correct file).
7. Select all of the orange Loading...files (these will be the incorrect files from the family), right-click and click **Unload**.

If you choose to load a text file, you will be presented with the Generic ASCII Text File Import Options window (Figure 31).

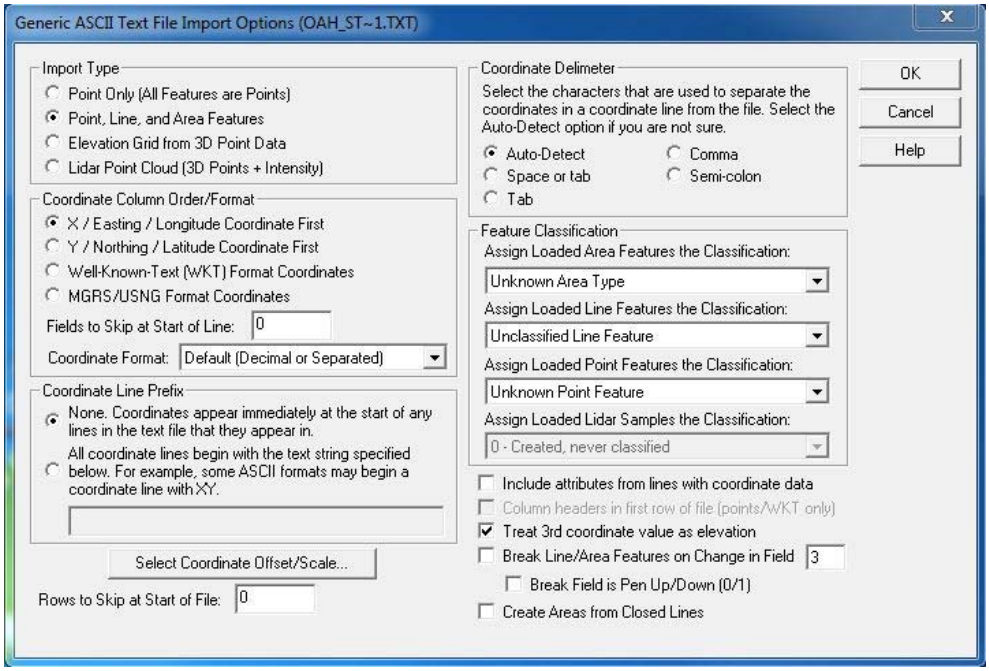


Figure 31. ASCII Text Import Options

If you accidentally loaded the text file, click **Cancel**, then unload the orange Loading... file in the chart database. If you intentionally loaded the text file, specify the format of the text file using the fields in the window. SAMM will render two-dimensional point or point, line, and area files.

5.4.2 Using the Basic Chart Loader

Figure 32 shows the sample charts (ENC, RNC, air photo) loaded in the charts database.

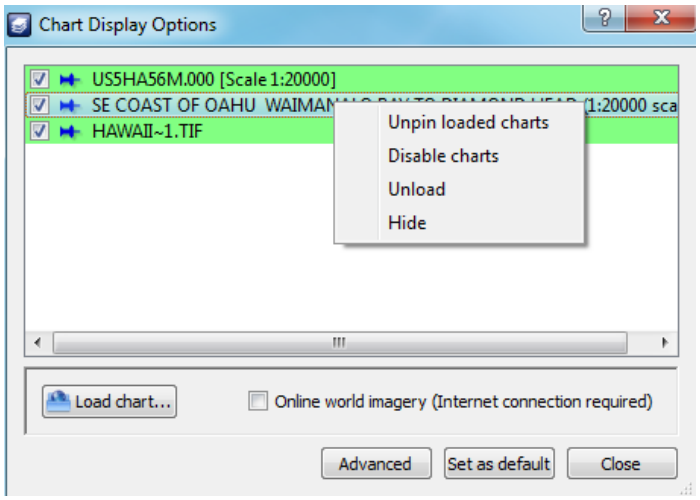


Figure 32. Charts Loaded in Basic Window, with Context Menu

The pin and green color coding are automatically displayed in the database table on any chart added manually, whether in the basic or advanced interface. The pin means that the chart cannot be unloaded by SAMM's auto load function, a feature of the advanced interface. Green

highlighting means that the chart is loaded in the mosaic display, whether through manual or automatic loading.

You can control which charts display in the mosaic window from the context menu, accessed by right-clicking on a file. The available commands follow.

- Unpin loaded charts: Allows the auto load function to recognize the chart.
- Disable charts: Prohibits rendering the chart, even if it is loaded.
- Unload: Removes the chart from the loaded list (and the basic interface).
- Hide: Hides the chart from the auto load function, but does not remove it from the database.

The ArcGIS World Imagery provides high-resolution worldwide coverage. It displays under the other layers. This service requires an Internet connection.

- To turn off the Web service, uncheck the box.

5.5 Elements of the Advanced Chart Display Options Window

The advanced Chart Display Options window is accessed by clicking the **Advanced** button in the basic Chart Display Options window. From the advanced window, you can populate the database by scanning folders for supported files; preview the files; and customize your chart display by configuring the auto load function, manually adding files, pinning files in the database, and turning the world imagery on and off. The folders added in the advanced interface are preserved between SAMM projects, so a chart database can be built during first time use and will be available in all SAMM projects.

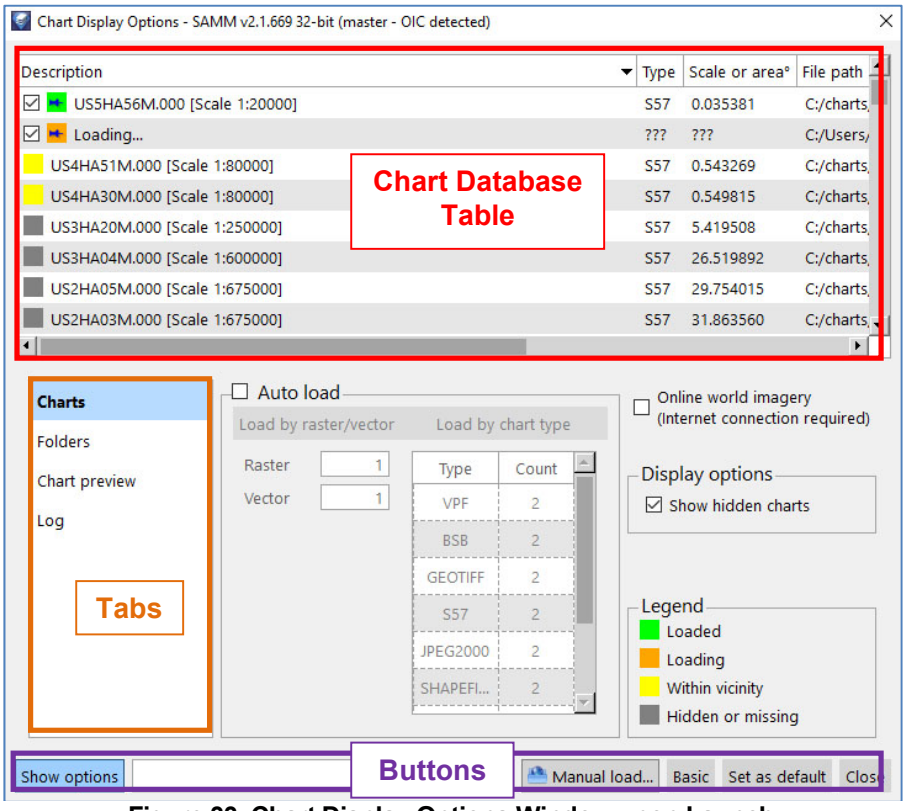


Figure 33. Chart Display Options Window upon Launch

The advanced window includes four tabs: Charts, Folders, Chart Preview, and Log. The chart database table, tab toggles, and buttons appear on every tab (Figure 33). The database table, appearing as the top panel, lists the geospatial data files that are present in the chart database as well as manually loaded charts. They are highlighted in every tab according to the legend appearing on the Charts tab. Unlike the basic window, the advanced table includes columns for the description, type, scale or area, and file path of each file. Files added by folder in the advanced window do not appear in the basic interface.

From the table, you can sort the table by column and select, unpin, disable, unload, and hide charts. The context menu features are the same as those available in the basic interface, except that when charts are unloaded, they do not disappear from the list.

- To sort by column, click on the column name.
- To resize the columns, click and drag on the border.
- To access the context menu, right-click on a chart.

5.5.1 Buttons

- The **Show options** button shows or hides the advanced interface tab content.
- The **Manual load...** button opens the manual load window.
- The **Basic** button toggles back to the basic chart display options interface.
- The **Set as default** button saves the current chart auto loading options and world imagery status as the default settings in the application.
- The **Close** button closes the Chart Display Options window. The next time the window is called, it will open to the last interface viewed.

5.5.2 The Folders Tab

The Folders tab enables you to populate the chart database from folders stored on your local hard drive or network. Figure 34 shows the add/scan charts panel of the Folders tab.

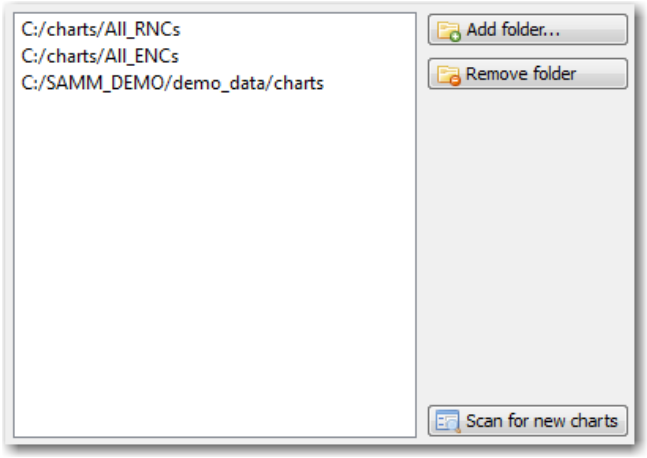


Figure 34. Add/Scan Charts Panel

- The **Add folder...** allows users to browse to folders containing chart files and add them to the list of folders to be searched for charts.
- The **Remove folder** button removes files/folders from the add/scan charts panel. All charts located within the folder are removed from the database as well.

- The **Scan for new charts** button scans files from the listed folders and adds them to the database (and populates the database table). Press this after you add a folder.

5.5.2.1 Populating the Charts Database

Adding a chart to the database makes it available for use in future projects without having to manually add it. To do this:

1. Add folders: On the Folders tab, click the **Add folder...** button and navigate to the location holding the folder. Click on the folder to select it and click **Select Folder**. Add as many folders as you have containing relevant geospatial data. The scanning algorithm in the next step will recursively search inside all subfolders. For simplicity, consider saving all of your background layers in one main folder and add that folder to SAMM. Take care to preserve the file structure of any acquired DNC folders, or the scanning algorithm may not recognize the charts. When the scanner finds a folder containing a file named LHT, it stops looking for compatible data because the LHT file means that it has found a DNC. Data that are not DNC data stored inside a folder with a DNC LHT file will be lost.
2. Scan folders: After you have added your main charts folders and your root DNC folders, select a folder in the list and click **Scan for new charts**. This process runs in the background so you may continue working in SAMM, with the exception that adding another folder will stop the scanner (rescan the folder if this happens). The scanning function finds all files in the selected folder that are compatible for display in SAMM.

Once SAMM has scanned the folders, the available files appear in the database table (Figure 35). The auto load function in the advanced interface selects charts from this database to display.

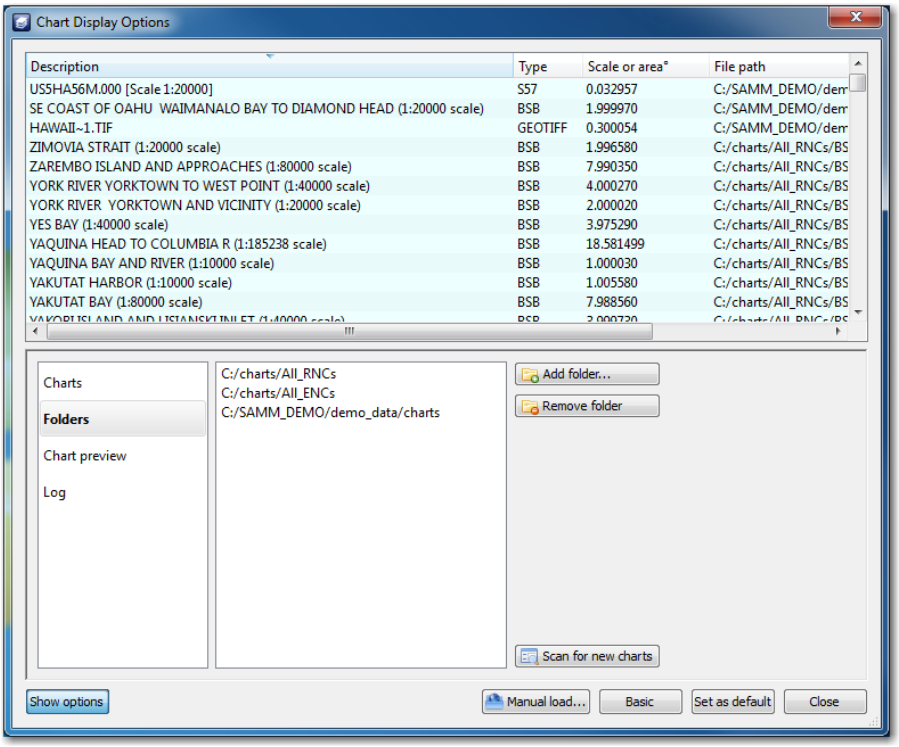


Figure 35. Populated Chart Database

5.5.3 The Chart Preview Tab

The previewing charts tab of the advanced interface enables viewing any chart in the database. This helps you get a feel for each type of chart file, if you are unfamiliar, and also shows you the geographic extent and level of detail present in each file. To preview a chart, click on the chart preview tab. The chart highlighted in the database shows in the viewing window. Click on a chart to highlight it. Resize the chart preview panel with a click and drag on the panel border.

5.5.4 The Charts Tab

The Charts tab is the default tab displayed (Figure 36~~Figure 36~~).

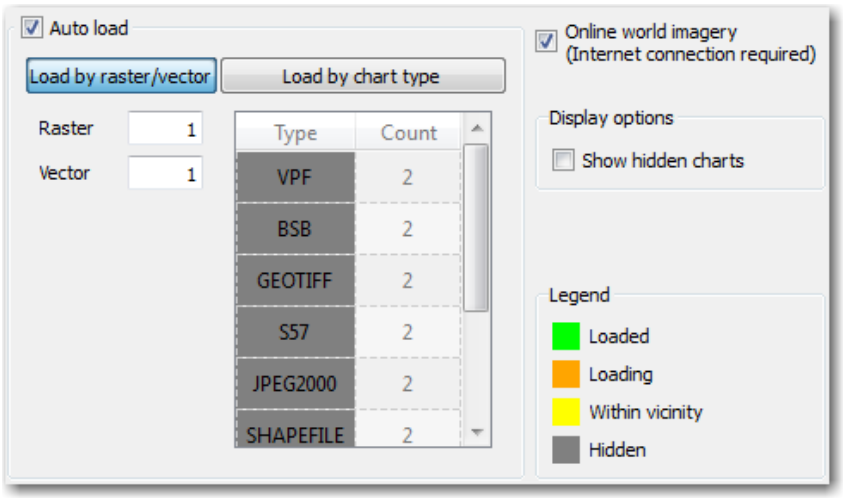


Figure 36. Charts Tab

By default, the **Auto load** and **Online world imagery** checkboxes are checked. Uncheck them to disable the features. The auto load feature loads the files from the chart database that most closely match the resolution (raster) or coverage (vector) of the mosaic window extent into the mosaic window. It constantly looks for charts that satisfy its criteria, set in the **Load by raster/vector** and **Load by chart type** fields.

- The load by raster/vector feature loads charts up to the number entered per type of data file (raster or vector). Click in the **Raster** or **Vector** fields and enter a number to change the numbers.
- The load by chart type feature loads charts of the specific format up to the number per format (VPF for DNC, S-57 for ENC, BSB for RNC, GeoTIFF, shapefile, etc.). Formats are listed in the Type column as they are loaded to the chart database. *The list doesn't forget any file types loaded in all of SAMM's history, so it may present file types that are not present in the database anymore. This happens when you unload the source folder.* Click in the types fields to enter the number per file type that the auto loader should load.

Toggle between the method that the auto load algorithm uses to load charts by clicking on the buttons. The auto loader indicates which method is in use by highlighting the button in blue.

The display options and legend refer to the database table.

- The **Show hidden charts** box unhides files hidden from the table. It does not unhide them from the auto load algorithm. To do this, you must right-click on the chart and click **Unhide**.

5.5.4.1 Color Coding

SAMM color codes the charts in the database so that you can see what charts will be rendered and what charts might be available for rendering. The legend is shown on the Charts tab, but the color coding is used on all tabs of the advanced interface. Only the green, loaded charts display in the basic interface.

Green
Charts that are loaded are bright green and will be rendered, unless they are disabled. (You may want to disable a chart, instead of unloading it, to prevent the autoloader from replacing it in the display.) Green charts were either automatically loaded because they meet the auto loader's criteria, or they were manually loaded through either

a. the **Manual load...** button, or
b. the **Load** command available on the right-click menu on a chart in the database.

Unless the database has been sorted, the green loaded charts always appear at the top of the list, in the order of smallest vector first, then higher resolution rasters.

Orange
Orange highlighting is transient. These charts are loading, so the orange indicates that SAMM is actively loading them to the mosaic window. They will turn green when they are loaded.

Yellow
The yellow charts follow; these are yellow because they

a. don't meet the auto-load criteria but intercept the mosaic window extent or
b. they were manually unloaded using the **Unload** command from the database context menu.

The yellow charts are within the vicinity of the project, and are available to the autoloader if the auto load settings are changed. The charts are ordered using the same convention as the green ones, with vectors covering the smallest area first, then rasters of higher resolution. If the database is sorted, they will reorder according to the sort but this does not affect the display.

Gray
Hidden charts are highlighted in grey, when they are shown. They are hidden from the auto loader. You may toggle their display in the chart database on and off from the **Show hidden charts** checkbox under Display options on the Charts tab.

5.5.4.2 Manually Loaded vs. Folder Added Chart Behavior

SAMM's chart loader determines how to treat a chart based on how it was loaded. You can force the manually loaded or folder added behavior using the context menu commands.

SAMM's auto load algorithm either recognizes a chart in the database as suitable for loading, or it doesn't. If it doesn't recognize the chart, that chart file has either been pinned, so it can be rendered, or it is hidden, and it cannot be rendered. SAMM automatically pins every chart that has been loaded manually, either in the basic interface or using the **Manual load...** button in the advanced interface. You can also pin any chart by right-clicking on it in the database list and clicking **Pin Loaded Chart** (if the chart is already loaded) or clicking **Load** (to load the chart, which SAMM then automatically pins), or double-clicking on the chart.

You can hide any chart from the auto load algorithm by right-clicking on it and clicking **Hide**. It disappears from the database list, but will display if you click the **Show hidden charts** box on the Charts tab. To reveal these charts to the auto load algorithm, you must right-click on the

hidden chart and click **Unhide**. If you click **Load** on a hidden chart, it will load it and then pin it. It will still be hidden from the algorithm, but will then be available for rendering.

Charts added through a folder (and therefore added to the charts database) will not be available in the basic interface, unless you manually pin them or the autoloader has loaded them. The autoloader looks at these charts in order to find charts suitable for rendering.

Every loaded chart has the option to be disabled, or to prevent it from rendering without hiding it. This keeps the chart in the loaded station, which means the autoloader counts it as a loaded chart, but the chart does not render.

5.5.5 The Tools Tab

The tools tab allows the user to generate a S-63 user permit file which is required to obtain protected S-63 chart files.

