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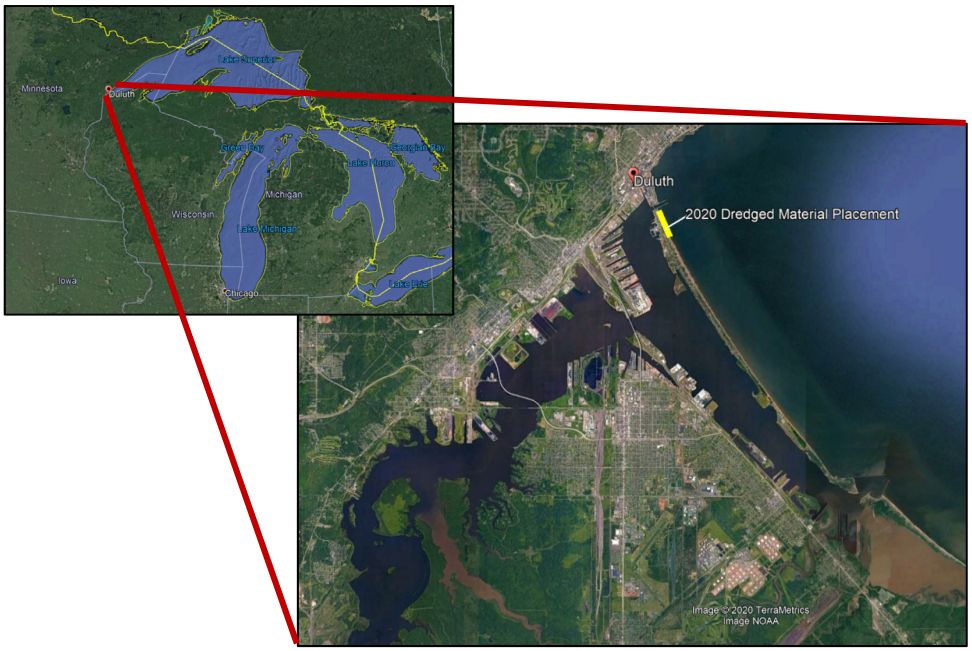
Engineer Research and Development Center

National Regional Sediment Management Program Detroit District (LRE) & ERDC-CHL:

Applying Remotely Sensed Measures of Nearshore Radiation Stress to Predict the Fate of Dredged Material Placed as Beach Nourishment

Description

Working collaboratively, LRE & ERDC-CHL installed the Radar Inlet Observing System (RIOS) at Duluth-Superior Harbor to monitor placement of dredged material as beach nourishment. Under RSM, LRE & ERDC-CHL will extract measures of radiation stress from RIOS observations and test the ability to predict direction of sediment transport from the initial placement.



Location of Duluth-Superior Harbor and 2020 Dredged Material Placement

Issue/Challenge To Address

Duluth-Superior Harbor is the largest port in the Great Lakes and requires approximately 110,000 cubic yards of annual dredging. Decreasing capacity within dredged material placement facilities has caused LRE to investigate alternative solutions for placement of dredged material at Duluth-Superior Harbor. As part of efforts for beneficial use of dredged material, a placement site was selected along the Lake Superior side of Minnesota Point to help prevent erosion due to high lake levels. Establishing the lakeward side of Minnesota Point as a long-term placement option requires the support of local stakeholders and permitting agencies. In order to gain that support, the fate of the placement material and overall benefit to the beach must be determined.

In summer of 2020 RIOS was installed at Minnesota Point prior to placement of material on the beach. The system has remained on-site during placement activities and will be in operation through the fall of 2020 to collect hourly observations during storm events.

Objectives of processing RIOS data collected in Duluth are to:

1. Test the rigor of RIOS in monitoring placement of dredged material on the beach and within the inner surf zone on the Great Lakes and establish a methodology for similar future applications

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2. Test whether RIOS-measures of radiation stress during storm events can accurately predict the direction of sediment transport from the initial placement
3. Evaluate if placement acts as effective shore protection by analyzing hourly RIOS measures of runup relative to shore infrastructure

Successes Lessons Learned

Lessons learned will be compiled throughout the duration of this study.

Projected Benefits Cost Savings Value Added

Establishment of viable beneficial-use placement sites for O&M
Cost-effective, quantifiable measure of shore protection effectiveness
Forecasting capabilities in the evolution of placed material from direct observations
Adaptive placement strategies

Expected Products

- Technical Note designed to inform project engineers and Operations personnel of the performance of the Duluth beach placement project
- Project Performance Brief to LRE

Stakeholders/Users

Stakeholders include the Environmental Protection Agency Great Lakes Restoration Initiative (GLRI), the Minnesota Pollution Control Agency (MPCA), Wisconsin Department of Natural Resources (WiDNR), Minnesota Department of Natural Resources (MnDNR), Fond Du Lac Indian Reservation, St. Louis River Alliance, Duluth Seaway Port Authority, and the City of Duluth.

Leveraging Opportunities

The USACE has partnered with the EPA GLRI program to build a RIOS specifically for Great Lakes sediment management projects. Additionally, in 2019 the Detroit District Operations Branch funded a RIOS dredged material placement monitoring effort at Leland Harbor on Lake Michigan, which led to the 2020 monitoring effort in Duluth. The Detroit District Operations Branch and the EPA GLRI program have partnered to share the costs of implementing RIOS in Duluth in 2020 and Superior, WI in 2021. With system development and installation costs of $95K covered by these partnerships, RSM funding for this project can be focused on analyzing RIOS data to help GLRI make decisions about habitat restoration and to support the Detroit District Operations Branch in their efforts to establish long-term beneficial use placement sites.

Points of Contact

Rachel Malburg, CELRE-EHE
Hydraulic Engineering Branch
Hydraulic Engineer
313-226-3436
Rachel.M.Malburg@usace.army.mil

Jesse McNinch, CEERD-HFA
ERDC CHL Field Research Facility
Research Oceanographer
252-261-6840
Jesse.McNinch@usace.army.mil

Participating Partners

Detroit District Operations Branch and Duluth Area Office
EPA Great Lakes Restoration Initiative