



Rock Reef Fisheries Enhancement

Introduction – Guiding Principles

The Goals of this Project Include:

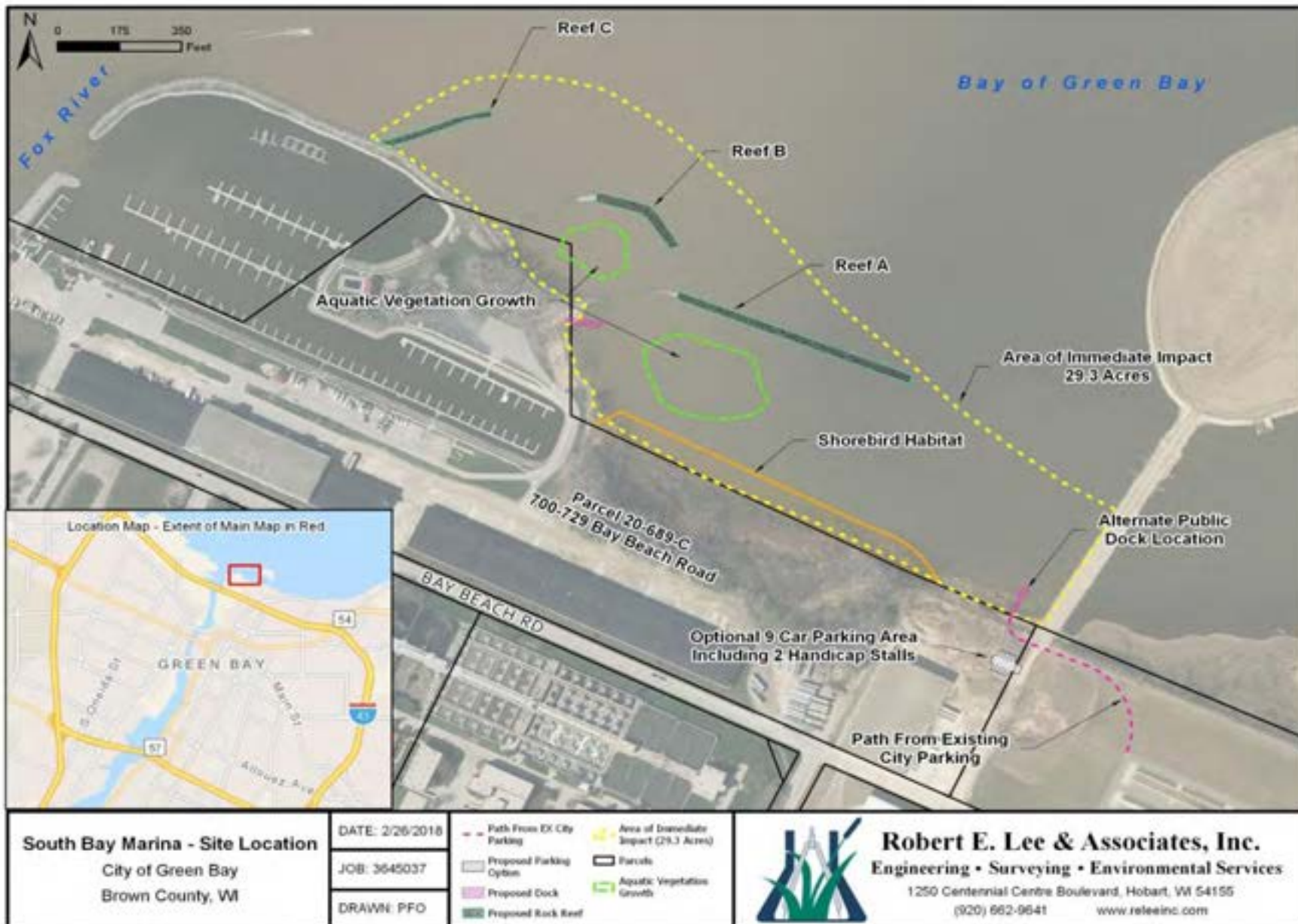
- *Restore and Extend the Rock Reef Fisheries Habitat*
- *Enhancement of Fishery Population*
- *Improve Conditions for Aquatic Vegetation Growth and Mudflat Beach for Shorebirds*
- *Expand Community Access to the Waterfront*
- *Improve Protection of Adjacent Properties*



Process

- *Stakeholder Input*
- *Establish Guiding Principles and Measures of Success*
- *Refinement of Concept Plan*
- *Technical Review Workshop*
- *Wave Modeling*
- *Draft Permit Application Review*
- *Final Concept Plan*

