October 2021

Mind the Gap – in Sidescan

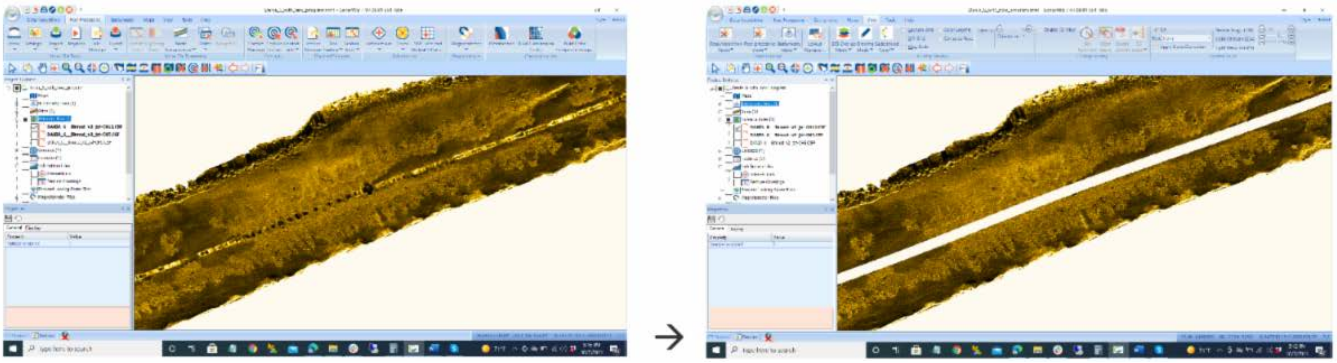
The traditional sidescan system with port and starboard channel have the inherent “space” between the channels when viewing the data. Once bottom tracked, the two sides get stretched to form a filled area. However, the imagery at and close to nadir is never ideal; identifying targets are difficult, and any shadows from them would be small. Standard operation would be to run additional sidescan lines offset from the original line, with good imagery to fill in the data at the nadir area. A decent solution but one that comes with a penalty. A full survey line needs to be run to fill an area that might be just 10 meters wide (based upon the height of the towfish).

Another option has been to fit an extra Forward Looking Sonar, usually to the nose of the towfish, but the oblique angle of the FLS data versus the standard sidescan typically makes for issues when blending the two data sources into one overall data mosaic. Two recent solutions have been proposed: Klein’s MAX-View 600 and EdgeTech's 2205 system. Chesapeake has been able to process these files to add in the gap data between the two sides. What’s interesting is that the two sonars use a different technology and methodology to accomplish this feat, as they both solve the gap problem.

The latest innovation from EdgeTech is the ability to see the nadir gap from both the left and right sides, providing shadows from either direction, as well as in a three- dimensional aspect in the nadir gap. In the EdgeTech Gap-Fill, the shadows are perpendicular to the vehicle’s path and consistent with traditional side scan methods, enabling easy interpretation of data. The gap fill data in the 2205 system is coincident with the side scan data and is therefore geospatially the same.

Along the way, SonarWiz had to be modified to handle the extra data. In the next release, changes to CH5-CH6 have been added. This provides file specific options for JSF files and a new way to blend these multiple channels when they overlay one another. The last point allows the user to have the traditional sidescan data, add in the gap data, and see a nice, nearly seamless merge with the two overlaps. There is no sense adding in a gap fill with a noticeable area where they overlap a lot.

I also found a few subtle tools to make the combined image look like a single filled swath. From the original data, bottom track as normal. But then, remove the small nadir region (3 – 4 meters), to totally clear out the data. Since we have overlapping data, we will fill this in with the other channels.



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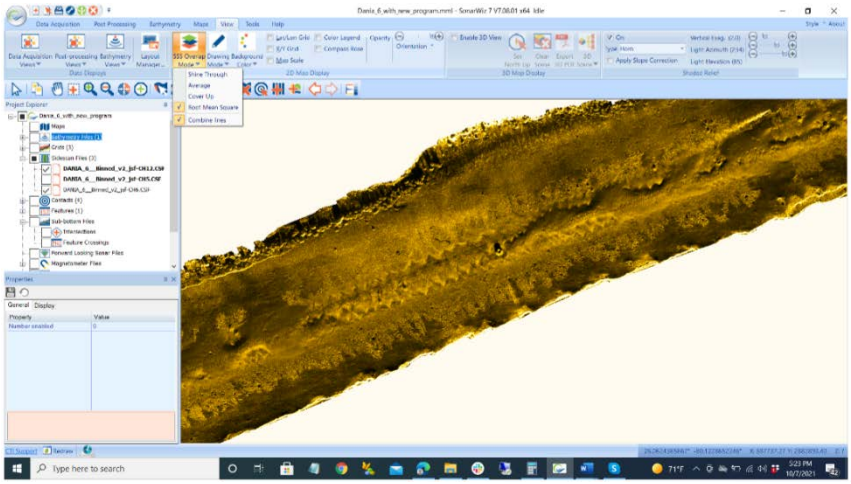
Next, we import the gap fill channel. For the EdgeTech, CH5 is the port side looking towards starboard, CH6 is the starboard side looking to port. They have the same footprint, but we can see the shadows will appear differently on the two.

