

Coastal Structures Risk Communication Middle UP, Northern Wisconsin Harbors

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Detroit District

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®

US Army Corps of Engineers
BUILDING STRONG



Introduction and Agenda

Purpose:

Communicate the risk of breakwater and structure conditions to local stakeholders and navigation system users. With a focus on structure condition, function, and economic consequences of coastal structures on the Great Lakes.

Focus Topics:

1. Coastal Structure Risk Communication
2. Condition Assessment of Coastal Structures
3. Harbor Infrastructure Inventory Process
4. Next Steps and Open Discussion



Regional Risk Communication Meetings



Coastal Structures

Great Lakes Navigation



- 104+ miles of navigational structures on the Great Lakes
- Most built between 1860 and 1940
- Timber crib construction (typical)
- Low Lake water levels since the 1990's have accelerated deterioration



Typical Coastal Structures



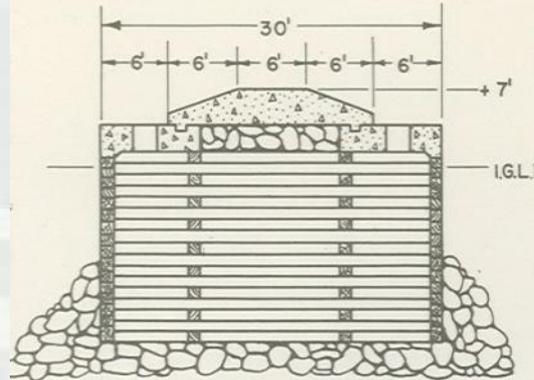
Steel Sheet
Pile
Structures



Rubble
Mound/Laid-Up
Stone Structures



Other
Components:
safety
(railings,
walking
surface, etc.)



Typical Wood
Crib/ Concrete
Cap Structures
Cross-section



Structure Function/Consequences



Calumet Harbor, IL&IN

Contain and reduce shoaling in navigation channel



Milwaukee Harbor, WI

Protect navigation channel and shoreline infrastructure



St. Joseph Harbor, MI

Control wave climate within navigation channel and harbor



Coastal Structure Communication Objective

Program Objective: Communicate the risk of breakwater and structure conditions to local stakeholders and navigation system users

Process:

1. **Conduct Condition Assessments**

- Commercial Harbors- Use detailed Breakwater Assessment Team (BAT) Evaluation
- Recreational Harbors- Rely on expert elicitation

2. **Conduct Harbor Infrastructure Inventory on all structures**

3. **Prepare summary document** that conveys the current condition of the harbor infrastructure as well as the risk involved in the event of failure

4. **Share with stakeholders** in regional meetings



Harbor Infrastructure Inventory Process

- Gather information on critical infrastructure protected by federally maintained navigation structures
 - ▶ Review Documents:
 - Project Drawings
 - Harbor Fact Sheet
 - Aerial/Satellite Photography; Photo document critical infrastructure
 - ▶ Identify Critical Infrastructure to Visit
 - ▶ Research Identified Critical Infrastructure
- Site Visit Tasks
 - ▶ Met with Local Officials, Port Authority, Harbor Master, when available
 - ▶ Visit Identified Areas/Critical Infrastructure & Gather Information
- Post Site Visit Tasks
 - ▶ Create Report Following the Standard Report Template



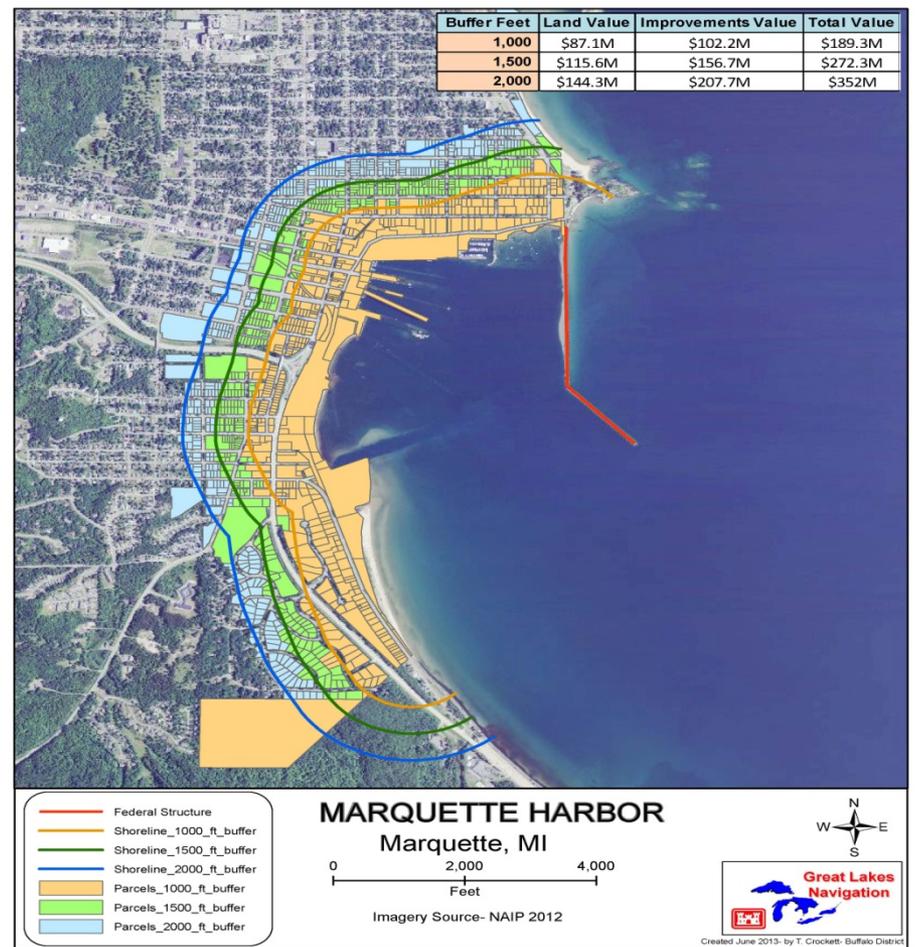
Harbor Infrastructure Inventory Report Content

- **HARBOR LOCATION**
- **PROJECT DESCRIPTION**
 - Authorization, harbor type (commercial or recreational), length of breakwater structures and channel
- **DATE OF SITE VISIT**
- **SUMMARY OF STRUCTURES**
 - Lists all structures and facilities that are believed to be protected by the federal navigation structures; also identify any other potential stakeholders
- **SUMMARY OF IMPACT**
 - Summarizes any potential damage that could be experienced if the federal breakwater fails.
- **DESCRIPTION OF STRUCTURES**
 - Aerial photo with all potential affected structures shown along with pictures and a brief description of each potentially affected structure



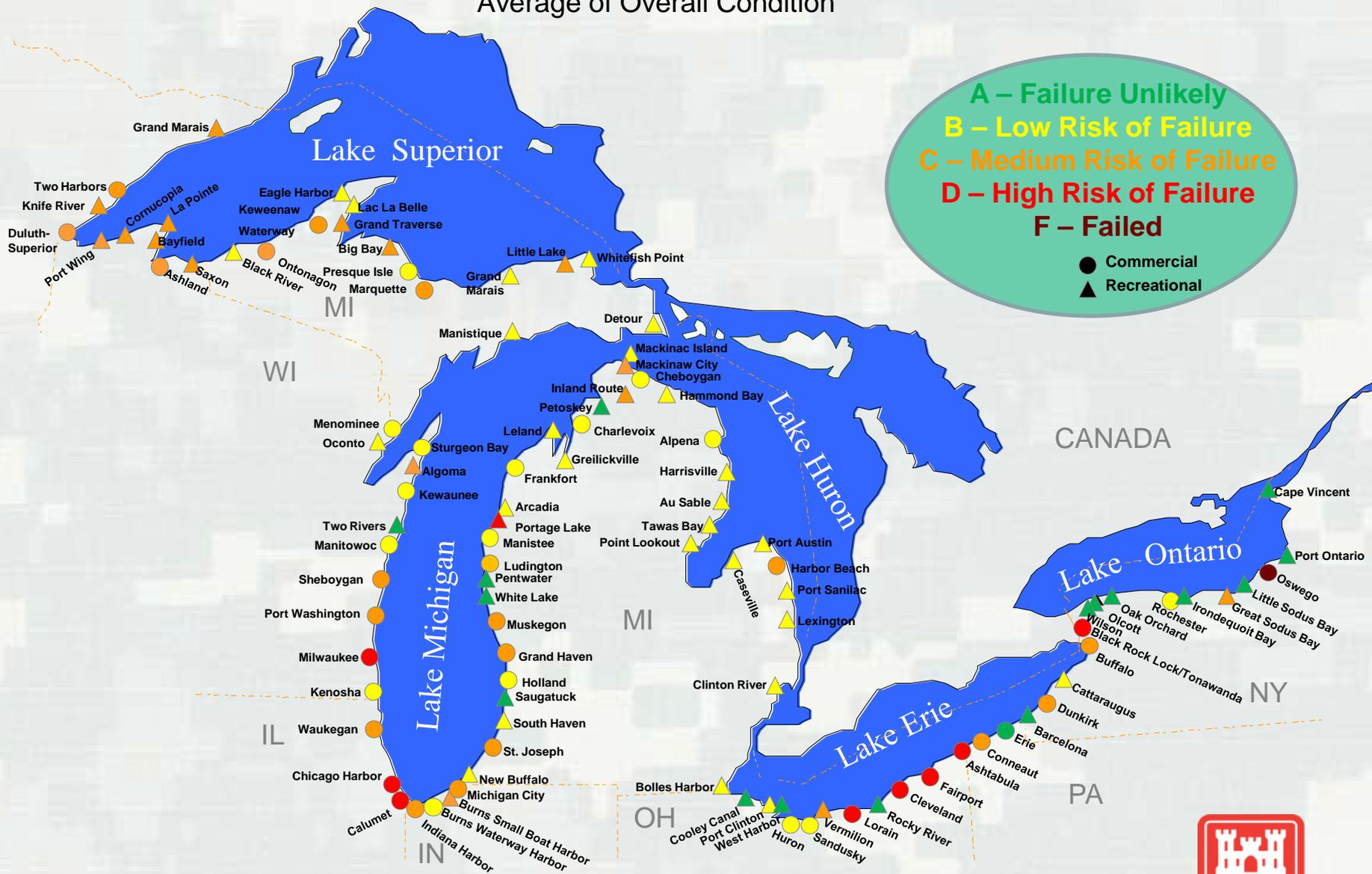
High Level Display of Potential Impact Areas

- Three potential impact areas were defined at 500 ft intervals
- Shows potential value of land and infrastructure within each “potential impact area” based on tax assessment data



Harbor Structure Condition Assessments

Average of Overall Condition



Harbors of “Middle UP and Northern Wisconsin”



Kewaunee Harbor: B – Low Risk of Failure



Kewaunee Harbor:



North Breakwater.



North Breakwater.



Kewaunee Harbor:



South Breakwater.



Confined Disposal Facility.



Kewaunee Harbor:

Infrastructure:

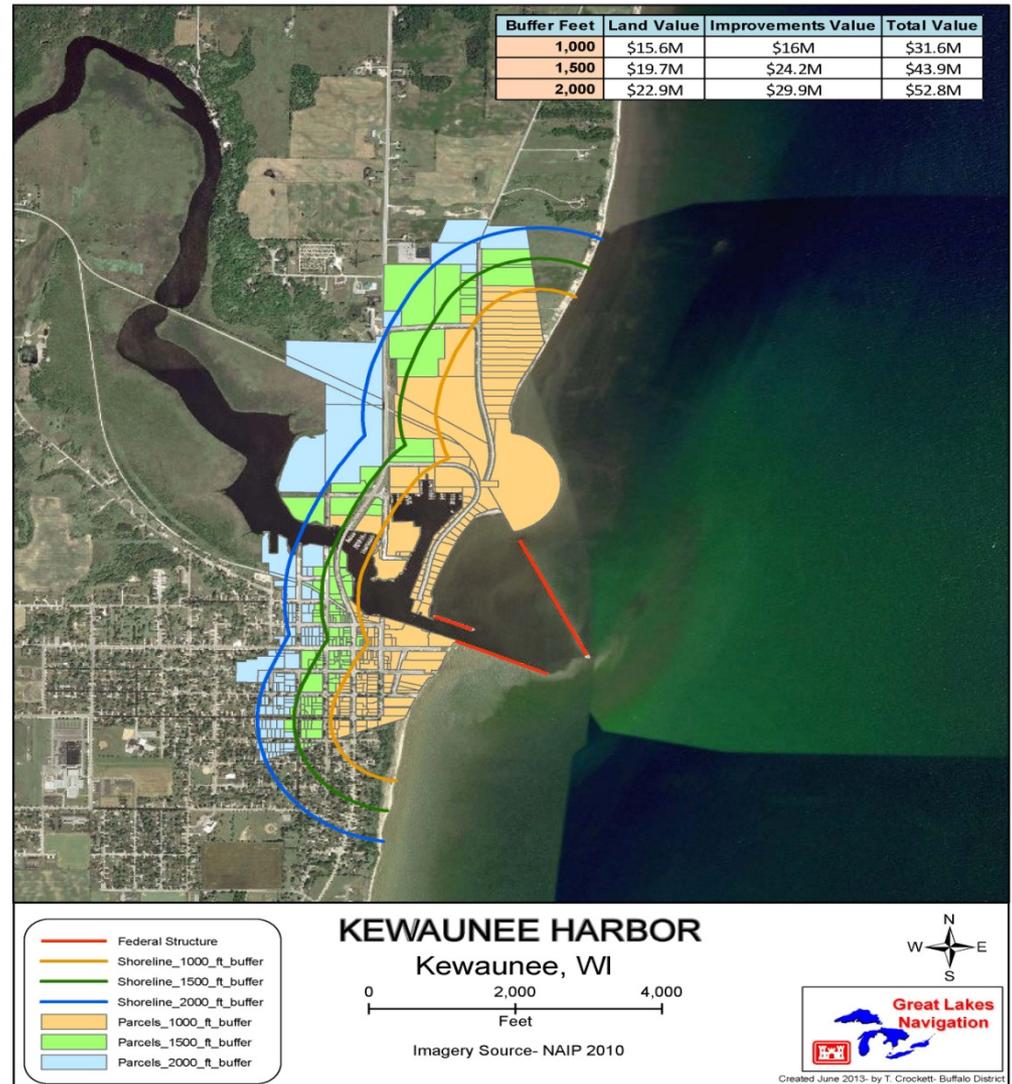
1. Wisconsin Highway 42 Bridge
2. Kewaunee Marina
3. Salmons Harbor Marina
4. Kewaunee Combined Disposal Facility
5. Restaurants
6. Commercial Business
7. Corps of Engineers Office
8. Commercial Business
9. Residents