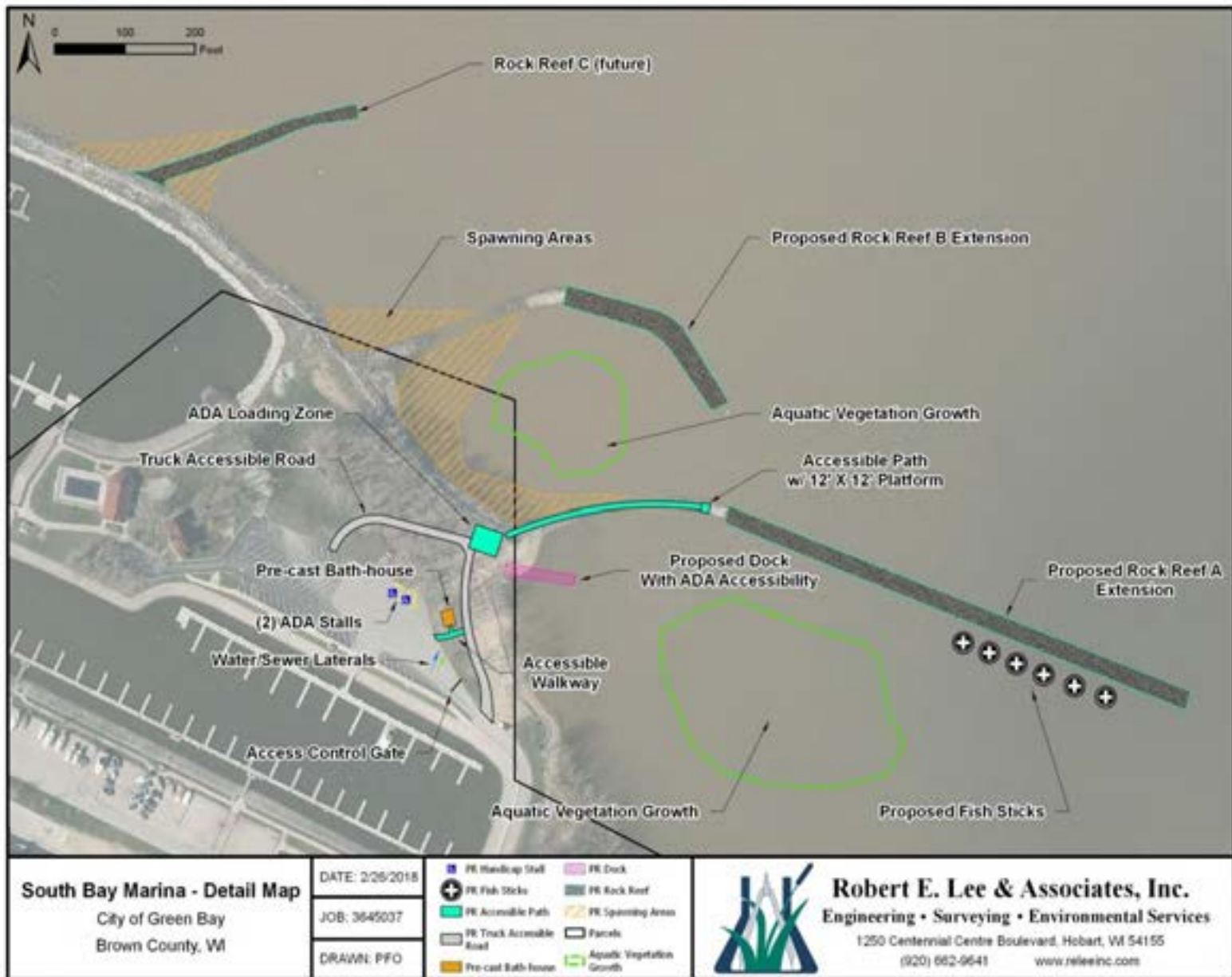




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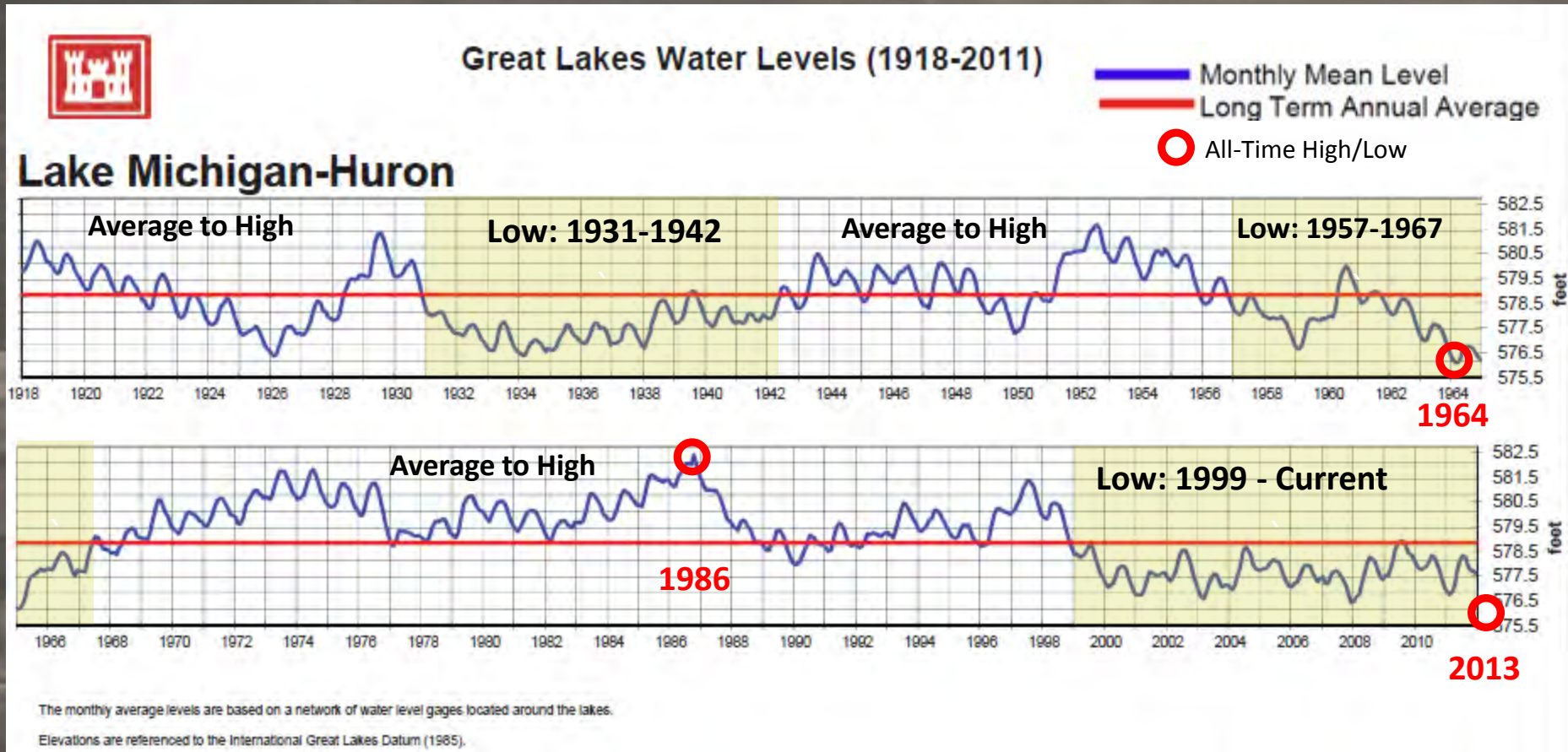