5.5.6 The Log Tab

The log tab reports errors in the chart module, including the database, scanner, and renderer.

5.6 Advanced Chart Loader Tutorial

There are three ways to display background content in the mosaic window using the advanced interface. To load background layers in SAMM, follow the steps in Table 9.

Table 9. Load and Display Charts

To auto load files from folders:	To load Web-hosted content:	To load individual files:
1. Click the **Chart background options** icon in SAMM's toolbar. 2. Click the **Advanced** button. 3. Click the **Folders** tab. 4. Click **Add Folder**. 5. Navigate to and click the folder containing charts and/or geocoded files. 6. Click **Select Folder**. 7. Click **Scan for new charts**. 8. Click the **Charts** tab. 9. Ensure the **Auto load** box is checked. 10. Click **Close** to exit the window.	1. Click the **Chart background options** icon in SAMM's toolbar. 2. Click the **Advanced** button. 3. Stay on the **Charts** tab. 4. Ensure the **Online chart** box is checked. 5. Click on the type of map or imagery you want to select it. 6. Uncheck the **Auto load** box (for the playback tutorial). 7. Click **Close** to exit the window.	1. Click the **Chart background options** icon in SAMM's toolbar. 2. Click the **Advanced** button. 3. Stay on the **Charts** tab. 4. Click the **Manual load...** button on the bottom of the window, next to the **Close** button. 5. Navigate to and click the chart (or other geocoded files). 6. Click **Open**. 7. Click **Close** to exit the window.

5.7 Chart Customization Commands

The features for customizing the chart display are collected in Table 10 with the methods available to execute the commands.

Table 10. Chart Customization Commands

Command	Action
Select chart	• In the chart database table, click or right-click on the chart.
Select multiple adjacent charts	• In the chart database table, click on the first chart, hold Shift, and click on the last chart.
Select multiple non-adjacent charts	• In the chart database table, click on the first chart, hold Ctrl, and click on each subsequent chart.
Hide charts from chart database table	• In the chart database table, right-click on the chart and click **Hide**.
Show hidden charts in chart database table	• In the display options and legend panel of the Charts tab, click the **Show hidden charts** checkbox.
Unhide hidden charts	• After showing the hidden chart, in the chart database table, right-click on the charts and click **Unhide**.
Turn hide/unhide a chart from the auto loader while keeping the chart loaded	• In the chart database table, right-click on the chart and click **Pin loaded chart/Unpin loaded chart**.
Unload manually loaded chart from the chart database table	• In the chart database table, right-click on the chart and click **Unload**.
Enable/Disable forced display of a loaded chart in the mosaic window	• In the chart database table, check/uncheck the box next to the chart. • In the chart database table, right-click on the chart and click on **Disable charts** or **Enable charts**.
Restrict the auto load feature to a certain number of raster/vector charts	• In the auto load panel of the Charts tab, ensure the **Auto load** box is checked, then enter the number of raster charts in the **Raster** field and the number of vector charts in the **Vector** field.
Restrict the auto load feature to a certain number of charts by chart type	• In the auto load panel of the Charts tab, ensure the **Auto load** box is checked, then click the **Load by chart type** button and enter the number of each type of chart in the chart type fields.
Turn the world imagery on/off	• In the online chart panel of the Charts tab, ensure the **Online chart** box is checked and click on the desired service (imagery, topography, weather).
Disable the auto load function	• In the auto load panel of the Charts tab, click the box next to the **Auto load** field to uncheck it.
Set the current settings as default	• In the display options and legend panel of the Charts tab, click the **Set as default** button.
Preview the chart	• In the chart database table of the Chart preview tab, click on the chart.

6 Add Files or Begin Acquisition

SAMM can mosaic data in acquisition, playback, or quick look modes. To mosaic data properly, SAMM accesses two classes of data: the sonar data itself and metadata. When in playback or quick look mode, SAMM gets these data from the raw data files. During acquisition, however, SAMM receives these data either as they are broadcast from the sonar software, or directly from the sensors. *At this time, Blueprint Oculus and StarFish, Marine Electronics SeaView, R2Sonic, Tritech Gemini and Imagenex 881L-GS/882L owners must interface directly with the navigation/heading sources and the sonar, and other sonar systems interface to the position and heading feeds with the native sonar software.*

The first part of this section describes how to start a project in quick look or playback mode by adding data files to the project. The second part describes how to load data from directory, which can be used to build a near-realtime mosaic during data acquisition. The third part describes how to interface with the metadata sources, and the fourth part provides instructions for interfacing with supported sonar systems. The Add data dropdown menu (Figure 37), accessed by clicking the **Add data menu** icon, controls file loading and interfacing with a sensor or sonar software program.

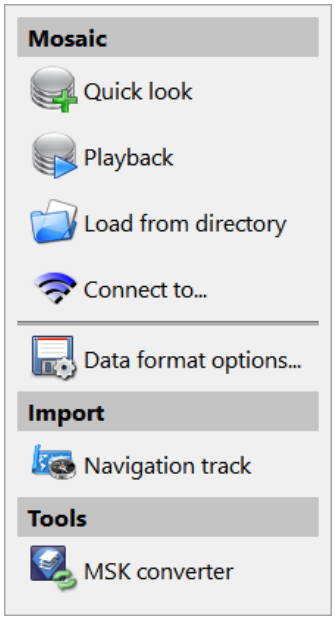


Figure 37. Add Data Dropdown Menu

6.1 Add Files in Playback or Quick Look Mode

Supported data formats for quick look and playback include BlueView (*.son), C-max (*.cm2), EdgeTech (*.jsf), Triton (*xtf), Humminbird (*.dat), Klein (*.sdf), Kongsberg processed M3 (*.imb), Kongsberg SMB (*.smb), GeoDAS (*.oic), Reson/Norbit (*.s7k), SAMM (*.msk), Sonadyne Solstice (*.swf8/*.swf32), Sound Metrics ARIS/DIDSON (*.aris/*.ddf), Blueprint StarFish (*.logdoc) and Wuxi Haica (*.hca). We suggest you practice with SAMM in playback mode prior to conducting a survey in acquisition mode. Gridded bathymetry data (*.xyz/*.csv) can be loaded in quick look mode.

6.1.1 Quick Look

Quick look option allows the user to select a collection of data files of the same type to generate mosaic without viewing the data. The resulting mosaic can be composed of numerous swaths, each of which is created from raw data files that are continuous in time. Therefore, if the data files were continuously recorded throughout the survey, the mosaic will have only one swath. If the data logging was paused during turns, the mosaic will have the number of swaths equal to the number of survey lines.

Quick look dialog enables the user to select data files of the same type from multiple locations as well as to specify mosaicking options (Figure 38).

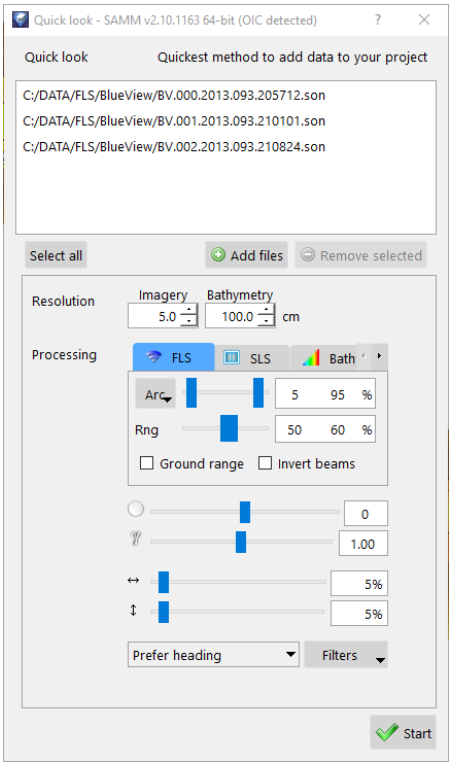


Figure 38. Quick Look Dialog

To load data files in Quick look mode:

1. Click the **Add data menu** icon.
2. Click **Quick look**.
3. Navigate to the directory containing the files (C:\SAMM_DEMO\demo_data).
4. Select files you wish to load. Note that at any one time you can only load the data of the same format. If you wish to load multiple passes from different sensors, you may do this only in multiple, sequential loadings (As an example, first create the project and load forward-look data and create swaths. Then when those files have finished mosaicking, you can load sidescan data from the same area, and SAMM will create new swaths for them in the same project.)
5. Click **Open**.
6. In the Quick look dialog, add more files or remove selected files as necessary.
7. Set mosaic resolution.
8. Click the FLS or SLS tab to set processing options.

- For FLS data, set the arc and range, as well as ground range (altitude data needs to be recorded) and invert beams options (See Section 7.4.1.1 for detail).
- For SLS data, set the minimum and maximum clipping ranges, normalization and layback options (See Section 7.4.1.2 for detail).

9. Set the gamma, brightness, horizontal feathering and vertical feathering of swaths.
10. Select a preferred heading option from prefer heading, prefer recorded course and derived from navigation (Figure 39).

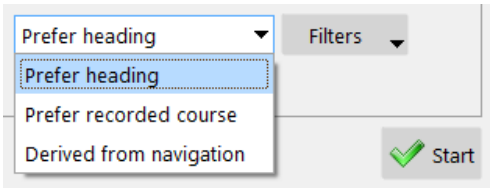


Figure 39. Heading options

11. Set the despike and smoothing filters for position, heading and altitude (Figure 40).

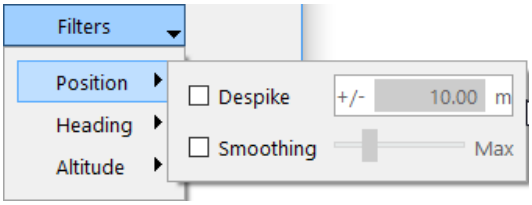


Figure 40. Filters options

12. Click **Start**.
13. Monitor file loading progress in the status bar on the bottom right. The swaths display when all files are loaded.

6.1.2 Playback Files

Playback files option allows the user to replay the survey and watch mosaic being created with user inputs such as breaking the swath at line turns and marking targets.

To Add data for playback mode:

1. Click the **Add data menu** icon.
2. Click **Playback**.
3. Navigate to the directory containing the files (C:\SAMM_DEMO\demo_data).
4. Click on a file, then press Ctrl+A to select all of them. Note that you can only playback data of the same format.
5. Click **Open**.
6. Monitor file loading progress in the status bar on the bottom right.
7. Click the **Start** button on the playback controls. The survey playback begins and mosaic starts to build up.

Figure 41 shows SAMM's GUI playing the sample data.

- Live info, playback controls and processing controls appear in the Swath list's place, and the list has shifted to below the processing controls.
- `data.1385510330801_037_ds.msk`, referenced in the Swath list, is drawn behind the vessel in the mosaic window.

- World imagery is layered under the vessel and swaths in the mosaic window.
- The **Add data menu** icon turns into the **Stop adding data** icon; press this to stop adding data. You can also use the Stop playback button in the Playback controls.
- The file playback progress is present in the status bar.

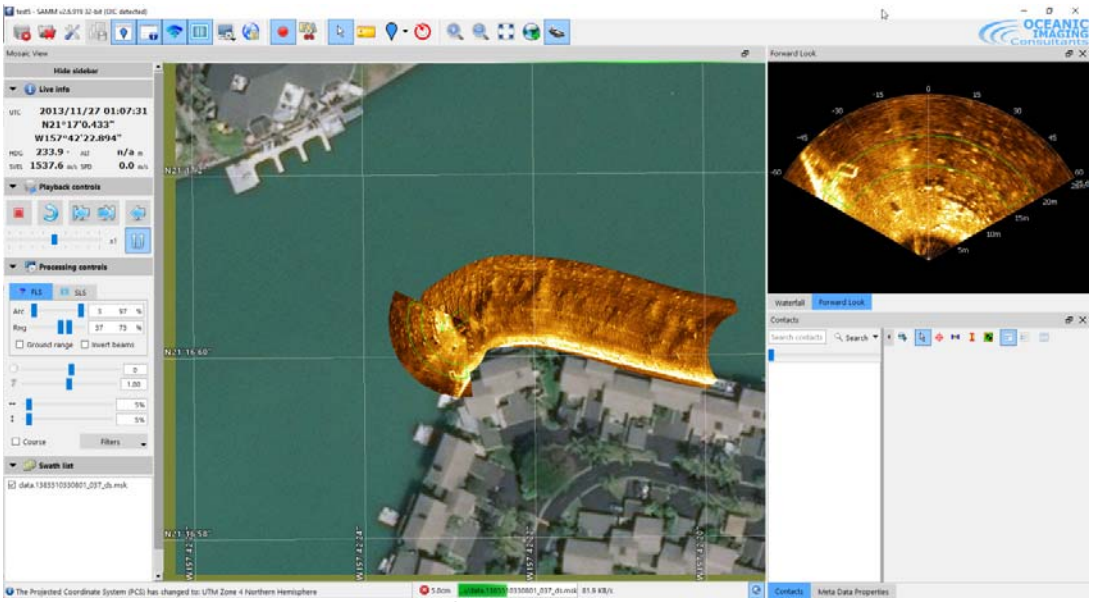


Figure 41. GUI in Playback Mode

This is the standard SAMM playback mode. You can use the playback controls to pause, restart, slow down or accelerate playback, restart from the first file, jump to previous or next file, and start from the beginning of current file. During playback you can break swaths (use the Break swath button or B key), adjust swath properties and update charts/views.

SAMM does not support adding data from widely disparate locations to the same project at this time. Please start a new project for each new region of operation.

6.2 Load Files from Directory

Similar to the Quick look function, SAMM can load files from a selected directory. This mode allows SAMM to monitor the selected directory and when new files are added to the directory, SAMM automatically grabs them and adds to the mosaic. This mode is useful for sonar systems to which SAMM currently does not interface in real-time but supports playback/load of the data formats (e.g. Sound Metrics ARIS/DIDSON, Reson FLS, Humminbird, C-Max and XTF sidescan). During a survey, as data acquisition software writes a new file to a folder that SAMM is monitoring, the file gets loaded to SAMM and the mosaic updates. The update rate of the mosaic depends on how often the data acquisition software writes data to a file. If a file creation interval is set small (e.g. 10 seconds), SAMM can create mosaic in near-realtime.

Load from directory window allows the user to set up how the data files are loaded (Figure 42).

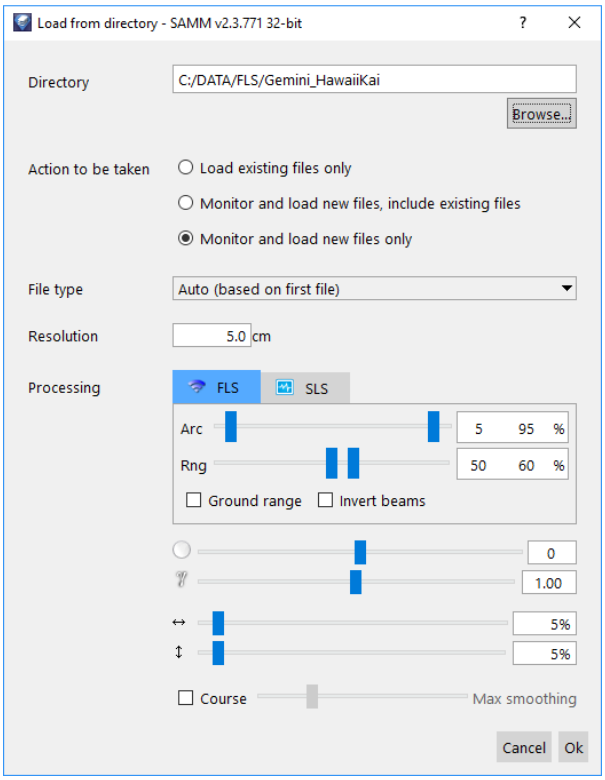


Figure 42. Load from directory dialog

To load data files from directory:

1. Click the **Add data menu** icon.
2. Click **Load from directory**.
3. Click **Browse...** and navigate to the directory where you want to load files.
4. For the Action to be taken item, select one of the 3 modes:
    - Load existing files only
    - Monitor and load new files, include existing files
    - Monitor and load new files only
5. Select file type from the dropdown list. Note that SAMM can load data files of the same type.
6. Set mosaic resolution.
7. Processing options enables the user to set processing parameters for mosaicking (See Section 7.4 for detail).
8. Click **OK**.
9. Monitor file queue indicator and file loading progress in the status bar. The swaths display as files are loaded.
10. To stop file loading when in directory monitor mode, click the **Stop adding data** icon.

6.3 Interface with Metadata Sensors

SAMM can receive the metadata inputs of position, heading, and time (if available) through one serial port for integrated systems or two serial ports. SAMM automatically detects the NMEA data protocols and selects the most accurate type available. The following string types are listed in order of preference:

- Lon/Lat
  - PTNL, GGK
  - GGA
  - RMC
  - GLL
- Heading
  - HDT
  - *(HDG, HDM, DPT, and RMC are not yet supported.)*
- Time and Date
  - ZDA (While not required for mosaicking, it will increase the accuracy of the mosaic if available.)

Please set your navigation devices to the highest available data protocol in this list. *Please note that at this time SAMM receives data only in the National Marine Electronics Association (NMEA) formats. Custom data string format reader can be added (e.g. User-Defined-V1), please contact OIC for detail.*

SAMM assumes the received lon/lat are on the WGS 1984 datum. This is the most frequently used datum for navigation systems because it is the datum used by the Global Positioning System (GPS) satellite constellation. Confirm that your navigational system is set to the WGS 1984 datum.

To configure the metadata input:

1. Click the **Add data menu** icon.
2. Click **Connect to...**
3. Pick your sonar from the list. (*Navigation/heading interfacing is required for the Tritech Gemini, R2Sonic, Marine Electronics Dolphin, Blueprint Oculus and StarFish and Imagenex sonar systems at this time. All other systems receive navigation and heading data via their native software*)

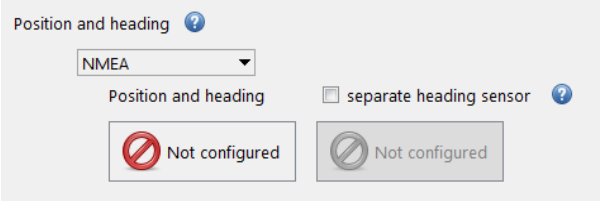


Figure 43. Navigation Interfacing

4. In the Position and heading options, select **NMEA** from the dropdown menu (Figure 43).
5. Click the **separate heading sensor** checkbox if you are using separate heading sensor.
6. Click the **Not configured** button and select **Serial Port** or **Network**.
7. If the Serial port is selected, choose the serial port into which the sensor is plugged and ensure that the **Baud**, **Data bits**, **Parity**, and **Stop bits** fields match the corresponding sensor settings.
8. If the Network is selected, configure the network interface, IP address and port.
9. If you are using two different ports for position and heading, repeat steps 6 through 8 to configure for the heading sensor.

6.4 Connect To...

This section describes how to connect SAMM with each brand of supported imaging sonar, scanning sonar and sidescan sonar. For each sonar system, default acquisition and processing parameters are provided, the user may set their own. The following settings are common to all or some of the systems:

- **Resolution**: The size of one pixel in centimeter. Note that setting too small a value may cause long processing times and dropped packets.
- **Preferred heading source**: Select one of the three heading source to be used for mosaicking. Some sensors do not provide heading. When selected data is not found, SAMM will use the next available data.
- **Use ground range**: Check this to use ground range correction. This option requires altitude data to be present. If altitude is not found, processing will default to slant range. (Only available for FLS and scanning sonar)
- **Invert beams**: Check this if the sonar head was mounted upside-down. When checked, the order of the beams will be reversed. This also affects the data output to the MSK files. (Only available for FLS and scanning sonar)

6.4.1 Kongsberg Mesotech M3

SAMM interfaces with the M3 sonar by receiving a data and metadata string from the sonar software directly. The M3 sonar software is capable of running in several application modes. If you run the sonar in EIQ -Fine or EIQ- Ultrafine modes without remaining stationary, the resulting mosaic may be distorted (see the M3 manual for reference).

