3DSS-DX-450 Sonar Data Overview

3DSS™ Data Outputs

The 3DSS-DX-450 Sonar simultaneously outputs three different data types:

1. Conventional 2D Sidescan data – port and starboard Range, Amplitude samples (1.3cm range increment per sample).
2. 3D Sidescan data – port an starboard Range, Angle, Amplitude samples (1.3cm per sample range increment) where multiple simultaneous angles-of-arrival at the same range are individually resolved in angle and amplitude.
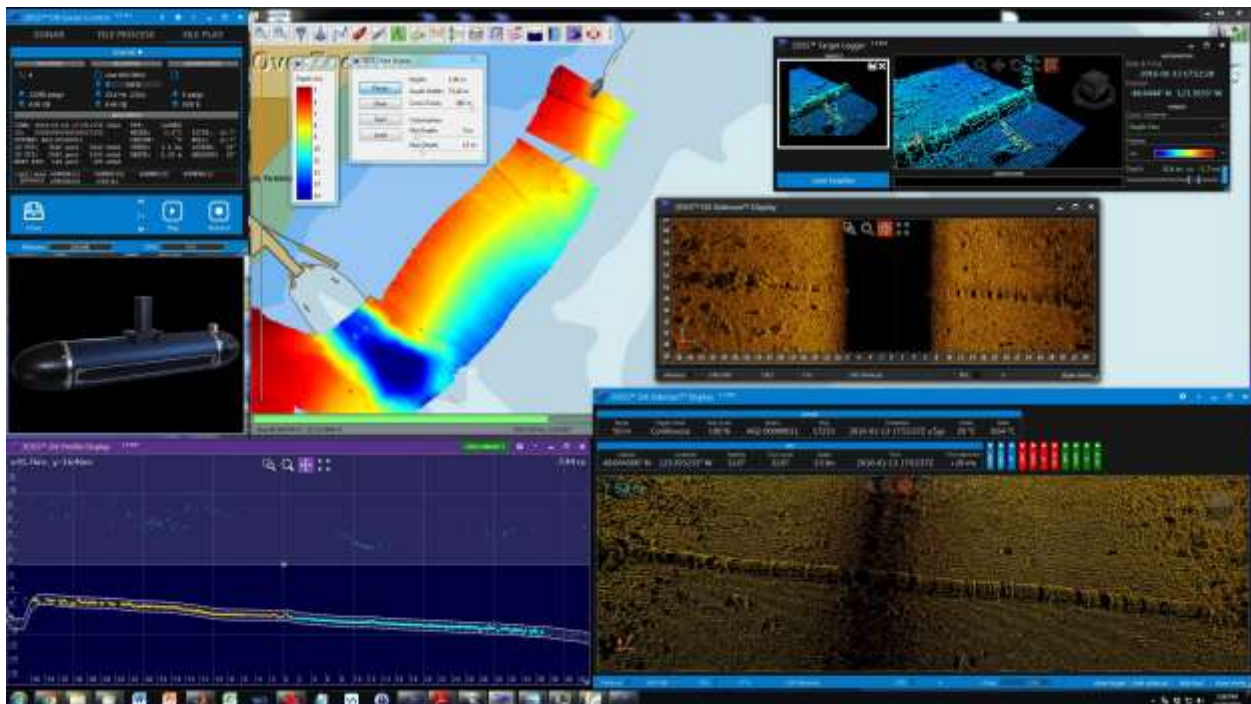3. Bathymetry data – depth soundings from the seabed at evenly spaced intervals to port and starboard.

Figure 1. 3DSS™ real-time display example showing all four *3DSS-DX-450* real-time displays including, the *3D Sidescan Display*, the *2D Sidescan Display*, the *Bathymetry Profile Display*, and the *Bathymetry Chart Display*. The combination of 3D imagery and wide area coverage Bathymetry from the compact *3DSS-DX-450* provide a detailed view of the seabed and its morphology together with objects on the seabed and in the water-column (e.g. measurements of the pipe on the seabed in the top right corner are made using the *3D Target Capture* feature).

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3DSS™ Data DISPLAYS

3DSS™ 3D AND 2D SIDESCAN DISPLAY

The 3D Sidescan Display program provides both real-time and post-time 3D sidescan and 2D sidescan data display simultaneously in separate windows. Both displays are waterfall type displays that show the most recently acquired data over a specified number of pings. These displays do not make use of navigation information for mosaicing or map creation.