Rock Reef Fisheries Enhancement

Lake Michigan Water Levels (Long Term Cycle)

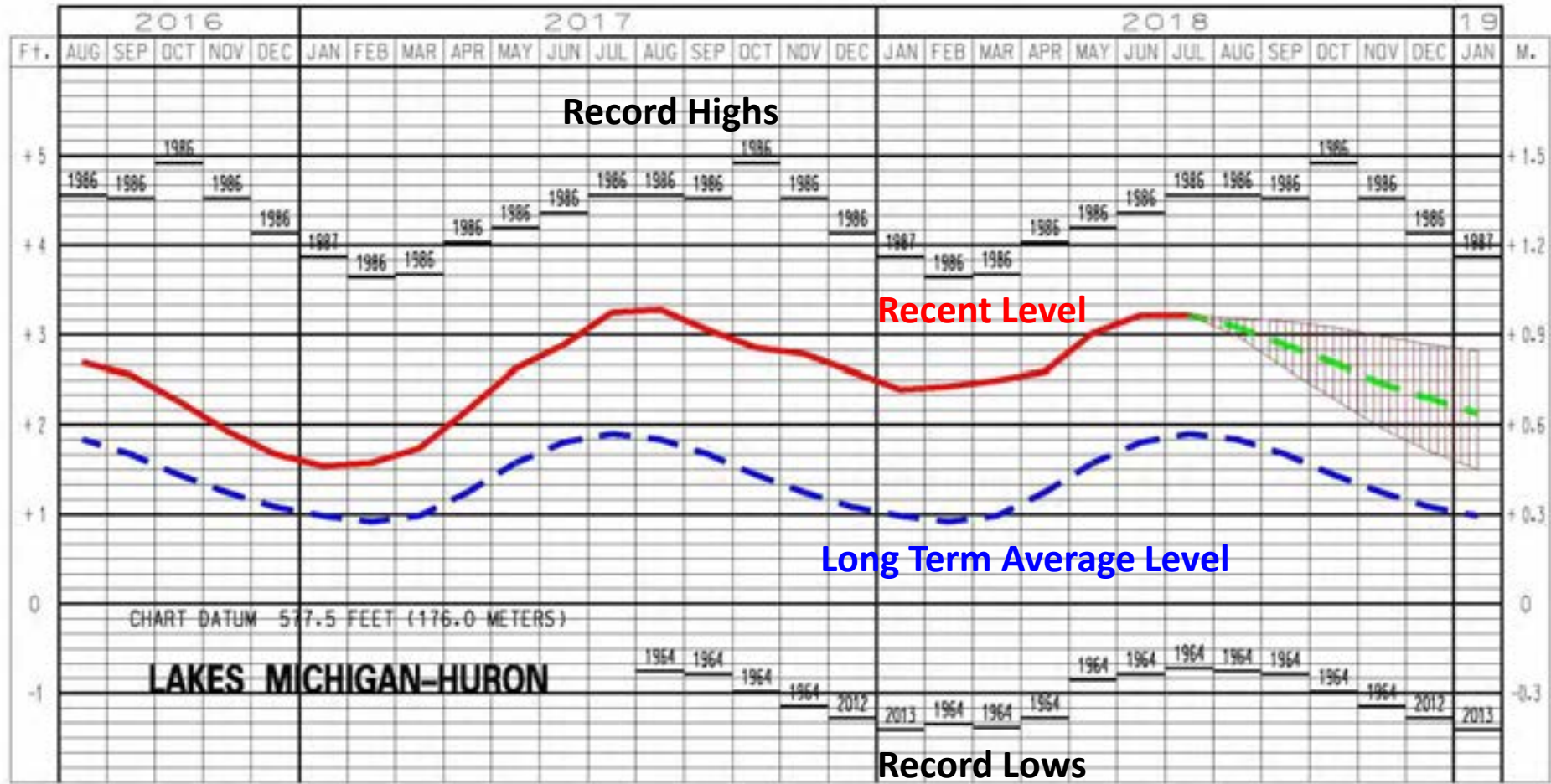
- Long term cycle: -1.4' LWD to +5 LWD (+2.75' today)
- Three 10-year low water periods, separated by average/high water
- Pre-1918 research shows water reached +6.6' LWD (1.6' above 1986)



Lake Michigan Water Levels (Annual Cycle)

- 1' – 2' swing annually

LAKES MICHIGAN-HURON WATER LEVELS - AUGUST 2018





McDonald - national flooding hazard info



Legend

- FIRM Panels
- Cross-Sections
- Flood Hazard Boundaries**
 - Other Boundaries
 - Unit Lines
 - SPMA / Flood Zone Boundary
- Flood Hazard Zones**
 - 1% Annual Chance Flood Hazard
 - Regulatory Floodway
 - Special Floodway
 - Area of Undetermined Flood Hazard
 - 0.2% Annual Chance Flood Hazard
 - Future Conditions 1% Annual Chance Flood Hazard
 - Area with Reduced Risk Due to Levee
- Municipality
- State Boundaries
- County Boundaries
- Major Roads**
 - Interstate Highway
 - State Highway
 - US Highway
- County and Local Roads**
 - County HWY
 - Local Road
- Railroads
- Tribal Lands
- Index to EN_Image_Basemap_Leaf_Off