Kewaunee Harbor

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$15.6M	\$16M	\$31.6M
1,500	\$19.7M	\$24.2M	\$43.9M
2,000	\$22.9M	\$29.9M	\$52.8M



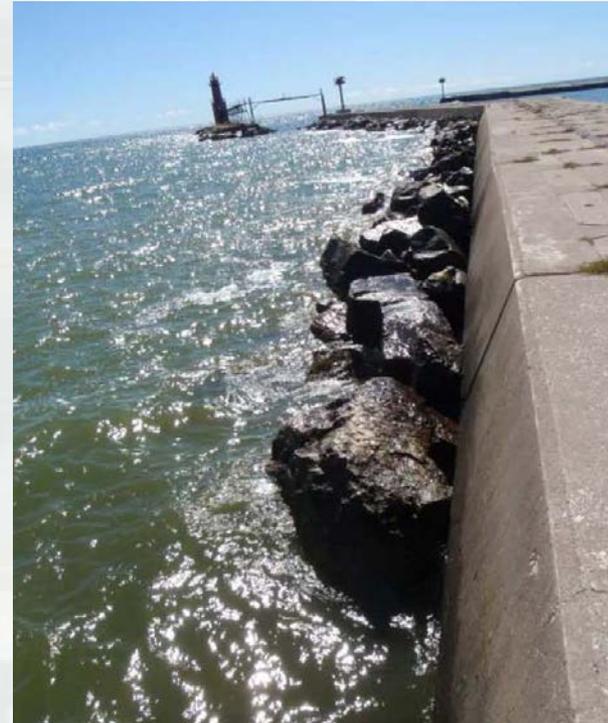
Algoma Harbor: C – Medium Risk of Failure



Algoma Harbor:



North Breakwater.



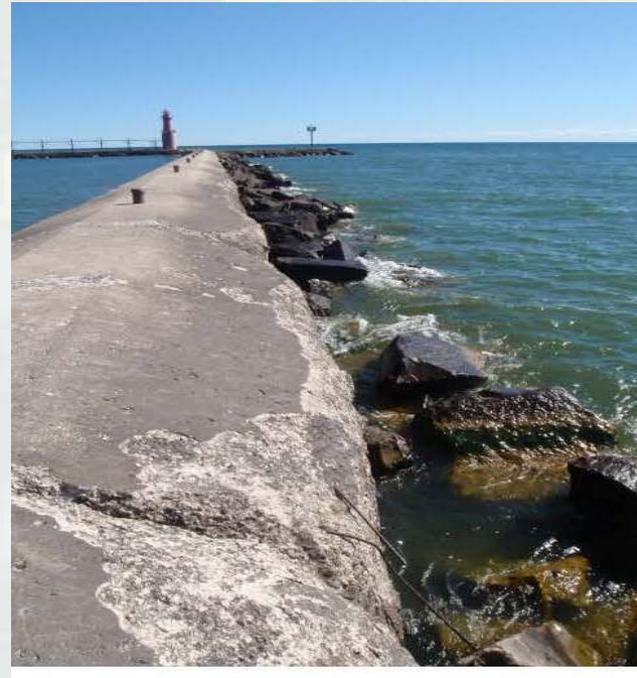
Section C, outside Scour Protection.



Algoma Harbor:



South Breakwater, Section F.



Deterioration in Section D



Algoma Harbor:

Infrastructure

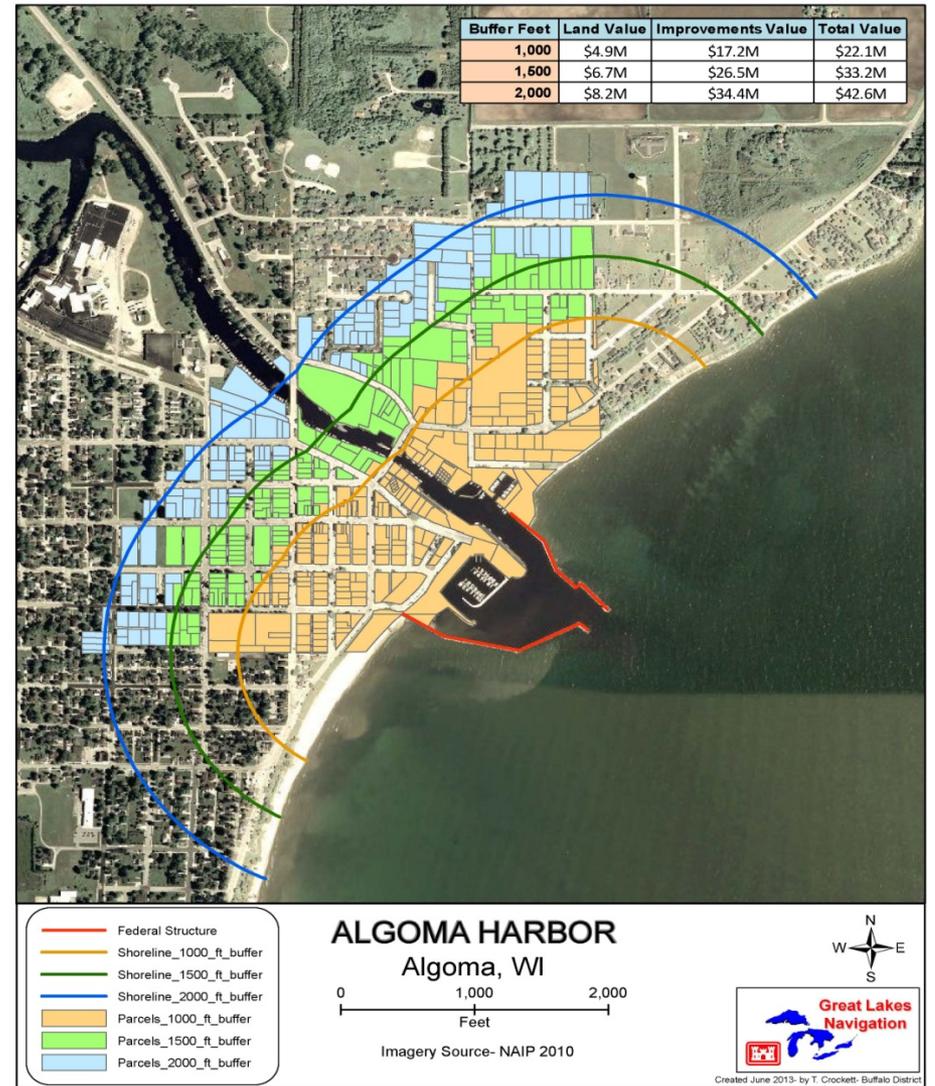
1. City of Algoma Marina
2. Academy of Fine Arts
3. County Road S Bridge
4. Sunrise Cove Marina



Algoma Harbor

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$4.9M	\$17.2M	\$22.1M
1,500	\$6.7M	\$26.5M	\$33.2M
2,000	\$8.2M	\$34.4M	\$42.6M



Sturgeon Bay Harbor: B – Low Risk of Failure



Sturgeon Bay Harbor:



North Breakwater.



Moderate Deterioration of Harbor Side foot locks.



Sturgeon Bay Harbor:



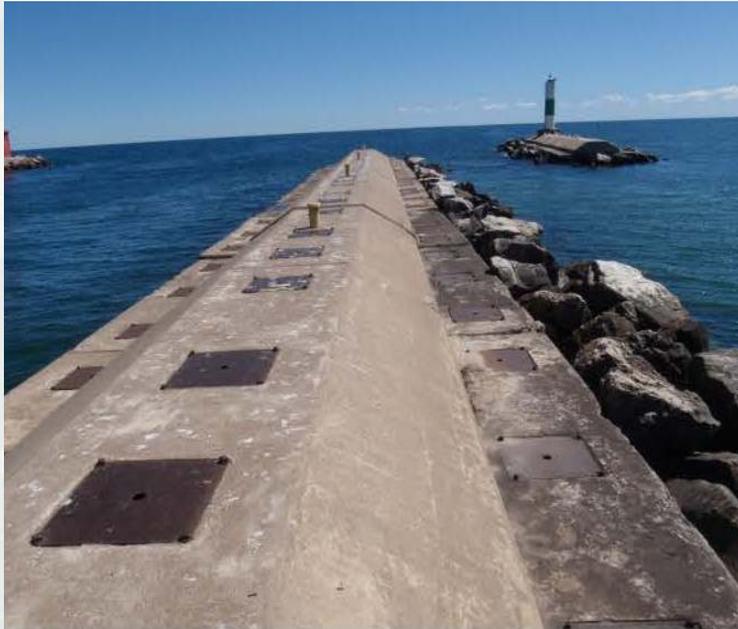
North Breakwater, Detached Portion.



South Breakwater, Revetment Portion.



Sturgeon Bay Harbor:



South Breakwater, Section A.



South Breakwater, end pier is inclined away from navigation light.



Sturgeon Bay Harbor:

Infrastructure:

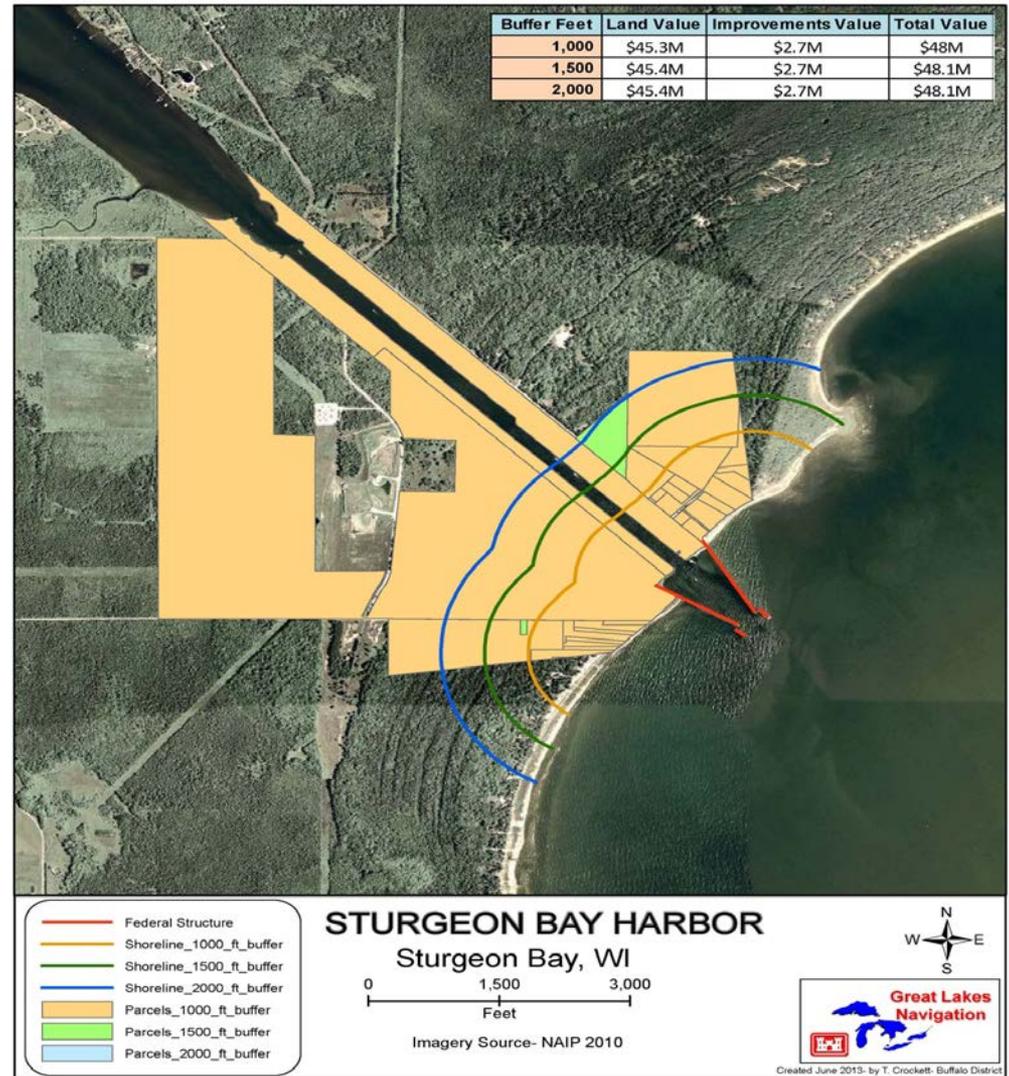
1. U.S. Coast Guard
2. South side of Ship Canal, mainly undeveloped.
3. Canal Walkway



Sturgeon Bay Harbor

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$45.3M	\$2.7M	\$48M
1,500	\$45.4M	\$2.7M	\$48.1M
2,000	\$45.4M	\$2.7M	\$48.1M



Oconto Harbor:

B – Low Risk of Failure



Oconto Harbor:



South Breakwater.



