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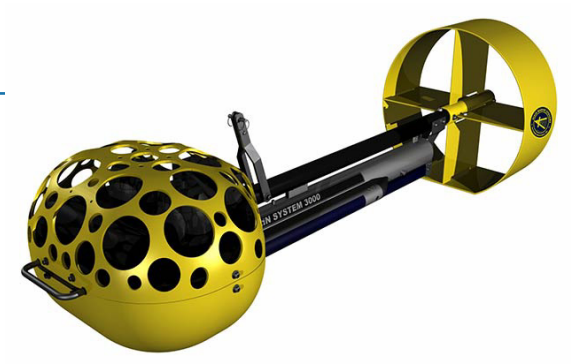
# Development – HSX CONVERTER Supports Klein K-Chirp SDF Data

By Peter Ramsay

## INTRODUCTION

Klein Marine Systems has a Chirp sub-bottom profiler (K-Chirp Model 3310) which mounts on the front of a Klein 3000 side-scan sonar to produce a combined towed side-scan/sub-bottom profiling system (Figure 1). The K-Chirp system is in a Mills Cross configuration and consists of two transmit transducers and a linear hydrophone receiver. This towfish acquires four channels of side-scan sonar data (100/500 kHz) and one sub-bottom profiling channel which is stored in a single SDF format file.

***FIGURE 1.*** *Klein Marine Systems K-Chirp Model 3310 attached to a Klein 3000 side-scan sonar.*



One HYPACK customer asked if he could process the SDF format sub-bottom profiling data acquired in SonarPro using HYPACK® SUB-BOTTOM. HYPACK worked with Klein Marine Systems to further our understanding of the sub-bottom profiling data in the SDF file format to assist the customer.

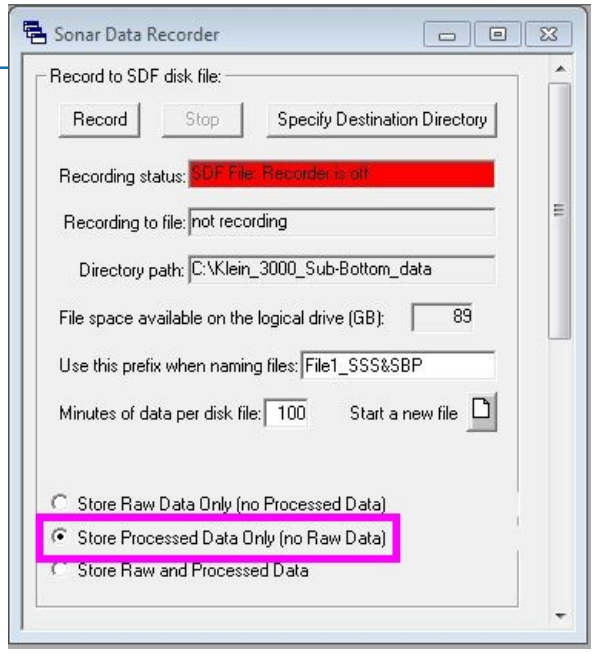
## HYPACK® SUB-BOTTOM & SDF FORMAT DATA

The 2017/2017a versions of HYPACK® SUB-BOTTOM read SEG-Y and JSF format data directly into the SUB-BOTTOM PROCESSING program, but at this stage, HYPACK® does not support the SDF file format in HYPACK® SUB-BOTTOM. Direct importing of the Klein SDF format side-scan sonar data is, however, supported in HYSCAN (HYPACK® side-scan sonar processing software).

## SUB-BOTTOM ACQUISITION IN SONARPRO

When acquiring side-scan sonar and K-Chirp sub-bottom profiling (SBP) data in SonarPro (Klein Marine Systems acquisition software), the SBP data can be stored as “raw” signed data or “match filtered” unsigned data. This option is set in the Sonar Data Recorder as “Store Processed Data Only” (Figure 2). The preferred option is “match filtered” processed data for analysis in HYPACK® SUB-BOTTOM.