To interface with the M3 sonar:

1. Launch the M3 sonar software and connect the sonar as usual.
2. Launch SAMM.
3. Click the **Add data menu** icon.
4. Click **Connect to...**
5. Select **Kongsberg M3** from the supported sensors list and click **Load**.
6. In the M3 interface window (Figure 44), set processing parameters as necessary.
7. If SAMM and the M3 software are running on the same computer, do not change the IP address from `127.0.0.1`. If the sonar software is running on a different computer and networked to the SAMM computer, select an appropriate network from the Network interface dropdown and enter the IP address of the computer running the M3 software in the **IP address** field.

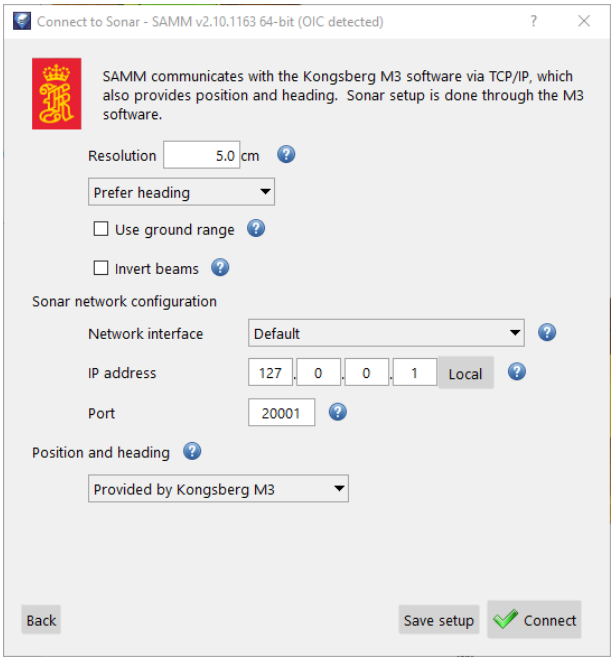


Figure 44. M3 Interfacing

8. Do not change the port number from 20001 unless you change it in the M3 sonar software. Then, enter the matching port number in the **Port** field.
9. By default, SAMM expects position and heading data to be provided by M3 software. However, you can choose to receive it directly from the navigation sensors.

10. Click the Connect button.
11. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

6.4.2 Kongsberg Mesotech MS1000

SAMM interfaces with the MS1000 series sonar by receiving a data and metadata string from the sonar software directly.

To interface with the MS1000 sonar:

1. Launch the MS1000 sonar software and connect the sonar as usual.
2. Launch SAMM.
3. Click the **Add data menu** icon.
4. Click **Connect to...**
5. Select **Kongsberg MS1000** from the supported sensors list and click **Load**.
6. In the MS1000 interface window (Figure 45), set processing parameters as necessary.
7. If SAMM and the MS1000 software are running on the same computer, do not change the IP address from `127.0.0.1`. If the sonar software is running on a different computer that is networked to the SAMM computer, select an appropriate network from the Network interface dropdown and enter the IP address of the computer running the MS1000 software in the **IP address** field.

Figure 45. MS1000 Interfacing

8. Do not change the port number from 5000 unless you change it in the MS1000 sonar software. Then, enter the matching port number in the **Port** field.
9. By default, SAMM expects position and heading data to be provided by MS1000 software. However, you can choose to receive it directly from the navigation sensors.
10. Click the Connect button.
11. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

6.4.3 Teledyne BlueView 2D Multibeam Imaging Sonar

Similar to M3 interfacing, SAMM interfaces with the BlueView family of 2D imaging sonar systems by receiving data and metadata strings from the sonar software, ProViewer. ProViewer, however, must be configured to push data to SAMM. The following instructions and screenshot were valid with ProViewer 4 at the time of this writing, but may not be up to date. Please consult the ProViewer manual for the most accurate instructions.

To interface with ProViewer:

1. Launch ProViewer version 4.3 or newer and connect to the sonar as usual.
2. Configure NMEA settings via the NMEA(GPS) tab in the application settings menu (Figure 46). SAMM requires GGA, HDT, and ZDA inputs to be configured.
3. Configure ProViewer for streaming data to SAMM by clicking on the **Application settings** icon, clicking on the AppEx tab, Click the checkbox next to **RTheta Images, Nav. Data and/or Pan/Tilt Data** (match Figure 47). If you are running SAMM on a different computer than ProViewer, enter the IP address in the field. Otherwise, enter the local IP address (192.168.1.3 if using the IP address suggested in the ProViewer manual). Click **Show Advanced Settings** if the IP address is unavailable.
4. Turn on the data broadcasting by clicking the AppEx broadcast on icon in ProViewer.
5. Launch SAMM.
6. Click the **Add data menu** icon.
7. Click **Connect To...**
8. Select **BlueView ProViewer** from the supported sensor list and click **Load**.
9. In the BlueView interface window (Figure 48), set processing parameters as necessary.

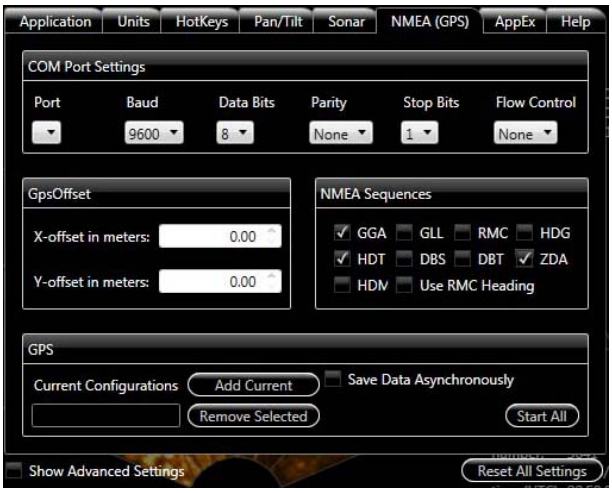


Figure 46. ProViewer NMEA Panel

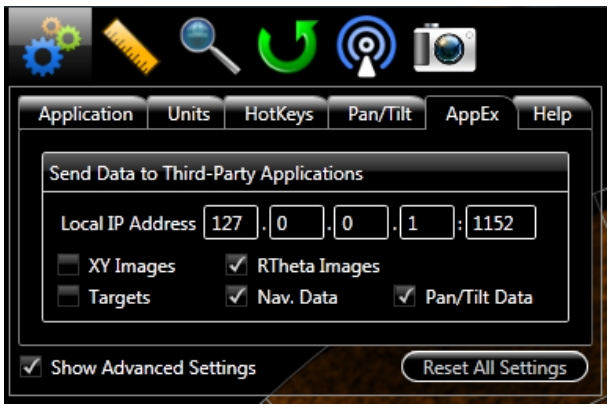


Figure 47. ProViewer Data Streaming Configuration

10. If SAMM and ProViewer are running on the same computer, do not change the IP address from `127.0.0.1`. If ProViewer is running on a different computer than SAMM, select an appropriate network from the Network interface dropdown and enter the IP address of the computer running the ProViewer software in the **IP address** field.

11. Do not change the port number from 1152 unless you changed it in the sonar software. Then, enter the matching port number in the **Port** field. *(The option to log data in *.son format is not yet available.)*
12. By default, SAMM expects position and heading data to be provided by Proviewer. However, you can choose to receive it directly from the navigation sensors.
13. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

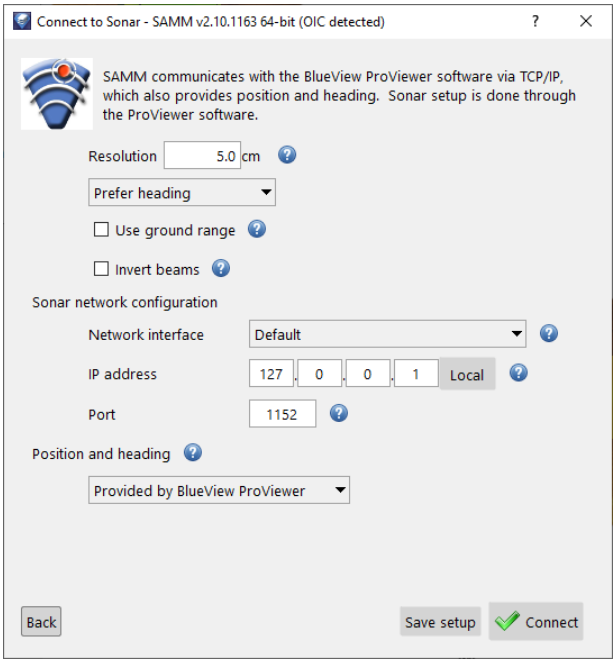


Figure 48. BlueView Interfacing

6.4.4 Wuxi Haica HY1645

SAMM interfaces with the HY1645 image sonar by receiving a data and metadata string from the sonar software directly.

To interface with the HY1645 sonar:

1. Launch the HY1645 sonar software and connect the sonar as usual.
2. Launch SAMM.
3. Click the **Add data menu** icon.
4. Click **Connect to...**
5. Select **HY1645 Image Sonar (Wuxi Haica)** from the supported sensors list and click **Load**.
6. In the HY1645 interface window (Figure 49), set processing parameters as necessary.
7. If SAMM and the HY1645 software are running on the same computer, do not change the IP address from `127.0.0.1`. If the sonar software is running on a different computer that is networked to the SAMM computer, select an appropriate network from the Network interface dropdown and enter the IP address of the computer running the HY1645 software in the **IP address** field.

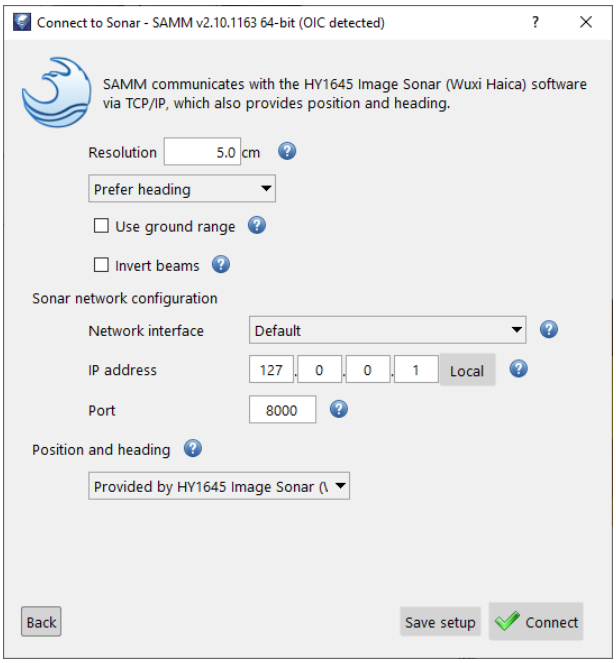


Figure 49. HY1645 Interfacing

8. Do not change the port number from 8000 unless you change it in the HY1645 sonar software. Then, enter the matching port number in the **Port** field.
9. By default, SAMM expects position and heading data to be provided by HY1645 software. However, you can choose to receive it directly from the navigation sensors.
10. Click the Connect button.
11. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

6.4.5 Tritech Gemini, Marine Electronics Dolphin, Blueprint Oculus, or R2Sonic

For the Kongsberg, BlueView and Wuxi Haica sonars, SAMM receives the sonar data and metadata through the respective software packages. For the Tritech Gemini, Marine Electronics Dolphin, Blueprint Subsea Oculus and R2Sonic in forward-looking mode, SAMM interfaces directly with the sonar, so no native sonar software need be run. Please exit the native sonar program before launching SAMM, and note that you must complete interfacing with the navigation sensors in SAMM before beginning acquisition of data.

To interface with the Gemini, R2Sonic, Oculus or Dolphin sonars:

1. Connect the sonar as usual.
2. Launch SAMM.
3. Click the **Add data menu** icon.
4. Click **Connect to...**
5. Select **Gemini, R2Sonic, Oculus or Dolphin** from the supported sensors list and click **Load**.
6. In the Connect to Sonar window (Figure 50), set processing and sonar parameters as necessary. Please consult the sonar manuals for the sonar specific settings.
7. Configure the metadata input for position and heading (see section 6.3).
8. Click the Connect button.
9. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

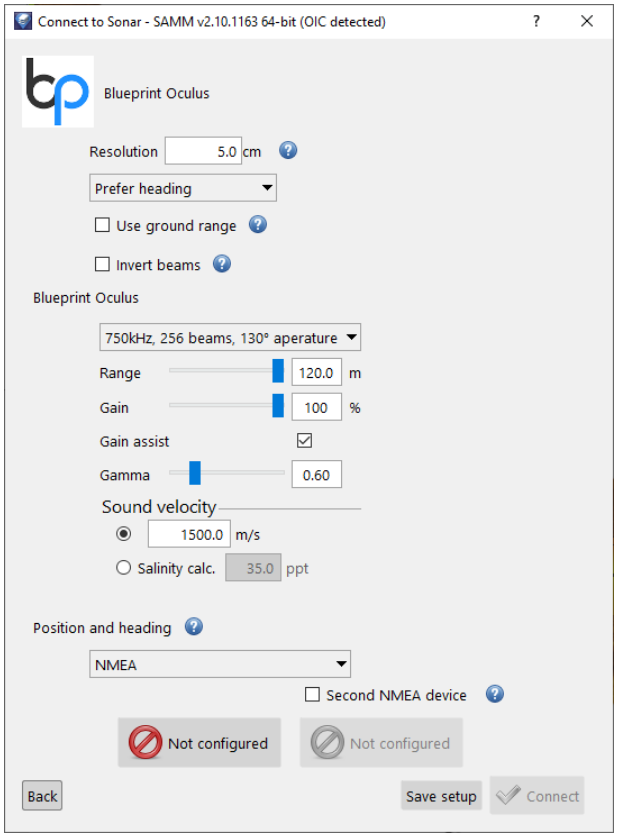


Figure 50. Oculus Interfacing

6.4.6 EdgeTech Sonar

SAMM interfaces with the EdgeTech sonar systems by receiving sidescan data and metadata string from the Discover software directly.

To interface with the EdgeTech sonar:

1. Launch the Discover software and connect the sonar as usual.
2. Be sure to configure NMEA inputs, GGA, HDT and ZDA.
3. Launch SAMM.
4. Click the **Add data menu** icon.
5. Click **Connect to...**
6. Select **EdgeTech Discover** from the supported sensors list and click **Load**.
7. In the EdgeTech interface window (Figure 51), set processing parameters as necessary.
8. Select Discover software version between Bathymetric and Sidescan.
9. If SAMM and the Discover software are running on the same computer, do not change the IP address from `127.0.0.1`. If the sonar software is running on a different computer that is networked to the SAMM computer, enter the IP address of the computer running the Discover software in the **IP address** field.
10. Do not change the port number from 1900 unless you change it in the Discover software. Then, enter the matching port number in the **Port** field.
11. By default, SAMM expects position and heading data to be provided by the Discover software. However, you can choose to receive it directly from the navigation sensors.
12. Click the Connect button.
13. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

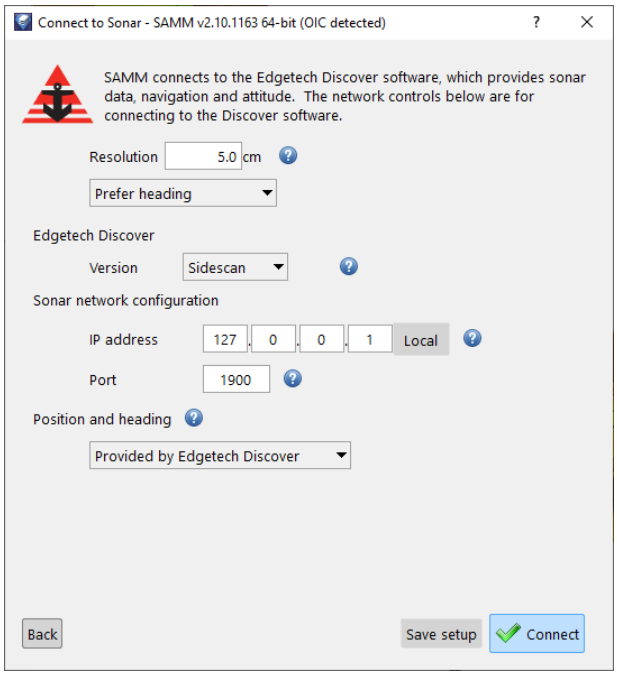


Figure 51. EdgeTech Interfacing

6.4.7 Klein Sonar

SAMM interfaces with the Klein sonar systems by receiving sidescan data and metadata string from the Klein TPU directly.

To interface with the Klein sonar:

1. Launch the SonarPro software and connect the sonar as usual.
2. Be sure to configure NMEA inputs, GGA, HDT and ZDA.
3. Launch SAMM.
4. Click the **Add data menu** icon.
5. Click **Connect to...**
6. Select **Klein** from the supported sensors list and click **Load**.
7. In the Klein interface window (Figure 52), set processing parameters as necessary.
8. SAMM requires Klein Software libraries to connect to the TPU. It will attempt to detect the installation automatically. If it's not detected, enter the install path in the box.
9. Enter the IP address of the TPU in the **IP address** field.
10. By default, SAMM expects position and heading data to be provided by Klein. However, you can choose to receive it directly from the navigation sensors.
11. Click the Connect button.
12. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

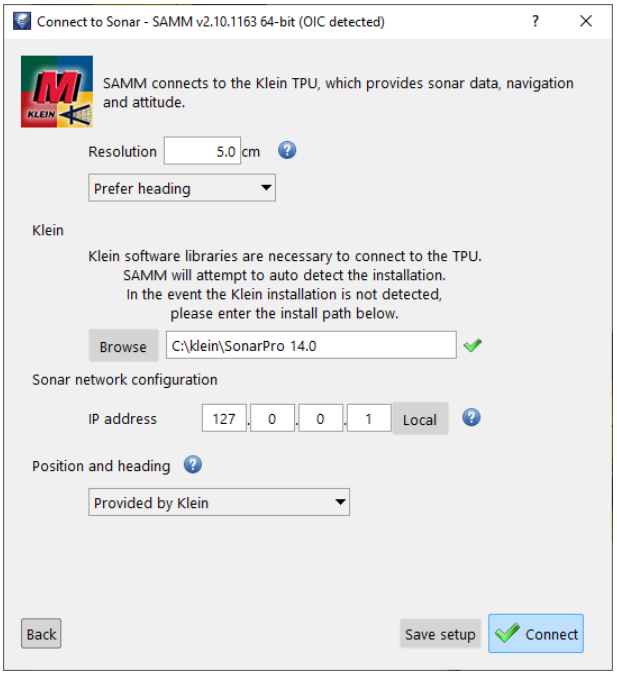


Figure 52. Klein Interfacing

6.4.8 Blueprint StarFish Sidescan Sonar

SAMM interfaces directly with the Blueprint StarFish sidescan sonar, so StarFish Scanline software does not need be run. Please exit the Scanline program before launching SAMM, and note that you must complete interfacing with the navigation sensors in SAMM before beginning acquisition of data.

