FY17 RSM IPR

Seattle District, Nearshore placement in Skagit Bay

David R. Michalsen, P.E.
Scott H. Brown, P.E.

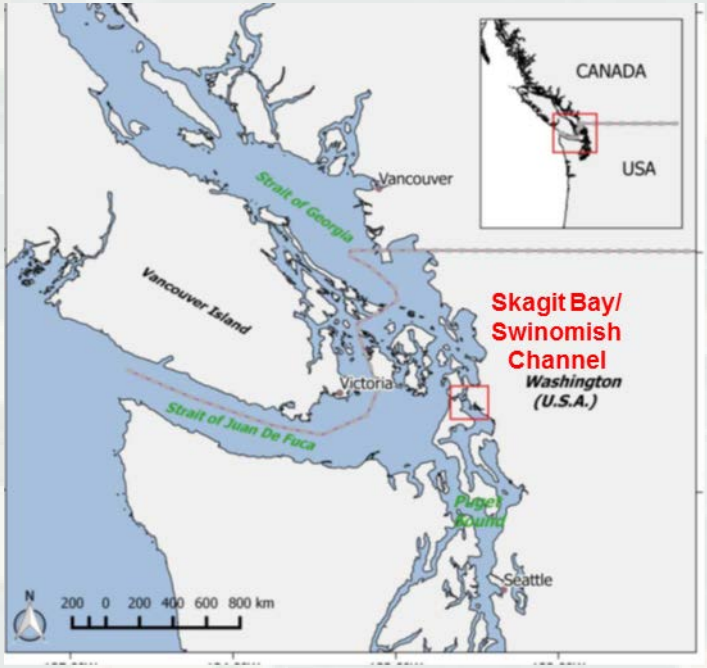
BLUF: The RSM project funded a particle tracking model (PTM) analysis of a sediment bypassing operation at the Swinomish Federal Navigation Project. The goal of the bypassing program seeks to limit the life-cycle costs associated with the O&M dredging project. Updated NEPA documents have recently been completed to allow for hydraulic and mechanical dredging and placement in the Skagit Bay delta region

Description/Challenges

- High shoaling rates causing tidal delays likely due to deterioration of jetties at the inlet
- Limited O&M dollars available
- Long haul distance to designated open water placement site
- Nearshore habitat, water quality, and fish passage concerns

Objectives

- Investigate placement areas within the Skagit River delta to minimize O&M costs
- Mimic natural sediment delivery from Skagit R.
- Keep material within the nearshore system
- Avoid critical habitat



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District/Other USACE PDT Members

- David Michalsen, P.E., Coastal Engineer
- Scott Brown, P.E., Coastal Engineer
- John Pell, P.G., Navigation Project Manager
- Kym Anderson, P.G., Chief, Navigation Section
- Nancy Gleason, Fisheries Biologist
- Zeki Demirbilek, Ph.D, P.E., ERDC-CHL

Stakeholders and Partners

- Tarang Khanggaonkar, PNNL
- Eric Grossman, USGS
- David Ralston, WHOI
- Patsy Martin, Port of Skagit

Leveraging/Collaborative Opportunities

Prior O&M funded work with Pacific Northwest National Laboratory (PNNL) to investigate the hydrodynamics, water quality, and sediment dynamics near the mouth of the Skagit River North Fork and southern Entrance to the Swinomish Channel was leveraged in this study. The FVCOM model was used to force the PTM to analyze sediment fate and transport associated with nearshore dredged material placement.