For area surveying and map creation, the *3DSS-DX-450* sonar system is compatible with several third party survey software packages (e.g. Hypack, SonarWiz, QINSy, CARIS HIPS/SIPS).

The 3D Sidescan Display includes the 3D Target Logger which allows real-time or post time selection of displayed objects of interest for capture and logging in a target catalogue. Captured targets can be measured in three dimensions, included position and time and can be annotated with user comments.
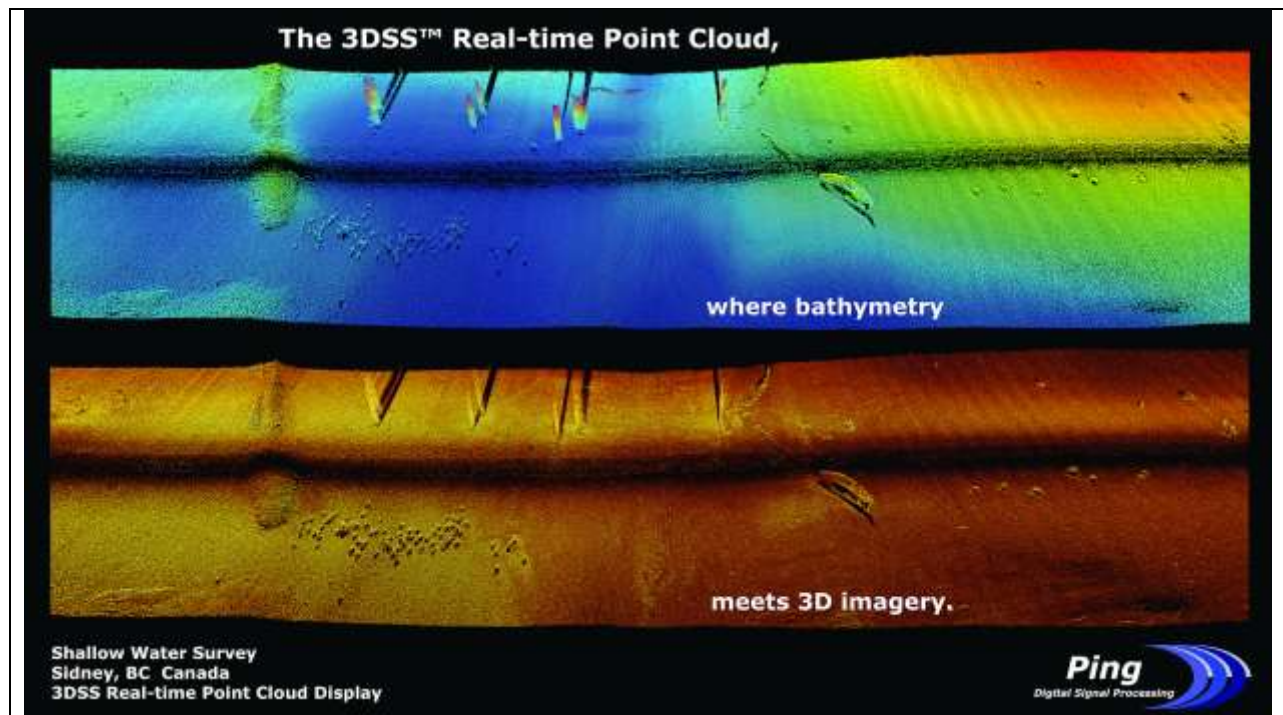