South Breakwater.



Oconto Harbor:

Infrastructure:

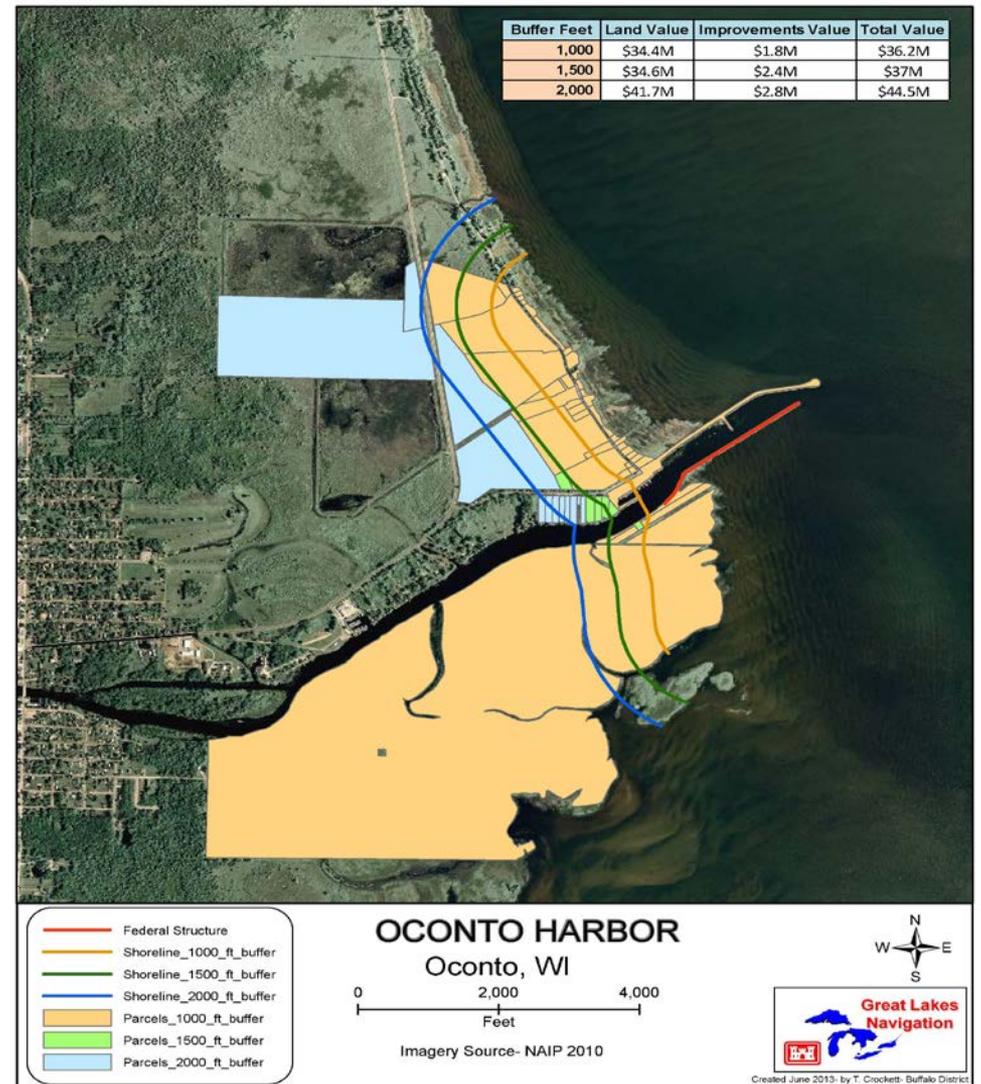
1. Breakwater Park



Oconto Harbor:

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$34.4M	\$1.8M	\$36.2M
1,500	\$34.6M	\$2.4M	\$37M
2,000	\$41.7M	\$2.8M	\$44.5M



Menominee Harbor:
C – Medium Risk of Failure



Menominee Harbor:



Overview of North Breakwater.



North Breakwater, Section C.



Menominee Harbor:



Overview of South Breakwater.



South Breakwater - Section D,
deterioration on side.



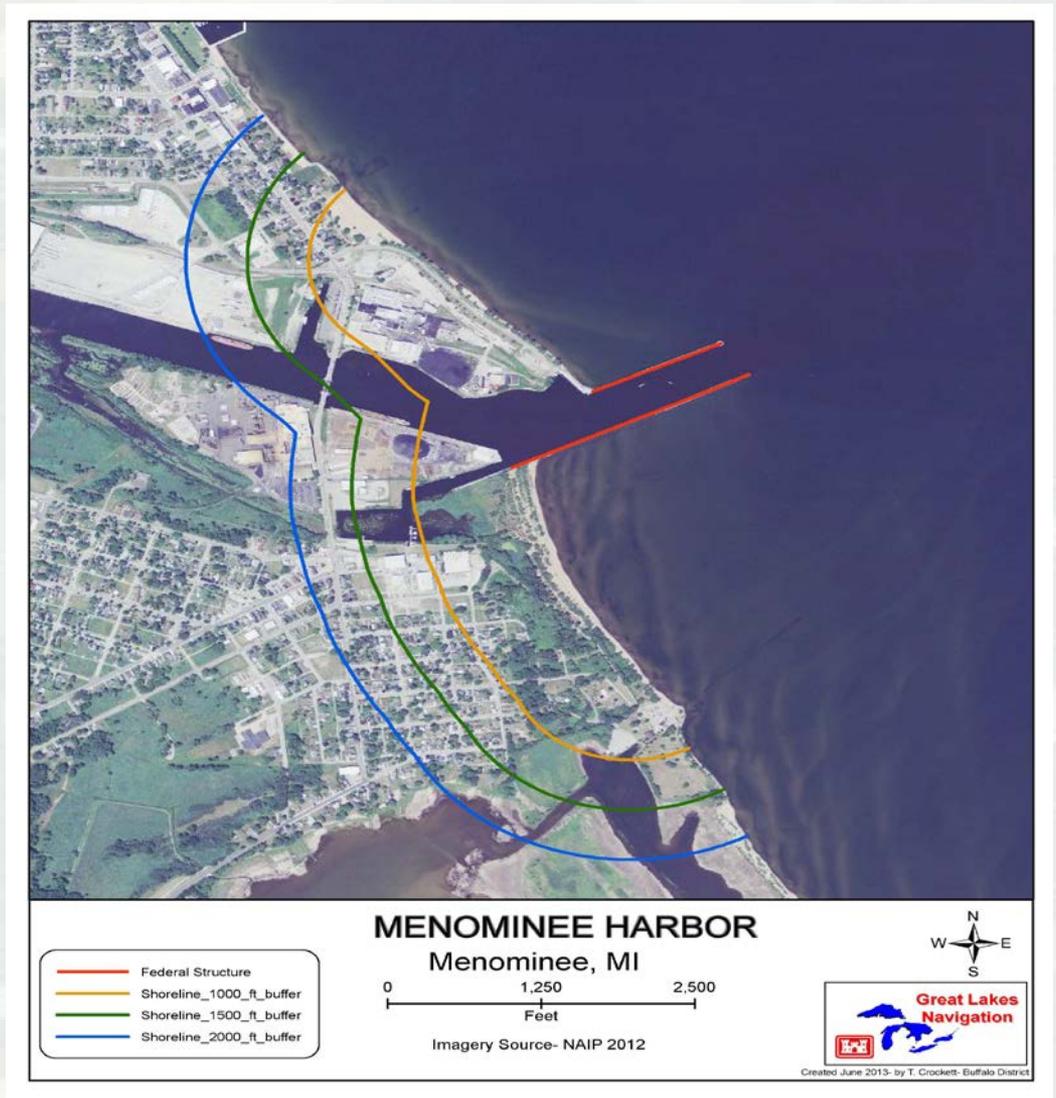
Menominee Harbor:

Infrastructure:

1. US 41 Highway Bridge
2. Marine Corporation
3. Fire Suppression Business
4. Wastewater Treatment Plant
5. Pulp Mill
6. Iron Casting Foundry
7. 1st Street Bridge
8. Logistics Company



Menominee Harbor:



**Cedar River Harbor:
B – Low Risk of Failure**



Cedar River Harbor:



West Breakwater.



East Breakwater.



Cedar River Harbor:

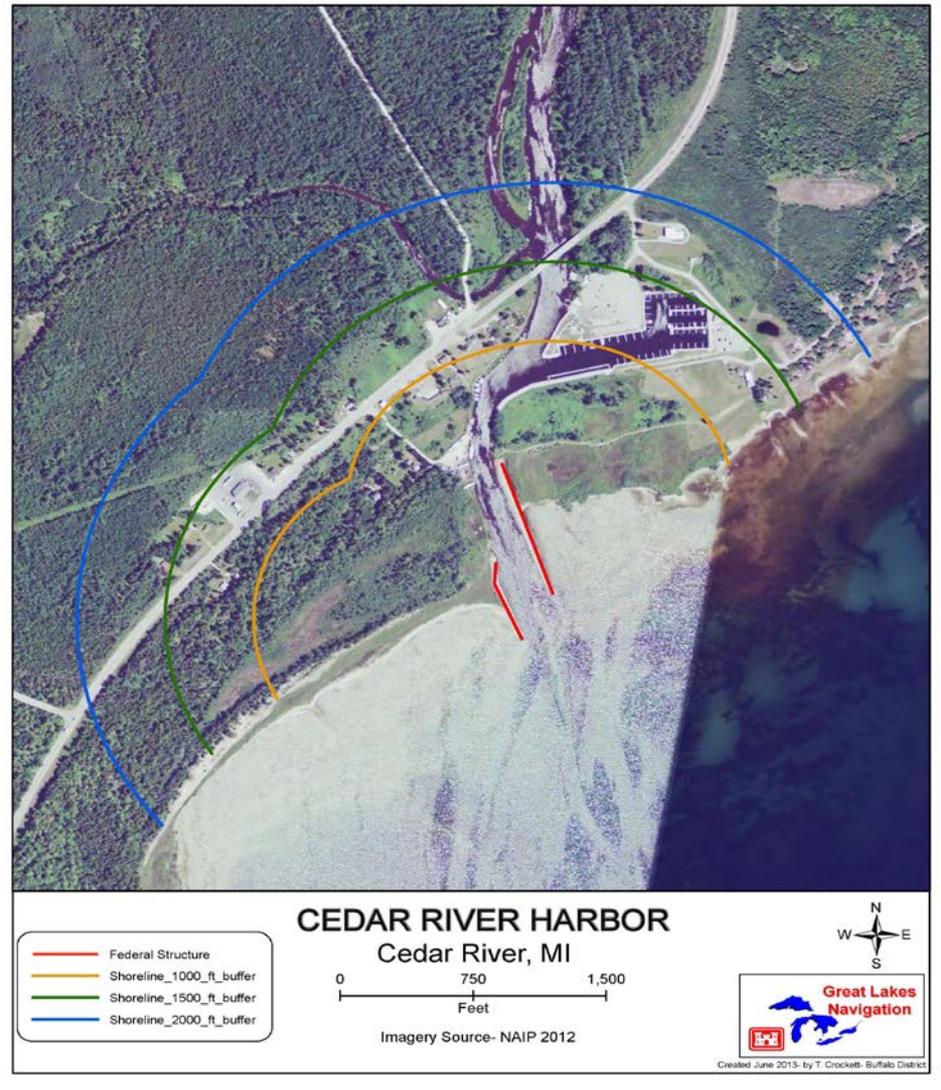
Infrastructure:

1. Cedar River State Harbor
2. Private Business



Cedar River Harbor:

Potential Impact Areas



Marquette Harbor: B – Low Risk of Failure



Marquette Harbor:



Stone protection lakeside of Breakwater.



Easterly Breakwater.



Outer Rubble Breakwater,
looking southeast.



Marquette Harbor:



Breakwater concrete miss alignment.



