Marblehead Municipal Light Department and Adjoining Public Lands Coastal Resilience Implementation and Expanded Analysis and Design

Funded by MA Coastal Zone Management Coastal Resiliency Grant

Harbors and Waters Board, January 3, 2022

Barbara Warren, Salem Sound Coastwatch Executive Director

Photo credits: Salem Sound Coastwatch

February 3, 2020 - 1st presentation 282 people attended

Available for viewing at https://vimeo.com/393491717

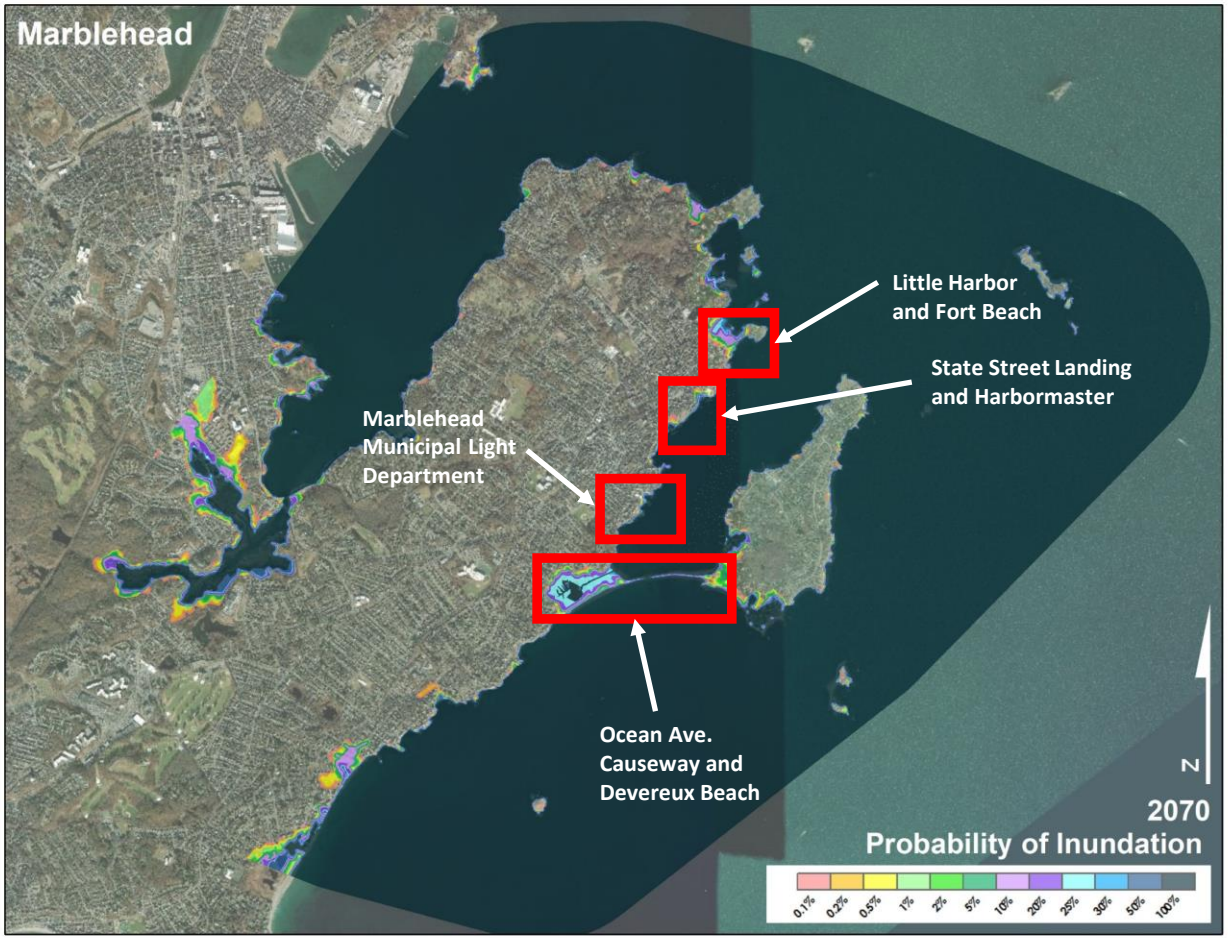
The Future of Marblehead Harbor:

Probabilistic Modeling of Flooding and how it can Help Communities Adapt to the Changing Climate

Town of Marblehead, MA

Kirk F. Bosma, P.E.
kbosma@woodsholegroup.com

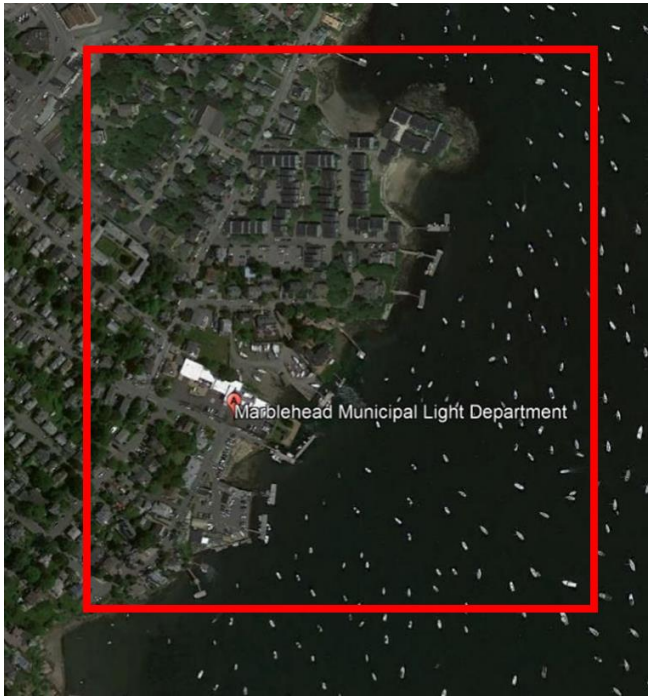
WOODS HOLE GROUP
A CLS COMPANY



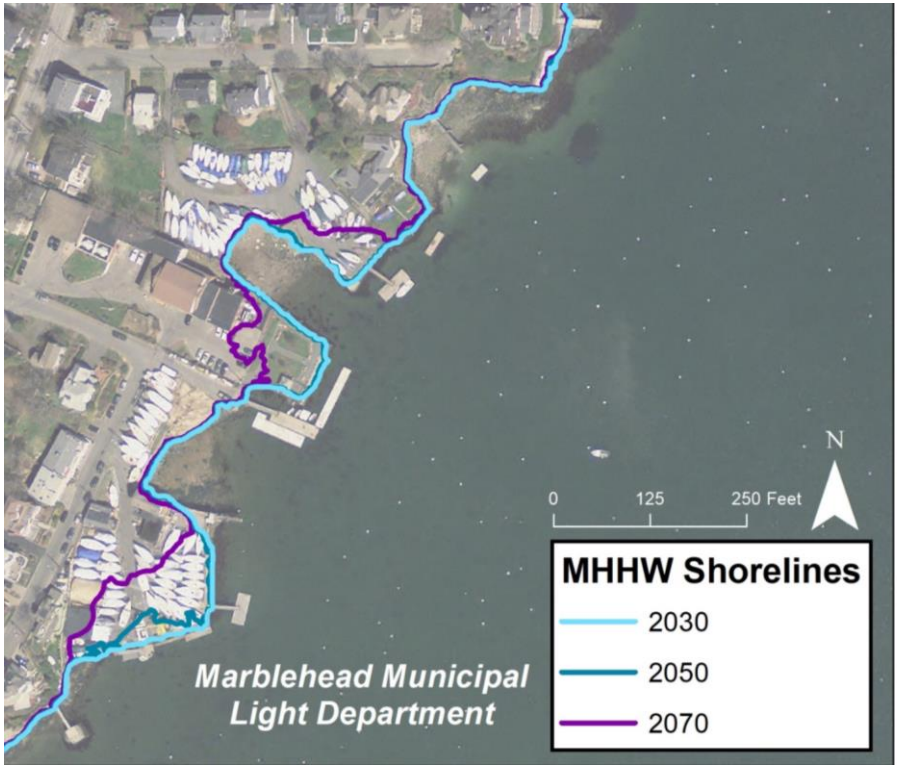
Marblehead selected four Focus Areas:

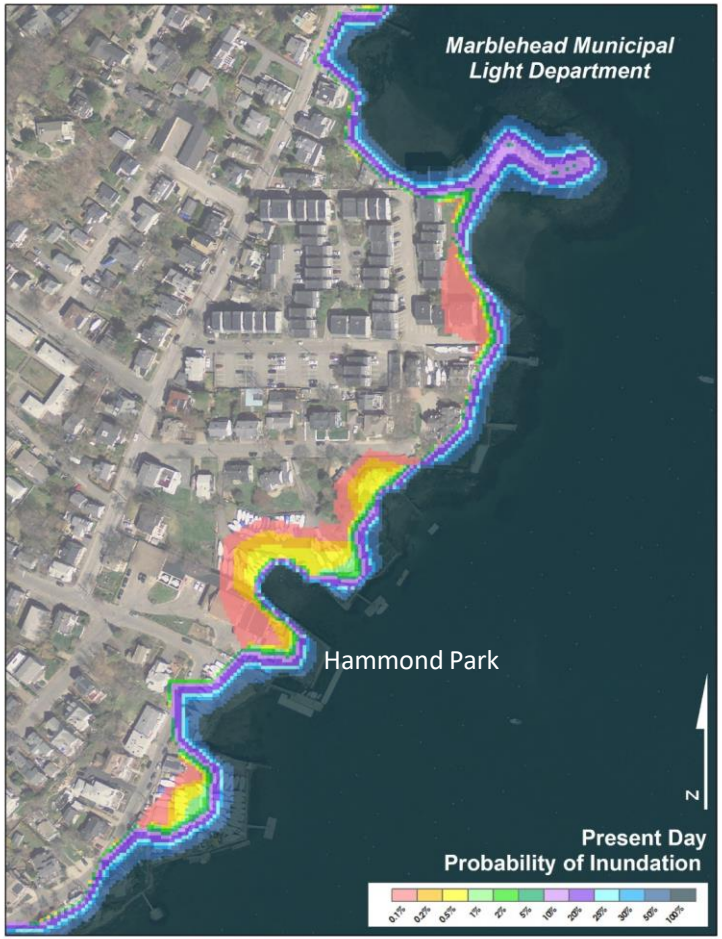
- Little Harbor and Fort Beach
- State Street Landing and Harbormaster
- **Marblehead Municipal Light Department**
- Ocean Ave. - Causeway, Riverhead and Devereux Beaches