0.1 0 0.05 0.1 Miles

NAD_1983_HARN_Wisconsin_TM

1: 3,960

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Notes



Rock Reef Fisheries Enhancement

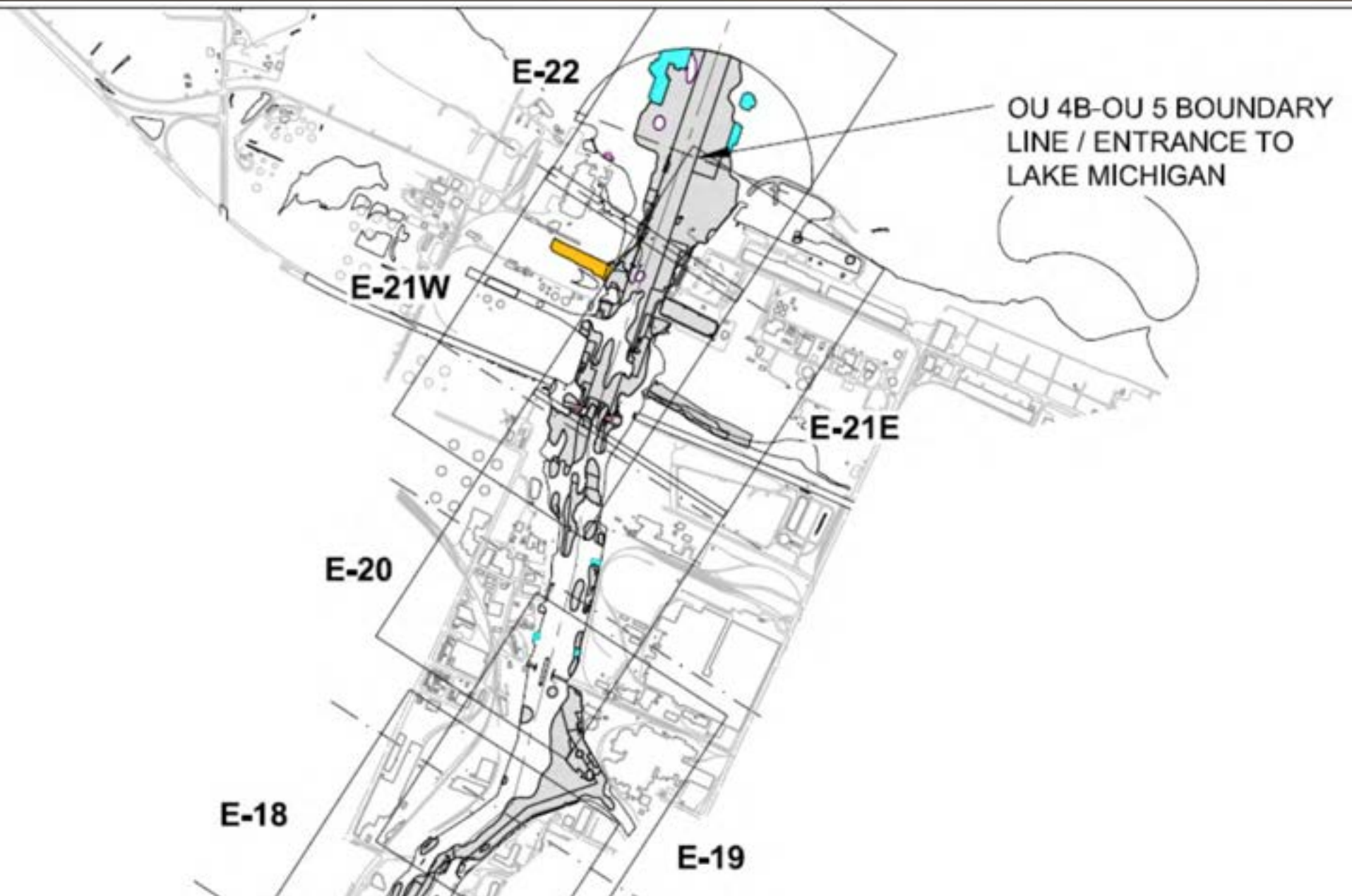








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Technical Review Meetings

Stakeholder Workshops - September 10/11 2018

Technical Review Workshop – TBD October 2018

Draft Permit Application Review – TBD December 2018














Final Concept Plan Review – TBD January 2019



Summary of Feedback - Technical

- *Keep in Mind the Technical Requirements of the NRDA Program*
- *Understand what improvements NRDA can and cannot fund*
- *Shorebird species habitat may be difficult to create in this area.*
- *Focus on creating habitat for bass & pan fish (centrarchidae) and possibly spotted muskies.*
 - *This habitat would look like backwater habitat similar to what it looks like now.*