Concrete Spalling.



Marquette Harbor:



Under water video showing a 24" void between the timber cribs near cross section 22+40 facing west.



Remote Operated Vehicle is inside timber crib structure near cross section 22+40.



Marquette Harbor:

Infrastructure:

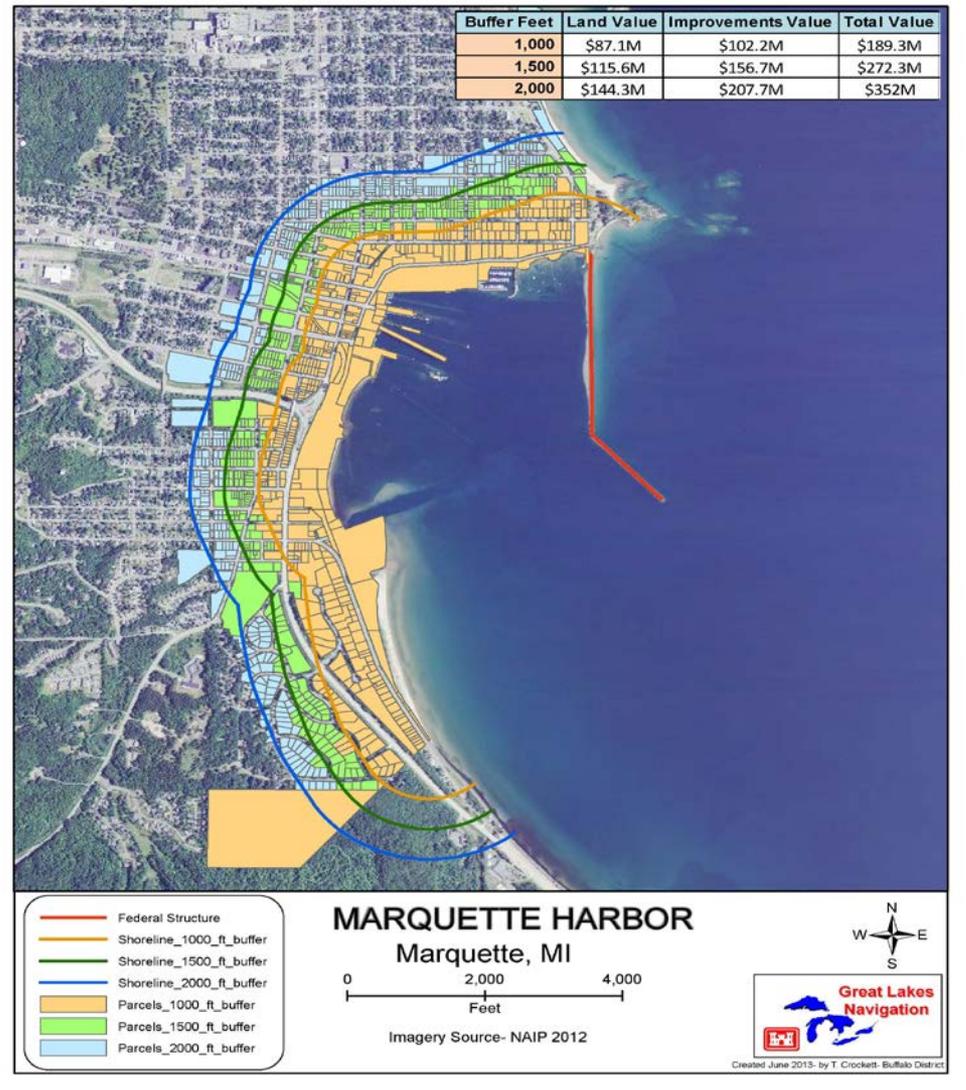
1. South Beach Park
2. Residential Homes
3. Power Plant
5. Recreational Path
6. Founders Landing Beach
8. Ore Dock
9. Private Marina
10. Condominiums
11. Mattson Park
12. Cinder Pond Marina
13. Private Marina
14. Sanitary Lift Station



Marquette Harbor:

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$87.1M	\$102.2M	\$189.3M
1,500	\$115.6M	\$156.7M	\$272.3M
2,000	\$144.3M	\$1.9M	\$3.5M



Presque Isle Harbor:
B – Low Risk of Failure



Presque Isle Harbor:

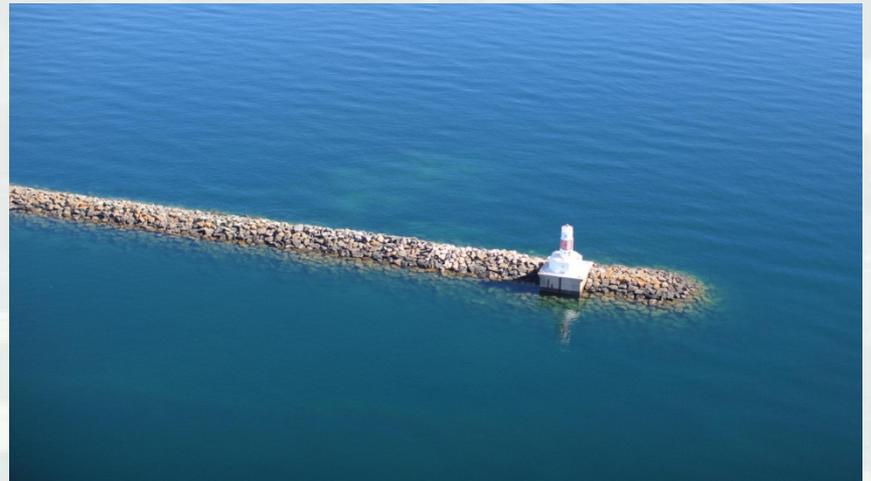


Concrete Breakwater – near shore.

End of rubble mound Breakwater.



Transition from concrete to rubble mound.



Presque Isle Harbor :



Rubble mound cross section.



Settlement between breakwater sections.



Presque Isle Harbor :

Infrastructure:

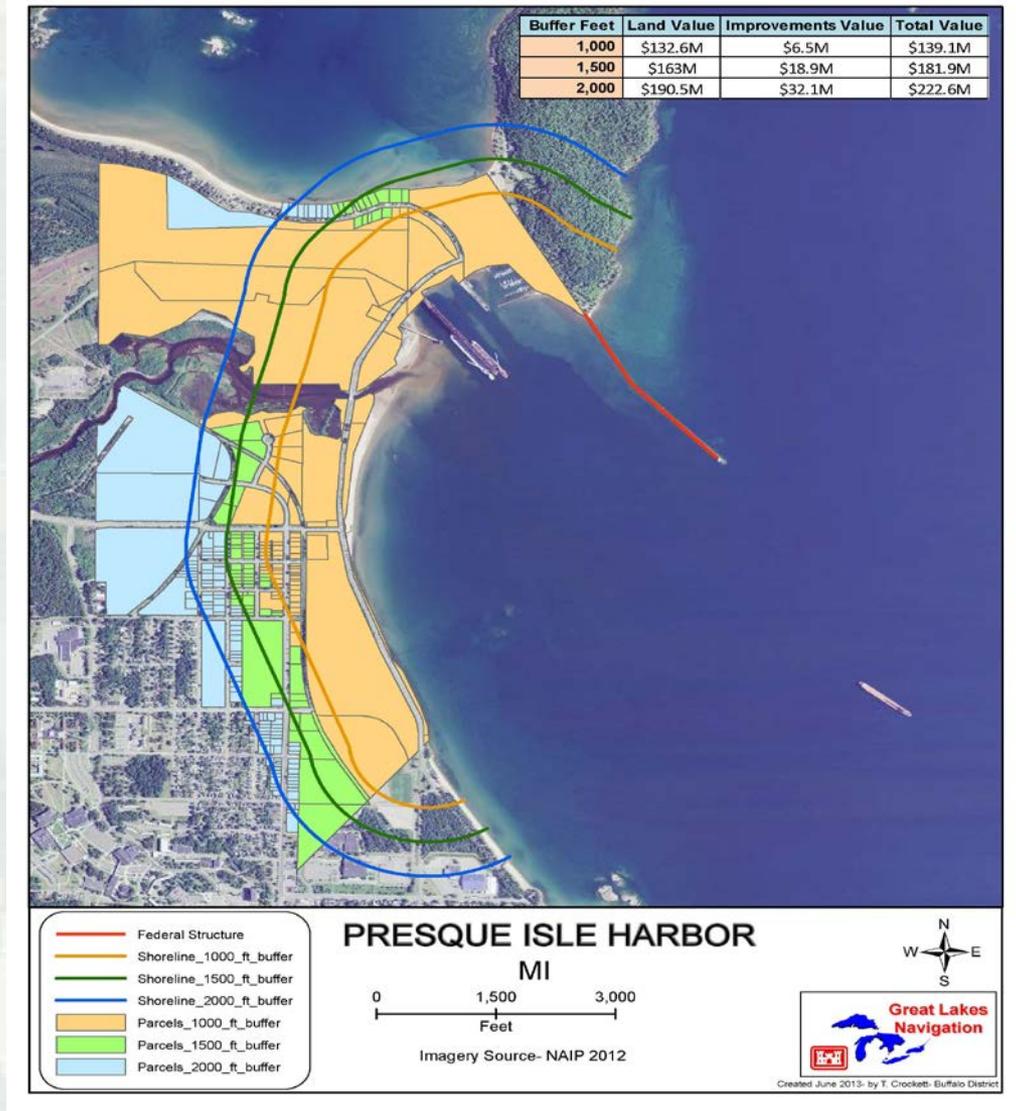
1. Residential
2. Office Complex
3. Sanitary Lift Station
4. Presque Isle Power Plant
5. Power Plant Coal Conveyor
6. Railroad Ore Loading Dock
7. Presque Isle Marina



Presque Isle Harbor :

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$132.6M	\$6.5M	\$139.1M
1,500	\$163M	\$18.9M	\$181.9M
2,000	\$190.5M	\$32.1M	\$222.6M



Big Bay Harbor: C – Medium Risk of Failure



Big Bay Harbor:



Shore side view of structures.



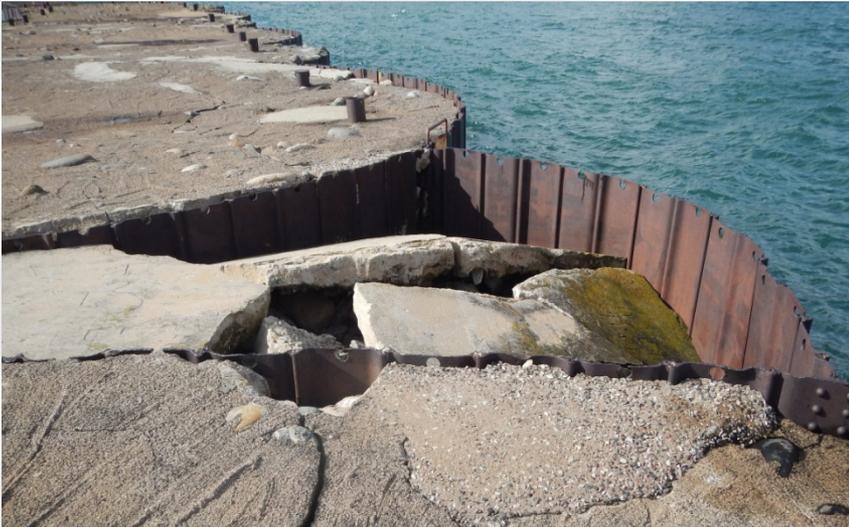
Steel sheet pile wall.



Sheet pile cells.



Big Bay Harbor:



Void in Sheet Pile Cell.

Steel Sheet Pile and Rubble Mound Breakwater.