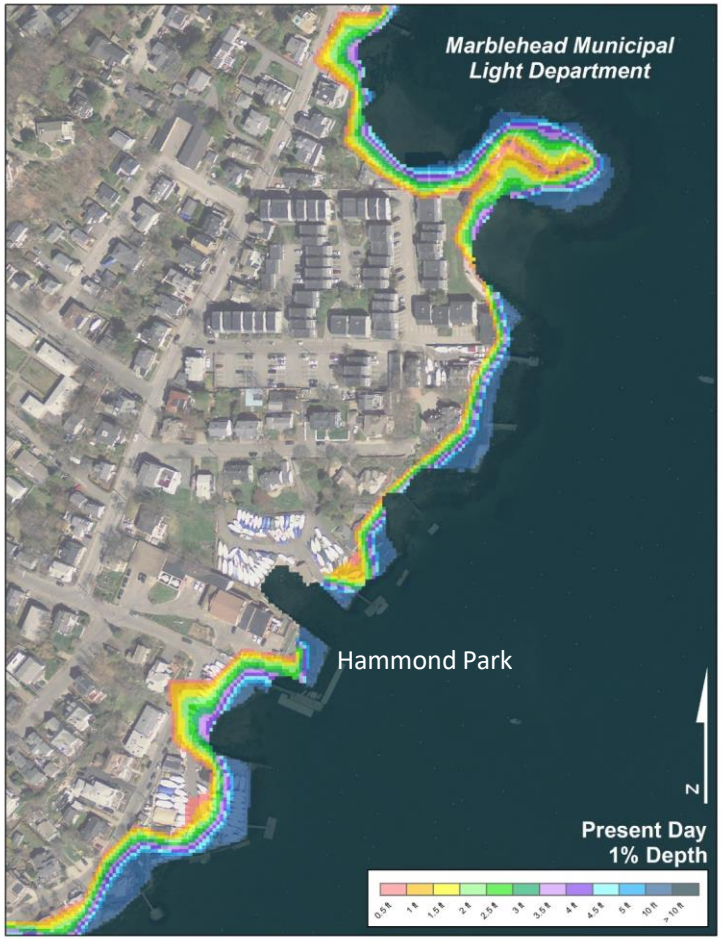
Marblehead Municipal Light Department

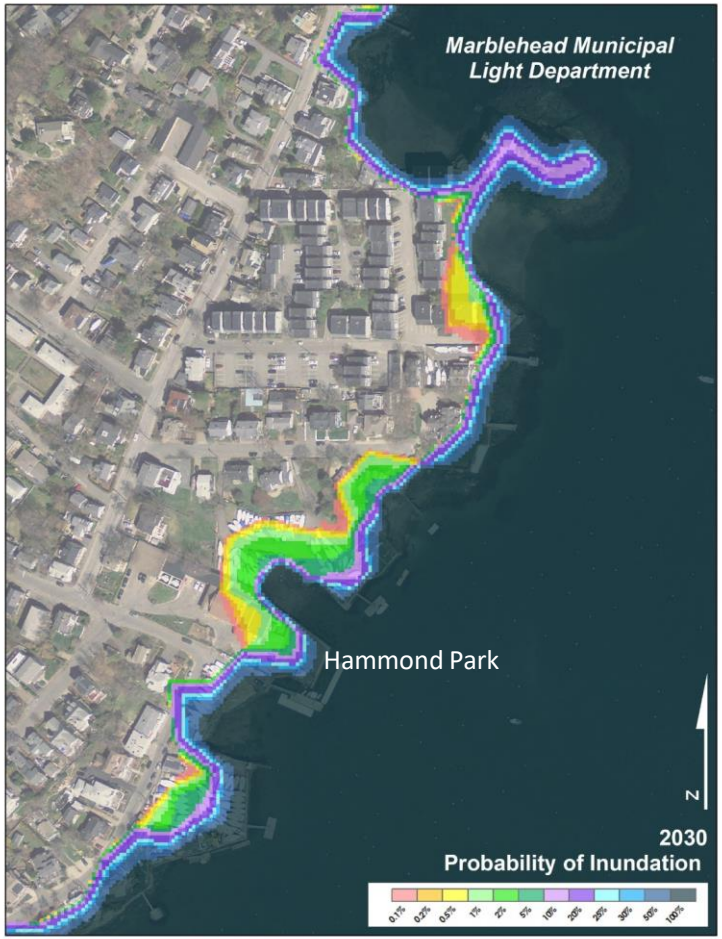


