

# Engineering with Nature – In Action: SLR AOC Living Shoreline Design Basis

Engineering With Nature and Buffalo District Collaborative Meeting  
Introducing the EWN Opportunity and Implementation Guide  
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# DULUTH EWN

## 21<sup>st</sup> Ave West Habitat Restoration Project

### *Project Goals and Objectives*

- ❖ ***Removal of SLR AOC beneficial use impairments (BUIs)***
  - ***Loss of fish and wildlife habitat***
  - ***Degraded Benthos***
- ❖ ***Cost effective and environmentally acceptable dredged material (DM) management***
- ❖ ***Maximize habitat improvements using EWN approach***
  - ***Given budget, schedule and engineering constraints***
- ❖ ***Evaluate engineering feasibility of shallow water DM in pilot study***
  - ***Data & experience needed for two more habitat restoration sites in the AOC!!***



# STAKEHODERS and Stakeholders, and stakeholders...

***Maximizing the economic, environmental, and social benefits of the project requires collaboration!***

- *City of Duluth*
- *Duluth Seaway Port Authority*
- *Fond du Lac Tribe*
- *Minnesota DNR*
- *Minnesota Land Trust*
- *Minnesota PCA*
- *Wisconsin DNR*
- *University of MN\**
- *USACE –LRE, MVP*
- *USEPA/GLNPO*
- *USEPA/ORD MED \**
- *USFWS*
- *USGS\**
- *Western Lake Superior Sanitary District (WLSSD)*
- *And more NGOs!*

*\* Providing significant technical support*



# 21<sup>st</sup> Ave West Habitat Design Basis

## *Ecological Concept Plan Goals*

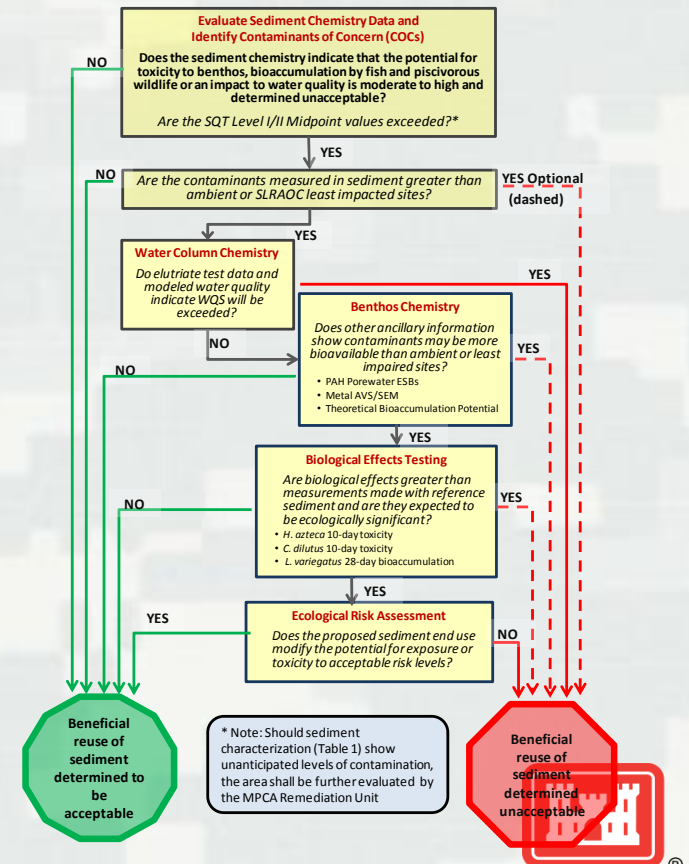
- ✓ Create 30 acres of new shallow water habitat
  - +++ emergent marsh, invertebrate richness, waterfowl habitat and SAV associated fish
- ✓ Create 22 acres of near shore island/upland habitat
  - + +Piping Plover and Common Tern habitat
  - ++ migratory songbird habitat
- ✓ Soften bulkhead / riprap shoreline by creating emergent vegetation beds given constraints on constructability and sustainability
- ✓ Maintain ¼ mile distance predation barrier from new shoreline and existing Interstate Island PP habitat



# Restoration Program Specific Guidelines For Evaluating Sediment Quality are Being Drafted by MPCA

- ✓ ***MPCA Guidelines being developed specifically for AOC Habitat Restoration program***
- ✓ ***Close coordination with USACE's federal requirements!***
- ✓ ***Tiered approach for risk management decisions***
- ✓ ***Recognition that sediment screening values are predictors of potential toxicity***
- ✓ ***Biological effects data maybe required in addition to sediment screening values***
- ✓ ***Consistent with existing MPCA guidance and Federal guidelines***

## In-Progress DRAFT



# Biological Outcome Models For Predicting Aquatic Vegetation Habitat Zones Have Been Developed



- *Statistical models predict probability of Emergent marsh , Floating Leaf and Submerged Aquatic vegetation*
- *Incorporates water depth and Relative Exposure Index (fetch) as primary variables*
- *Used for evaluating design options*
- *UM-Duluth NRRI and USEPA-MED developed models - significant technical support!!*