Big Bay Harbor:

Infrastructure:

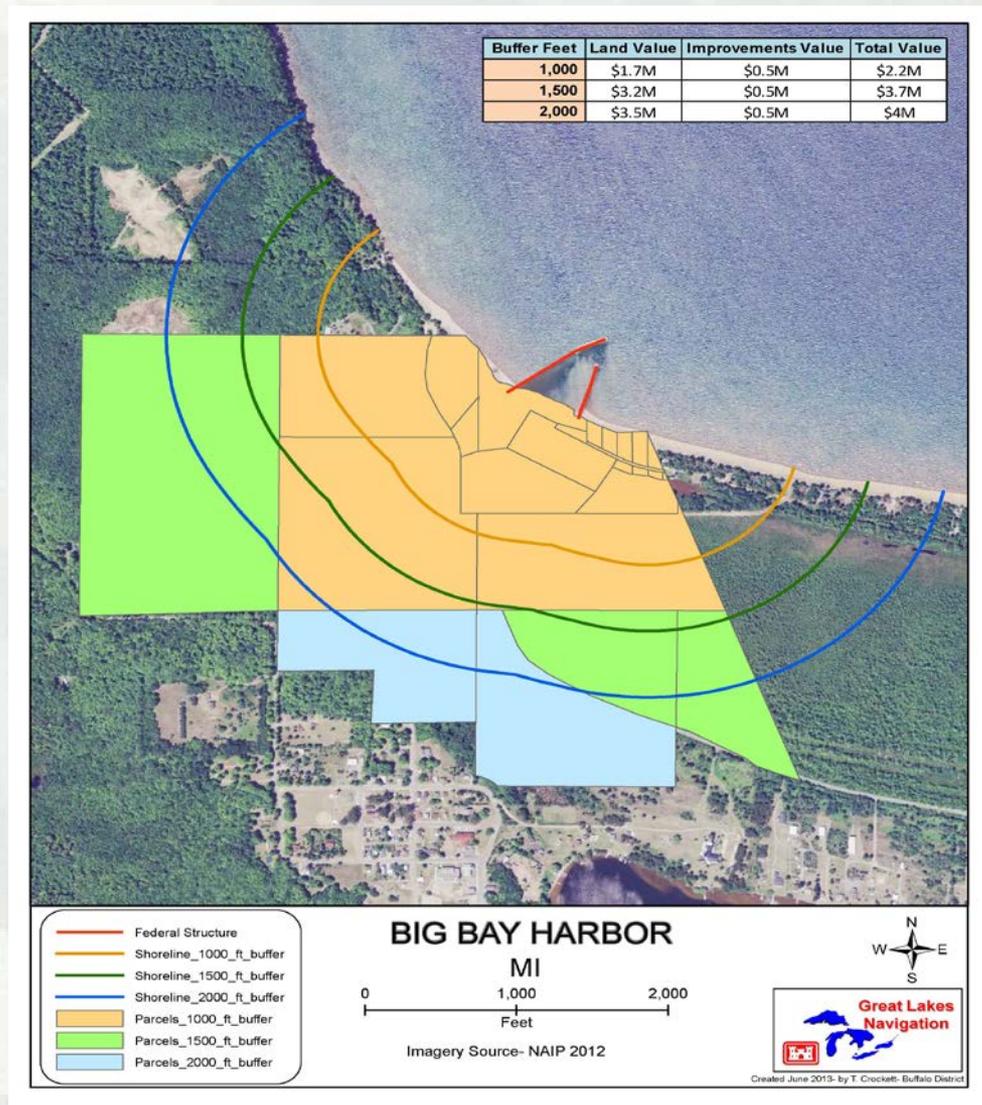
1. MDNR Marina



Big Bay Harbor: :

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$1.7M	\$0.5M	\$2.2M
1,500	\$3.2M	\$0.5M	\$3.7M
2,000	\$3.5M	\$0.5M	\$4.0M



Grand Traverse Bay Harbor:

B – Low Risk of Failure/ C – Medium Risk of Failure



Grand Traverse Bay Harbor:



North Breakwater



North Breakwater



Grand Traverse Bay Harbor :



North Breakwater.



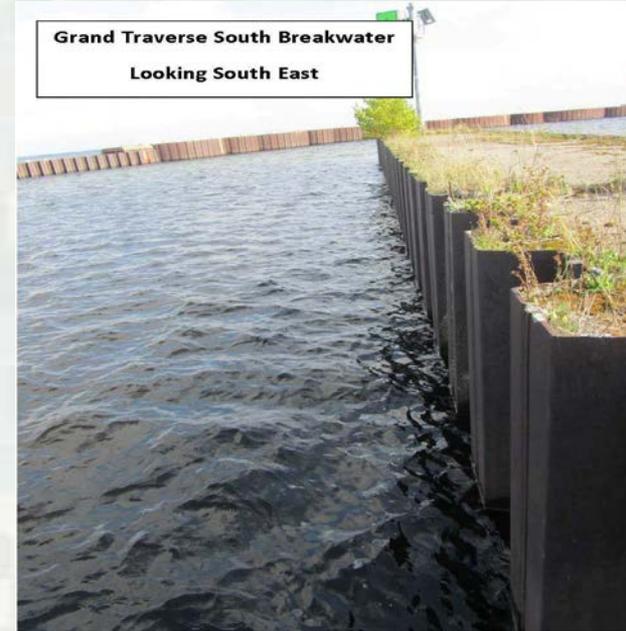
North Breakwater.



Grand Traverse Bay Harbor :



South Breakwater.



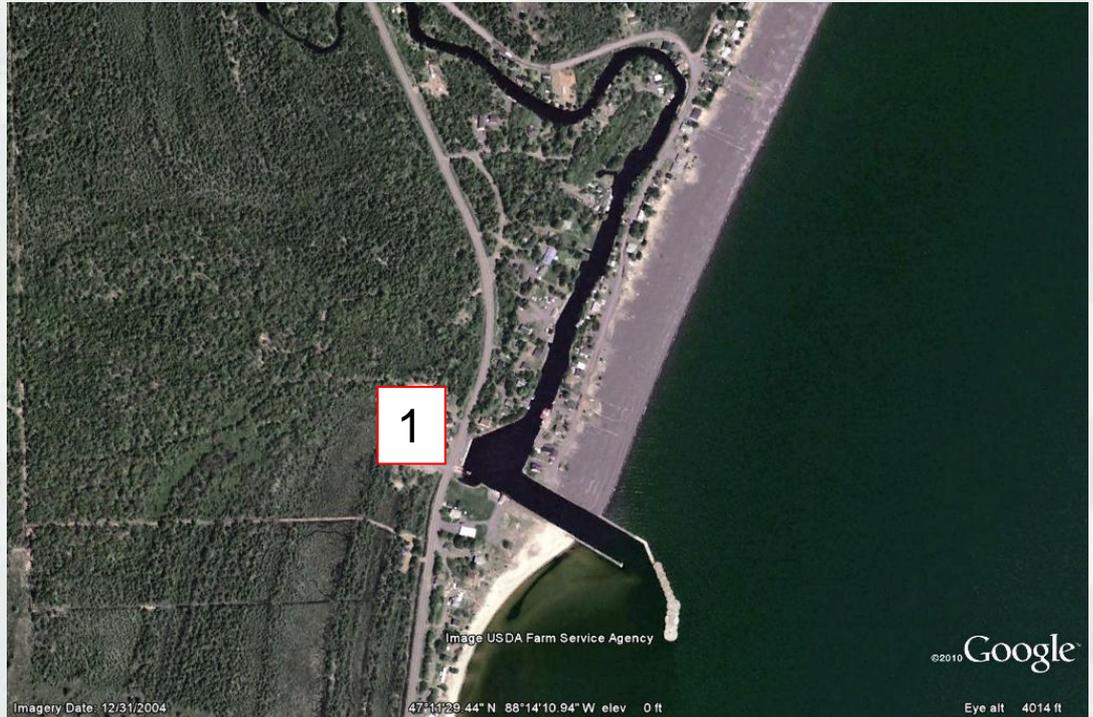
South Breakwater.



Grand Traverse Bay Harbor :

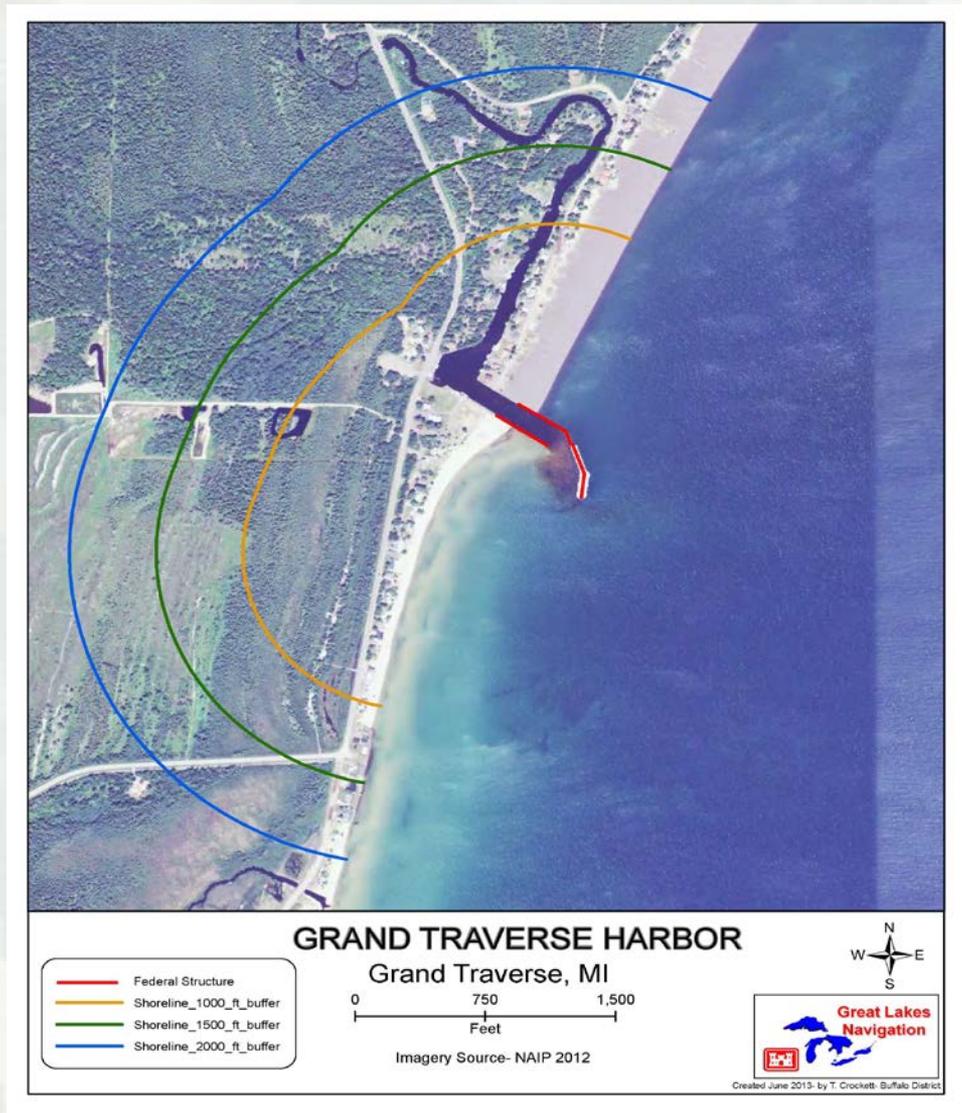
Infrastructure:

1. Big Traverse Road adjacent to harbor.



Grand Traverse Bay Harbor :

Potential Impact Areas



Lac La Belle Harbor:
B – Low Risk of Failure



Lac La Belle Harbor:



North Entry, Looking West.



North Entry, Looking East.



Lac La Belle Harbor:



North Entry, Looking East.



North Entry.



Lac La Belle Harbor:

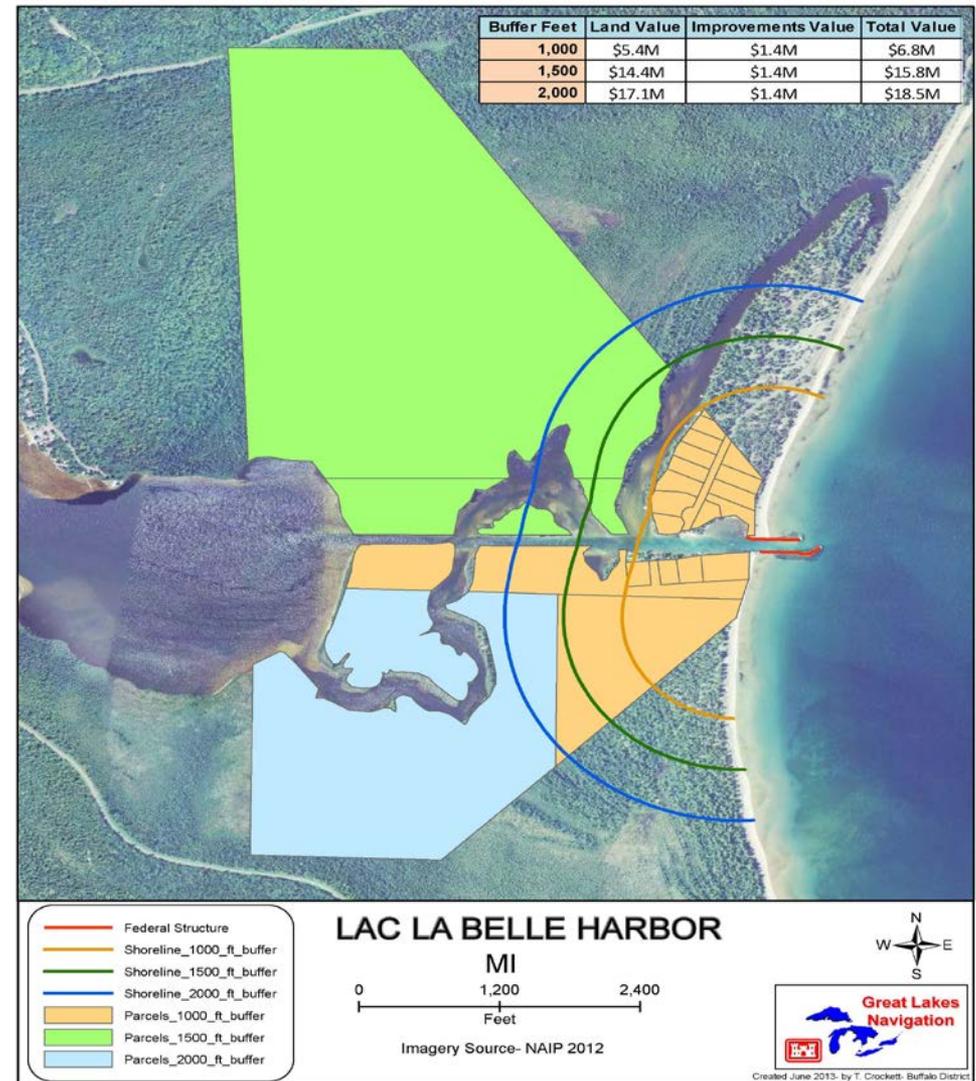
Infrastructure:



Lac La Belle Harbor: :

Potential Impact Areas

Buffer Feet	Land Value	Improv. Value	Total Assessed Value
1,000	\$5.4M	\$1.4M	\$6.8M
1,500	\$14.4M	\$1.4M	\$15.87M
2,000	\$17.1M	\$1.4M	\$18.5M



Eagle Harbor: B – Low Risk of Failure



Eagle Harbor:



Rubble Mound Breakwater – Looking South.