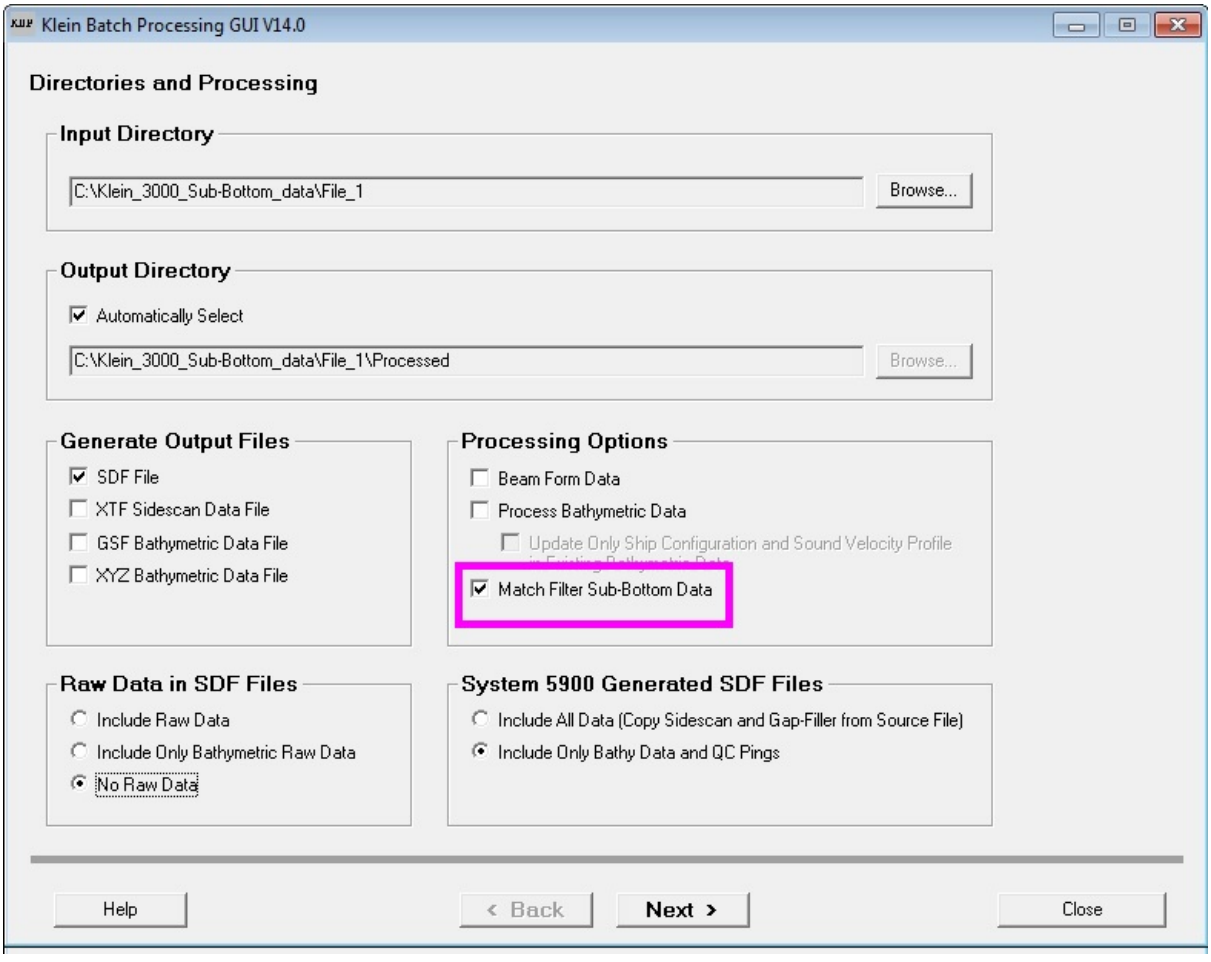
*FIGURE 2. Option to store "match filtered" SBP data in SonarPro.*




If, however, only "raw" Chirp SBP was stored in the SDF files, then one can reprocess the files in the Klein Batch Processing program and select the "Match Filter Sub-Bottom Data" option (Figure 3). This will write the processed SDF files to a separate "Processed" folder.

The "match filtered" SDF data is what is recommended for processing in HYPACK® SUB-BOTTOM.