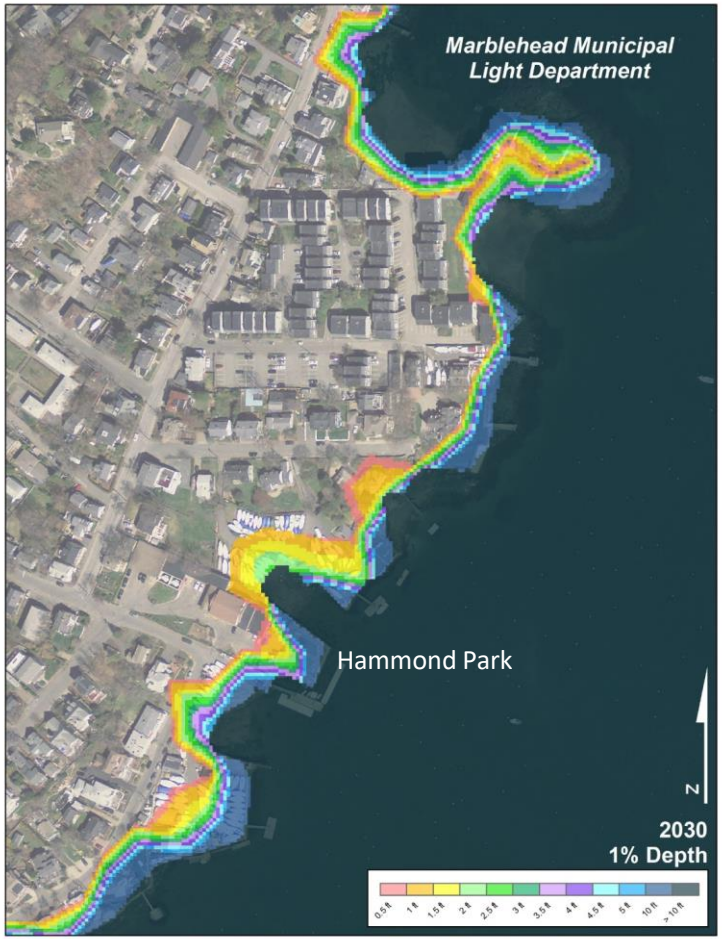
Predicted Coastal Shallow Flooding at MHHW