Rubble Mound Breakwater – Looking North.



Eagle Harbor:



Steel Revetment, Looking South.



Steel Revetment, Looking Southwest



Steel Revetment, Looking West.



Eagle Harbor:

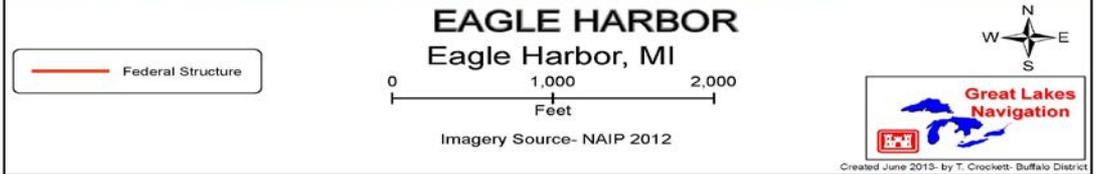
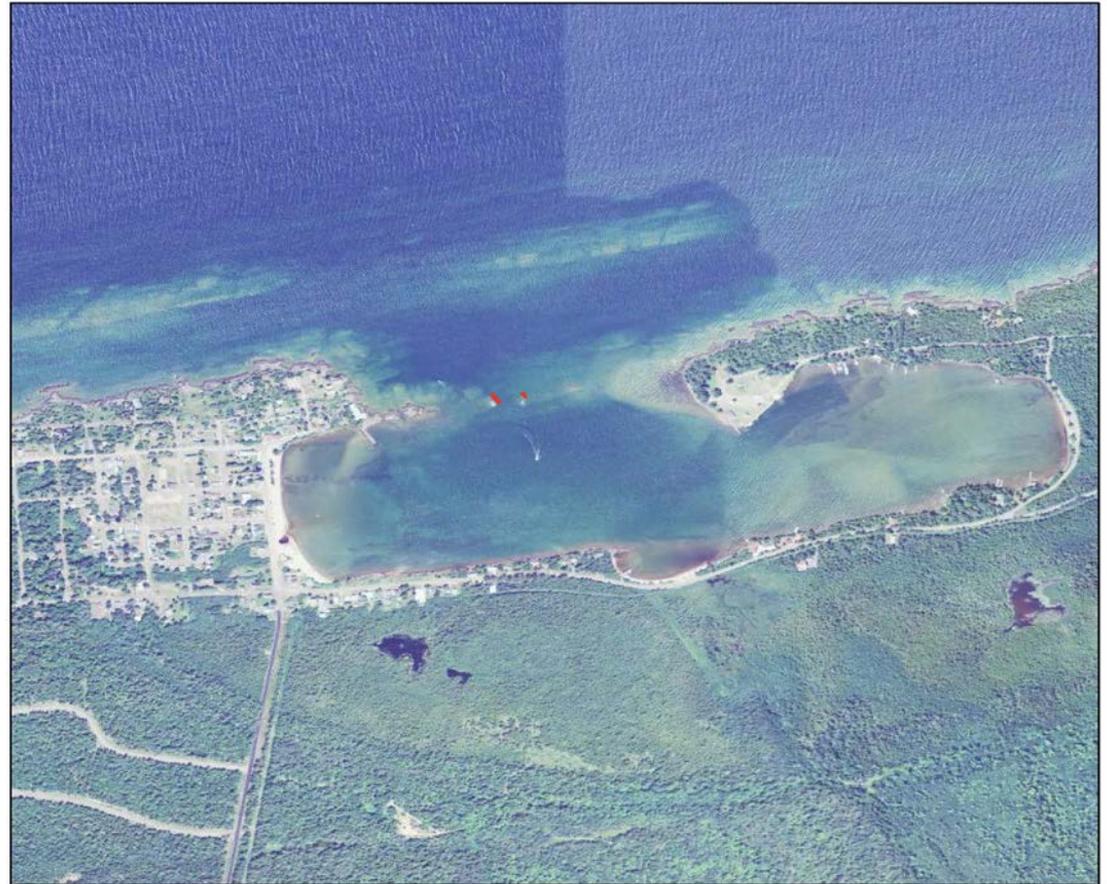
Infrastructure:

1. Eagle Harbor State Dock



Eagle Harbor:

Potential Impact Areas



Keweenaw Waterway Harbor:
C (East) – Medium Risk of Failure
B (West) – Low Risk of Failure



Keweenaw Waterway Harbor:



Keweenaw Waterway
Upper Entry Hancock Side
Looking North



Keweenaw Waterway
Upper Entry Hancock Side
Looking South East

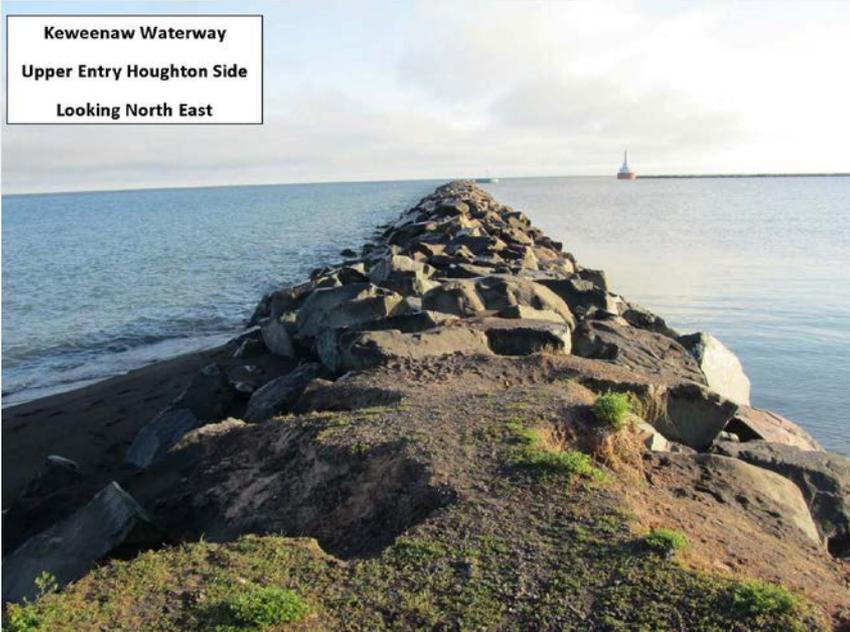


Keweenaw Waterway
Upper Entry Hancock Side
Looking South East

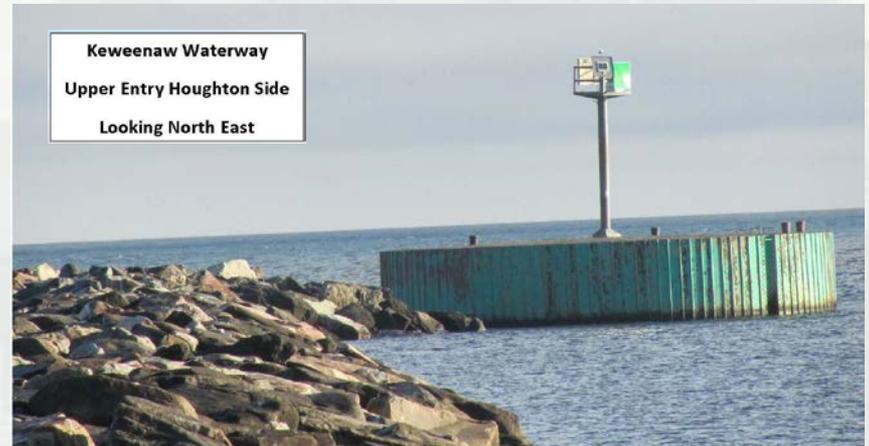
West /Upper Entry.



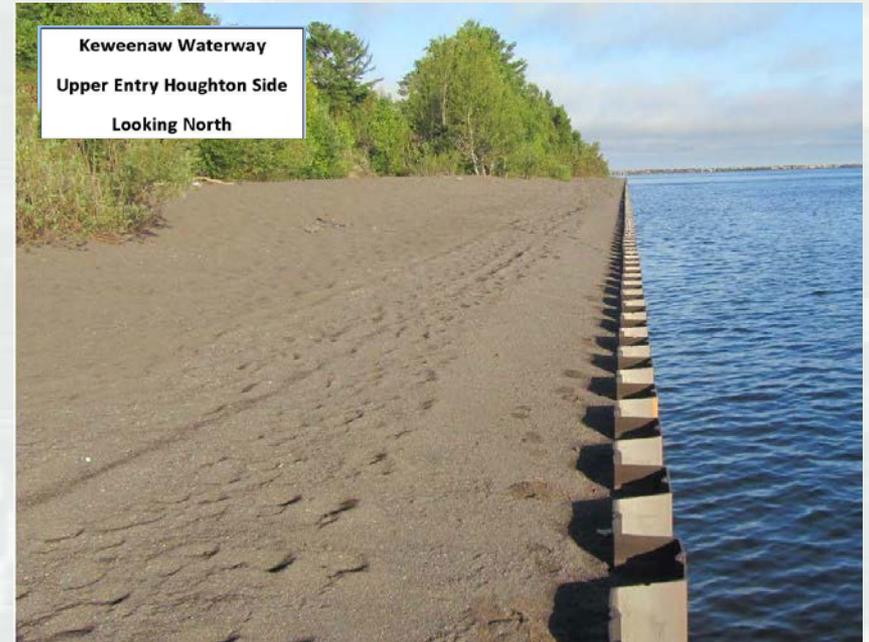
Keweenaw Waterway Harbor:



Keweenaw Waterway
Upper Entry Houghton Side
Looking North East



Keweenaw Waterway
Upper Entry Houghton Side
Looking North East

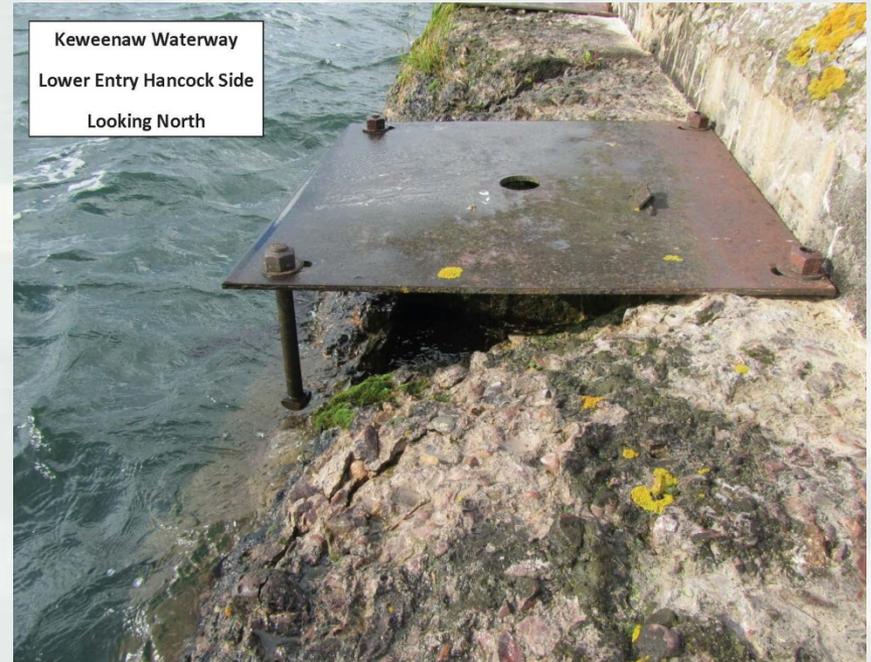


Keweenaw Waterway
Upper Entry Houghton Side
Looking North

West /Upper Entry..