*FIGURE 3. Setup of the Klein Batch Processing program to covert the "raw" SDF SBP data to "match filtered" SDF SBP data.*

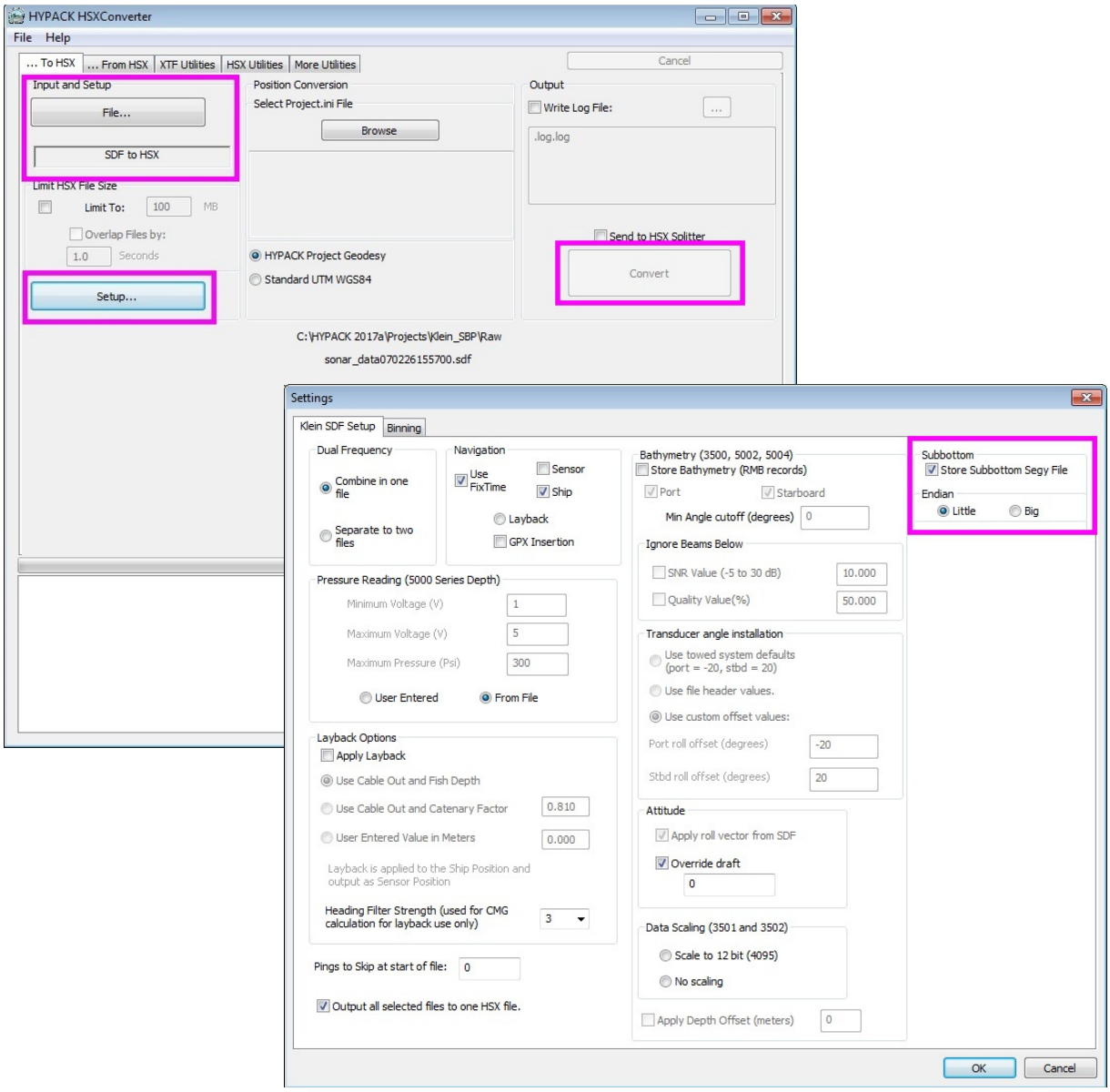


## THE SOLUTION

To be able to read the sub-bottom profiling data channel in the SDF files, we need to strip out the SBP channel from the SDF file/s and convert these data to SEG-Y, which the HYPACK® SUB-BOTTOM can read. HYPACK® HSX CONVERTER program can convert a comprehensive library of industry standard file formats for viewing and processing in HYPACK® software.

The HSX CONVERTER provides extensive support for converting SDF side-scan sonar to HSX format under the Setup (Figure 4). The HSX CONVERTER has recently been modified to extract the sub-bottom profiling data from SDF files and store these data as SEG-Y files.