To interface with the Blueprint StarFish sonar:

1. Connect the sonar as usual.
2. Launch SAMM.
3. Click the **Add data menu** icon.
4. Click **Connect to...**
5. Select **StarFish** from the supported sensors list and click **Load**.
6. In the StarFish interface window (Figure 53), set processing and sonar parameters as necessary. Make sure to select an appropriate sonar model.
7. Configure the metadata input for position and heading (see section 6.3).
8. Click the Connect button.
9. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

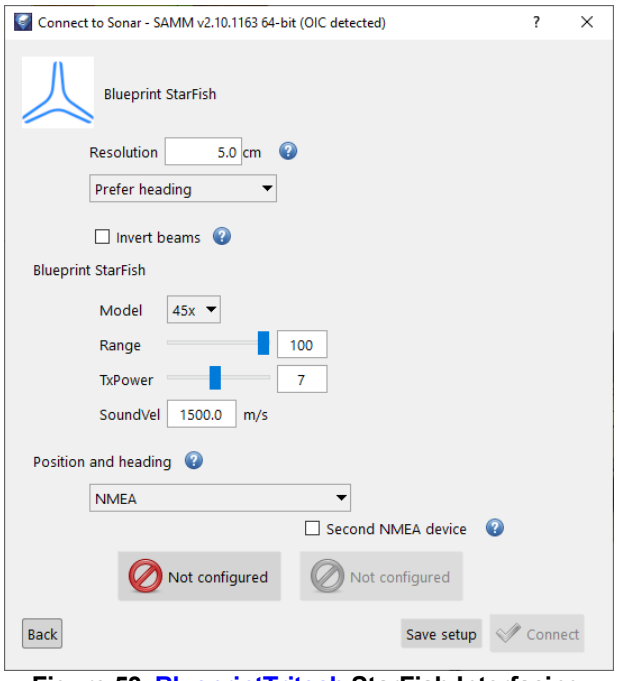


Figure 53. Blueprint~~Tritech~~ StarFish Interfacing

6.4.9 Imagenex YellowFin/BlackFin (87x) Sidescan Sonar

SAMM interfaces directly with the Imagenex YellowFin and BlackFin sidescan sonar, so YellowFin or BlackFin software does not need be run. Please exit the manufacture's program before launching SAMM, and note that you must complete interfacing with the navigation sensors in SAMM before beginning acquisition of data.

To interface with the Imagenex YellowFin/BlackFin sonar:

1. Connect the sonar as usual.
2. Launch SAMM.
3. Click the **Add data menu** icon.
4. Click **Connect to...**
5. Select **Imagenex 87x** from the supported sensors list and click **Load**.
6. In the interface window (Figure 54), select sonar model and set processing and sonar parameters as necessary.
7. Do not change the sonar network configuration unless you change it in YellowFin/BlackFin sonar. Then, enter the matching IP address and port number in the **IP address** and **Port** fields.
8. Configure the metadata input for position and heading (see section 6.3).
9. Click the Connect button.
10. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

Figure 54. Imagenex 87x Interfacing

6.4.10 Sonar systems supported by GeoDAS

GeoDAS interfaces with numerous sidescan, multibeam and interferometry sonar systems that are not supported by SAMM directly. SAMM connects to GeoDAS to receive sidescan or backscatter data and metadata string.

To interface with GeoDAS:

1. Launch GeoDAS and connect the sonar as usual.
2. Be sure to configure NMEA inputs, GGA, HDT, and ZDA.
3. Set up UDP Broadcasting (Figure 55). Check Enable. Set the port to 5000, and select the appropriate broadcast IP address. If SAMM and GeoDAS are running on the same computer, choose 127.0.0.1, if they are on separate computers, choose to broadcast on the IP to which both computers are connected. Click OK.
4. Launch SAMM.
5. Click the **Add data menu** icon.
6. Click **Connect to...**
7. Select **GeoDAS** from the supported sensors list and click **Load**.
8. In the GeoDAS interface window (Figure 56**Error! Reference source not found.**), set processing parameters as necessary.
9. If SAMM and GeoDAS are running on the same computer, do not change the IP address from `127.0.0.1`. If GeoDAS is running on a different computer that is networked to the SAMM computer, select an appropriate network from the Network interface dropdown and enter the IP address of the computer running the GeoDAS software in the **IP address** field.
10. Do not change the port number from 5000 unless you change it in GeoDAS. Then, enter the matching port number in the **Port** field.
11. By default, SAMM expects position and heading data to be provided by GeoDAS. However, you can choose to receive it directly from the navigation sensors.
12. Click the Connect button.
13. Monitor the connection status in the Device status popup and in the status bar on the bottom left. Acquisition begins automatically. SAMM flashes a warning if it is not recording. Click the **Record toggle** icon to switch recording on and off.

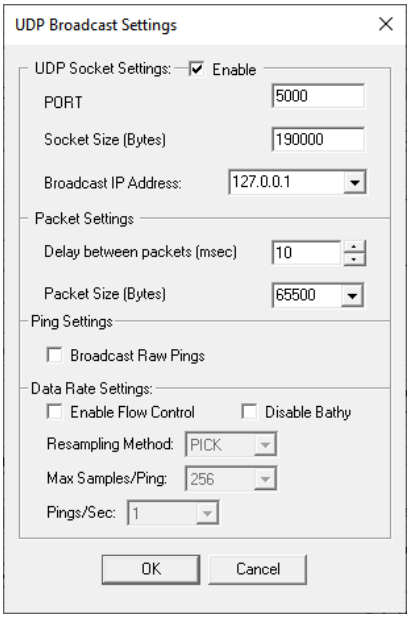


Figure 55. GeoDAS UDP Broadcast Settings

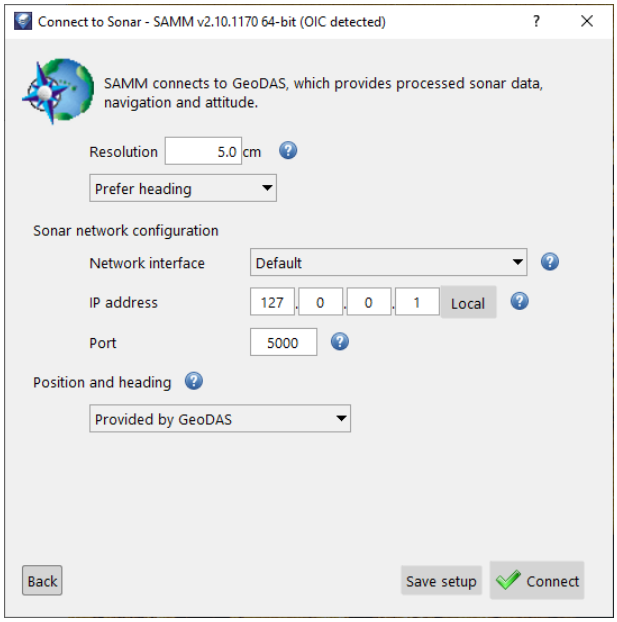


Figure 56. GeoDAS Interfacing

6.4.11 Troubleshooting

If you experience connection problems with your sonar, try to solve or isolate the connection problem using the following steps:

1. Close SAMM and launch the native sonar software. If the sonar software does not work, consult the sonar's owner's manual to solve the connection issue. *Please note that the native sonar software and SAMM cannot run at the same time.*
2. If you are still not receiving sonar data in SAMM (but the native sonar software works), you may try to:
    - Disable all network adaptors other than the Ethernet port that the sonar is connected to in the Windows Explorer Network and Sharing Center. In Windows 7, access this center through the Network and Internet page on your computer's Control Panel. Then, click **Change adapter settings** in the left panel. Right-click on the connections that are not connected to the sonar and click **Disable**.
    - If the problem persists, you may try to disable your firewall or set a firewall exception for the SAMM software.
3. If you are not receiving position/heading data:
    - If using a serial port, please make sure your GPS/compass is outputting NMEA Lon/Lat message and NMEA HDT messages for heading. Make sure that serial communication settings in SAMM (baud rate, parity, stop bit) match your device(s).
    - If you are using GreenSea navigation data, make sure to select the GreenSea navigation from the Position and heading dropdown menu. This disables the serial port input.
4. If the PPI does not look correct, try viewing the sonar properties by clicking the **Properties** icon on the main toolbar and identifying the problem from the attributes.

6.4.12 Sonar Controls

For the Kongsberg, BlueView, EdgeTech, Klein, GeoDAS and Wuxi Haica sonars, SAMM receives the sonar data and metadata through the respective software packages. For the Tritech Gemini, R2Sonic in forward-looking mode, Marine Electronics Dolphin, Blueprint Subsea Oculus and StarFish, and Imagenex YellowFin and BlackFin sonars, SAMM interfaces directly with the sonar and provides controls on the sidebar. Note that changing sonar properties available in the Sonar controls will affect the recorded data (*.msk).

6.4.12.1 Gemini Sonar Controls

The Gemini sonar controls include range and gain slider bars, a checkbox for fixing the sound velocity, and a checkbox for disabling the auto ping mode (Figure 57).

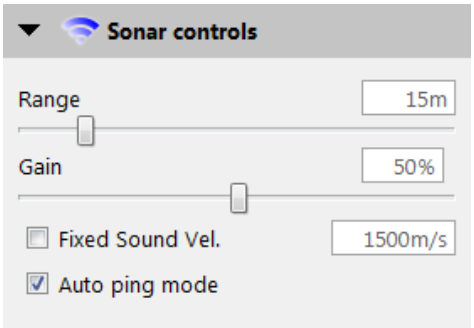


Figure 57. Gemini Controls

The range slider enables the user to specify the maximum range the sonar will scan (or ping period). Longer ranges mean longer ping periods, since the ping must travel further. The gain slider enables the user to control the relative sonar receive gain. Gemini users may experiment with this setting according to their preference and water and target conditions; OIC has found the 60-75% range a useful starting point in our test marina. Setting the gain too high introduces artifacts into the sonar data (Figure 57. Gemini Controls~~Figure 57~~).

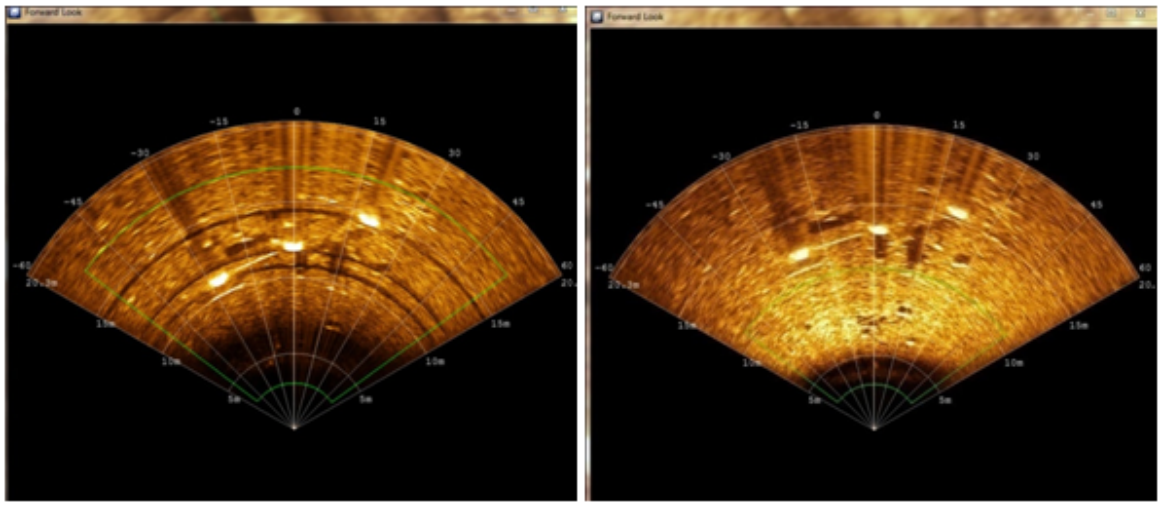


Figure 58. Black banding artifacts with high gain and the same data with lower gain

The current sensor sound velocity displays at sensor depth in the sonar controls box (in meters/second). The sound velocity value can be overridden by checking the checkbox next to the **Fixed Sound Vel.** box. This is typically performed when actual sound velocity sensor data are not available; the Tritech Gemini is equipped with a sound velocity probe, so sensor data should be used if accurate. Sound velocity generally varies from 1450 m/s for very cold waters to 1550 m/s for very warm waters. In most circumstances you do not need to change the sound velocity.

Auto ping mode is the default mode and should be used most of the time. In this mode, the sonar controls when it pings; it pings again when it has pushed the last processed ping to the receiving software. If you disable auto ping mode, the sonar will wait to ping until it has received the command to ping from SAMM. If the ping backlog gets too high, SAMM may discard some raw ping records in an attempt to keep up. Auto ping mode is sufficient for most computer systems and should be used unless SAMM is overwhelmed with ping packets. The Auto ping mode is analogous to the Continuous mode in Tritech's Seanet Pro software, while disabling the Auto ping mode is analogous to the Triggered mode.

6.4.12.2 R2Sonic Sonar Controls

The R2Sonic sonar controls include range (RNG), sector width (WIDTH), brightness (BRT), sector rotation (ROT), gain (GAIN), power (PWR), pulse length (Plen), and transmit on/off (TX)(Figure 59). Projector type (PROJ), frequency (FREQ), and time synch method (SYNC) can be accessed by clicking the advanced setting button. These controls work the same way as the corresponding controls in the R2Sonic native software.

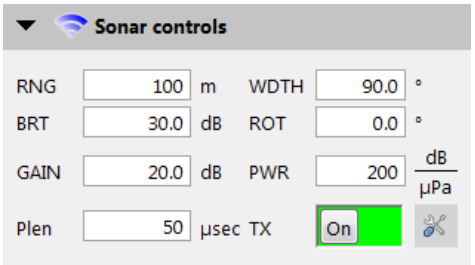


Figure 59. R2Sonic Sonar Controls

6.4.12.3 Marine Electronics Dolphin Sea View

The Dolphin Sea View controls include range, gain, clutter, resolution, sound velocity (SoundVel), angle, transmit power (TxPower), pulse length (PulseLen) and Bearing (Figure 60). The Dolphin Sea View has a magnetic compass built into the sonar head. If you do not have a dedicated source of heading, check the box for **Bearing** to utilize the built in compass.

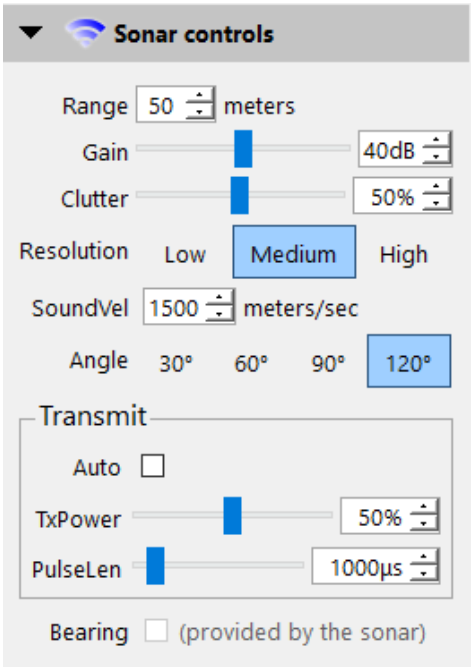


Figure 60. Dolphin Sea View Controls

6.4.12.4 Blueprint Subsea Oculus

The Blueprint Oculus controls include range, gain, gain assist, gamma, and sound velocity (Figure 61). The Blueprint Oculus features a gain assist mode, where gain is automatically adjusted during data acquisition. We highly recommend that you do not enable this function.

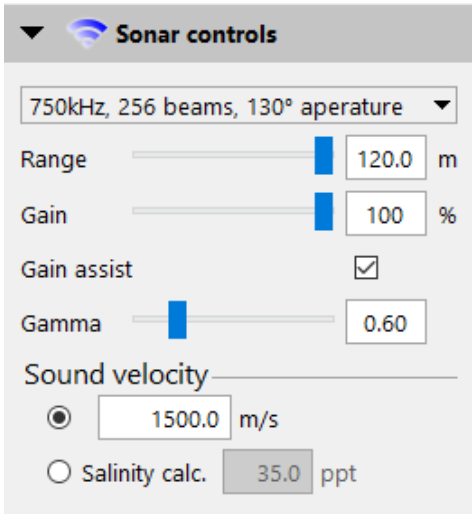


Figure 61. Blueprint Oculus Controls

6.4.12.5 Blueprint Subsea StarFish

The Blueprint StarFish sidescan sonar controls include range, Txpower and sound velocity (Figure 62). Selected sonar model is also displayed in the control.

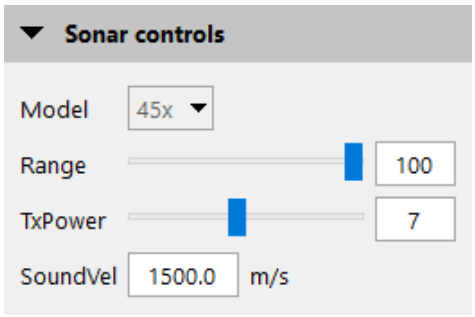


Figure 62. Blueprint StarFish Controls

6.4.12.6 Imagenex YellowFin

The Imagenex YellowFin sidescan sonar controls include frequency, range, data gain and gain balance (Figure 63).

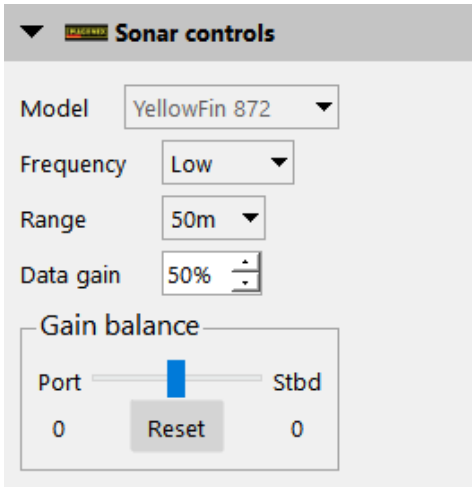


Figure 63. Imagenex YellowFin Controls

6.4.12.7 Imagenex BlackFin

The Imagenex BlackFin sidescan sonar controls include mode (CW or Chirp), range, number of points and gain (Figure 64).

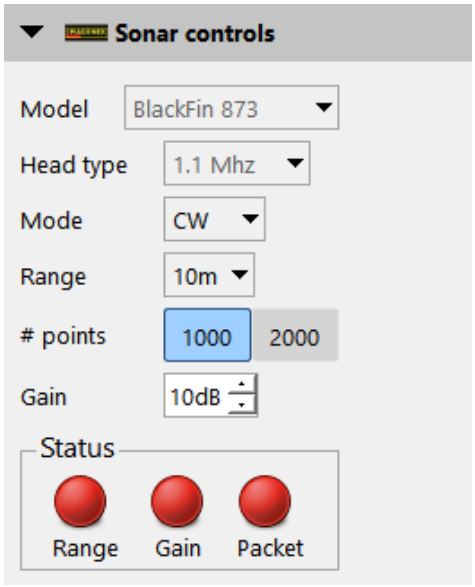


Figure 64. Imagenex BlackFin Controls

7 Display and Processing Settings

SAMM has display options which enable you to control how your sonar display and mosaic appear. These settings control some elements of the GUI, like the mosaic window and the live info feeds, or the data display. In the section, we describe how to:

- adjust the mosaic window display;
- manage swaths using the Swath list;
- control playback;
- toggle the display units;
- adjust the post-processing rendering options.

7.1 Adjust the Mosaic Window Display

By default, the bounds and content of the mosaic window are set by the user providing data, either in real-time or playback/load. Optionally, the user can use the :GoTo: dialog (accessed from the “GoTo” button on the toolbar) to set the mosaic viewport center coordinate and width. For details on this please see Appendix A, Mission Planning and Analysis. The GUI allows control the content and geographic boundaries of the mosaic window. This manual described how to load background content (charts and imagery) into the mosaic window in Section 5. Table 11 lists available commands to adjust the extent and behavior of this window and how to execute the commands.