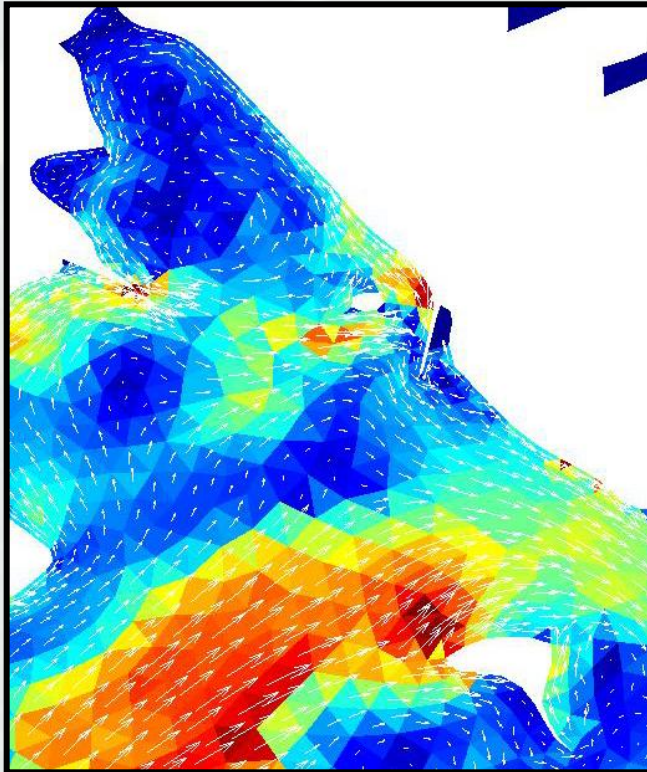
# Biological Outcome Models For Predicting Macroinvertebrate Communities Have Been Developed



- *Macroinvertebrate multimetric index (SLRLCI) developed based on least impaired sites within AOC*
- *Graphical models created for predicting total taxa and SLRLCI*
- *Incorporates water depth and Relative Exposure Index (fetch) as primary variables*
- *Used for evaluating design options*
- *USEPA-MED providing technical support!!*



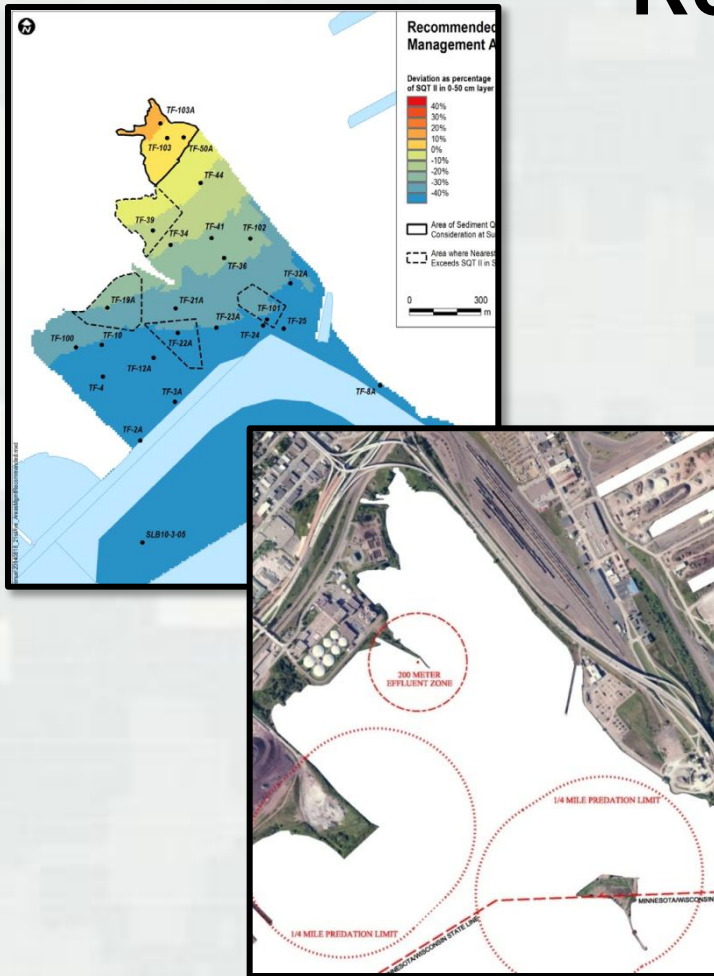
# Hydrodynamic/Sediment Transport Model to Evaluate Sediment Stability, Habitat Resiliency, Climate change



- *Short term stability and constructability of new shoreline, shoals and islands*
- *Impact of bathymetric design on modeled REI , aquatic vegetation and benthic macroinvertebrates*
- *Predicted long term resiliency of aquatic macrophyte beds*



# Other Design Constraints For Habitat Restoration



- ***Hydraulic placement of DM in shallow water***
- ***Contaminated sediments at depth***
- ***Mixing zone for WLSSD outfall***
- ***1/4 mile offset for islands to prevent predation of T&E species***
- ***Federal navigation channel***
- ***Dredged material availability and schedule***
- ***Public land /real estate ownership***
- ***Design calibration: construction tolerances***



# A 3-year Pilot Demonstration To Evaluate Construction Methods and Outcomes.



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