Image/Link	Scientific Name	Common Name	Lake Superior	Lake Michigan	Lake Huron	Lake Erie	Lake Ontario	Habitat
	Ambloplites rupestris	rock bass	N	N	N	N	N	stream/creek/river/littoral
	Etheostichus caeruleus	bluespotted sunfish					I	stream/creek/littoral, tributaries only
	Lepomis cyanellus	green sunfish	N	N	N	N	N	stream/creek/river/littoral
	Lepomis gibbosus	pumpkinseed	N	N	N	N	N	stream/creek/river/littoral
	Lepomis gulosus	warmouth		N	N	N		stream/creek/river/littoral, tributaries only
	Lepomis humilis	orangespotted sunfish				N	N	stream/creek/littoral
	Lepomis macrochirus	bluegill	N	N	N	N	N	stream/creek/river/littoral
	Lepomis megalotis	longear sunfish		N	N	N	N	stream/creek/river/littoral
	Lepomis microlophus	redeer sunfish		I		I		stream/creek/littoral
	Micropterus dolomieu	smallmouth bass	N	N	N	N	N	stream/creek/river/littoral
	Micropterus salmoides	largemouth bass	N	N	N	N	N	river/littoral
	Pomoxis annularis	white crappie		N	N	N	N	stream/creek/river/littoral
	Pomoxis nigromaculatus	black crappie		N	N	N	N	littoral



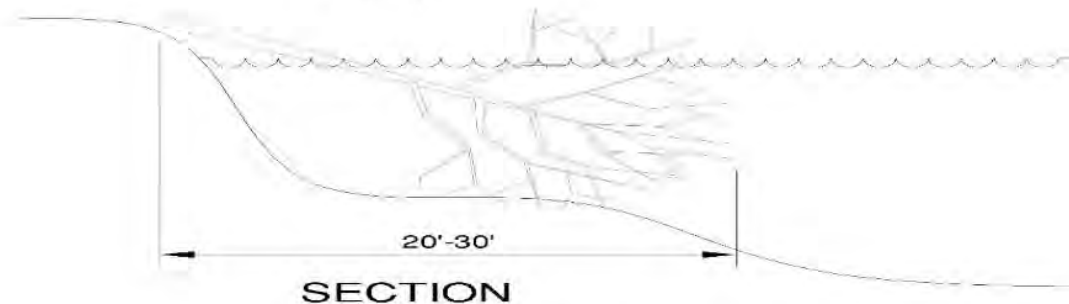
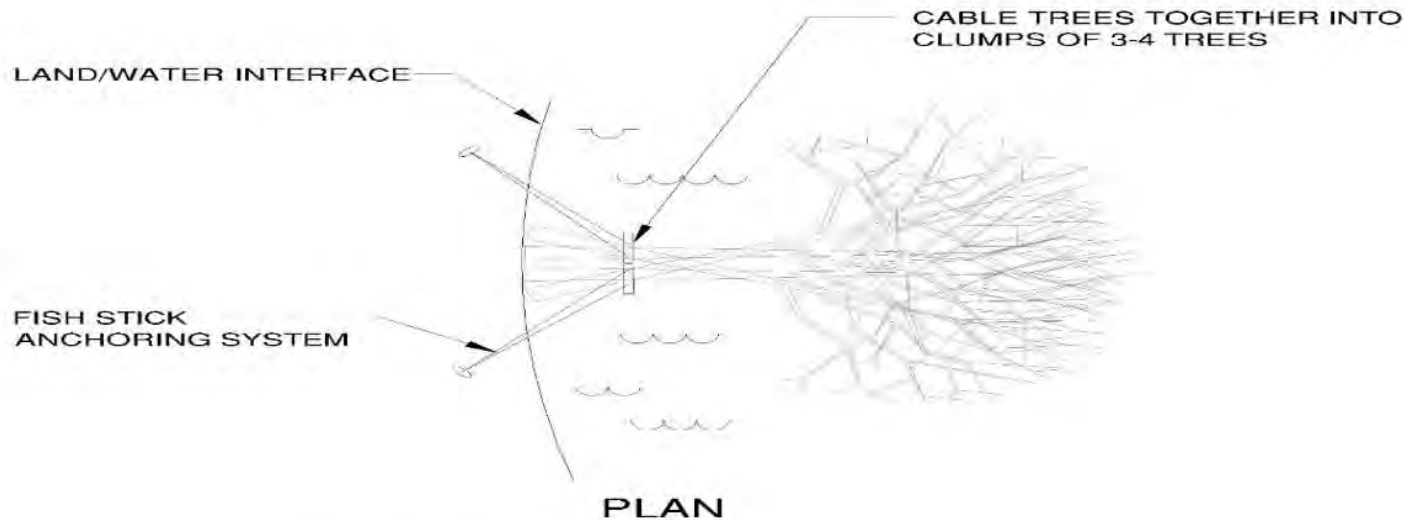
Summary of Feedback - Technical

- *Consider revision to breakwater design to increase circulation*
- *Consider Winnebago example, balance benefits of still water vs stagnation*
- *Create resiliency in the habitat design (accommodate for low and high water levels).*
- *May need O&M plan for plantings or chemical or mechanical removal of overgrowth.*









NOTE: TWO PIPES WILL BE USED PER GROUPING OF TREES; AND, EACH PIPE WILL BE ATTACHED TO TWO SEPARATE TREE TRUNKS WITHIN THE GROUP. EACH GROUPING SHALL BE SECURED TOGETHER AROUND EACH TRUNK WITH A MIN. 3/8" GALVANIZED CABLE AND CABLE CLAMPS.