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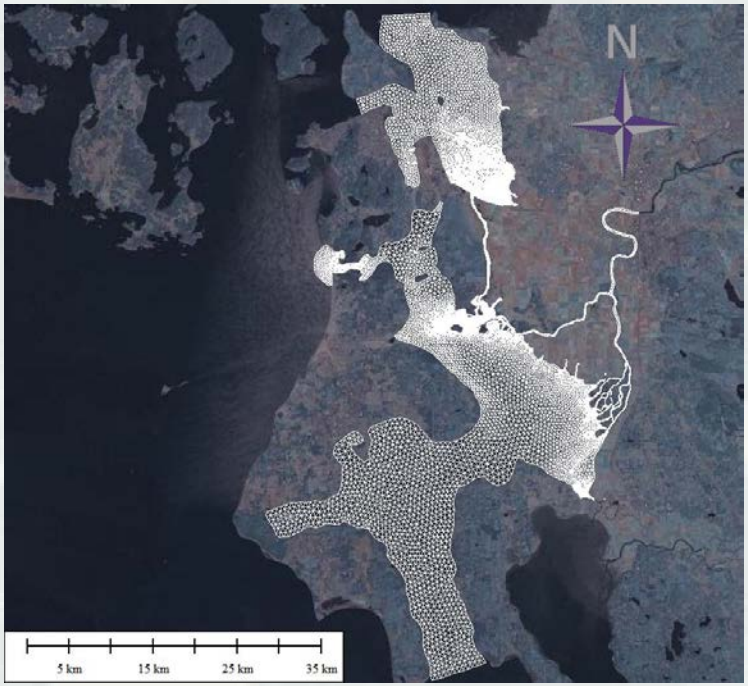
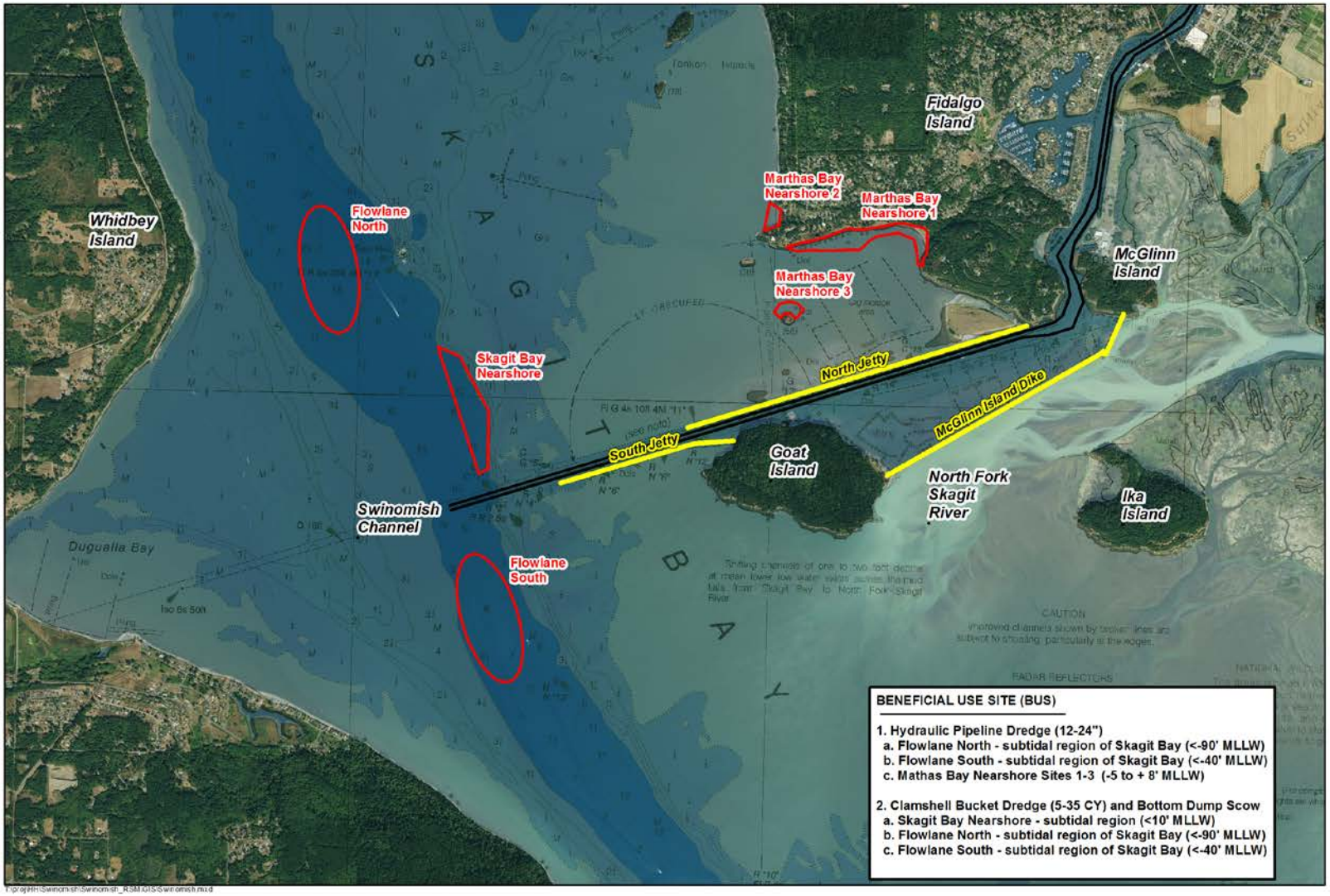
Approach

- Employ Finite-Volume Community Ocean Model (FVCOM) model developed by PNNL/USACE to investigate hydrodynamics and shoaling patterns in Skagit Bay and Swinomish channel
- FVCOM hydrodynamics run on HPC Topaz at ERDC
- Couple FVCOM with Particle Tracking model (PTM) to investigate potential placement sites for both hydraulic and mechanical placement
- Investigate fate and transport of dredged material at a suite of placement sites
    - Recommend the most favorable areas as options in new EA/404/FONSI



PNNL/USACE FVCOM

Swinomish Channel - Federal Navigation Project



Legend

swinomish nav structures
Swinomish_Placement_Sites
Navigation Channel
Navigation Channel

