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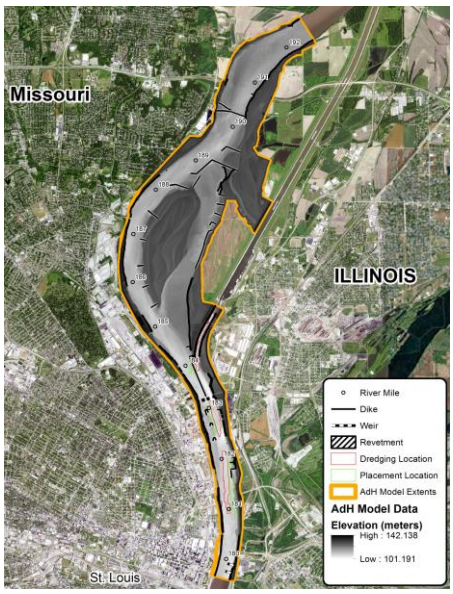
National Regional Sediment Management Program St. Louis District (MVS):

Sedimentation Impacts within the St. Louis Harbor Reach of the Middle Mississippi River

Description

The St. Louis Harbor reach, between River Mile (RM) 192.5 and RM 179.5 of the Middle Mississippi River (MMR), has experienced issues including sediment deposition leading to dredging, difficult flow and alignment through bridge spans, and shoaling problems at fleeting areas and facilities. The St. Louis Harbor reach is downstream of the Chain of Rocks reach, also known as the “old channel”, and the man-made Chain of Rocks Canal and Locks 27.



The navigation channel in this location is narrow due to bridge piers, navigation structures, and fleeting facilities. Dredging within the navigation channel near RM 183.0 has led to temporary channel closures causing additional wait times. To date, the problem has been addressed through monitoring and channel maintenance dredging.

The goal of this effort is to utilize an Adaptive Hydraulics (AdH) numerical sediment model to investigate the hydraulics and sediment transport through the Chain of Rocks and St. Louis Harbor reaches. To solve the issues in the St. Louis Harbor Reach, engineers need to understand the hydraulics and sediment transport in the Chain of Rocks reach under different flow conditions including; water surface slopes, the influx of sediment, the storage and release of sediment, and the effect of Mosenthein Chute and existing river training structures.

Issue/Challenge To Address

The Chain of Rocks reach was used as the navigation channel prior to the construction of the Chain of Rocks Canal, Locks 27, and the Low Water Dam. This reach is the most complex and dynamic reach on the Middle Mississippi River. Due to the lack of navigation it has had the least amount of data collected resulting in many unknowns. The reach spans from RM 194, at the head of the Chain of Rocks Canal, to the end of the Canal, the exit from Locks 27, and the end of the L-Dike 184.2L. The complexity starts just upstream of the reach at the confluence with the Missouri River near River Mile 195. Surveys indicate that sediment is stored just below the confluence and within the point bar along Duck Island. Sediment influxes from the Missouri River cause this bar to expand and contract. Between River Miles 194 and 190.5 the River is wide and uncontracted (no river training structures) with a water surface low slope (0.2 feet per mile).
The Low Water Dam 27 is at approximately River Mile 190.3. The Dam spans the width of the river and was completed in 1962. It was constructed to create a slack water pool during low water and insure adequate river depth at low water over the lower miter sill of old Lock and Dam 26. Before construction of the dam, for many years there was a progressive lowering of the low water plane due to degradation of the Mississippi River. That same degradation also created the need to bypass the "Old Channel" and construct the Canal and Locks 27. The "Homer Dike" is just upstream of the Dam and is used to direct water towards water intakes and to provide access to a water intake tower for the St. Louis Water Department.

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Much of the channel below the Dam is bedrock, especially along the Missouri bank. Data has shown that the water surface slope is much higher just downstream of the Dam, most likely due to the bedrock outcrops and higher channel bottom. Water surface slopes are likely 2 to 3 feet per mile closer to the dam before normalizing to an average 0.5 feet per mile in the Harbor. In addition to the water surface slope, it is highly likely that Mosenthein Chute, which is wide and stores a significant amount of sediment, is also a significant part of the channel morphology of the Old Channel.

An analysis of monthly hydrographic survey through the Old Channel suggests significant sediment storage and release events occurs in the old channel, most notably just below the Dam. This release of stored sediment during low water appears to be causing some of the problems related to the dredging and navigation issues at Mile 183.

Lessons Learned

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

Expected Products

- Updated maps of collected field data
- Calibrated AdH Model of the reach
- Report and Presentation detailing the hydraulics and sediment transport through the reach

Stakeholders/Users

The study will include multiple meetings with environmental partners (Illinois Department of Natural Resources, Missouri Department of Conservation, U.S. Fish & Wildlife Service, etc) and navigation partners (River Industry Action Committee, barge companies, fleeting facilities, etc)

Projected Benefits Value Added

Understanding the hydraulics and sediment storage and transport through the reaches is necessary to formulate a solution for managing sediment in the St. Louis Harbor and reducing costly repetitive dredging. This will lead to less channel closures and will provide a more safe and dependable navigation channel.

Leveraging Opportunities

An existing AdH model of the study reach will be adapted and used for this model study. This will reduce the time and cost of developing and calibrating the model.

Existing prototype data will be used in combination with newly collected data to evaluate how sediment load and bathymetry are changing over time. This data includes bathymetric data, flow data, stage data, sediment samples, and water slope information.

The St. Louis District will rely on the expertise of The U.S. Army Engineer Research and Development Center's (ERDC) Coastal and Hydraulics Laboratory for technical issues relating to AdH/SEDLIB – specifically the sediment portion of the model.

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Participating Partners

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