FISH STICK DETAIL

DETAIL

DATE
01/2018
FILE
FISH STICK DETAIL
JOB NO.
3645037



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Rock Reef Fisheries Enhancement

Summary of Feedback – Permitting & Compliance

- *Collaborate with USACE to review potential Nationwide Permits for Habitat Creation*
 - *Collaborate with USFWS may support Nationwide permit 27*
 - *Docks and fishing piers may also be Nationwide Permits*
 - *Potential fill below OHWM will trigger more detailed permit review*
- *Confirm Location of bulkhead line and jurisdiction impacts*
 - *WDNR searching archive for bulkhead definition and impacts*
- *AOC Dredging of Fox River is very near western edge of the project area, adjust plans to avoid potential conflict*



Summary of Feedback – Permitting & Compliance

- *Sampling of this area was conducted and is thought to have ND results.*
- *WDNR will require Chapter 30 individual permit application (wetland and public lake bed permitting)*
- *Piers have exemptions for certain dimensions*
- *Will need O&M plan*
- *Confirm Nav channel limits*



Summary of Feedback – User Groups

- *Green Bay sail and paddle- sandy beach for easy launch and navigation for sailors. (NE wind and waves moves pieces of revetment onto beach, sand was brought in above OHWM previously)*
- *Maintain ADA compliance, expand functionality of ADA Access*
- *YMCA- Looking for recreational use, all age accessibility, beach area and swimming (adds complexity), environmental education and outreach programs*
- *Kayak launches (ADA accessible)- other launches- Bellevue, City Dock, Shipyard*
 - *Create a blue way trail throughout green bay.*



Summary of Feedback – User Groups

- *Veterans- accessible parking and bathrooms, they would be willing to assist funding especially if hunting, fishing, camping kind of recreational activities are available.*
- *Walleye habitat - 2-4" potato shaped substrate is the best for spawning in less than 4' of water. Three criteria 1- big stone & polished smaller stone, 2- maintenance plan, 3- measurable program (fish use and confirm effectiveness of structure)*
- *City- 1000 ft beach restoration project & other master plan projects*
- *Duck Hunters- Fall, as long as feet are wet are allowed to hunt.*









Community Boating Initiatives Enhancement





Youth Boating Programs
Rock River Fisheries Enhancement





Rock Reef Fisheries Enhancement

Summary of Feedback – Neighbors

- *Priorities are habitat restoration, shoreline protection, and accessibility.*
- *Consider expansion of neighboring businesses*
- *Work towards cohesiveness between south bay/ Bay Beach*
- *New water is not moving, and has concerns about odor complaints and other things of that nature in this area.*
- *City master plan - 1000ft beach restoration, 450' long viewing platform, and fish habitat (artificial reefs)*



Summary of Feedback – Neighbors

- *Popular fishing area near old pipeline at bay beach road end*
- *Connect to sanctuary city park and UWGB*
 - *Link UWGB to downtown via river*
- *Resiliency in design so as not to become damaged*
- *Water trail (docks, day docks, maps, places to stop, eagles nest)*
- *Make breakwaters curvy or aesthetically pleasing considering the view from Renard Island*





Summary of Feedback - Other

- *Cat Island is good birding habitat and will not be accessible to public except by boat. It would be great to try to attract birders to the area if possible. Look at Cat Island as an example to try to recreate shorebird habitat.*



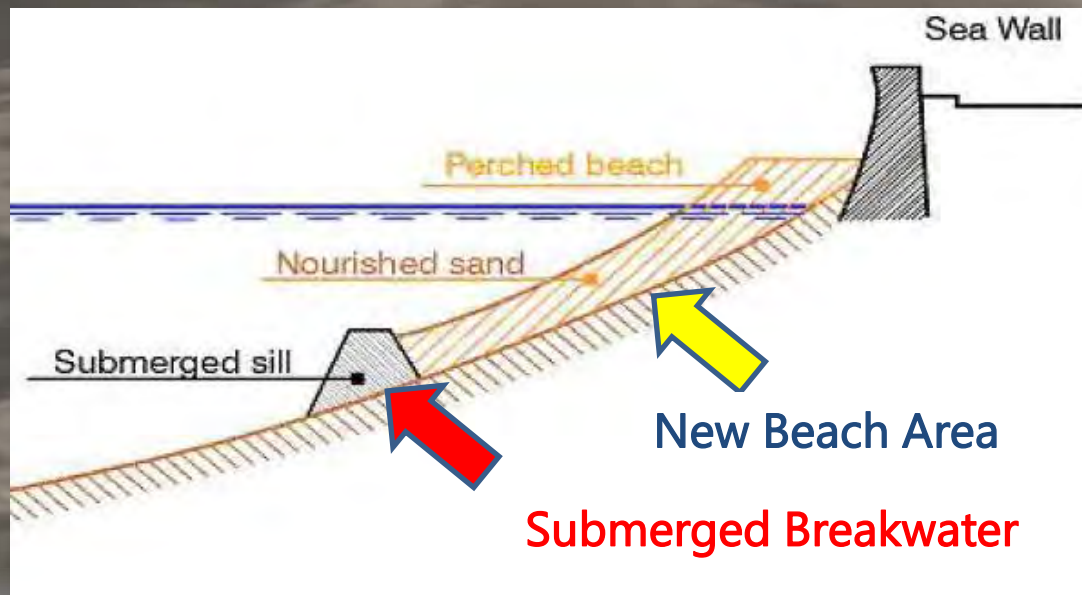
Project Background

2010 U.S. Army Corps Recommendation:

25 offshore breakwaters \$2.6M

Low Cost Phase 1 Option:

Install 5-10 offshore breakwaters & monitor for 2 years



The Plan

Goals:

- Protect homes/property
- Protect water intake structure
- Solve sand starvation issues



The Plan

Initial Recommendation:

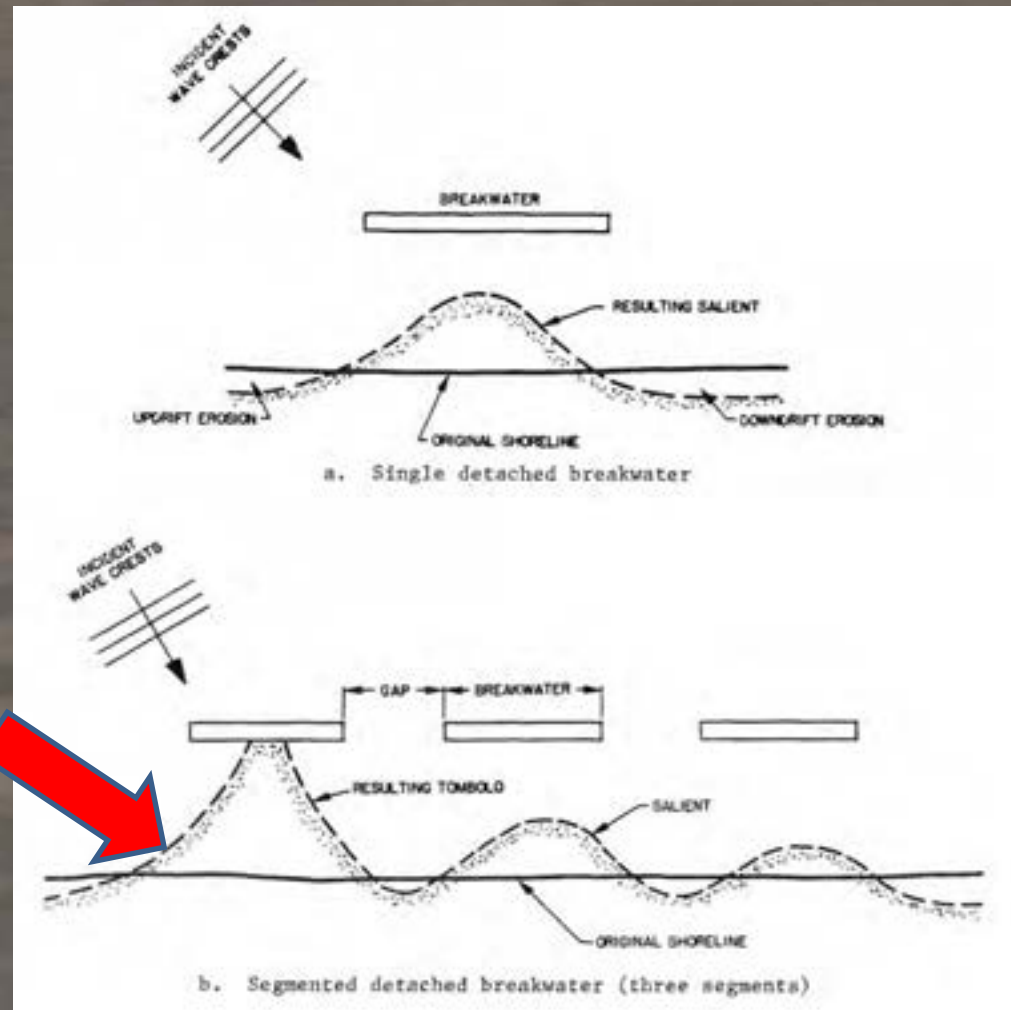
- Construct 33 offshore breakwaters
- Beach nourishment - Total 650,000 CY



The Plan

Breakwater Design 101

New Beach Area



The Plan

Breakwater Example: Lake Forest, IL





PROTECTED BEACH AREA

RUBBLEMOUND DETACHED
BREAKWATER

Detached Breakwater

Example Photo

Photo Courtesy of Virginia Institute of Marine Science

New Buffalo

May, 2017



LEED Gold Certification
AIA SustainABILITY Award
ASLA President's Award
Engineering News Record
"Best Project"
ISS Fabien Cousteau Blue Award