***FIGURE 4.*** *HSX Converter File Input and Setup options (top), SDF file format conversion options. Note the new option to convert the SDF sub-bottom data to SEG-Y format (bottom).*



1. **Load the SDF data into the HSX CONVERTER and then open the Setup** to select the file conversion parameters.
2. In the Setup (Settings) dialog, **select the Store Sub-bottom SEG-Y File and Little Endian options and click [OK]**.

   Big endian and little endian are terms that describe the order in which a sequence of bytes are stored in computer memory and most modern PC's use Little Endian.
3. **Click [Convert]** to convert the file/s.

## *VIEWING & PROCESSING K-CHIRP DATA IN HYPACK® SUB-BOTTOM*

Once the "match filtered" SDF SBP data have been converted to SEG-Y format, these data can be loaded into SUB-BOTTOM PROCESSOR for display and processing to final data products. One advantage of using the K-Chirp Model 3310 sub-bottom profiler mounted on a Klein 3000 side-scan sonar is that the sub-bottom profiling data and side-scan sonar data are co-registered and the side-scan sonar mosaic can be processed in HYSCAN using the original SDF files or the HSX side-scan sonar files generated from the HSX CONVERTER during the conversion of the SDF files to SEG-Y.

To visualize the SBP to its full potential, it is advisable to adjust the dynamic range maximum value to less than the Data Maximum value displayed in the Settings Window and then adjust the TVG to produce a high quality result. No band filtering is generally necessary with K-Chirp data. The mosaic can be loaded in the HYPACK® Shell and this will then be displayed in the SUB-BOTTOM PROCESSOR View Tracks window as an aid to the sub-bottom profiling interpretation. The interpretation "picks" will be plotted on the mosaic for quality control purposes.

A series of screen grabs are presented showing the K-Chirp 3310 data processed in the SUB-BOTTOM PROCESSOR. The data is courtesy of Klein Marine Systems.

***FIGURE 5.*** *K-Chirp data showing a channel in the bedrock infilled with laminated sediments. Note the co-registered side-scan sonar mosaic in the View Tracks window.*