Table 11. Mosaic Window Extent Commands

Command	Action
Zoom in 	• Zooms in to the cursor position. - Roll the mouse wheel away from you. • Zooms in to center. - Press the + key. - Use a two finger scroll toward you on a laptop track pad. - In the toolbar, click the **Zoom in** icon.
Zoom out 	• Zooms out from the cursor position. - Roll the mouse wheel toward you. • Zooms out from center. - Press the - keys. - Use a two finger scroll away from you. - In the toolbar, click the **Zoom out** icon.
Zoom to the extent of the survey 	• In the toolbar, click the **Reset View to the Entire Survey** icon. • Press the spacebar.
Center view on sensor and track it 	• In the toolbar, click the **Auto adjust the display to follow the sensor** icon.
Pan	• Click anywhere in the mosaic window and drag your mouse.

7.2 Manage Swaths

SAMM lets you manage swath layers during acquisition, playback and in post-processing mode. The Swath list controls layering in the mosaic window. The commands that fit into the swath management class are listed in Table 12, with directions for execution. Please keep in mind that these commands do not affect the raw data in any way.

Table 12. Swath Management Commands

Command	Action
Turn off in mosaic window	• Click the box next to the name to uncheck it.
Turn on in mosaic window	• Click the box next to the name to check it.
Rename	• Click the name to select it, then press **F2** key to activate keyboard input. Enter the new name.
Bring forward/Send backward	• Click the name to select it, then drag to the desired layering position in the list.
Delete	• Click the name to select it, then click the **Delete** button.
Change properties	• Click the name to select it, then click **Display selected swath properties** to open the Swath properties window. **Contrast** and **Opacity** in the Rendering controls panel can be modified.
Select multiple consecutive swaths	• Click the first swath to select it, then hold Shift and click the last swath.
Select multiple nonconsecutive swaths	• Click the first swath to select it, then hold Ctrl and click the other swaths.
Display full swath name	• Click Toggle full swath name view to expand the Swath list window
Turn on/off all bathymetry/imagery layers	• Click Toggle the display of bathymetry /imagery swaths in the Mosaic view to turn on/off respective layers.

7.2.1 Swath Management and Playback Tutorial

These steps demonstrate most of the swath management and playback features. Follow along using the demo data in playback mode, checking the results on your screen against the bulleted results. Launch SAMM, create a new project, and add data from the demo_data folder in playback mode (the example uses the files data.1385510330801_37_ds.msk and data.1385510330801_39_ds.msk) and press “Play”.

1. In the Swath list, click the checkbox next to `data.1385510330801_037_ds.msk`.
   - The swath turns off in the mosaic window.
2. Click the checkbox again.
   - The swath shows in the mosaic window.
3. Using the playback controls, click **Pause**.
   - The vessel, live info feed, and file loading progress freeze.
4. Click **Play**.
   - The vessel starts moving again.

- The Live info feeds update.

5. Drag the **Speed** slider bar to the left.
   - The vessel slows down.
6. Drag it to the right.
   - The vessel speeds up.
7. Drag the speed back to the middle (`x1`).
   - The vessel returns to the normal speed.
8. Wait until the vessel turns. Then, in the toolbar, click the **Manually start a new swath** button.
   - `data.1385510330801_039_ds.msk` appears in the Swath list above `data.1385510330801_037_ds.msk`.
9. Turn `data.1385510330801_039_ds.msk` on and off. Pay attention to what it looks like.
10. Click `data.1385510330801_037_ds.msk` and then drag it over `data.1385510330801_039_ds.msk`.
    - `data.1385510330801_037_ds.msk` is layered over `data.1385510330801_039_ds.msk`.
11. Turn off `data.1385510330801_037_ds.msk`.
    - `data.1385510330801_039_ds.msk` is now visible.
12. In the main toolbar, click the **Record** icon.
    - The boat moves without painting a swath underneath it.
    - Text in the bottom left of the taskbar changes to `Live`.
13. Click **Record** again.
    - SAMM paints the swath behind the vessel again.
    - The text in the bottom left of the task bar changes back to `Recording.`
    - `data.1385510330801_039_ds.msk_2` appears in the Swath list.
14. Click on `data.1385510330801_037_ds.msk` and then click **Delete**.
    - The swath disappears from the mosaic display. This does not affect the raw data (the files in the folder that you added), but the swath is gone from this particular project unless you add the source data file again.
15. Click on `data.1385510330801_039_ds.msk_2`, then press F2. Enter `Second Swath`.
    - The name changes to `Second Swath`.

7.3 Toggle Display Units

Display units of parameters may be changed from the Configuration window. Section 4.2.3 described how to set the initial display units. This section provides a tutorial to supplement Section 4.2.3.

7.3.1 Display Units Tutorial

This tutorial shows how to change position units from the Configuration window and toggle position formats in the status bar.

1. Click the **Configuration** icon.
2. Click the Display tab.
3. Select **Degree minute second** from the **Longitude/Latitude** dropdown box.
   - The position fields in the Live Info feed change to degree minute seconds.
   - The cursor position unit correspondingly changes in the bottom right of the status bar.

4. Click the **Reset units to default** button to reset the default settings.
5. Click the **Toggle between Lon/Lat vs. Easting/Northing** icon to the far right of the status bar (Figure 65).
   - The units toggle between GPS WGS 1984 Longitude and Latitude coordinates in the format set from the Configuration window and Universal Transverse Mercator coordinate meters.

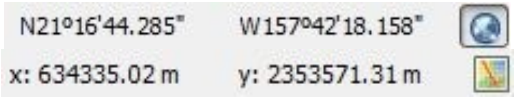


Figure 65. Status Bar Position Units

7.4 Apply Processing Options

You can process sonar data by clipping the sonar image range or adjusting the rendering options. These features do not affect the raw data in any way.

7.4.1 Processing Controls

When in playback or acquisition mode, the imagery processing options are available in the Processing controls panel on the sidebar and can be changed as you play or acquire data. In quick look and load from directory mode, these options are only available at the setup. Processing controls panel shows 4 data tabs: FLS, SLS, Bathy and Grid. Checking the box for Show relevant tabs turns off tabs that are not available in the data.

7.4.1.1 FLS Processing Options

The FLS processing options are as follows (Figure 66)

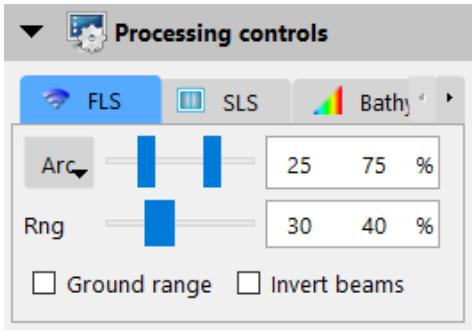


Figure 66. FLS Processing Options

- **Arc or Range-X Coverage**: Adjusting these values trims the outer arc or horizontal (X-axis) range of the FLS imagery data (Figure 67). The minimum value will clip from the port side of the FLS sector and the maximum value will define the trim from the starboard side. Values are relative to the arc length of the actual data (percentage).
- **Range Coverage**: Adjusting these values sets the inner and outer range of the FLS imagery data to be used. The minimum value clips from the sonar head, and the maximum value clips from the outer edge of the data. Values are relative to the range of the actual data (percentage).
- **Mosaicking options**: SAMM can mosaic data in ground range if altitude data is available. Invert beams will flip the FLS imagery and is useful for correcting inverted installations. Check the boxes to enable these options.

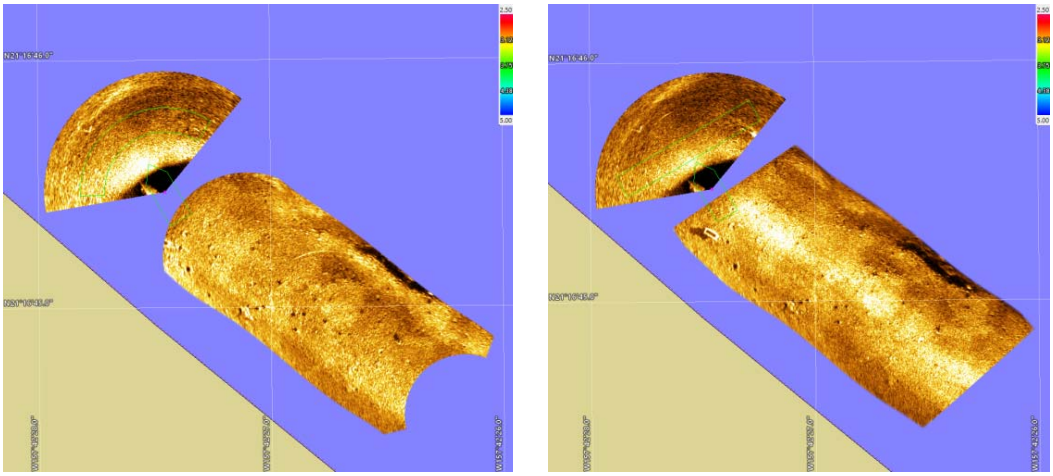


Figure 67. Arc mosaicking vs Rng-X mosaicking

7.4.1.2 SLS (Sidescan) Processing Options

The SLS processing options are as follows (Figure 68):

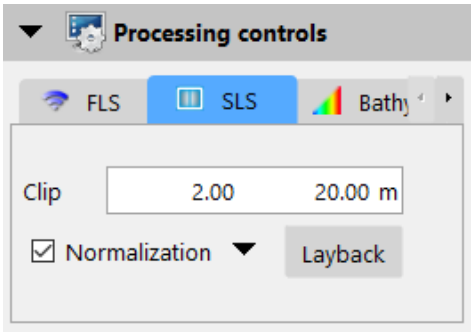


Figure 68. SLS Processing Options

- **Clip**: Adjusting these values trims the SLS data to the specified minimum and maximum ranges.
- **Normalization**: Compensates for backscatter variations due to system beam-pattern irregularities and natural variation of backscatter with angle of incidence. Check the box for Normalization to turn on normalization. Click the triangle button to access the contrast boost setting (Figure 69).
  - **Level**: The amount of contrast boost to apply to the resultant data.
  - **Range**: Boosts the contrast application at far range. The lowest setting, the boost is linearly applied from minimal at near range to max at far range. As the range slider is pushed right, the curve of the boost emphasizes far range more while nearer range is less. It is a parabolic curve with exponents 1, 2, 4 and 10.
- **Layback**: Set layback options if the sensor is towed and cable out is available. To apply layback, check the box for Apply towfish layback and select options to use recorded or manual cable out and sensor depth data (Figure 70).

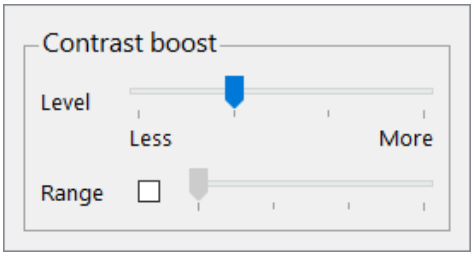


Figure 69. Normalization Options

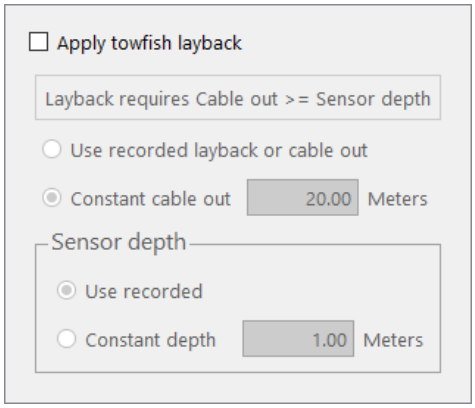


Figure 70. Layback Options

7.4.1.3 Bathymetry Processing Options

SAMM can generate bathymetry grid from sidescan altitude data. Water depth values are computed by adding altitude (recorded or bottom tracking) and sensor depth data. Turn on Bathymetry from altitude in the Configuration window (See Section 4.1.3 for detail).

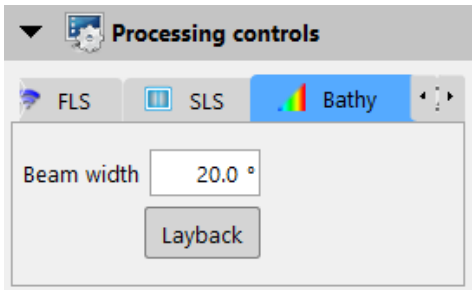


Figure 71. Bathymetry Processing Options

The bathymetry processing options are as follow (Figure 71):

- **Beam width**: Set beam width of generated bathymetry data.
- **Layback**: Set layback options if the sensor is towed and cable out is available. The layback is shared with SLS (See Section 7.4.1.2).

7.4.1.4 Grid Processing Options

Some sidescan systems (e.g. Sonadyne Solstice) generate processed grid data instead of ping data. SAMM creates mosaic imagery using those grid data.

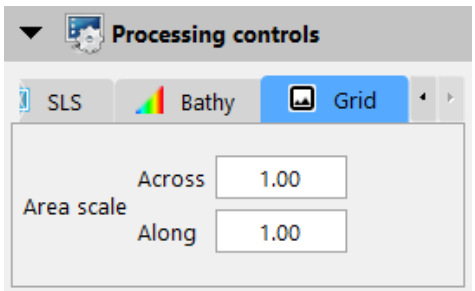


Figure 72. Grid Processing Options

The grid processing options are as follow (Figure 72):

- **Area scale**: Set across and along track scale of each grid pixel.

7.4.1.5 Other Processing Options

The following processing options are common to all data layers (Figure 73).

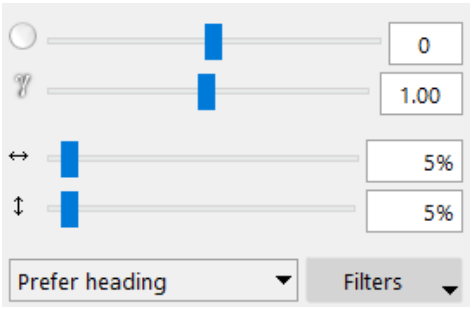


Figure 73. Rendering Options

- **Contrast**: The brightness and gamma rendering options change the intensity and emphasis on light or dark tones in the imagery, respectively.
- **Feathering**: Adjusting the feathering value controls how the imagery is blended together where images overlap. A value of 0% will create a sharp boundary at the overlaps, and increasingly higher values will cause more blending.
- **Preferred heading source**: Select one of the three heading source to be used for mosaicking. When the selected data is not found, SAMM will use the next available data.
- **Filters**: Navigation, Heading and Altitude data can be smoothed by applying Despike and Smoothing filters.

Note that processing options in the Processing controls on the sidebar are applied to the currently processed swath only.

7.4.2 Swath Properties

Imagery processing and display options are available for the swaths that are already mosaicked from the **Properties** button on the Swath list (Figure 74). To open the window, select swath(s) in the Swath list and then click **Properties (the tool icon below the swath list)**. *At this time, contrast and opacity are the only available features.* Save the settings by clicking **OK** before moving to the next swath.

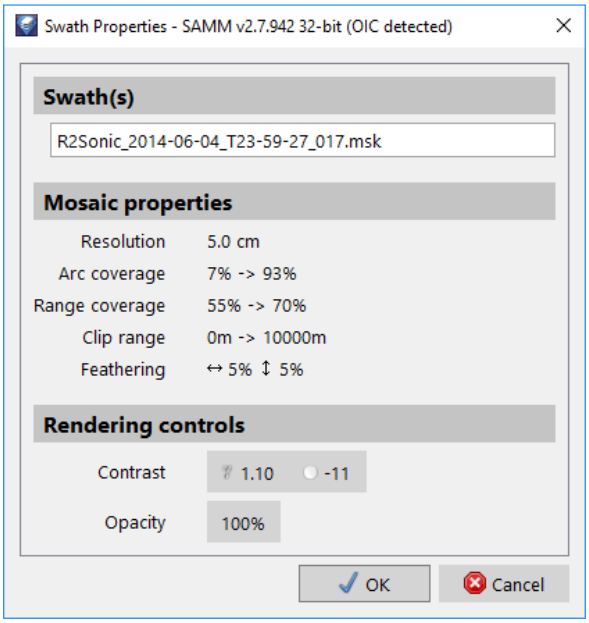


Figure 74. Swath Properties Window

7.4.3 Playback of *.son files

A sound velocity input box appears in the Processing controls on the sidebar when SAMM plays back *.son files from the BlueView 2D multibeam imaging sonar. Entering the value that is closer to the true speed of sound of water during your survey will reduce image distortion between segments and minimize the black banding artifact in the image (Figure 75).

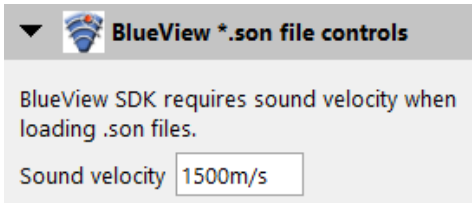


Figure 75. BlueView *.son File Controls

7.4.4 Bottom Tracking

For sidescan imagery processing, bottom tracking is required to remove the water column record from the data in order to produce a seamless sidescan mosaic. By default, SAMM uses recorded altitude values for bottom tracking. You can manually override the altitude data using the Bottom Tracking tool in the Waterfall window. Click the Bottom Tracking button to activate the tool and select Auto, Manual or Disabled (Figure 76).

- **Auto**: SAMM will automatically detect and track the bottom. If the resultant tracking is noisy, adjust the despike and smoothing filters for altitude in the SLS Processing Controls panel on the sidebar.
- **Manual**: Click within the Oscilloscope to set and override the altitude.
- **Disabled**: Default mode. The altitude packets from the device or files will be used. Check the box to turn on auto tracking if no altitude data was detected during scan.

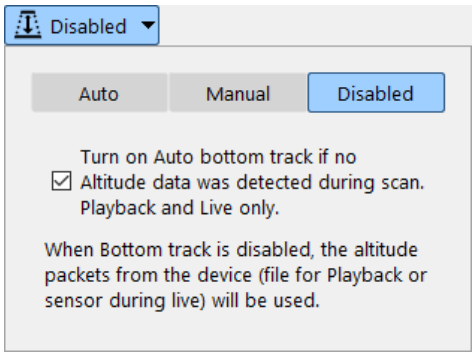


Figure 76. Bottom Tracking Tools

7.5 Display Options

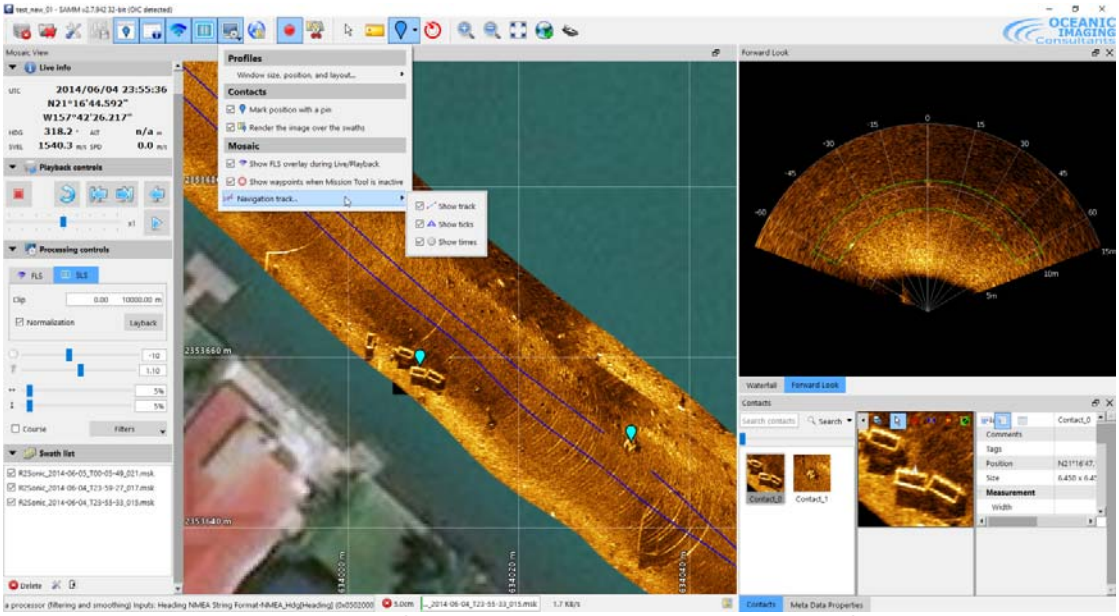


Figure 77. Display Options Dialog With Navigation Track Options

Select the “Display Options” icon on the toolbar to access the Display Options Dialog (Figure 77). The Display Options Dialog supports options for visual features in the mosaic window.