SOUNDINGS IN FATHOMS

Location Map

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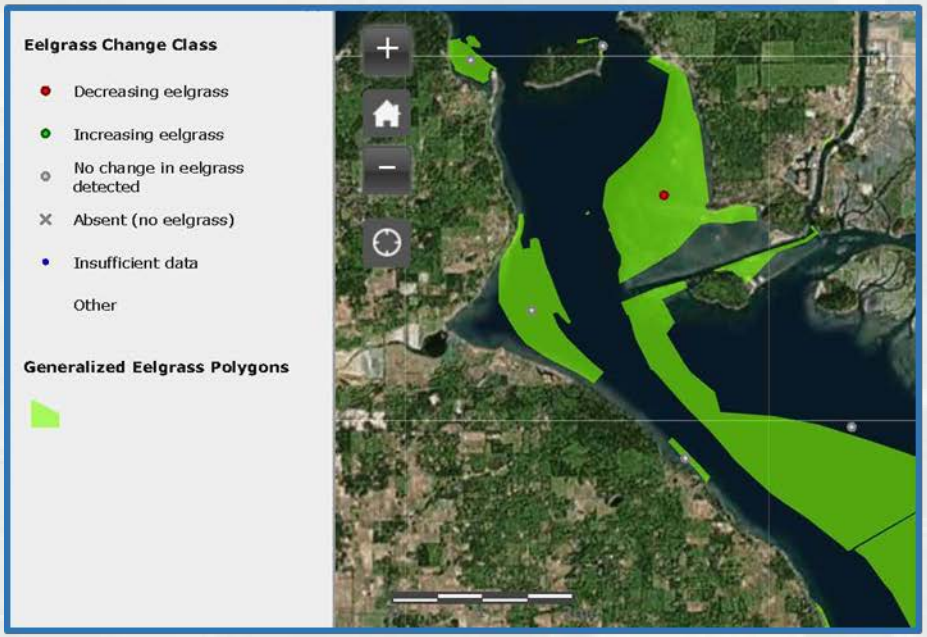
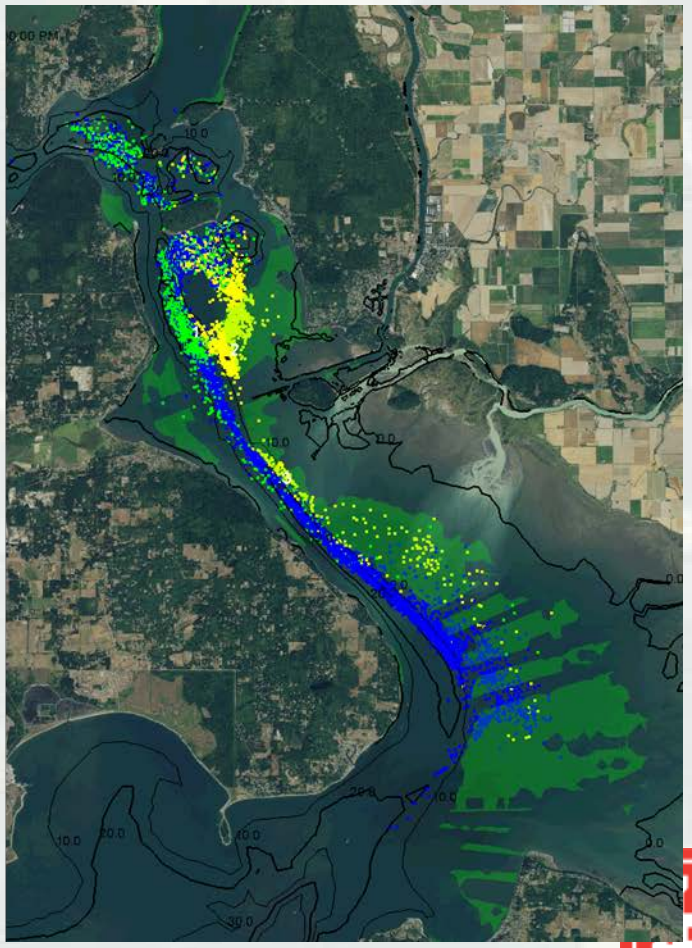
Accomplishments/Benefits/Lessons

- **Working hydro-model allowed for easy PTM simulations to investigate feasibility level siting questions**
- **PTM allowed for impacts analysis to eelgrass and ESA listed species**





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What is working?

- **Good collaboration between USACE, PNNL, USGS, Port, and Tribes**

- **Paper published in Journal of Marine Science.** *J. Mar. Sci. Eng.* **2017**, *5*(2), 19; doi:10.3390/jmse5020019

- **Good science informing dredged material management in Puget Sound**
  1. **Determined Marthas Bay sites have less capacity, less dispersive, and may adversely impact eelgrass**
  2. **Determined Flowlane North Site may impact ESA rockfish habitat as some material is found to settle in the deep rock depression in Saratoga Passage.**
  3. **Flowlane South and Skagit Bay Nearshore Site found to be feasible for placement**

What is not working?

- Current O&M operations. Deteriorated coastal navigation structures are impacting navigation channel functionality

Value to the Nation

- Lower O&M dredging costs over the project life-cycle
- Dredged material placement <1mile vs. 20+ miles away
- Improve safety of barge transits
- minimize carbon footprint of dredging/disposal
- Material kept in Skagit nearshore delta region
- May provide benefits to eelgrass and salt marsh
- NEPA documents good until 2029