a) Raw 3D Sidescan point cloud data view of seabed, pilings, small wreck and rocky features near Sidney, BC Canada. Seabed topogrphy and morphology are shown simultaneously by viewing the same data set colorized by depth (top image) and by backscatter amplitude (lower image). 3D Sidescan imagery shows seabed and water-column features with true three dimensional geometry.
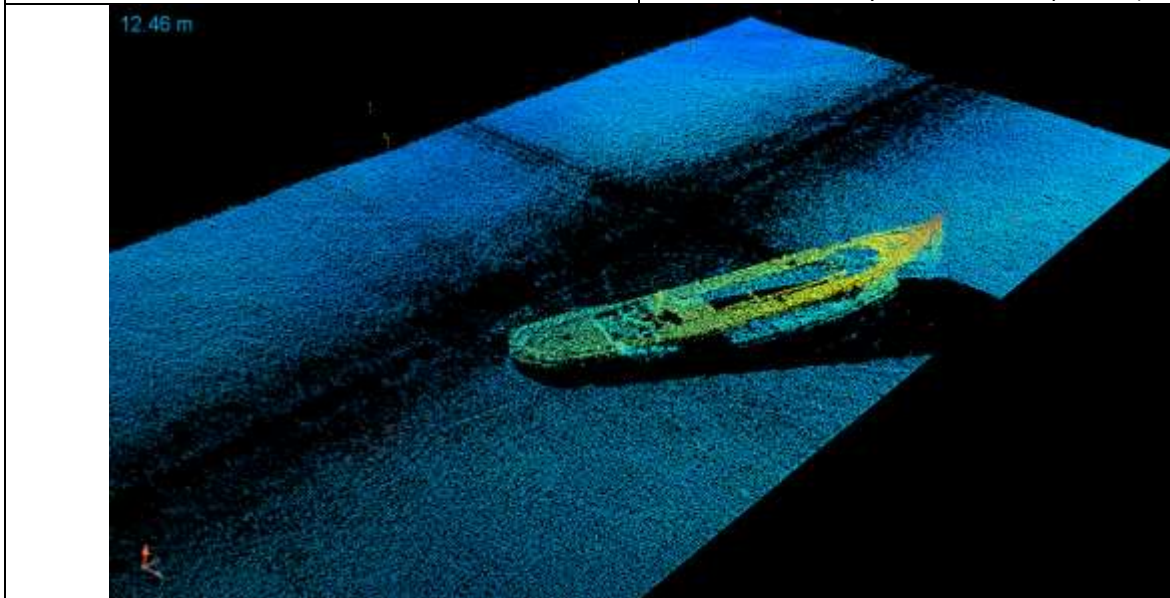
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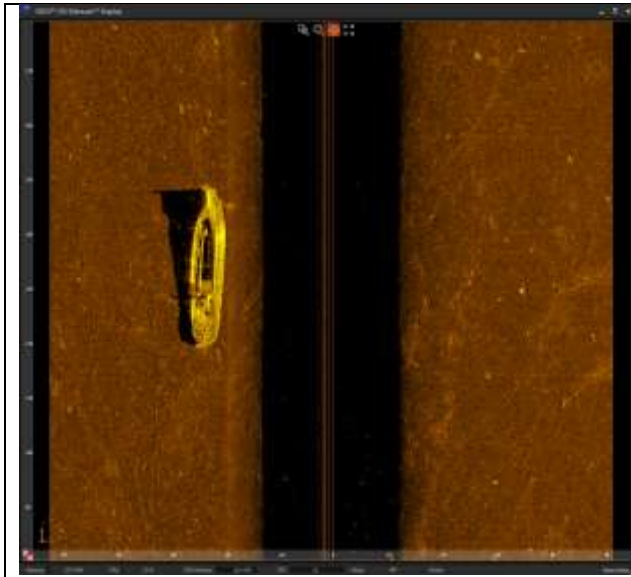
b) 2D Sidescan view of J.E. Boyden wreck in Lake Union, Seattle.
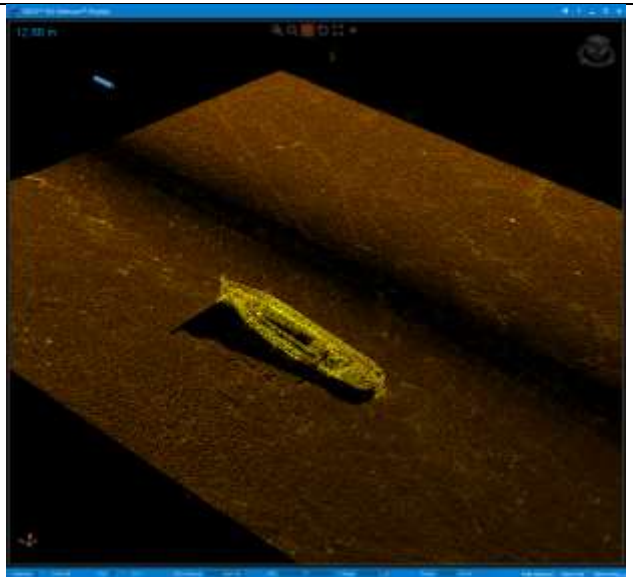
c) 3D Sidescan view of J.E. Boyden wreck colorized by backscatter amplitude (raw data)

d) Alternate 3D Sidescan view of J.E. Boyden wreck colorized by depth (raw data).