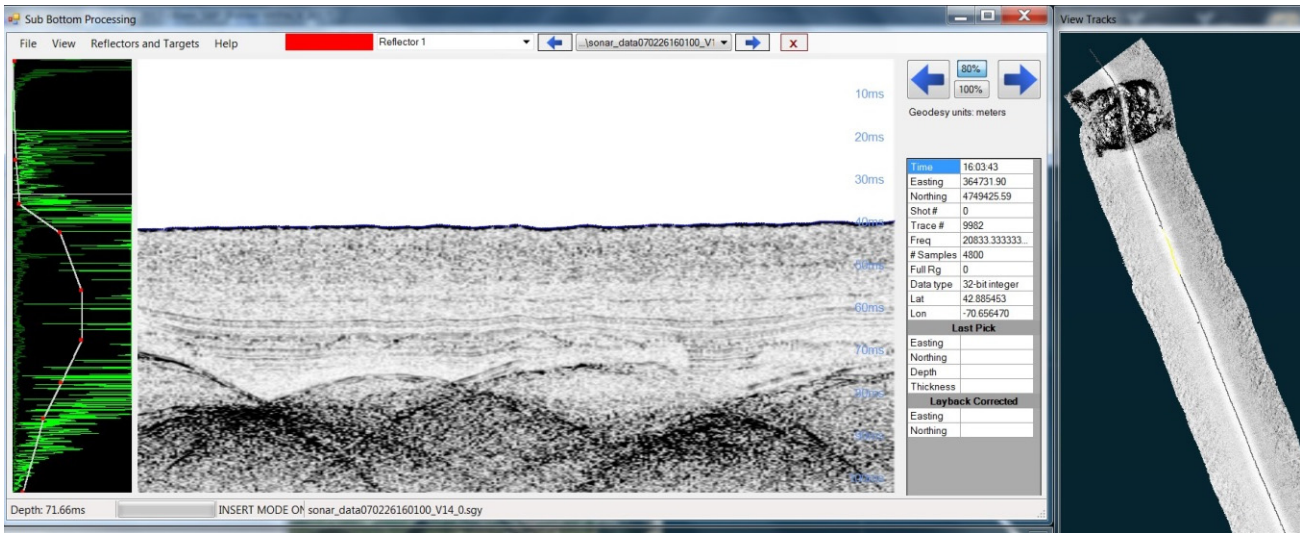


***FIGURE 6.*** *K-Chirp data with a color palette applied to enhance the sub-bottom geology.*

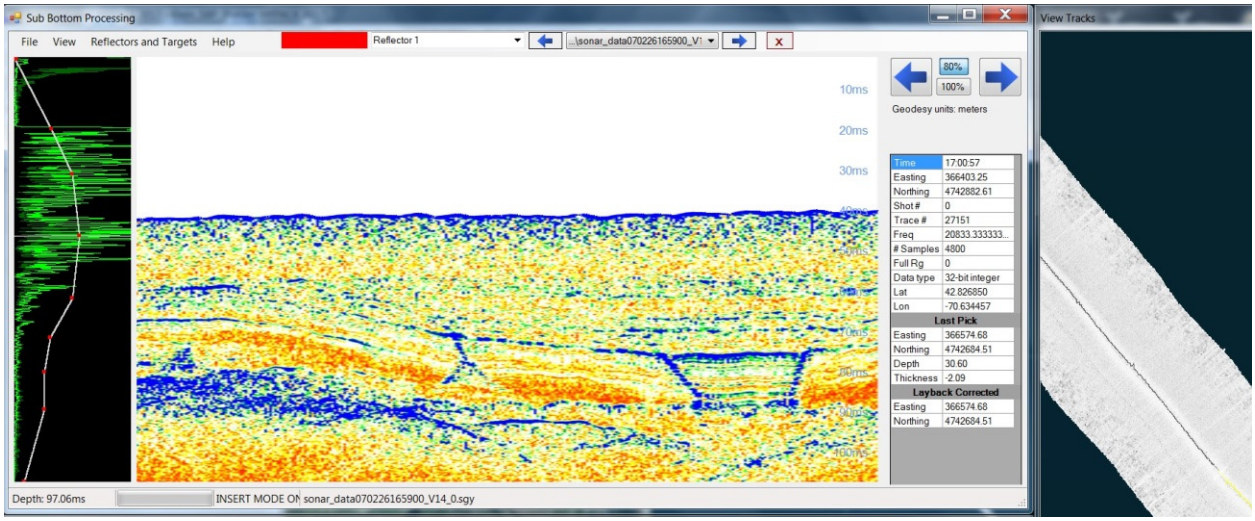



***FIGURE 7.*** *K-Chirp data showing the interpretation (green polygon) of a sediment filled channel adjacent to a bedrock outcrop. Note the co-registered side-scan sonar mosaic in the View Tracks window showing the bedrock outcrops.*

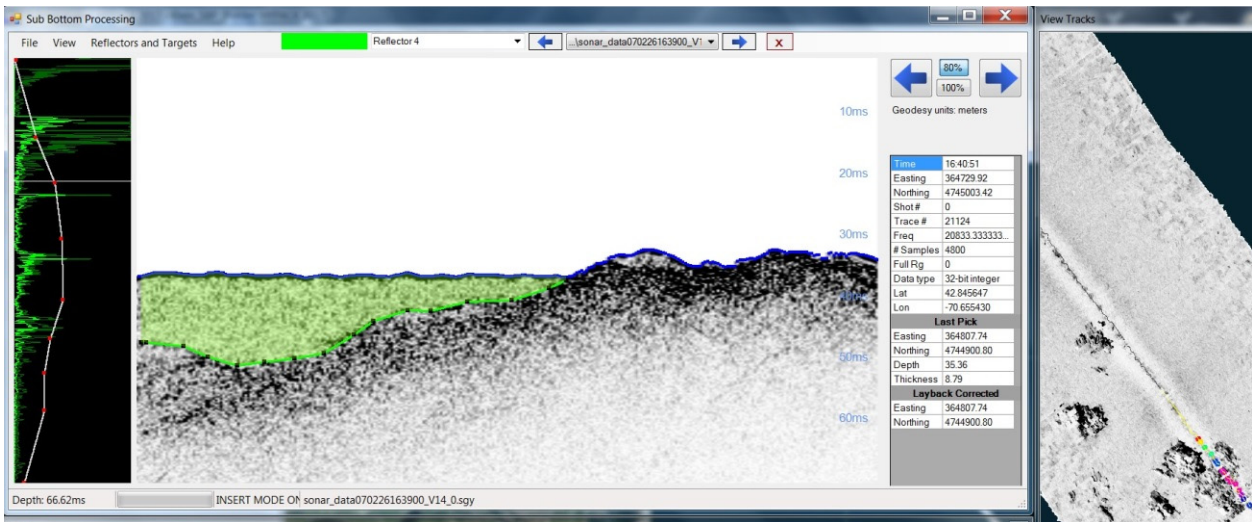


***FIGURE 8.*** *K-Chirp data showing a 38 m thickness of unconsolidated laminated sediments (green polygon) with smaller channel fill features.*