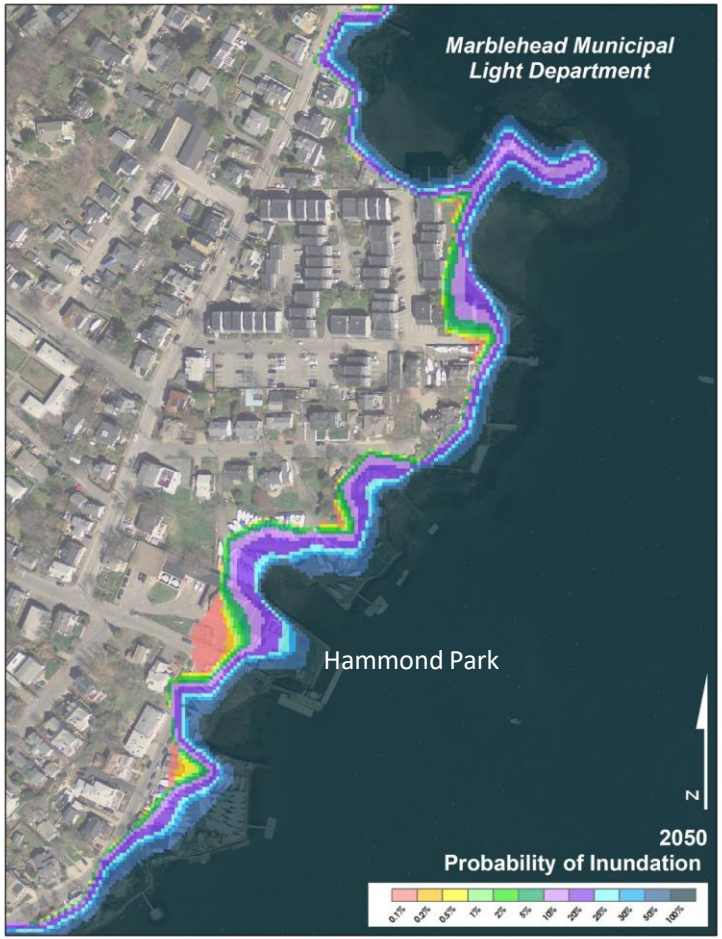


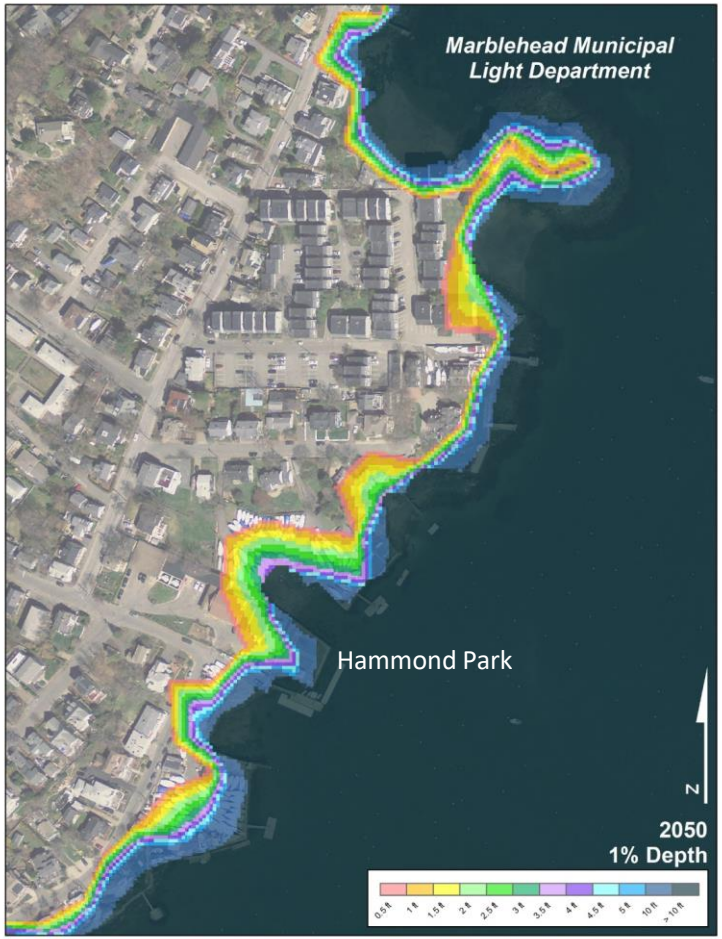

Marblehead Municipal
Light Department
Hammond Park
N
Present Day
Probability of Inundation