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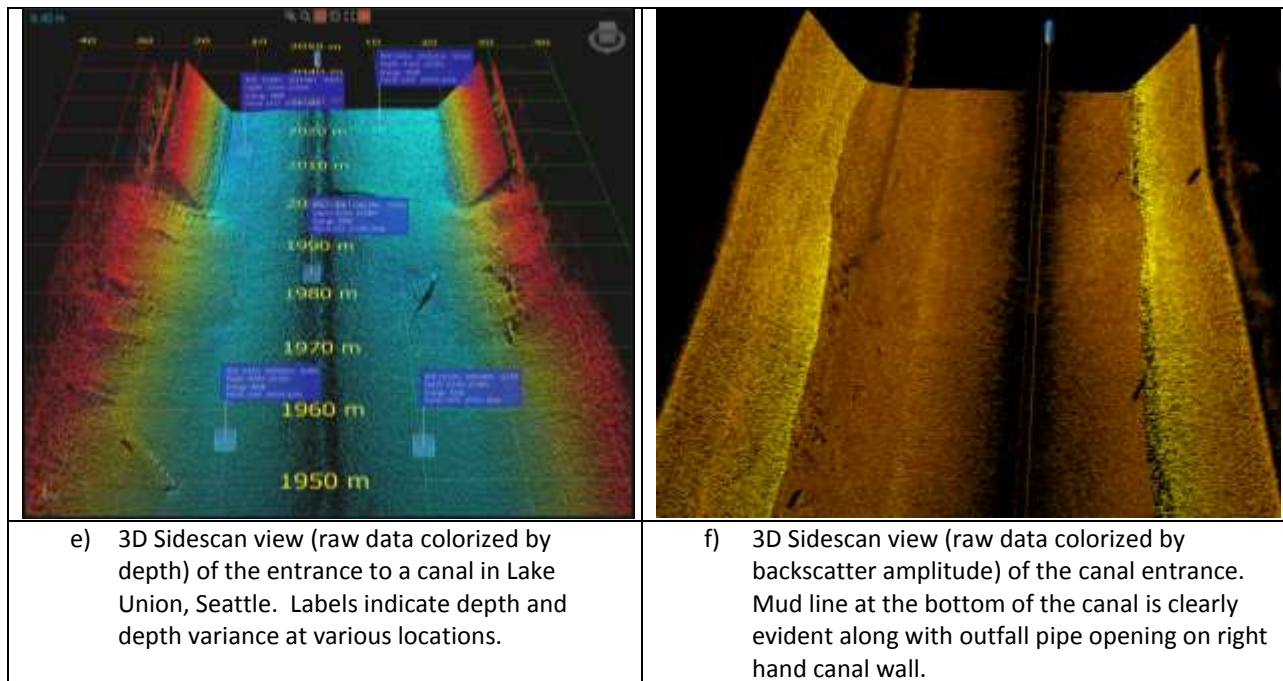| e) 3D Sidescan view (raw data colorized by depth) of the entrance to a canal in Lake Union, Seattle. Labels indicate depth and depth variance at various locations.	f) 3D Sidescan view (raw data colorized by backscatter amplitude) of the canal entrance. Mud line at the bottom of the canal is clearly evident along with outfall pipe opening on right hand canal wall.

Figure 1. 3DSS™ real-time 3D Sidescan display screen captures.