Rock Reef Fisheries Enhancement



Rockwell Harbor Enhancement

31st Street Harbor, Chicago



31st Street Harbor
Chicago, Illinois



Rock Reef Fisheries Enhancement

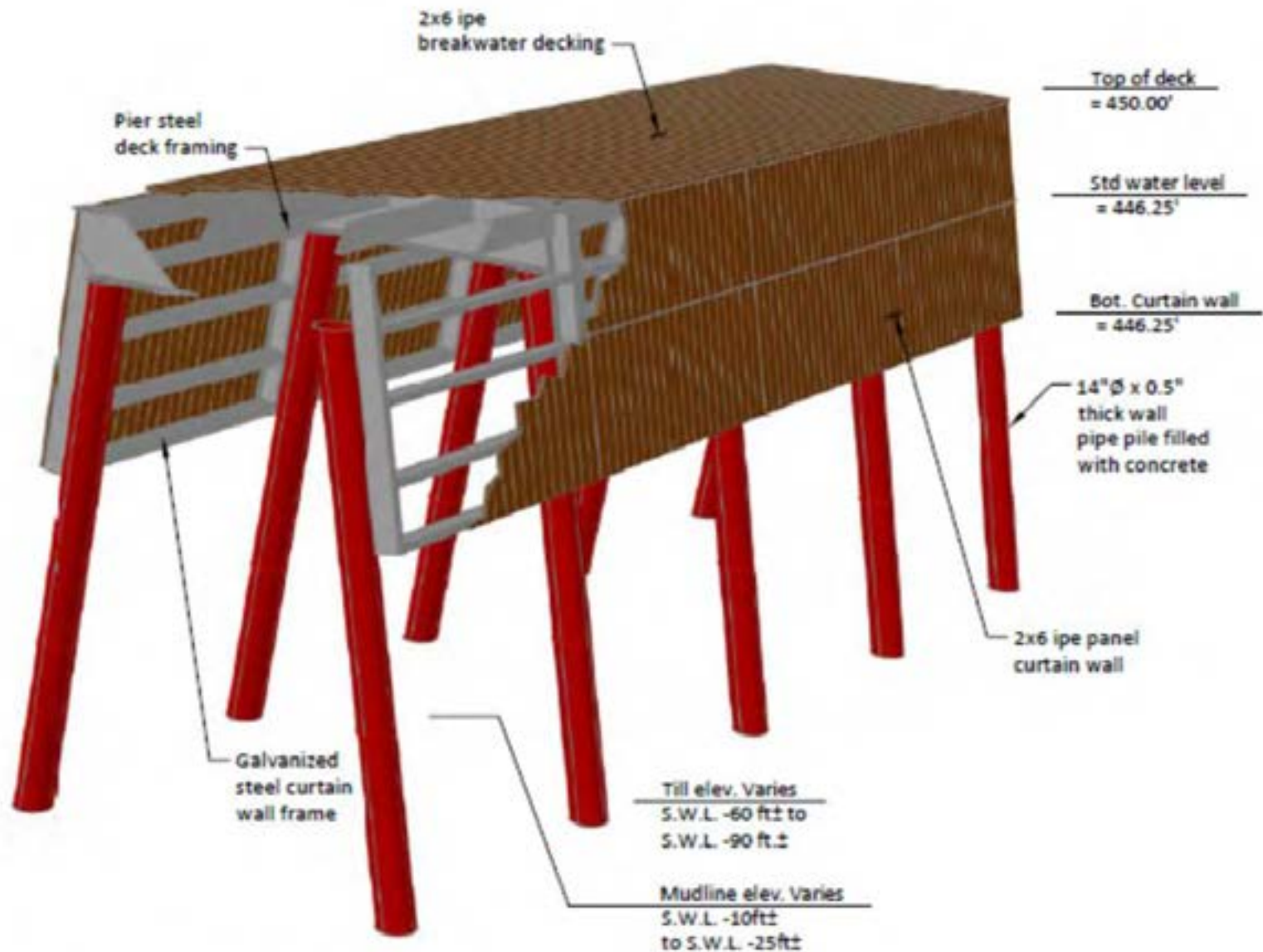


Figure 32: Proposed Long Pier extension





Rock Reef Fisheries Enhancement



Rock Reef Fisheries Enhancement



Rockwater Fisheries Enhancement | Warrington, The Olympic Village Sydney, Australia



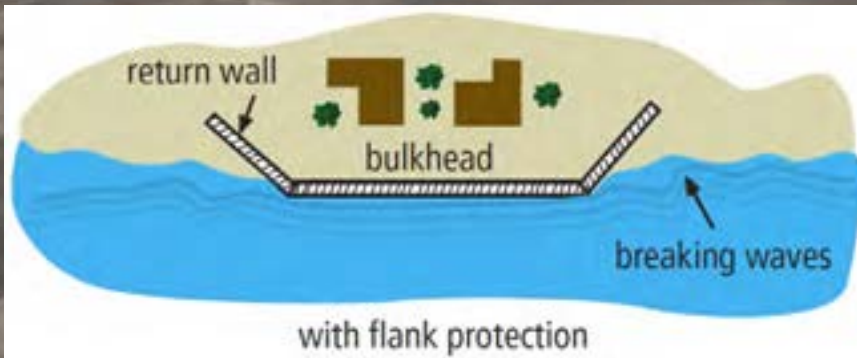
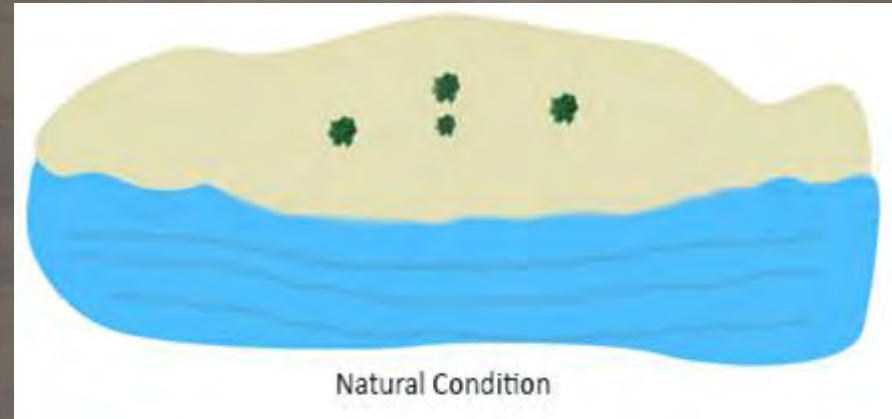
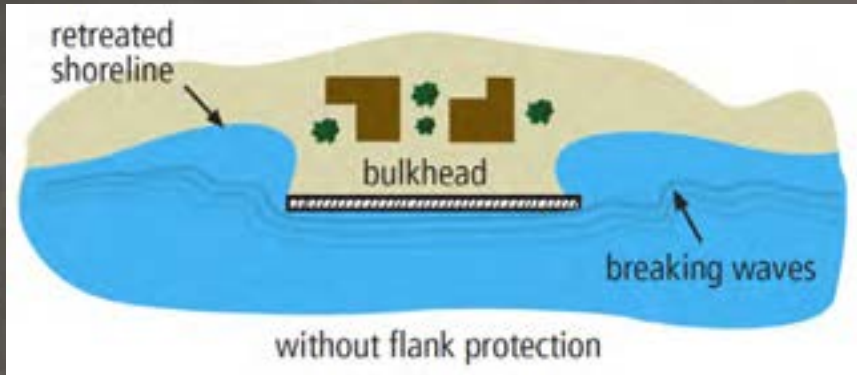






Shoreline Protection Considerations

- **Length** – sufficient length and/or return walls are required to prevent flanking and adverse effects to neighbors



*Graphic from USACE/University of Wisconsin, "Living with the Coast" Booklet