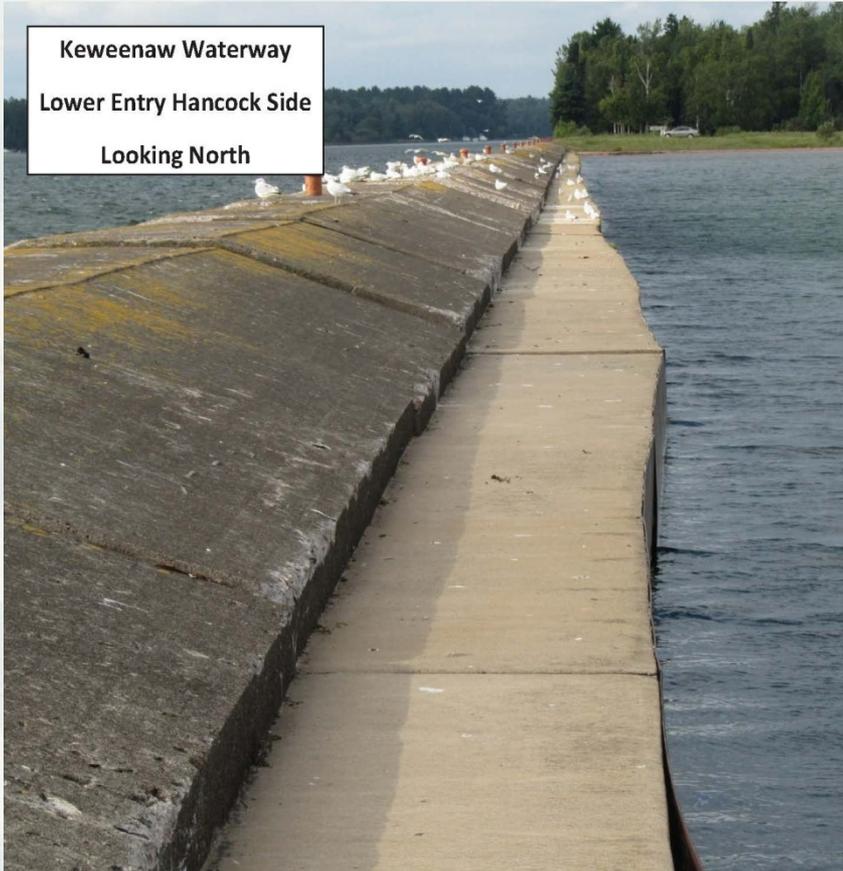
Keweenaw Waterway Harbor:



East/Lower Entry..



Keweenaw Waterway Harbor:



East/Lower Entry..



Keweenaw Waterway Harbor:



East/Lower Entry.



Keweenaw Waterway Harbor:

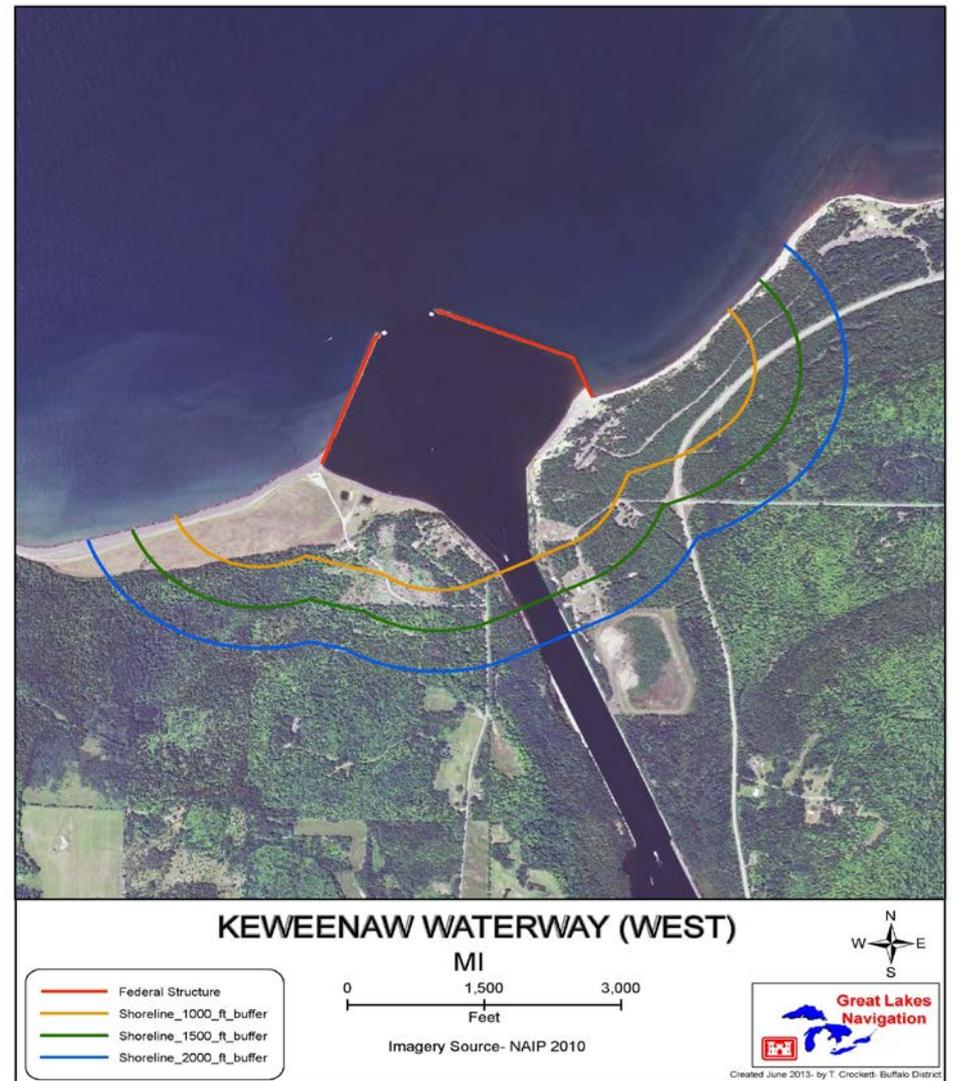
Infrastructure:

1. Residential
2. Private Marina



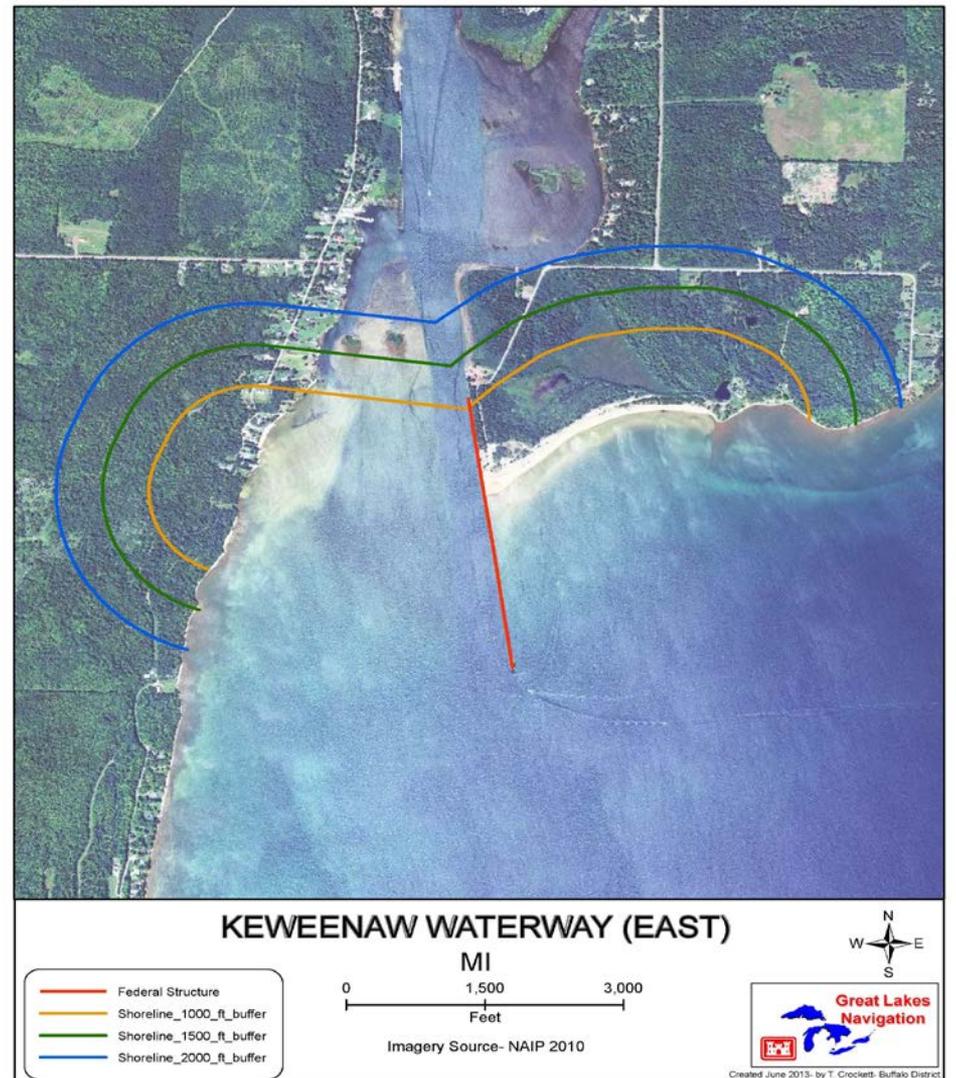
Keweenaw Waterway Harbor:

Potential Impact Areas



Keweenaw Waterway Harbor:

Potential Impact Areas



What Can Be Done?

- Federal Funding
 - ▶ Funding request through the Federal Budget process each fiscal year
 - Contract structural repair
 - Government floating plant repair
- Local Funding
 - ▶ Mechanisms in place to accept local funding
- Transfer to State/Local Entity
 - ▶ Section 216 Process



Visit our website for more information:

www.lre.usace.army.mil/Missions/GreatLakesNavigation.aspx



[HOME](#) > [MISSIONS](#) > [GREAT LAKES NAVIGATION](#)

Great Lakes Navigation System

The Great Lakes navigation system is a continuous 27-foot deep draft waterway that extends from the western end of Lake Superior at Duluth, MN to the Gulf of St. Lawrence on the Atlantic Ocean, a distance of over 2,400 miles. This bi-national resource is composed of the five Great Lakes, the connecting channels of the Great Lakes, the St Lawrence River and the Gulf of St. Lawrence. The U.S. portion of the system includes 140 harbors (60 commercial; 80 recreational), two operational locks, 104 miles of breakwaters and jetties, and over 600 miles of maintained navigation channels. In addition, the GLNS is connected to several other shallow draft waterways (Illinois Waterway, New York State Barge Canal, etc.) to form an important waterborne transportation network, reaching deep into the continent.

Contact GLNAVIGATION@USACE.ARMY.MIL to submit comments or questions related to the U.S. Army Corps of Engineers' role in Great Lakes navigation.



Great Lakes Navigation System

Contact Us

To submit comments or questions related to the U.S. Army Corps of Engineers' role in Great Lakes navigation, send email to GLNAVIGATION@usace.army.mil

Navigation Info

Great Lakes Harbors Information: Click for Great Lakes Harbors Fact Sheets and Fully Functional Harbor Maps.

Structure Risk Communication Meeting: The U.S. Army Corps of Engineers Great Lakes Navigation Team is in the process of planning a series of regional meetings to initiate a dialogue with state and local officials to inform them of the current condition of coastal infrastructure and the

Budgetary and Dredging Info

Fiscal Year 2014 President's Budget

[FY14 Budget Summary](#) - for the Great Lakes Navigation Business Line (Operations & Maintenance)

[FY14 President's Budget - Detailed Spreadsheet](#)

Fiscal Year 2013 President's Budget

[FY13 President's Budget - Detailed Spreadsheet](#)

Other Navigation Info

Great Lakes Navigation Informational Pamphlets

[Great Lakes Navigation System brochure \(PDF\)](#) - The Great Lakes Navigation System brochure gives information on the navigation system,

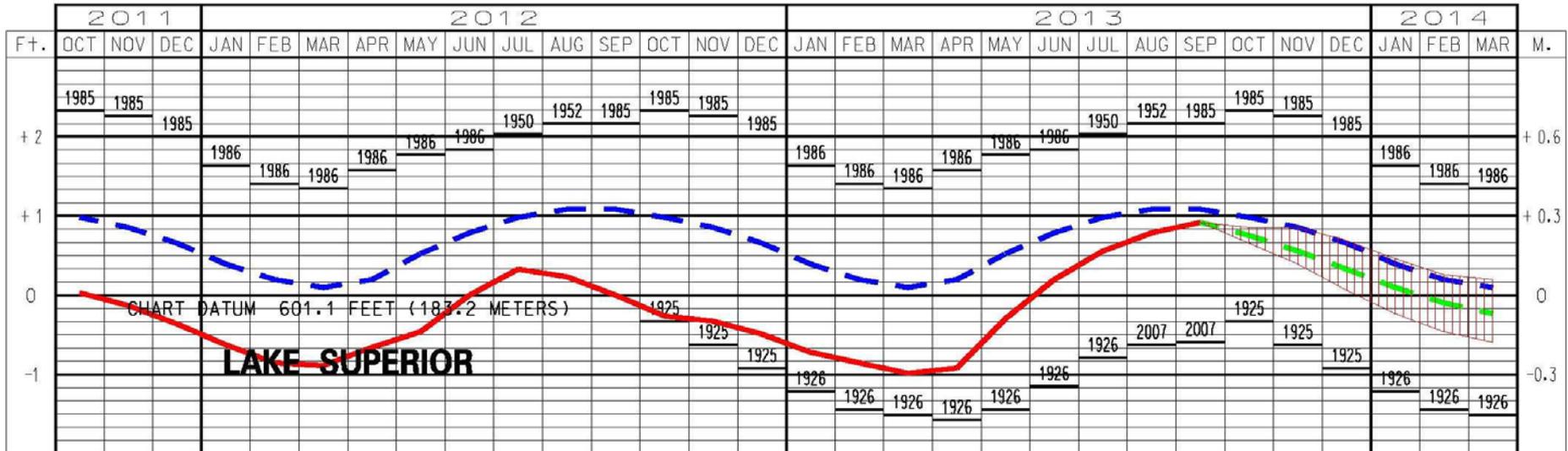


Questions?