7.5.1 Profiles Option

The Profiles option allows you to select a saved profile that stores window size, position, and layout profiles. See Section 4.30 to create a new profile.

7.5.2 Contacts

The Contacts section allows you to engage or disable marking of contact marks with a “push-pin” icon, and to turn on or off plotting of the actual target snippets over the mosaic. These options do NOT delete targets; unselecting them just de-clutters the mosaic display.

7.5.3 Mosaic

The Mosaic options allow you to turn on or off display of:

- The bathymetry and imagery swaths
- The FLS PPI image of the current ping on the mosaic
- Waypoints when not in “Mission Waypoint Generation mode” (see appendix A)

7.5.4 Navigation Track

The Navigation Track options allow you to:

- Toggle on and off the display of the sensor navigation track
- Toggle on or off “Tics” to indicate direction of travel
- Toggle on or off display of time fix associated with navigation positions.

None of these options in any way affect either the mosaic or the raw data, just the display.

7.6 Bathymetry Colormap and Contour Options

Mosaic window displays the depth scale bar when bathymetry mosaic is created (See Section 4.1.3). Click the depth scale bar to access the Bathymetry Colormap and Contour panel (Figure 78). Select a colormap from the dropdown menu and set min and max depth values in meters. Check for Contour to add contour lines to the bathymetry data and set the base and contour interval. You can also change the opacity of the contours. The depth value will be displayed by moving a cursor over a bathymetry swath.

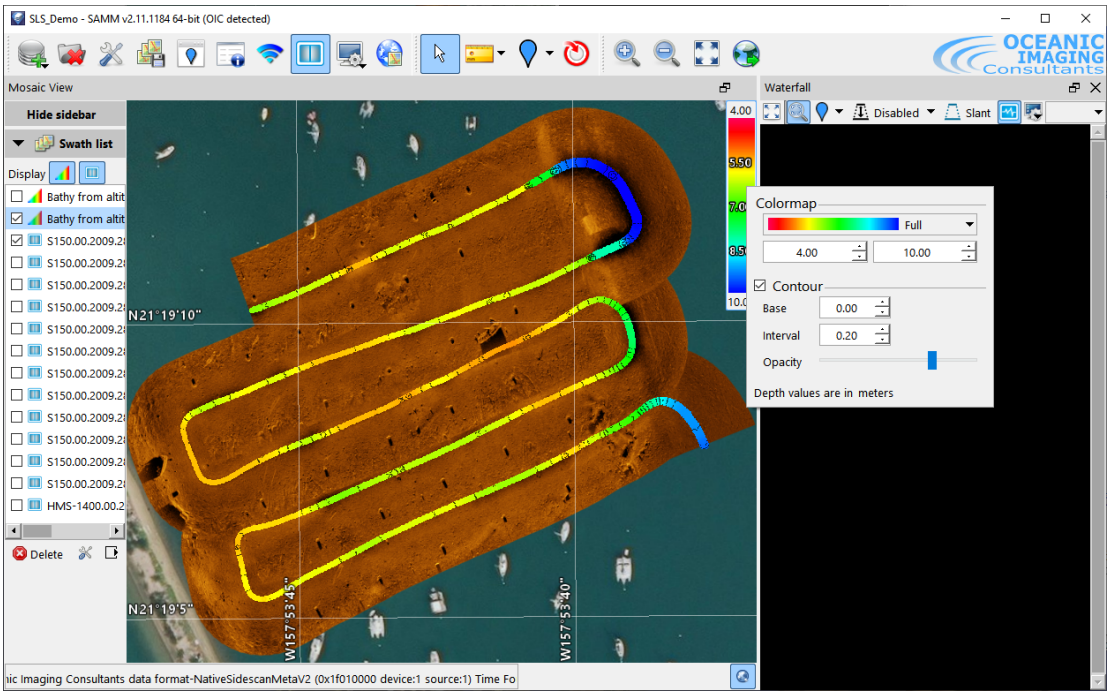


Figure 78. Bathymetry Colormap and Contour Panel

7.7 Imagery Processing Tutorials

7.7.1.1 Trimming Tutorial

This example shows how to apply the trimming filters. The observable effect of each function conveys more information than words, so make sure you are comfortable with how the default view looks before proceeding. If SAMM is not already playing data, as before, launch SAMM, create a new project, and add data from the demo_data folder in playback mode (the example uses the files data.1385510330801_37_ds.msk and data.1385510330801_40_ds.msk and press “Play”.

1. In the Processing controls panel, drag the Arc slider bars individually to 20 and 80, or input these values.
   - The green sector outlines in the Forward Look and mosaic window narrow to 60% of its range, losing 20% of the arc length from each edge.
   - The swath width narrows by the same factor as SAMM draws it behind the vessel in the mosaic window.
2. Return the arc slider bars to 0 and 100.
   - The sector outline and swath width return to full coverage.

3. In the Processing controls panel, Drag the right Rng (range) slider bar to 60.
   - The sector outline shrinks to 60% of its full coverage in the Forward Look and mosaic windows.
   - The swath coverage shrinks correspondingly as SAMM draws it in the mosaic window.
4. Drag the left Rng slider bar to 30.
   - The sector outline retreats to 30% of its coverage from the center of the circle, and the swath coverage responds.

7.7.1.2 Rendering Tutorial

This tutorial walks you through changing some of the rendering options available in SAMM. The rendering options include changing the colormap, and the contrast, opacity, and feathering values.

1. Click the **Configuration** icon in the toolbar.
2. In the Swath colormap panel in the Display tab, select **Reverse Gray** from the Mosaic in progress dropdown menu .
   - The mosaic in progress swath changes to a greyscale where objects are light and object shadows are dark.
3. Change it back to **Goldenrod** and click **Close.**
4. In the Processing controls on the sidebar, drag the Brightness slider bar to the left and right.
   - Watch the intensity of the PPI and mosaic change for the entire swath currently being mosaicked (Figure 79).
5. Drag the Gamma slider bar to the left and right.
   - Changing the gamma value enhances light or dark tones (Figure 79).

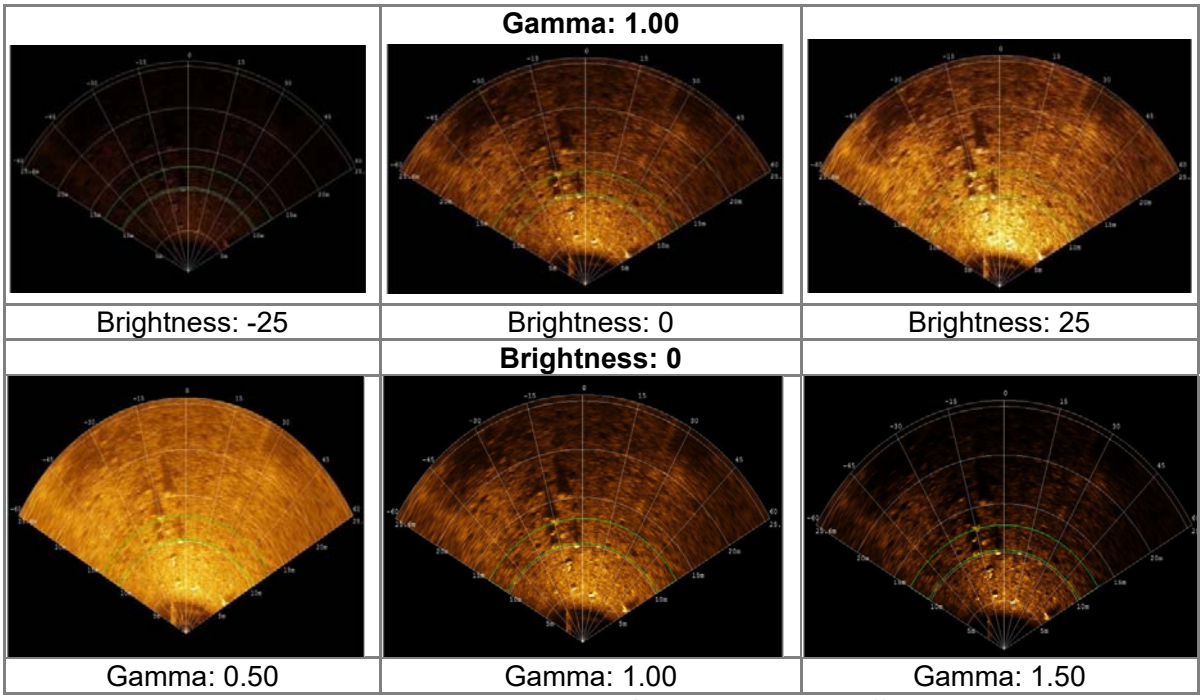


Figure 79. Brightness and Gamma Rendering Effects

6. Drag the Feathering slider bars to the left and right.
   - Adjusting the horizontal feathering varies the sharpness of port and starboard boundaries at overlapping swaths, while adjusting the vertical feathering affects the clarity of the entire image (Figure 80).

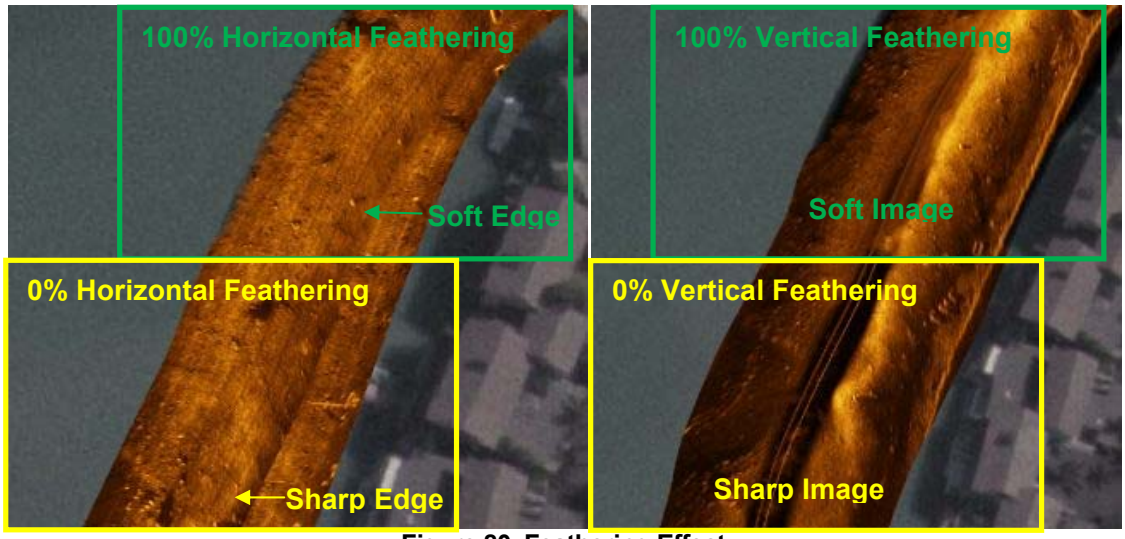


Figure 80. Feathering Effect

7. In the Swath list, select the swath that is currently being mosaicked and click the Display selected swath properties button.
8. Click the **100%** button next to Opacity and drag the slider bar to the left and right.
   - Transparency of the swath in the mosaic window changes with the slider.

8 Working with Contacts

SAMM supports marking “contacts” from the raw data in the Forward Look window or the SLS Waterfall window, as well as from the processed and mosaicked swaths. One benefit of post-processing data is enhancing the imagery sufficiently to maximize detection of contacts. For contacts marked in SAMM, SAMM stores the location, sonar image, and other properties. SAMM enables enlargement, enhancement, measurement, and classification of these contacts in the Contacts window or database. In addition, SAMM can export contact images and associated user-supplied information in an *.html or *.xml report.

This section describes the contact analysis workflow and the elements of the Contacts window as they are used in the process. It concludes with a brief tutorial to guide interaction with SAMM's contact features. The general contact workflow is to:

1. Mark contacts
2. Adjust the contact display
3. Attribute, or provide data about the contacts
4. Organize the contacts
5. Export a contact report
6. Optionally, broadcast contacts to a remote NMEA compatible plotter.

8.1 Mark Contacts

To build your contact database, you must first mark the contacts. You can mark the contacts in the Forward Look window or the Waterfall window during acquisition or playback mode. You can also mark contacts in the mosaic window in any mode. Marked contacts appear as small blue pins on an image in the mosaic window, as shown in Figure 81. The contact imagery is a square centered on the marked position, from the data of origin. The contact, marked position, and all other associated properties are saved locally in the contact database for later classification, organization and export.

Figure 81. Contacts in Mosaic Window

To mark a contact in the Forward Look window in acquisition or playback mode:

1. Double-click on the object in the Forward Look window.
   - A blue crosshair appears on the marked contact in the FLS window. The marker stays at the contact position and reappears in the FLS window when the FLS covers the target again (Figure 82).
   - A contact thumbnail is saved in the database.
   - If the Display Options item “Render the image over the swaths” is checked, the thumbnail appears in the mosaic window.
   - If the Display Options item “Mark position with a pin” is checked, a small blue marker appears over the mosaic, marking the recorded position of the contact.

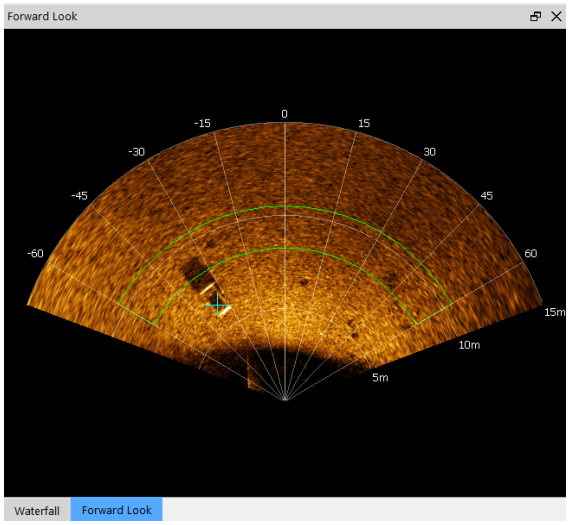


Figure 82. Marking a contact in FLS window

To mark a contact in the Waterfall window in acquisition or playback mode:

1. Click the **Contact Maker tool** icon in the Waterfall toolbar. The “Mark Contact” dialog can be accessed by clicking on the triangle next to the icon. You can define or auto generate contact name, select a contact type between "Geocoded" or "Snapshot", and size of the contact image.
2. Click on the target.
   - A blue dotted diamond appears around the marked contact in the waterfall (Figure 83). The dotted green box stays at the contact position and reappears in the waterfall when the SLS covers the target again.
   - A contact thumbnail is saved in the database.
   - If the Display Options item “Render the image over the swaths” is checked, the thumbnail appears in the mosaic window.
   - If the Display Options item “Mark position with a pin” is checked, a small blue marker appears over the mosaic, marking the recorded position of the contact.

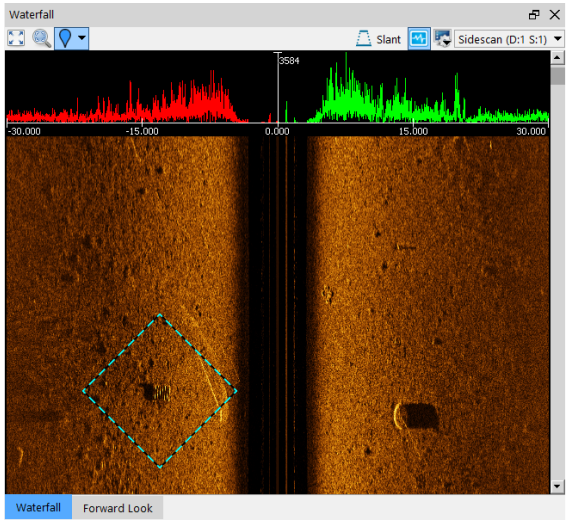


Figure 83. Marking a contact in Waterfall

To mark a contact in the Mosaic window:

1. Click the **Mark contact tool** icon in the toolbar.
2. The “Mark Contact” dialog can be accessed by clicking on the triangle next to the icon. You can define or auto generate contact name, set resolution and size of the contact image.

3. A white square frame appears around the mouse cursor in the Mosaic window. Click on the target.
   - A contact thumbnail is saved in the database.
   - The thumbnail appears in the mosaic window.
   - A small blue marker appears over the mosaic, marking the recorded position of the contact.Click the **Select Tool** icon to exit the “Mark contact” mode.

To turn on/off the display of the blue pins or the images:

1. Click the **Display options** icon
2. Check/uncheck the box next to **Mark position with a pin** or **Render the image over the swaths**.

8.2 Elements of the Contacts Window

Click the **Contacts** icon to open the contact database. Elements of the Contacts window are labelled in Figure 84. This section introduces the elements of the contact window and covers the Contacts window display options. Usage of these elements in the contacts workflow will be described in the following sections.

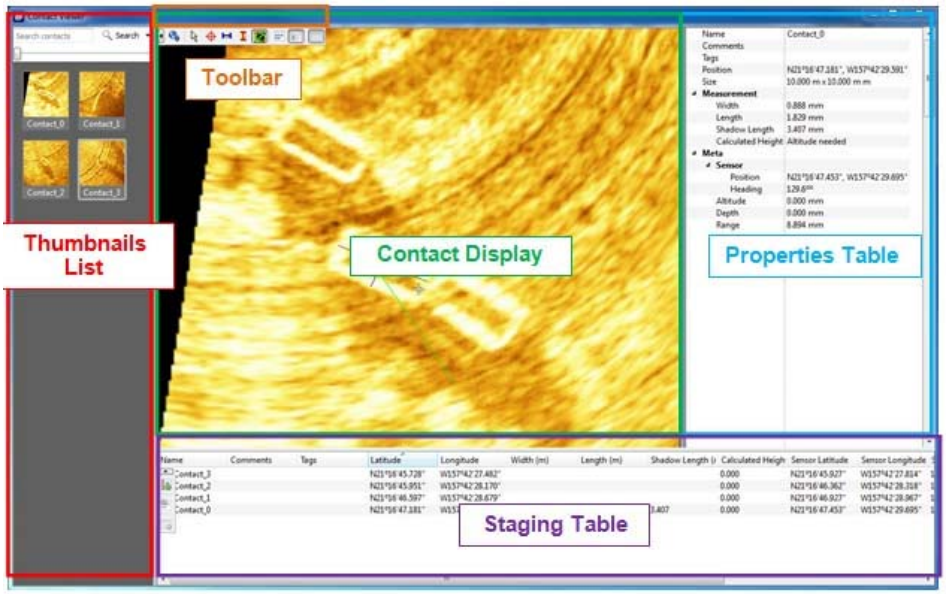


Figure 84. Contacts Window

The Contacts window contains the contact thumbnails list, a toolbar, the contact display with associated properties table, and the staging table. Contacts that you have marked are visible in the contact thumbnails list (unless you have previously set a filter in the search bar), but the contact display, properties table, and staging table do not open by default. Each element of the Contacts window can be resized by hovering over the edge of the panel, and clicking and dragging.

8.2.1 Thumbnails List

Thumbnails are smaller views of the contact, shown in the thumbnails list. To adjust the size of the thumbnail panel, click on the slider bar and drag to the desired size. From the list, you classify contacts and control the display of contacts in other elements of the Contacts window. The context menu includes commands to rename, edit comments, assign new tags, filter by tag, add contacts to the staging table, or delete contacts. Right-click on a thumbnail to access this menu.

