

Fluvial Bedload Sediment Collector Acquired and Refurbished for August 2023 Pilot Study at Lake Altoona, WI

Impact Statement: Bedload sediment collectors are innovative tools for sediment management which ERDC has investigated to supplement or replace dredging at several scales and locations since 2014. An FY23 USACE Dredging Operations and Environmental Research (DOER) Program funded project acquired free equipment from the State of Ohio for 2 large scale demonstrations. ERDC-EL acquired, refurbished, and will test a 12-ft scale unit on the Eau Claire River, WI, this August 2023. Lake Altoona District is a lake management district that plans to install a permanent 30-ft scale unit in 2024.

Bedload sediment collectors are innovative sediment management tools that have great potential to simplify sediment management, but there have been few successful demonstrations using large scale units. One early Boulder, CO, test using a 30-ft collector system led to several design innovations in the current model recently used in the Cuyahoga River, OH, and acquired by Lake Altoona District in Eau Claire, WI. The unit operated successfully for a cost of approximately \$1/cu yd of sand collected, but the regional hydrology and sediment regime only supported sediment transport during floods. The private-public venture was not suitable for aggregate collection and the equipment sat idle until this present Lake Altoona project acquired it as reported in a prior CW Weekly (April 2023). The sand bed Eau Claire River should be much more suitable to the bedload sediment collector design.

A second 12-ft sediment collector was designed with a bubbler system with the intent to flocculate and collect fine sediment in the Blanchard River, OH, another tributary to Lake Erie. The design was not effective for fine sediment transport and the similar regional hydrology limited bedload collection opportunities. The system was removed and sat idle after a flood damaged the bubbler system. This unit, shown below in a schematic representation of the system (Figure 1), was shipped to the USACE St. Paul District (MVP) Service Base where Dr. Chuck Theiling (ERDC Environmental Laboratory [EL]) worked with shop staff to test and repair the pumps (Figure 2).

Currently the project anticipates a Wisconsin Department of Natural Resources (WDNR) permit award in early August, and Dr. Theiling will work 21-31 August 2023 with local partners to test the 12-ft unit in the Eau Claire River above Lake Altoona. The test will include learning to use the equipment, conducting quantitative sampling for sediment collection rate, and testing entrainment potential with dye studies to visualize suction at the grate and neutrally buoyant spheres to simulate fish larvae. Video will be used to document entrainment. The testing will support design and permitting for the permanent 30-ft collector system.

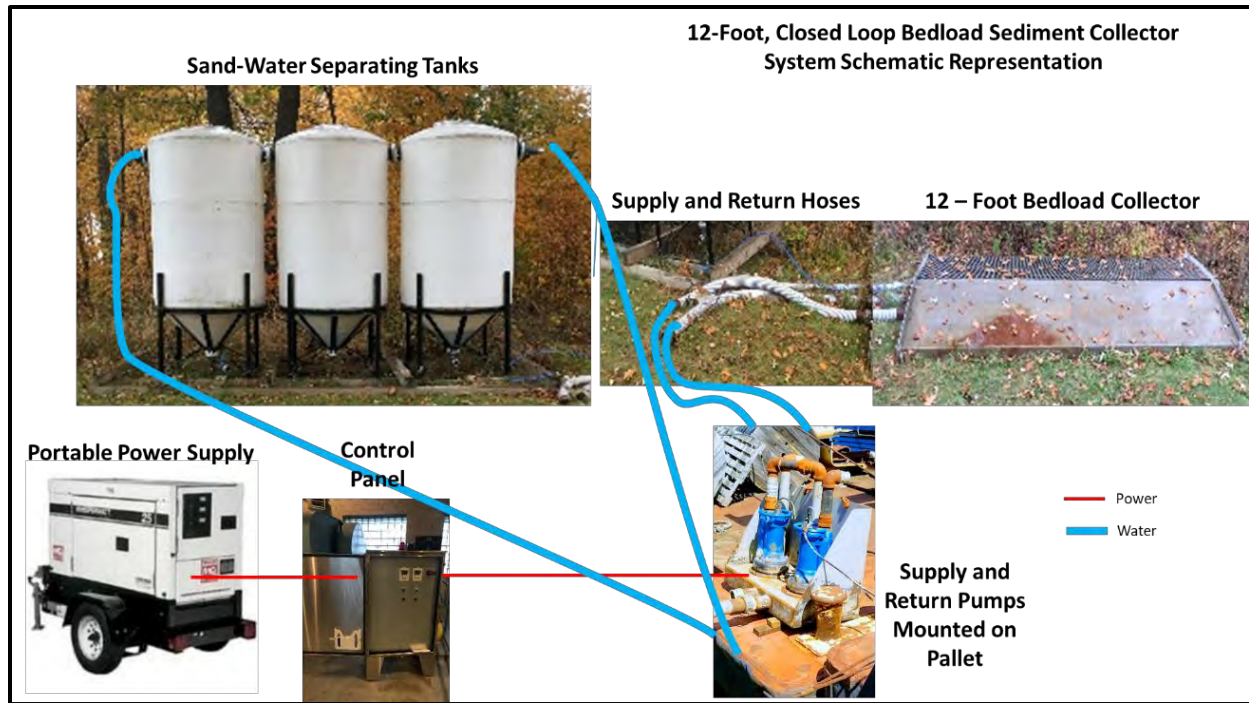


Figure 1. A conceptual representation of the bedload sediment collector system.



Figure 2. Transporting bedload sediment collector equipment (above) and testing pumps at the USACE St. Paul District (MVP) Service Base (right).

The 30-ft collector system requires significant engineering and design, permitting, equipment upgrades, pump well construction, and collector installation estimated to cost \$1 million. The Lake Altoona District secured a \$500,000 grant from the State of Wisconsin to support the project and Lake Altoona District established a fundraising entity to raise other funds. The Lake Altoona District is a taxing authority which is currently spending >\$300,000 annually to support sediment trap management. The objective is to replace dredging with a more efficient bedload sediment collector. Installation is expected to occur during winter 2024. The unit will be successful if it removes an equal amount of sediment as dredging (35,000 cu yd) for less cost.

This research addresses Statement of Need (SON)1854, Evaluating Bedload Sediment Collectors to By-Pass Shoaling Sediment, which was submitted by the USACE St. Paul District (MVP) for navigation channel applications and is also suitable for Great Lakes harbors. The Eau Claire River project is a fortunate coincidence emerging from a Planning Assistance to States (PAS) sediment study and District partners making connections among projects. The project team includes Chuck Theiling (EL), Burton Suedel (EL), Zach Tyler (ERDC Coastal and Hydraulics Laboratory [CHL]), and Ben Emery (CHL).

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