3DSS™ BATHYMETRY CHART DISPLAY

The 3DSS Chart Display is an OpenCPN based plugin that overlays bathymetric data from the 3DSS-DX-450 sonar onto a chart.

o Displayed bathymetric data is pitch and roll corrected using the 3DSS-DX-450's internal MRU and is binned prior to being displayed.
o Bathymetry colorization can be adjusted by setting a minimum and maximum depth.
o The 3DSS™ Chart Display supports both real time acquisition and file playback.
o Provides the option to save and load bathymetry overlay for future reference.
o Waypoints are automatically placed when playing back from or recording to a new file; showing where each file begins and ends on the map.
o OpenCPN provides navigational and survey planning features and supports a variety of external plugins.
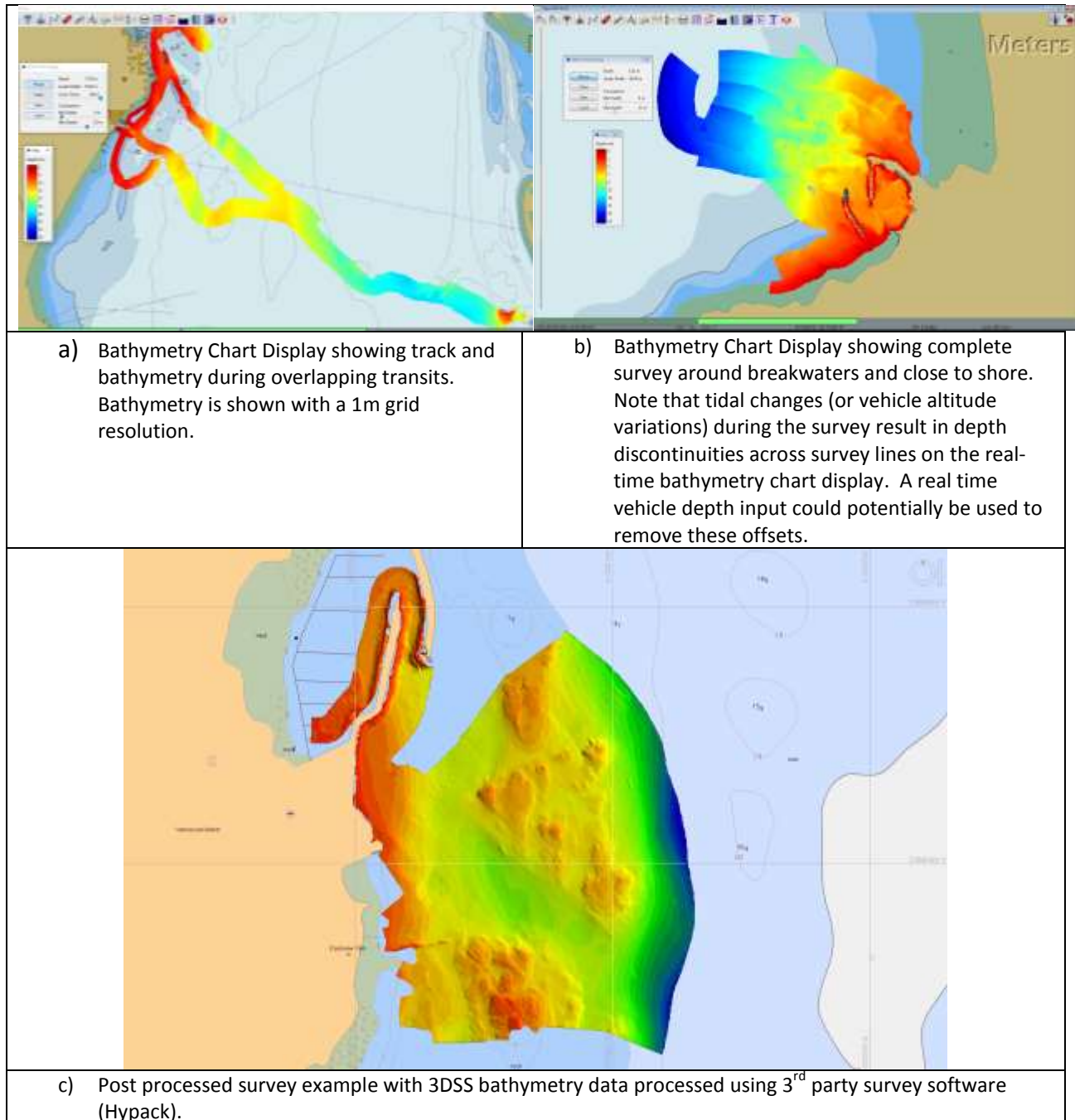
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| a) Bathymetry Chart Display showing track and bathymetry during overlapping transits. Bathymetry is shown with a 1m grid resolution. | b) Bathymetry Chart Display showing complete survey around breakwaters and close to shore. Note that tidal changes (or vehicle altitude variations) during the survey result in depth discontinuities across survey lines on the real-time bathymetry chart display. A real time vehicle depth input could potentially be used to remove these offsets. |

c) Post processed survey example with 3DSS bathymetry data processed using 3rd party survey software (Hypack).