When you click or right-click on a thumbnail, this selects the contact and displays it in the contact display. To control which contacts display:

- Select multiple adjacent contacts by clicking on the first thumbnail, holding Shift and clicking on the last thumbnail.
- Select multiple non-adjacent contacts by clicking on a thumbnail, then holding Ctrl and clicking on each thumbnail.
- Select all contacts by clicking on a thumbnail, then pressing Ctrl+A.
- Remove all contacts from the contact display by clicking in the empty space in the thumbnail list.

These standard Windows selection commands also apply to selecting multiple contacts for context menu options.

8.2.2 Contacts Toolbar

The icons in the Contacts toolbar are pictured and described in Table 13. To hide the toolbar, click the small Left arrow at the extreme left of the toolbar.

Table 13. Contacts Toolbar Icons

Icon	Icon Name	Function
	Import contacts	Import contacts from another SAMM project to the current project
	Pan/Zoom cursor	Allow the user to move the image (when the image is too large to fit in the Contact Display screen)
	Mark the contact center	Change the recorded position of the contact
	Contact width	Measure the width of the contact and save it as an attribute
	Contact length	Measure the length and save it as an attribute
	Shadow length	Measure the shadow length and save it as an attribute
	Tiles	Show only selected thumbnails in the display
	Properties	Show the properties table for the selected contacts
	Staging Table	Show or hide the staging table

8.2.3 Contact Display

The contact display shows a larger view of selected thumbnails. In the display, you can use the measuring tools to attribute the contact dimensions, and mark the contact center. You can also access the same commands on the display context menu as in the thumbnail context menu and the toolbar.

You may use your keyboard or mouse to navigate within the contact display. To zoom in on an area, hold Shift and drag a box around the area. To zoom in/out from the tile center, either:

- roll the mouse wheel away from/toward you;
- press the +/- keys; or
- on a laptop track pad, use a two finger scroll toward/away from you.

To zoom out to show the full tile, press the space bar or Esc key. You may also use the **Pan/Zoom** tool to pan. The areal pan and zoom methods work without activating the **Pan/Zoom** tool from the icon or the context menu. Hold shift and click and drag a box around the area to zoom, or hold Ctrl and click and drag to pan in the contact display.

8.2.4 Properties Table

The properties table shows the attributes of each selected contact in a report view, adjacent to the contact display. The **Name**, **Comments**, **Altitude**, and **Depth** fields are directly fillable in the properties table. **Position**, **Size**, **Sensor Position**, **Sensor Heading**, and **Range** are defined by the contact mark. **Position** and **Range** automatically update if the **Mark the contact center** tool is used to move the recorded contact. The **Tags** field is defined from the contact thumbnail list, and the **Width**, **Length**, and **Shadow Length** fields are filled when the user executes the measure tools. The **Calculated Height** field auto fills when the user enters an altitude.

To show/hide the properties table, click the **Properties/Tiles** icon or right-click on a tile and click **Properties**/**Tiles**.

8.2.5 Staging Table

The staging table shows a table view of the properties of each contact sent to it. The contact properties that are shown in the Properties table in report view, from top to bottom, appear by default from left to right as columns in the staging table. Use the staging table to export contacts as a report, or to prepare them for transmission to a NMEA compatible plotter.

To show or hide the staging table, click the **Staging table** icon. Adding contacts to the staging table also automatically displays the staging table. To do this, right-click on a tile or selected thumbnails and click **Add contact(s) to staging table**.

A small toolbar hosts icons for the staging table commands. These commands are also found on the staging table context menu. They are:

- create report
- send contact(s)
- export contact(s)
- show contact(s); and
- remove contact(s) from the staging table

Format the staging table by adjusting column width, hiding/unhiding columns, sorting, and rearranging column order.

- To resize columns, hover over the column break line, click, and drag.
- To hide/unhide columns, right-click on the column name row and click the checkbox next to the field name.
- To sort a column, click on the column name.

- To rearrange the column order, click on a column name and drag it to the desired location.

8.2.6 Contact Display Commands

For quick reference, the display options available in the Contacts utility are listed in Table 14. The methods available to execute the commands are bulleted to clarify when multiple execution methods exist.

Table 14. Contact Display Commands

Contacts Window Element	Command	Action
All	Resize elements	• Hover over the element edges and click and drag.
	Show/hide the properties table	• In the toolbar, click the **Properties/Tiles** icon • In the contact display, right-click on the contact and click **Properties**/**Tiles**.
	Show/hide the staging table	• In the toolbar, click the **Staging table** icon
	Show/hide toolbars	• Click the arrow icon at the left of the toolbar.
Contact Display	Add contacts to contact display	• In the thumbnail list, click on the thumbnail to select it.
	Add all contacts to the contact display	• In the thumbnail list, click on any thumbnail and press Ctrl+A.
	Add multiple nonadjacent contacts to the contact display	• In the thumbnail list, click on the first thumbnail, hold Ctrl and click on each thumbnail.
	Add multiple adjacent contacts to the contact display	• In the thumbnail list, click on the first thumbnail, hold Shift and click on the last thumbnail.
	Remove all contacts from contact display	• Click in the empty space of the thumbnail list.
Thumbnail List	Resize thumbnails	• In the thumbnail list, click on the slider bar and drag.
Thumbnail List and Contact Display	Show only those contacts in the staging table in the thumbnail list and contact display	• In the staging table, select the contacts to show and click the **Show contact(s)** icon in the toolbar. • In the staging table, select the contacts to show, right-click and click **Show contact(s)**.
Contact Display	Zoom in on area	• In the contact display, hold Shift and click and drag a box around the area.
	Zoom in to center	• In the contact display, roll the mouse wheel away from you. • In the contact display, press the + key. • In the contact display, use a two finger scroll toward you on a laptop track pad.

Contacts Window Element	Command	Action
	Zoom out from center	• Roll the mouse wheel toward you. • Press the - keys. • Use a two finger scroll away from you.
	Zoom to contact	• In the contact display when zoomed in, press the spacebar or esc.
	Pan	• In the toolbar, click the **Pan/Zoom** icon, and in the contact display click and drag. • In the contact viewer, right-click on the tile and click **Pan/Zoom**, and click and drag. • In the contact display, hold Ctrl and click and drag.
Staging Table	Add contacts to the staging table	• In the contact display, right-click on the tile and click **Add contact(s) to staging table**. • In the thumbnail list, right-click on the selected thumbnails and click **Add contact(s) to staging table**.
	Resize columns	• Hover over the column break line, click, and drag.
	Hide/Unhide Columns	• Right-click on the column name row and click the checkbox next to the field name.
	Rearrange the column order	• Click on a column name and drag it to the desired location.

8.3 Attribute Contacts

SAMM enables the user to make complete contact reports through classification and measurement of the contacts. These processes are used to define contact properties, so that data about the contacts may be transmitted with the images through your workflow.

8.3.1 Classify Contacts

The first step of attributing your contacts is to classify them with comments and tags. These are user-defined properties that give context to the image and enable sorting, filtering, and identification of each contact for later review and export. The comment field is a text field for entering any text description that suits your purpose. Tags are labels used to filter and sort your contact database.

8.3.1.1 Add Comments

Add a comment two different ways:

- In the thumbnail list, right-click on a thumbnail and click **Edit comments**. Enter the comment and press Enter/click **Okay**.
- In the properties table, click in the **Comments** field. Enter the comment and press Enter.

8.3.1.2 Add Tags

Recall, for SAMM tags are user-defined labels for contacts to allow grouping and analysis. Before adding tags, think about how you would like to be able to sort your data. Your classification system is only as useful as you make it. For example, you may make tags for

unknown, wreck, cinder block, diver, ordnance, etc. to be able to filter and sort contacts by the type of object they represent. Or, define tags using location identifiers or swath number if you have a need to sort by location. If the purpose of your survey was to identify and locate disposed ordnance, for example, you would obviously define tags for as many different ordnance types as are recognizable.

In the interest of good record keeping, you may want to define tags that will be applicable to future surveys. Once tags are defined, you can filter by the tag and send only the contacts with a certain tag to the staging table for reporting. You may assign more than one tag to contacts.

To get started tagging, define the tags in the database. This can be done with or without concurrently assigning the newly defined tag to a selected contact.

- In the thumbnail list, click the **Search** drop down menu and click **Create Tag**. Enter the tag name and click **OK**. This adds the tag to the database.
- Right-click on a thumbnail/tile, hover over **Tags** and click **Assign new tag**. Enter the tag name and click **OK**. This adds the new tag to the contact and the database.

Then, apply the tags to relevant contacts. As you may have gathered, this can be performed with or without concurrently defining a tag in the database.

- Right-click on a thumbnail/contact, hover over **Tags** and click the checkbox next to any tags to check it (Figure 85). Click anywhere outside the context menu to hide the menu.

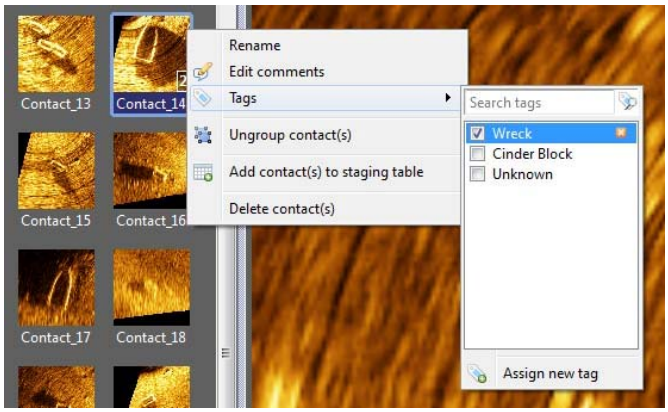


Figure 85. Assigning Tags

8.3.2 Measure Contacts

Three measure tools, accessed from the toolbar, can be used to precisely measure targets in the SAMM contact utility. The measure tool transforms the cursor into a line that you draw over the contact. The three measuring lines have distinct colors to symbolize the width (blue), length (red), and shadow length (green). Match these colors to the object dimensions consistently to ensure the accuracy of your contact measurement properties.

To change the cursor behavior to measuring, either click on one of the measuring icons in the toolbar or right-click on a tile and click one of the measure commands. To measure the contact, click on one edge of the contact then drag the mouse to the opposite edge. SAMM draws a line as you drag the mouse. When measuring shadow length, make sure that you click on the beginning of the shadow, closest to the object, and drag the mouse *in the direction the shadow is cast*. The distances are displayed in the properties table.

8.3.3 Calculate Contact Height

In order to calculate the contact height, the sensor altitude at the contact's position and shadow length must be known. To calculate the height, enter the altitude in the **Altitude** field of the properties table in the unit shown and measure the shadow length. SAMM uses these values to calculate the height. It is displayed in the **Height** field. If the sensor altitude is recorded (from an altimeter for FLS or bottom tracking for SLS), the **Altitude** field is automatically filled. Note that if the contact is marked as a snapshot in the slant range waterfall data, the altitude data will not be filled automatically.

8.3.4 Change Position

SAMM fills in the lon/lat position of the contact using the initial contact mark. You may edit this position by using the Mark the contact center tool. To change the cursor behavior to marking the contact center, either click the **Mark the contact center** icon or right-click on the tile and click **Center**. Then, click the new center on the contact display. The newly marked position updates in the properties table.

8.3.5 Rename Contacts

Naming contacts provides another way to sort the contacts, because the naming column may be sorted alphabetically in the contact staging table. By default, SAMM names each contact `Contact_X` where X is the sequence in which contacts were created. To rename the contact,

- in the thumbnail list, right-click on a thumbnail and click **Rename**. Enter the name and press Enter; or
- in the properties table, click in the **Name** field. Enter the name and press Enter.

8.3.6 Contact Attribution Commands

Table 15 provides a quick reference of the attribution commands and methods of executing the commands. The methods available to execute the commands are bulleted to clarify when multiple execution methods exist.

Table 15. Contact Attribution Commands

Command	Action
Rename	• In the thumbnail list, right-click on a thumbnail and click **Rename**. Enter the name and press Enter. • In the properties table, click in the **Name** field. Enter the name and press Enter.
Add comment	• In the thumbnail list, right-click on a thumbnail and click **Edit comments**. Enter the comment and press Enter/click **Okay**. • In the properties table, click in the **Comments** field. Enter the comment and press Enter.

Command	Action
Define tag in database	• In the thumbnail list, click the **Search** drop down menu and click **Create Tag**. Enter the tag name and click **OK.** • Also in the thumbnail list, right-click on a thumbnail, hover over **Tags** and click **Assign new tag**. Enter the tag name and click **OK**. This adds the new tag to the contact and the database.
Assign tag to contact	• In the thumbnail list or the contact display, right-click on a thumbnail/contact, hover over **Tags** and click **Assign new tag**. Enter the tag name and click **OK**. This adds the new tag to the contact and the database. • Also in the thumbnail list or the contact display, right-click on a thumbnail/contact, hover over **Tags** and click the checkbox next to any tags to check it. Click anywhere outside the context menu to hide the menu.
Remove tag from contact	• In the thumbnail list or contact display, right-click on a thumbnail/contact, hover over **Tags** and click the checkbox next to any tags to uncheck it. Click anywhere outside the context menu to hide the menu.
Mark the contact center	• In the toolbar, click the **Mark the contact center** icon. Click the new center on the contact display. • In the contact display, right-click and click on **Center.** Click the new center on the contact display.
Measure width	• In the toolbar, click on the **Measure Width** icon. Click on the extreme edge of the widest part of the object in the contact display, drag the mouse to the opposite edge, and release the mouse button. • In the contact display, right-click on the contact in the display and click **Width**. Click on the extreme edge of the widest part of the object in the contact display, drag the mouse to the opposite edge, and release the mouse button.
Measure length	• In the toolbar, click on the **Measure Length** icon. Click on the extreme edge of the object in the length dimension, drag the mouse to the opposite edge, and release the mouse button. • In the contact display, right-click on the contact in the display and click **Length**. Click on the extreme edge of the object in the length dimension, drag the mouse to the opposite edge, and release the mouse button.

Command	Action
Measure shadow length	• In the toolbar, click on the **Measure Shadow Length** icon. In the contact display, click on the beginning of the shadow, closest to the object, and drag the mouse *in the direction the shadow is cast*. Release the mouse button at the far edge of the shadow. • In the contact display, right-click on the contact and click **Shadow length**. Click on the beginning of the shadow, closest to the object, and drag the mouse *in the direction the shadow is cast*. Release the mouse button at the far edge of the shadow.
Calculate Height	• In the Properties table, enter the altitude of the sensor at the approximate time and position that the contact was marked in the unit shown in the **Altitude** field.

8.4 Group Contacts

Your survey will most likely generate multiple images of the same object. You may have noticed this while you were attributing your contacts. Using SAMM's grouping feature on multiple images of the same object defines a relationship between contacts in the database. To group contacts, click on a thumbnail in the thumbnail list and drag it over another thumbnail, then release the mouse button. The receiving contact becomes the group reference. You can also group contacts by selecting multiple contacts and right-clicking on a thumbnail, then selecting **Group contacts** from the context menu. The contact selected first becomes the group reference. No observations are deleted; the other grouped contacts are kept.

The clearest, most accurate contact should be used as the group reference, because it is the contact that holds the attributes for the group. The properties of the other grouped contacts are suppressed in the staging table. To change the group reference, right-click on the tile in the contact display and click **Set as group reference** (Figure 86). You may ungroup contacts by right-clicking on the thumbnail or contact tile and clicking **Ungroup contacts**.

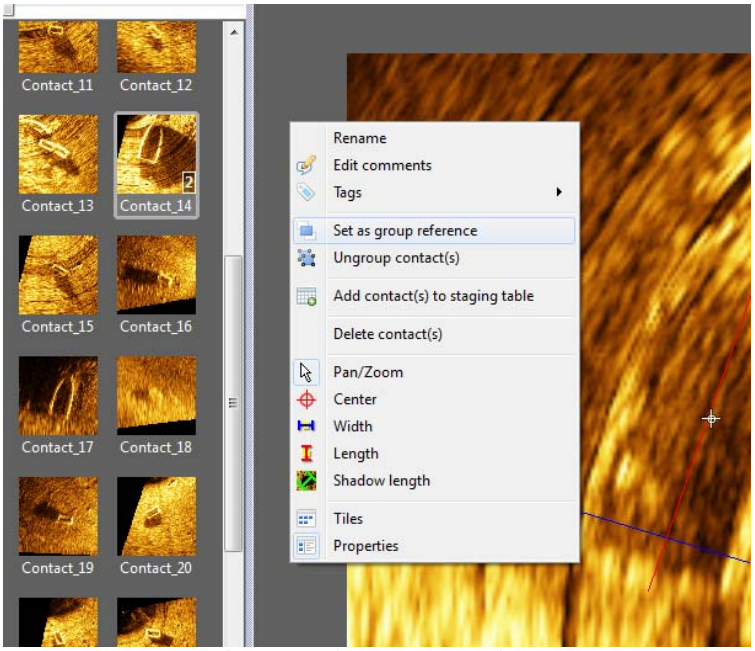


Figure 86. Grouped Contacts and Context Menu

After you have removed redundancies in your dataset by grouping unique objects, you are ready to export the contacts.

8.5 Export Contacts

The staging table, as the name implies, controls which contacts are exported to the *.html and *.xml reports.

8.5.1 Send contacts to the staging table

To efficiently add contacts to the staging table, limit the thumbnail list by searching and filtering, then batch select the contacts. Searching the thumbnail list hides all of the contacts that do not match the search terms. To search by name, enter the name in the **Search** field. You may also search the tags list for tag names. To do this, either click on the **Search** dropdown menu in the thumbnail list, or right-click on a thumbnail/tile and hover over **Tags**. Then, enter the name of the tag in the field. Clear the search using the **Clear search** button.

You may also filter by tag to limit the thumbnails shown in the list. To do this, access the tags window in the same way by either clicking on the **Search** dropdown menu in the thumbnail list, or right-clicking on a thumbnail/tile and hovering over **Tags**. Then, click the checkbox next to the tag whose thumbnails you want to keep in the thumbnail list. Or, enter `tags://` and then the name of the tag in the search bar (Figure 87).

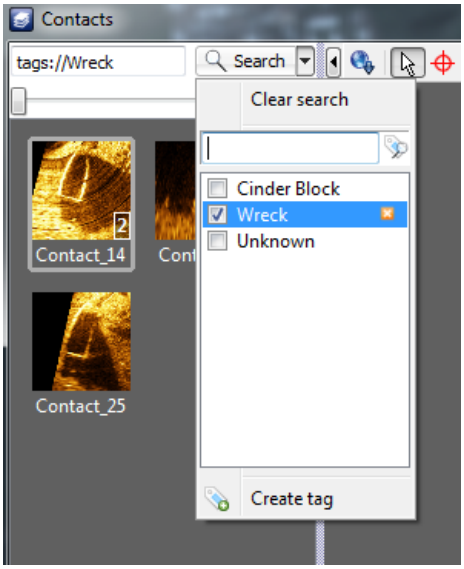


Figure 87. Filtering by Tag

To send contacts to the staging table, right-click on the selected thumbnails/tiles and click **Add contact(s) to staging table**. You can select all, multiple adjacent, or multiple non adjacent thumbnails in the same way as viewing them in the contact display (Section 8.2). The staging table will appear at the bottom of the Contacts interface, with contact and properties displayed in a tabular form.

8.5.2 Prep the Staging Table

At this time, most of the formatting functions in the staging table are for display purposes only. The order of the contacts in the table, however, is preserved in the report. Sort the table by clicking on the column name. Text fields sort alphabetically while numeric fields sort sequentially, in ascending or descending order. A small up arrow signifies ascending, while a small down arrow signifies descending.