Great Lakes Water Levels Forecast

LAKE SUPERIOR WATER LEVELS – OCTOBER 2013



LEGEND

LAKE LEVELS

RECORDED

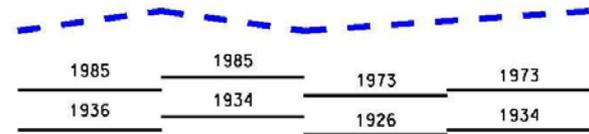
PROJECTED



AVERAGE **

MAXIMUM **

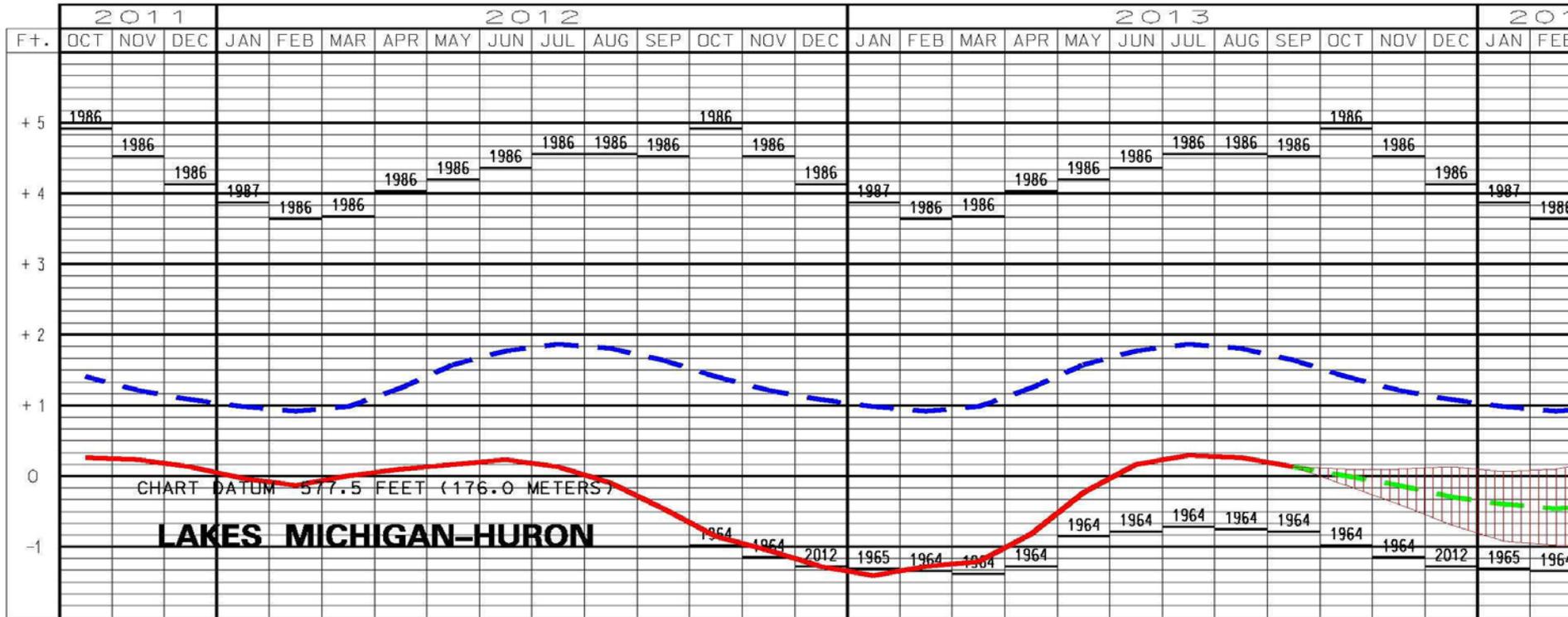
MINIMUM **



** Average, Maximum and Minimum for period 1918-2012

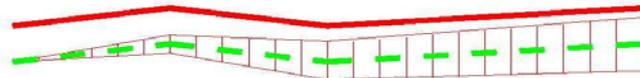


LAKES MICHIGAN-HURON WATER LEVELS - OCTOBER 2013

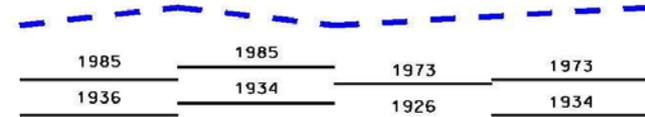


LEGEND LAKE LEVELS

RECORDED
PROJECTED



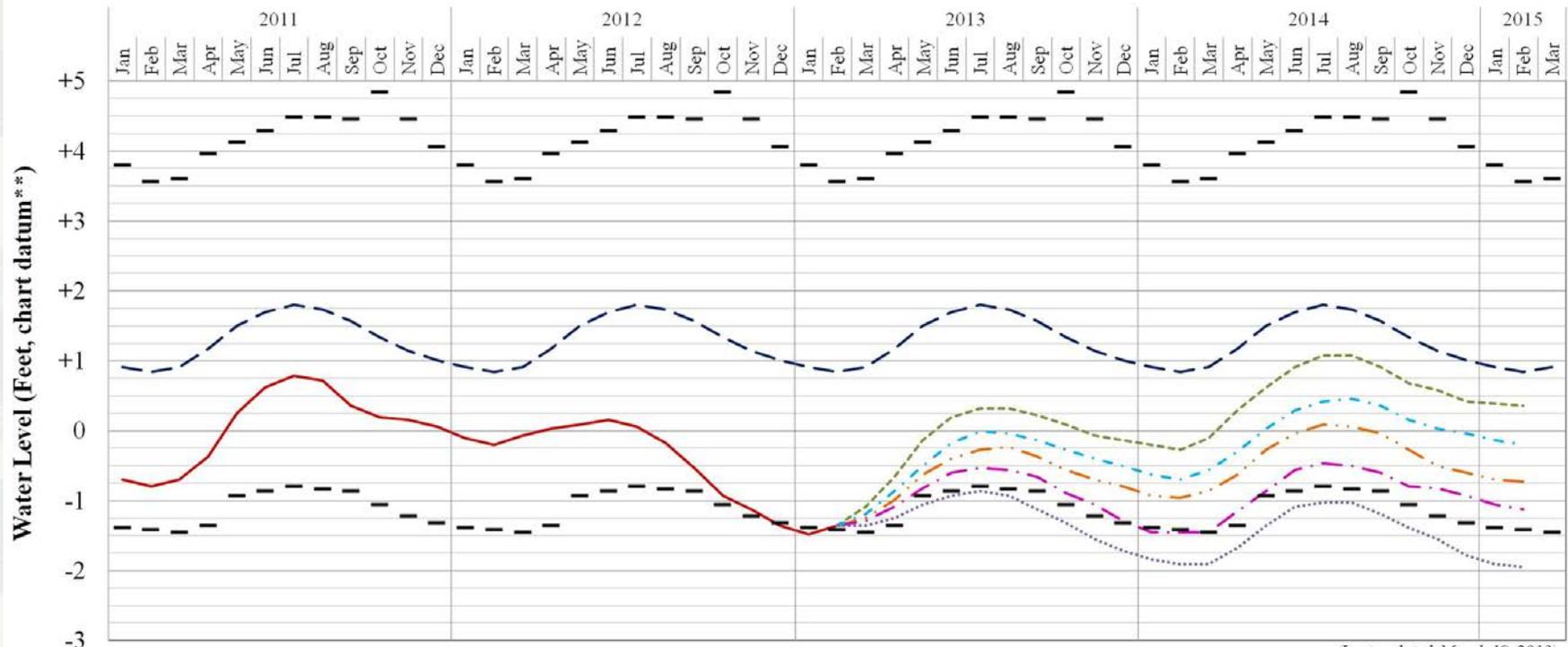
AVERAGE **
MAXIMUM **
MINIMUM **



** Average, Maximum and Minimum for period 1918-2012



2-Year Simulation of Lake Michigan-Huron Water Levels Under Varying Water Supplies



(Last updated: March 18, 2013)

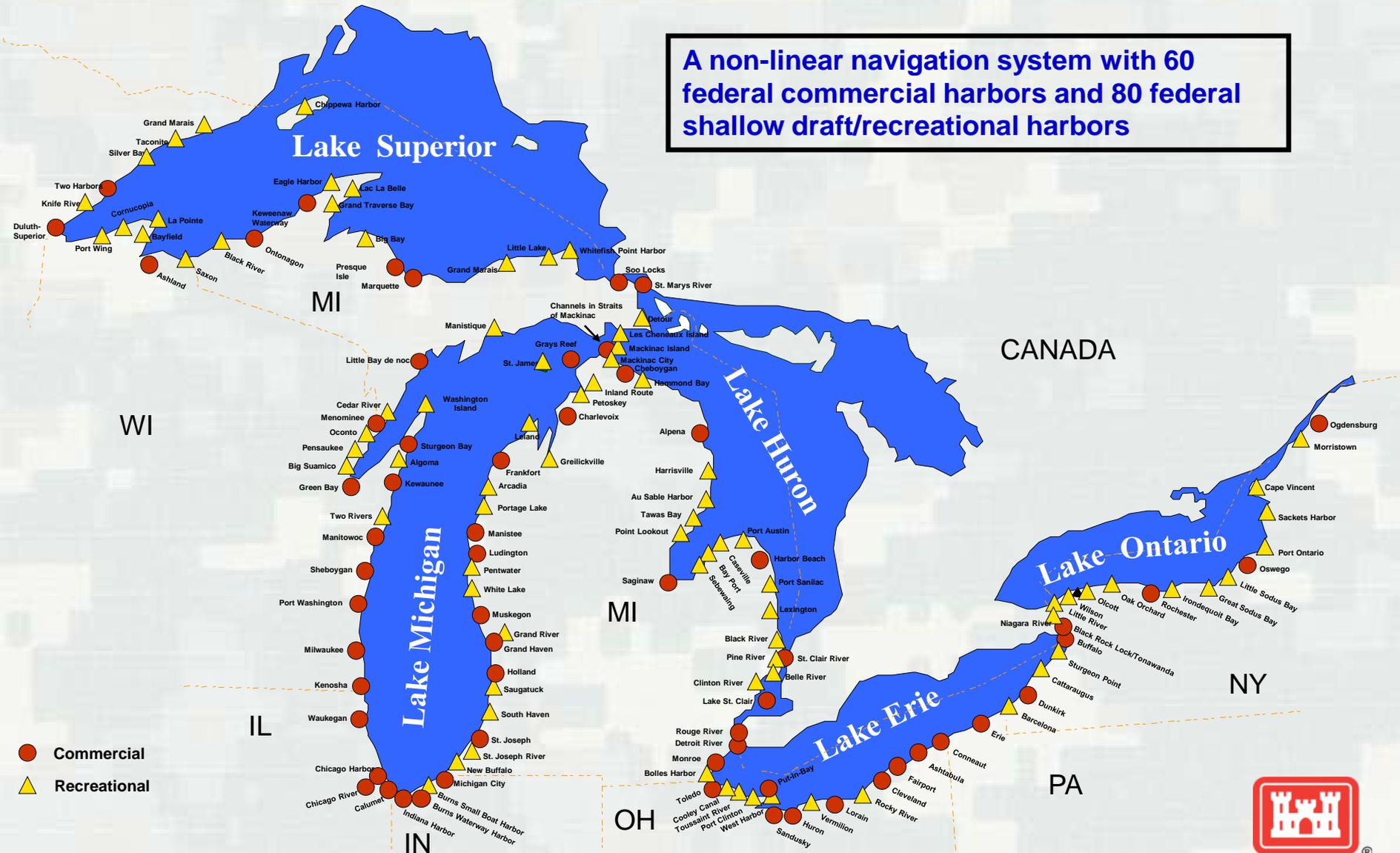
- Long Term Average*
- Historic Maximum*
- Historic Minimum*
- Recorded
- Projected Very Wet
- Projected Wet
- Projected Normal
- Projected Dry
- Projected Very Dry

* The Long Term Average, Historic Maximum, and Historic Minimum are from the official period of record for Great Lakes water levels, 1918 to 2012.
 ** Water levels are referenced to feet above (+) or below (-) chart datum. Chart datum for Lake Michigan-Huron is 577.5 ft, IGLD 1985.



Federal Harbors on the Great Lakes

A non-linear navigation system with 60 federal commercial harbors and 80 federal shallow draft/recreational harbors



FY13 Dredging Requirements and FY13 Funding