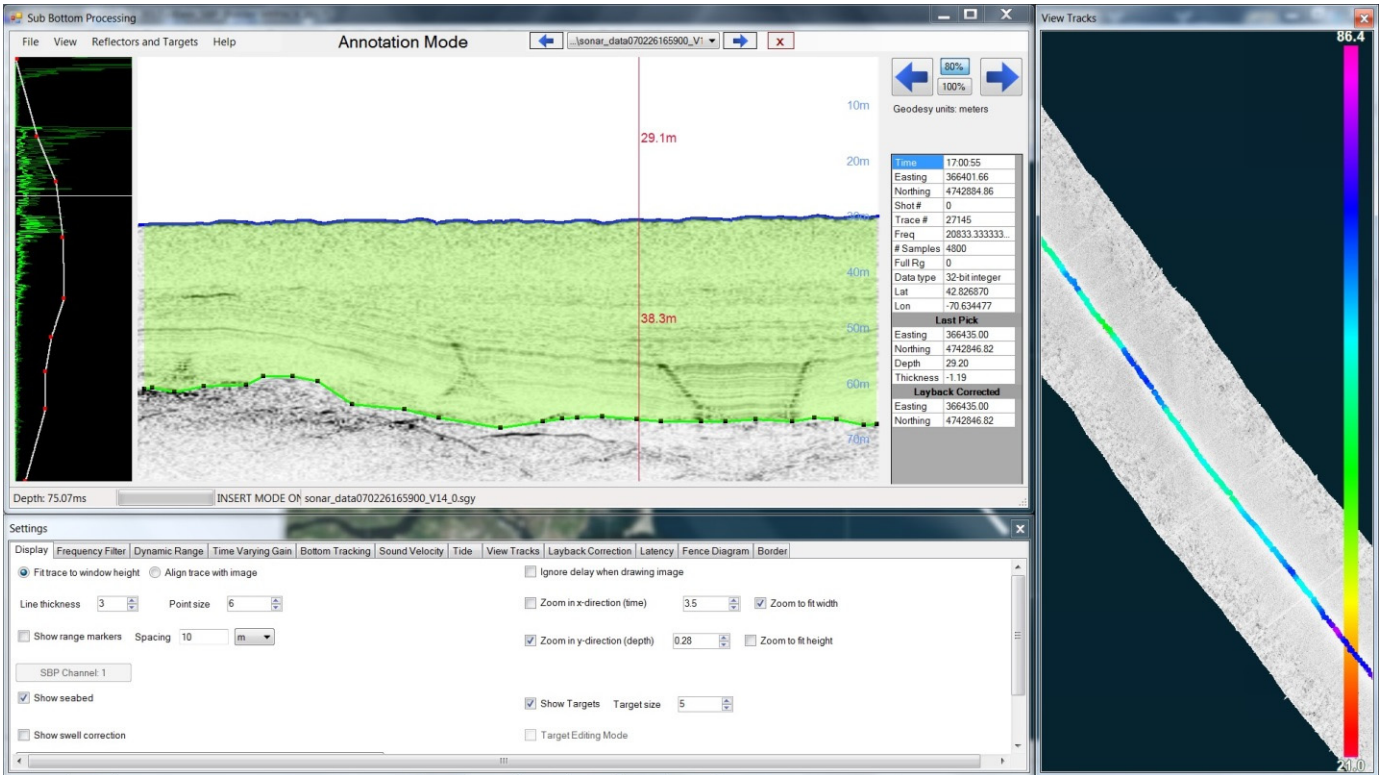



***FIGURE 9.*** *3D fly-through fence diagram of several lines of K-Chirp data showing the rugged bedrock topography and overlying laminated sediments.*