To remove contact(s) from the staging table, select them in the table and either click the **Remove contact(s) from staging** table icon or click this command on the right-click context menu. You may also choose to limit the display of thumbnails and tiles to those present in the staging table; use the **Show contact(s)** icon or context menu command to perform this action for contacts selected in the staging table. This assists in building your report because it shows you which images will be exported.

8.5.3 Create a Report

You can export reports in *.html and *.xml format from the staging table. To build the report:

1. In the staging table, sort the table to set the report order.
2. Click the **Create report** icon ( ).
3. In the Create Report window, navigate to the file location to save your report. The default file location is the project folder.
4. Enter a file name.
5. Click **Save**.

When you click Save, a popup window greets you with a successful report notification (Figure 88). Accept the message by clicking **OK** or view the report in a browser by clicking **Open**.

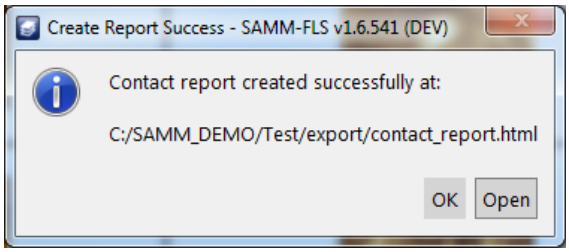


Figure 88. Create Report Success Window

The report export function creates a folder and three files in the project folder: one *.html file, one *.xml file of the same name, one targetexport.css file and one folder of the same name with "_images" appended to the name. This folder contains the *.png tiles of each contact. The *.html file contains each contact tile with its attributes displayed on the right in report form. *At this time, the report includes the Name, Time, Lon/Lat, Easting/Northing, Range, Heading, Sonar Altitude, Sonar Depth, Image Resolution, Measured Width, Measured Length, Measured Shadow, Height from Shadow, and Comment fields.*

8.5.4 Send Contacts

SAMM can send contacts over the network or a serial connection. Before sending contacts, make sure to set up the connection to send contacts (Section 4.5).

1. Add contacts you want to send out in the staging table.
2. Click the **Send Contact(s)** icon ( ).

8.5.5 Export Contacts

You can export contacts in csv format. To export contacts:

1. Add contacts you want to export in the staging table.
2. Click the **Export Contact(s)** icon ( ).

8.5.6 Delete Contacts

When reviewing the contacts, you may find contacts that are irrelevant to your purpose. If you desire to delete the contacts, select the contact(s), right-click on the selected thumbnails/tiles and click **Delete contact(s)** or press the delete key. Deletion is permanent. As an alternative to deletion, you may choose to export these contacts before deleting them from the project so that they are preserved in report form. A less efficient way of recovering deleted contacts is to remark them in playback mode.

8.5.7 Contact Organization Commands

Table 16 lists the organization commands and the methods to execute them as a quick reference. The multiple methods available to execute the commands are bulleted.

Table 16. Contact Organization Commands

Command	Action

Command	Action
Group contacts	• In the thumbnail list, click and drag the thumbnail over the group reference contact. • In the thumbnail list, select contacts to group, then right-click on one of the thumbnails and click **Group contact(s)**.
Ungroup contacts	• In the thumbnail list or contact display, right-click on the thumbnail/contact and click **Ungroup contact(s)**.
Set group reference	• In the contact display, right-click on the thumbnail/contact and click **Set as group reference**.
Search by name	• In the thumbnail list, enter the search term in the **Search contacts** field.
Search by tag	• In the thumbnail list, click on the **Search** dropdown menu, then enter the tag name in the field. • In the thumbnail list or contact display, right-click on a thumbnail/contact, hover over **Tags** and enter the tag name in the field.
Filter contacts by tag name	• In the thumbnail list, click the **Search** dropdown menu and click the checkbox next to the tag. • In the thumbnail list or contact display, right-click on a thumbnail/contact, hover over **Tags** and click the checkbox next to the tag. • Enter `tags://` and then the name of the tag in the search bar.
Add contacts to staging table	• In the thumbnail list, select contacts (single, multiple adjacent, multiple non adjacent, all) then in the thumbnail list, right-click on the thumbnail/tile and click **Add contact(s) to staging table**. • In the contact display, right-click on a tile and click **Add contact(s) to staging table**.
Sort by column	• In the staging table, click on the column name.
Remove contact(s) from staging table	• In the staging table, click on the contact(s) to select, then click the **Remove contact(s) from staging table** icon • In the staging table, click the contact(s) to select, then right-click and click **Remove contact(s) from staging table**.
Show only those contacts in the staging table in the thumbnail list and contact display	• In the staging table, select the contacts to show and click the **Show contact(s)** icon in the toolbar. • In the staging table, select the contacts to show, right-click and click **Show contact(s)**.
Delete contact(s)	• In the thumbnail list, right-click on selected thumbnails and click **Delete contact(s)**. • In the contact display, right-click on a tile and click **Delete contact(s)**.

Command	Action
Export a report	• In the staging table, sort by column to set the report order, then click the **Create report** icon. Enter a file name, change the file location if desired, click Save, and then click **OK** to return to the Contacts window or **Open** to view the *.html report in a browser.

8.6 Contacts Tutorial

This example demonstrates some of the contact features available in OIC's SAMM. Follow the directions with the sample data to learn to mark contacts, measure them, and create a report. As before, launch SAMM, create a project and select some FLS data for playback. Commence playback, and make sure the Forward Look window is open.

1. Look for something interesting in your Forward Look window. Double-click on it.
   - A small blue tack appears in the corresponding location in the mosaic window.
2. Mark three more targets in the same manner.
3. Click the **Contacts** tab (click **Contacts** icon if you don't see the tab).
   - The Contacts window opens. Not all elements of the Contacts window are visible yet.
4. Click on the **Contact_0** thumbnail.
   - The contact displays in the contact view.
5. Click the **Properties** icon on the toolbar (mouse over the buttons to see the names.)
   - The properties table opens on the right side of the Contacts window.
6. Click the **Measure Width** icon on the toolbar. Click on the extreme edge of the widest part of the target, drag the mouse to the opposite edge, and release the mouse button.
   - A blue line appears, representing the contact width.
   - The width field in the right panel displays the width in meters.
7. Measure the length and shadow length in the same manner. Measure the shadow in the direction the shadow is cast. You can enter the altitude, if known, in the properties table to calculate the height of the target.
8. Right-click on the contact icon and select **Add contact(s) to staging table**.
   - The staging table appears at the bottom of the Contacts window, with attribute information in a tabular view.
9. Click on **Contact_1** to select it. Hold Shift and click on **Contact_3** to select the second, third, and fourth contacts. Right-click and select **Add contact(s) to staging table**.
   - SAMM adds the contacts to the staging table. The Width (m), Length (m), and Shadow Length (m) fields are blank for contacts that you have not measured.
10. Right-click on any of the field names. Uncheck Sensor Latitude and Sensor Longitude.
    - They are no longer displayed in the table. This works for any column.
11. Click on the Latitude column.
    - SAMM sorts the table by ascending latitude. This works for any column.
12. Click the **Create report** button. Enter a file name and set the file location and click **Save**.
    - SAMM exports an .html file with images.
13. Close the Contacts window.

9 Additional Features

SAMM has four additional features present in the toolbars: the Meta data properties window, select tool, measure tool, and export tool. The “GoTo” and “Waypoints” tools are addressed in Appendix A.

9.1 Meta data properties

The meta data properties window displays various sonar and navigation/heading sensor properties, which can be used for informational and troubleshooting purposes.

To view meta data propertis:

1. Click the **Meta Data Properties** tab (click the **Meta data properties** icon in the toolbar if you don't see the tab).
2. Expand each items to view detailed information (Figure 89).

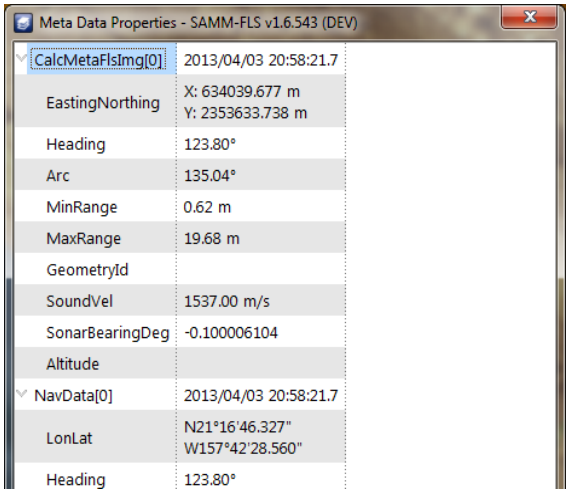


Figure 89. Meta data properties window

9.2 Select tool

The select tool allows the user to select swaths or contact markers in the Mosaic window. When a swath is clicked in the mosaic window, the corresponding swath in the Swath list will be highlighted. When a contact marker is clicked, the corresponding contact will be highlighted in the contact list and displayed in the contact view in the Contacts window.

9.3 Measure tool

The measure tool can be used to measure any portion of the mosaicked imagery in linear units.

To use the measure tool:

1. Click the **Measure tool** icon in the toolbar.
2. Click two or more points in the mosaic window between which you want to measure distance (Figure 90).
3. Click at the point to delete it or drag the point to move it.

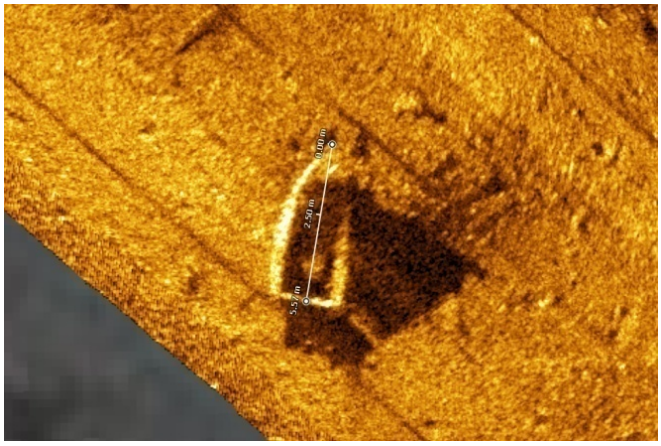


Figure 90. Measure Tool

9.4 Mission Tools

SAMM supports mission planning and analysis such as creation and export of waypoints. Mission tools are discussed in Appendix A.

9.5 Export Tool

The export tool integrates SAMM directly into your workflow, no matter which spatial analysis software package you use, by exporting in the widely readable GeoTIFF and Ascii XYZ formats or the freely accessible Google Earth format. The tool saves the mosaic as a geocoded image as it appears in the mosaic window or a xyz grid, with respect to swath layering and rendering properties. To export your mosaic, access the Export dialog from the **Export** icon (Figure 91). Note that the Export icon is only available in post-processing mode. If you are in acquisition or playback mode, exit the mode by clicking the **Stop adding data** icon on the toolbar. New formats for export are discussed in Appendix A.

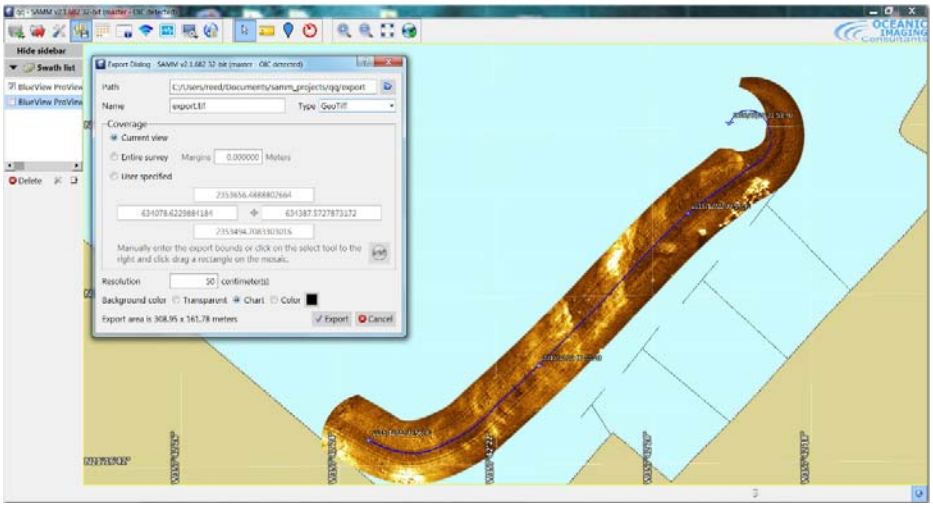


Figure 91. Export dialog

The default output folder is set to the export folder in the project and the file is named `export`. You may change the output folder by entering the new path into the **Folder** field or clicking the

folder button. Change the file name by entering it in the **File** field. Export file format can be selected from the dropdown menu next to the File field. The remaining file export options are available in the Properties subpanel of the export window. These include the coverage, resolution, and background color.

9.5.1 File Type

SAMM supports export to GeoTIFF, Tiled GeoTIFF(s) (*.tif or *.tiff), Google Earth (*.kmz, Tiled Map), Kenautics Missions and XYZ formats. Tagged-Image File Format (TIFF) files are a raster imagery file type. Rasters, as mentioned in Section 5.2, store data in a grid of pixels. GeoTIFFs are TIFFs with geographic tags embedded in the file, so the data (image that you see) and metadata (location information that allow placing the file on a map) are encoded in the same file. The format is an industry standard, and GeoTIFFs created in SAMM can be read in any program that reads GeoTIFFs as well as regular TIFFs (in most circumstances).

When exporting to Tiled GeoTIFFs, SAMM subdivides exported areas into smaller areas (2,048 x 2,048 pixels), referred to as tiles. Tiles are useful when working with survey data that will result in excessively large file sizes (due to survey size and/or high resolution exports) when exported to GeoTIFFs. Tiles that do not have any survey data within them will automatically not be exported, which helps to reduce the overall file size associated with the export as well as the time required to process an export. Figure 92 provides an example of the advantage of using tiles.

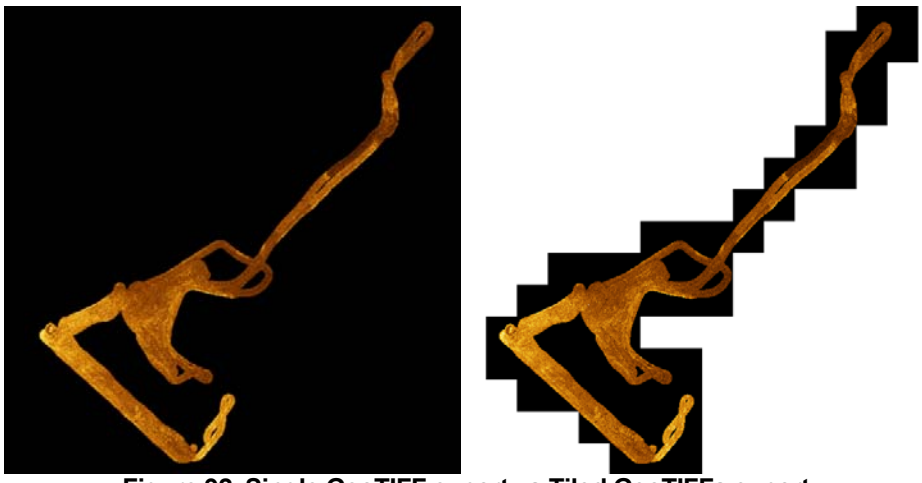


Figure 92. Single GeoTIFF export vs Tiled GeoTIFFs export

GoogleEarth files are the native file type for Google's mapping program. SAMM's *.kmz export can be added to a GoogleEarth map for further analysis or creating maps for reports (Figure 93).

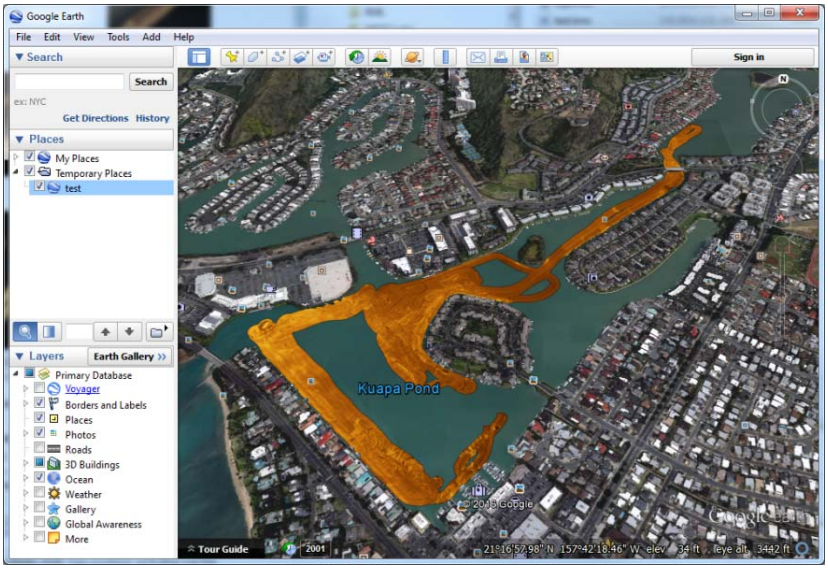


Figure 93. Exported data displayed in GoogleEarth

Tiled Map (MapTiler) export results in a sequence of folders containing maps at increasing resolution, allowing rapid zooming and display. The Kenautics Mission export option creates the CHARTS folder and the MissionYAML file, with the CHARTS folder filled in with a MapTiler map (Appendix A).

SAMM also exports bathymetry swath data created from altitude to Ascii XYZ files.

9.5.2 Coverage

The user may elect to export the visible extent of the mosaic, the entire survey or some user specified area. If you would like to limit the exported data to the extent of the mosaic window, set the extent of the mosaic window before opening the export tool. If you want to specify the export coverage, select User specified and manually enter the export bounds or click on the select tool and click-drag a rectangle on the mosaic.

9.5.3 Resolution

The resolution can be set between 0.1 cm (1 mm) and 1,000 cm (10 m). Because higher resolution images mean larger file sizes, plan on SAMM taking more time to export images of higher resolution.

9.5.4 Background color

SAMM allows the user to set the background color of the exported GeoTIFF image to either transparent or desired color, or to use the background image/chart. GoogleEarth export always sets the background to transparent.

9.5.5 Export Tutorial

This brief tutorial demonstrates how to export a mosaic file.

1. Be sure that you are in post-processing mode. Click the **Stop adding data** icon to exit from acquisition or playback mode.

2. Arrange the swaths with the clearest images on top (click and drag from the Swath list- see Section 7.2).
3. If you do not want to export the entire mosaic at once, pan and zoom in the mosaic window until the window only shows the extent of the mosaic for export.
4. Click the **Export** icon.
   - The Export Dialog displays.
5. In the **Path** field, change the path of the file by clicking the **folder** button. In the Export window, navigate to the desired folder and enter the file name. Click **Save**.
6. From the file format dropdown, choose **GeoTIFF, Tiled GeoTIFF(s)** or **Google Earth**.
7. In the **Coverage (visible swaths)** field, choose either **Current view** or **Entire survey**.
8. In the **Resolution** field, set the desired resolution.
9. In the **Background color** field, select either Transparent or Color. If Color is selected, click on the color button to set the background color.
10. Click **Export**.
    - SAMM function is halted while it builds the export file.

10 End Acquisition and Close Project

To stop data playback, or acquisition, and close the project:

1. Click the **Stop adding data** icon in the toolbar and click Yes in the popup window to end playback or acquisition.
   - SAMM stops painting swaths.
   - The FLS overlay and vessel icon disappear, and the Live info, Playback controls, Processing controls also disappear from the sidebar.
2. Click the **Close Project** icon.
   - SAMM saves the project automatically before returning to the opening screen.
3. Click **Close** to exit SAMM.