With the new overlay method “combined”, all files enabled will be blended with the algorithm selected. I like RMS, but give the others a try, and see which one works best for you. What’s really great for the overall mosaic, is that EdgeTech have cleverly managed to propagate the signal intensity in the Gap-Fill results, so alongtrack the Gap-Fill result matches the traditional sidescan as the signal intensity changes with the varying seabed type/material.

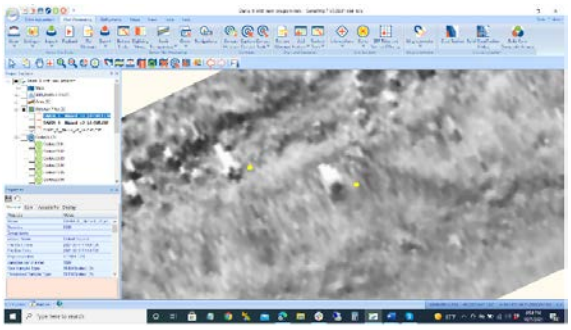
CH1-CH2 and CH6 data. Note the tire at center, which was at nadir of the sidescan.



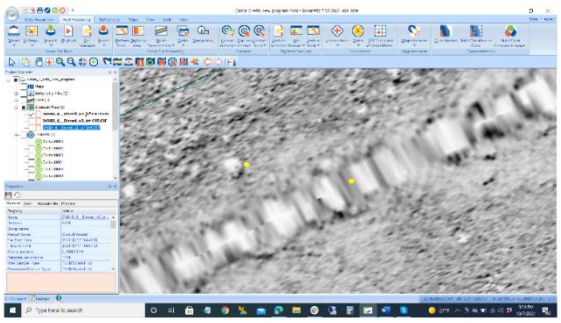
The idea of the gap fill is not just to fill the area at nadir, but to allow for targets to be easily visualized and measured. For that, we need shadows.

I identified two near nadir targets using the gap fill line, marking each with a point feature (in yellow). Overlaid on traditional Sidescan CH1-2, these would be hard to pick out and even harder to measure. Note one target is right at nadir and would be missed.

Gap Fill Line:



Traditional Sidescan Line:



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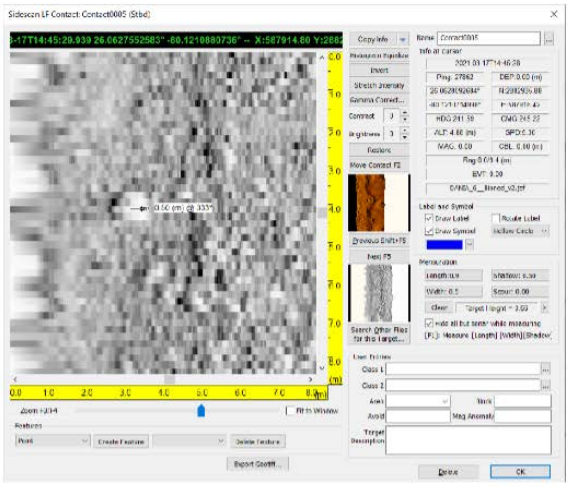
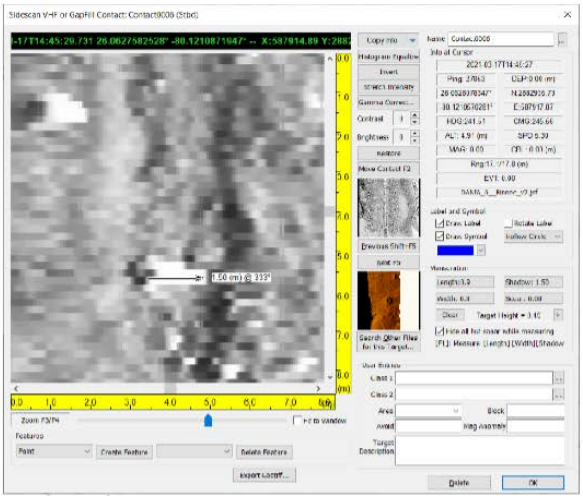
Measuring targets from both data sets, they are 50cm in height. However, the gap fill line had a larger shadow to work with.

Target from CH1-2 line

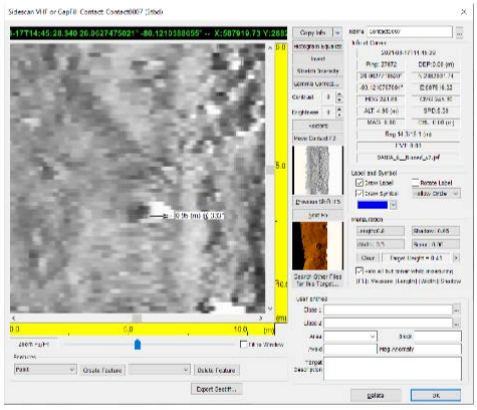


Traditional Sidescan Data



Gap Fill Data

What's more impressive is the target right at nadir. It is indistinguishable in the traditional sidescan data. However, the gap fill showed a clear target with a shadow, so that we can identify a 40cm tall rock.



This advantage of adding extra data during the same survey line will make survey work go faster, minimizing the total survey lines needed for full coverage.

In London, when riding the tube, we are always aware of the Mind the Gap announcement. With these gap fill sonars, we are now "Filling the Gap."

- Harold Orlinsky, General Manager

Chesapeake Technology, Inc., makers of SonarWiz software, is a privately held company based in Mountain View, California. SonarWiz is used by thousands worldwide, representing clients from government and private industries, leading academic institutions, and many of the world's navies.

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