Figure 2. 3DSS™ real-time Bathymetry Chart Display and post processed survey result produced using 3rd party survey software.

3DSS™ BATHYMETRY PROFILE DISPLAY

The *Bathymetry Profile Display* program is provides both real-time and post-time bathymetry cross-section display for each sonar ping. The profile display shows both the raw 3D sidescan profiles and the bottom tracked and equidistant binned bathymetry output. The port and starboard raw 3D sidescan points are colored by the return intensity. The generated bathymetry for port and starboard is colored in orange and cyan respectively. The position of the bottom track filter is drawn in white, and any raw 3D sidescan points falling outside of the bottom track cells are excluded from bathymetry. The size of the individual Bathymetry and 3D points on the display can be adjusted in the settings menu.
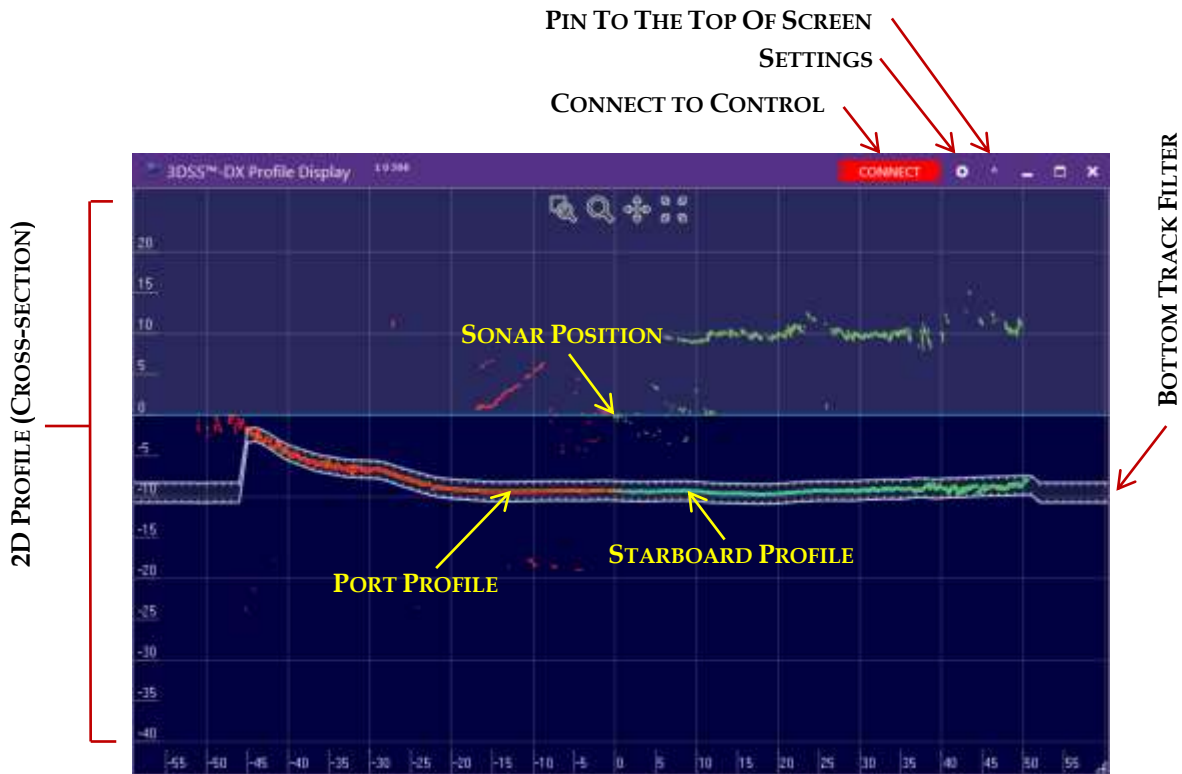

Figure 3. 3DSS™ real-time Bathymetry Profile Display showing a single ping with the bottom track window bracketing bathymetry data to port and starboard and raw backscatter multipath displayed outside the bottom track window.