

Book B

Bathymetry and Survey Line Locations

By
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Little is known about the [Silverman et al.](#) (1971) bathymetry and line locations map. The following includes a first-hand recollection by David Pevear, a listed author of the map, and my own speculations.

The map was apparently never published though it was clearly prepared with that formality in mind. The main artist was, probably, Sidney Prahl whose probable objective was to include the map in his thesis. Prahl was acknowledged by [Wold](#) (1982). A Prahl thesis would have been expected to describe the data sources in some detail. However, the University of Montana, Maureen and Mike Mansfield Library has no record of a Prahl thesis.

The map credits two sources of bathymetric data, i.e., Silverman's traverses and those from the Wold-Crosby seismic survey.

Arnold Silverman was on the faculty of the University of Montana, Department of Geology. David Pevear was a graduate student in the mid-1960's. Based on an attribution on the map and my personal correspondence with Pevear, the Silverman phase of the bathymetric work was conducted in 1965 and 1966. Pevear offered this recollection in an email dated May 11, 2011:

The echo sounder was a huge, military surplus thing; the sender (source), called a "magnetostriector", was at least a foot in diameter and was bolted thru the hull. It produced a relatively small strip chart, but the source was apparently powerful, for we saw what looked like sub-bottom reflectors that resembled the images on your website. We made quite a few profiles over much of the lake; I was worried that we would run aground in the delta area. Unfortunately, our navigation was by crude dead reckoning.

The "website" mentioned above is not this site, but the same images to which Pevear refers are in Books [C](#) and [E](#) of this collection. The bathymetry profiles in Book [D](#) are from the Wold-Crosby program, not the "strip charts" that Pevear mentioned above. The "delta area", mentioned above, is the delta of the Flathead River that is forming at the north end of the lake.

The second source of bathymetric coverage was attributed to the Wold-Crosby seismic profiling in 1970 (Book D). Whether or not the charts in Book D were made with the Silverman "magnetostriector" system or a different system assembled by Wold is not known.

This book includes two map file images

- a) an image of the only known surviving print of the original drawing
- b) an enhanced version of the image of the surviving print.

The surviving map, like all of the surviving documents of the 1970 project, is available to view in the K. Ross Toole archive of the Maureen and Mike Mansfield Library at the University of Montana. The surviving paper map is a blue line, diazo-style copy from an original that was probably prepared on drafting film. Whether or not the original artwork still exists is not known. Folklore among some University of Montana geology students of the early to mid-1970's era hints that the original drawing was severely damaged by an accident involving the science building's janitorial staff.

The surviving paper map has faded, and some features have bled into other parts of the document as the map lay folded for long periods of time. The map is also water damaged, torn, and stained from tape adhesives. In the fall of 2015, I learned that an archival group at the Montana Bureau of Mines and Geology (MBMG) in Butte, MT, had resources to enhance images of old drawings. The staff at MBMG offered to do what they could to enhance the image of the Silverman et al. map. The [second file](#) in this book is the result of their efforts.

The following is from Margaret Delaney, Program Administrator for Data Preservation of the MBMG, Mining Archives Department, after the first phase of the MBMG enhancement (October 29, 2015):

Montana Bureau of Mines and Geology, Mining Archives Department, updated the Bathymetry map of Flathead Lake by scanning the USGS 7.5 minute quadrangle maps (see below) of the bathymetry coverage area. The maps were scanned at a resolution of 600 dpi and combined into a composite base map using Photoshop and resized to the original Bathymetry map scale. Certain features of the new base map (e.g., islands) were removed to preserve the integrity of the original report's map features.

Seismic information from the high-resolution digital copy of the original report's map, obtained from the Maureen & Mike Mansfield Library at the University of Montana, was overlain on the base map and sharpened to give a crisp look to the bathymetry lines. All layers were double-checked for accuracy and merged into a single image.

USGS Quadrangle Maps used to create new base map:

- Elmo Quadrangle
- Wild Horse Island Quadrangle
- Rollins Quadrangle
- Bull Island Quadrangle
- Woods Bay Quadrangle
- Somers Quadrangle
- East Bay Quadrangle
- Polson Quadrangle
- Big Fork Quadrangle
- Buffalo Bridge Quadrangle

“Seismic information” referenced above is just the Silverman and the Wold-Crosby track lines, i.e., no actual seismic data were involved in the enhancement.

After the delivery of the MBMG enhanced image of the bathymetry map, I asked Delaney if the content of the map, i.e., the contours, line locations, and title block, could be easily overlain on a base that comprised the 1960's vintage topographic maps. MBMG agreed to make a new base map using files from the US Geological Survey's historical map collection and drop the

previously enhanced content onto the new base. This new base obviated the need to remove features such as the “islands” referenced above. The new base is essentially identical to the base that the original compiler would have made around 1970. The only difference is that the new base is in color.

The work at MBMG in assembling a new base map was analogous to the process that the compiler in the early 1970’s would have gone through. The difference being that the later effort was able to use all digital tools. Both base map assembly efforts started with the USGS topographic quadrangle maps. The MBMG assembled the maps digitally in an image editor while the earlier compiler had to be more manual. In 1970-71, the quadrangle sheets would have been physically trimmed of margins and edge annotations and taped together to form a large composite. Then, that composite sheet would have been photographed by a reprographics firm. A positive print on drafting film would have been made by projecting the negative to the scale desired by the compiler. This was a common practice in that era. The photography would have been black and white, losing any color that might have been in the original quadrangle sheets. Losing the color was not an issue in the early 1970’s. Copies of the base and its subsequent bathymetric content would have been monochrome.

The enhanced image is able to maintain the green of forested areas, the blue of the lake and tributary rivers, the red of major highways and section numbers, and so forth. I think that these color features soften the starkness of the original map and make the bathymetric content easier to read. Important to note in the enhancement is that nothing has been re-entered in terms of text in the title block or labels on contour and seismic survey lines.

The map from the initial MBMG enhancement is not on this site. A paper copy was printed and is available to view in the Toole archive of the Mansfield Library at the University of Montana. The file that is in this book is the map with the 1960’s vintage base map.

References Cited

Silverman, A. J., Pevear, D. R., and Prah, S. R., 1971, Bathymetry of Flathead Lake, Montana: unpublished. (URL: <http://scholarworks.umt.edu/flathead/15/>)