



Shallow Chirp Geophysical Survey of sediment thickness of the St. Clair River Delta, MI

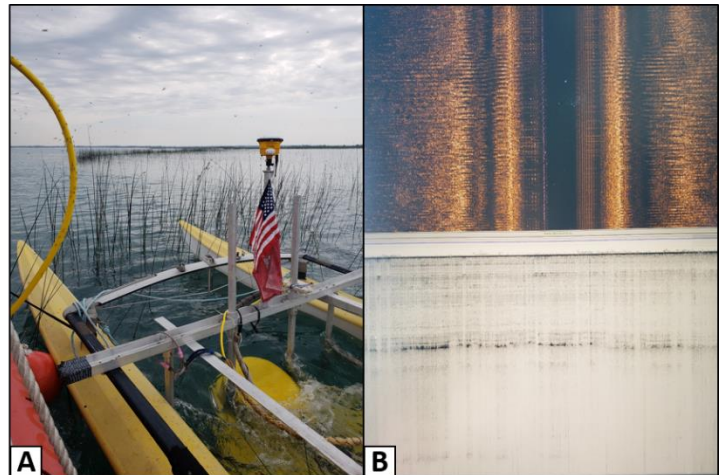
ERDC Dredging Operations Technical Support Program (DOTS)

U.S. ARMY CORPS OF ENGINEERS

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Response Summary:

The thickness of sand-sized (e.g. transport-relevant) sediment in the St. Clair River delta in Lake St. Clair, the largest freshwater delta in the world, is an ongoing concern for the USACE Detroit District, particularly with respect to the regional sediment budget. Sediment preserved within the delta is a significant potential sediment source during periods of high river flow. The most effective and accurate way to map sediment thickness over the 450 km² delta is via a shallow acoustic seismic reflection (chirp subbottom) geophysical survey. Over the last several years, ERDC researchers Heidi Wadman and Jesse McNinch have trained District staff in the use of an LRE-owned chirp subbottom profiler, and LRE has successfully deployed the instrument on a few projects. Recently, District staff deployed their system in the St. Clair River Delta, and determined that it does not have the necessary power, or low enough acoustic frequencies, to penetrate through the lakebed and map reflection surfaces (stratigraphic layers) deeper than ~10 feet. These data are necessary for an accurate reconstruction of the historic sediment budget. ERDC's Coastal and Hydraulics Laboratory owns a chirp sub-bottom profiler which operates at a lower frequency and higher power, and is capable of deeper penetration through the deltaic strata. ERDC researcher Heidi Wadman and technician J. Robert Mitchell traveled to the St. Clair River delta to assist LRE in the collection of chirp subbottom data using ERDC's profiler. This project represented a successful technology transfer in that ERDC was able to leave the field site after the first week of the 4-week survey, leaving LRE to complete the survey with only District personnel. Figure A shows ERDC's chirp towfish mapping the shallow delta region, and B presents a snapshot of the co-registered sidescan sonar (upper) and chirp subbottom (data) real-time data display.



Period of Performance:

Survey commenced on July 9, 2018, and ERDC departed the site on July 16, 2018. LRE continued to survey, completing the entire effort by August 3, 2018, collecting over 100 miles of survey data.

Benefits of the Response to the USACE Dredging/Navigation Program:

Shallow acoustic seismic reflection (chirp subbottom) geophysical surveys represent a significant improvement with respect to accurate quantification of variations in underlying stratigraphy in aqueous environments. Chirp data can be collected simultaneously with bathymetric and sidescan sonar data, providing three-dimensional stratigraphic maps at a higher accuracy and lower cost than boreholes alone.

Deliverables:

Geophysical subbottom and sidescan sonar data which can be used to compile stratigraphic and isopach maps of the St. Clair River delta.



Providing environmental and engineering technical support to the U.S. Army Corps of Engineers Operations and Maintenance navigation and dredging missions

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