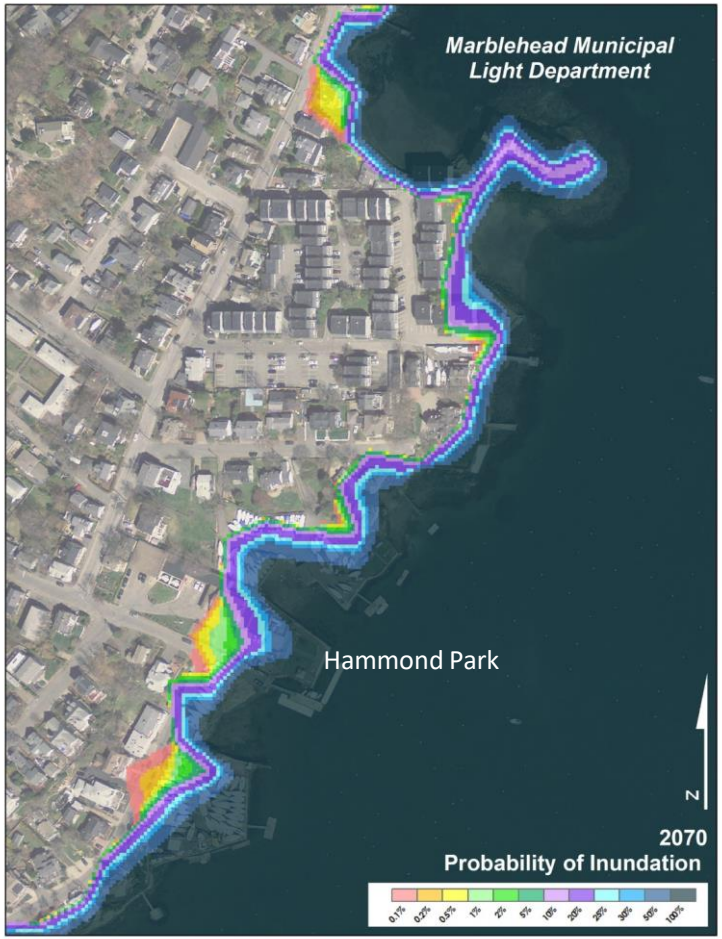

Marblehead Municipal
Light Department
Hammond Park
N
Present Day
1% Depth

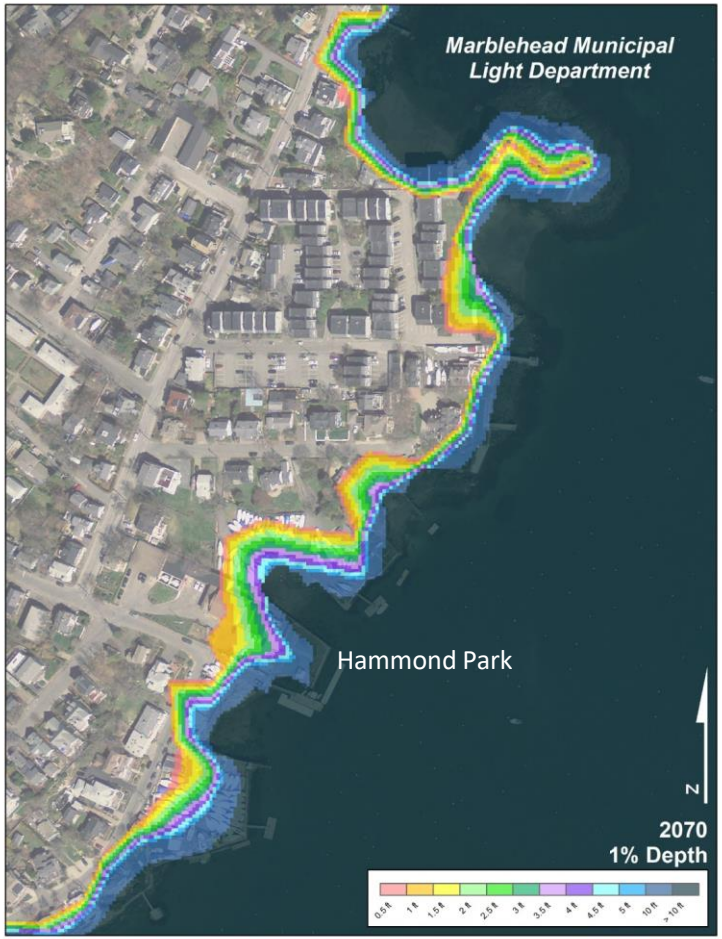

Marblehead Municipal
Light Department
Hammond Park
N
2030
Probability of Inundation


Marblehead Municipal
Light Department
Hammond Park
N
2030
1% Depth


Marblehead Municipal
Light Department
Hammond Park
N
2050
Probability of Inundation


Marblehead Municipal
Light Department
Hammond Park
N
2050
1% Depth


Marblehead Municipal
Light Department
Hammond Park
N
2070
Probability of Inundation
0.1%
0.2%
0.5%
1%
2%
5%
10%
20%
30%
50%
100%


Marblehead Municipal
Light Department
Hammond Park
N
2070
1% Depth
0.5 ft
1 ft
1.5 ft
2 ft
2.5 ft
3 ft
3.5 ft
4 ft
4.5 ft
5 ft
10 ft
> 10 ft

August 17th 2020 - 2nd presentation online > 85 people attended

Available for viewing at https://vimeo.com/450127541

The Future of Marblehead Harbor:

Climate Adaptation: Themes and Concepts

Town of Marblehead, MA

Kirk F. Bosma, P.E.
kbosma@woodsholegroup.com

WOODS HOLE GROUP
A CLS COMPANY

Adaptations based on Three SCENARIO THEMES

near, mid and long-term strategies

to increase coastal resiliency for at risk area around the Harbor

NATURAL RESOURCES

Emphasize ecosystem health and resilience

PROTECTION

Emphasize protection and maintenance of infrastructure and current use

TRANSFORM

Emphasize a balance of uses now with a vision of potential transformation of future flood prone areas.

Conceptual Adaptations for Marblehead Harbor

What they are…

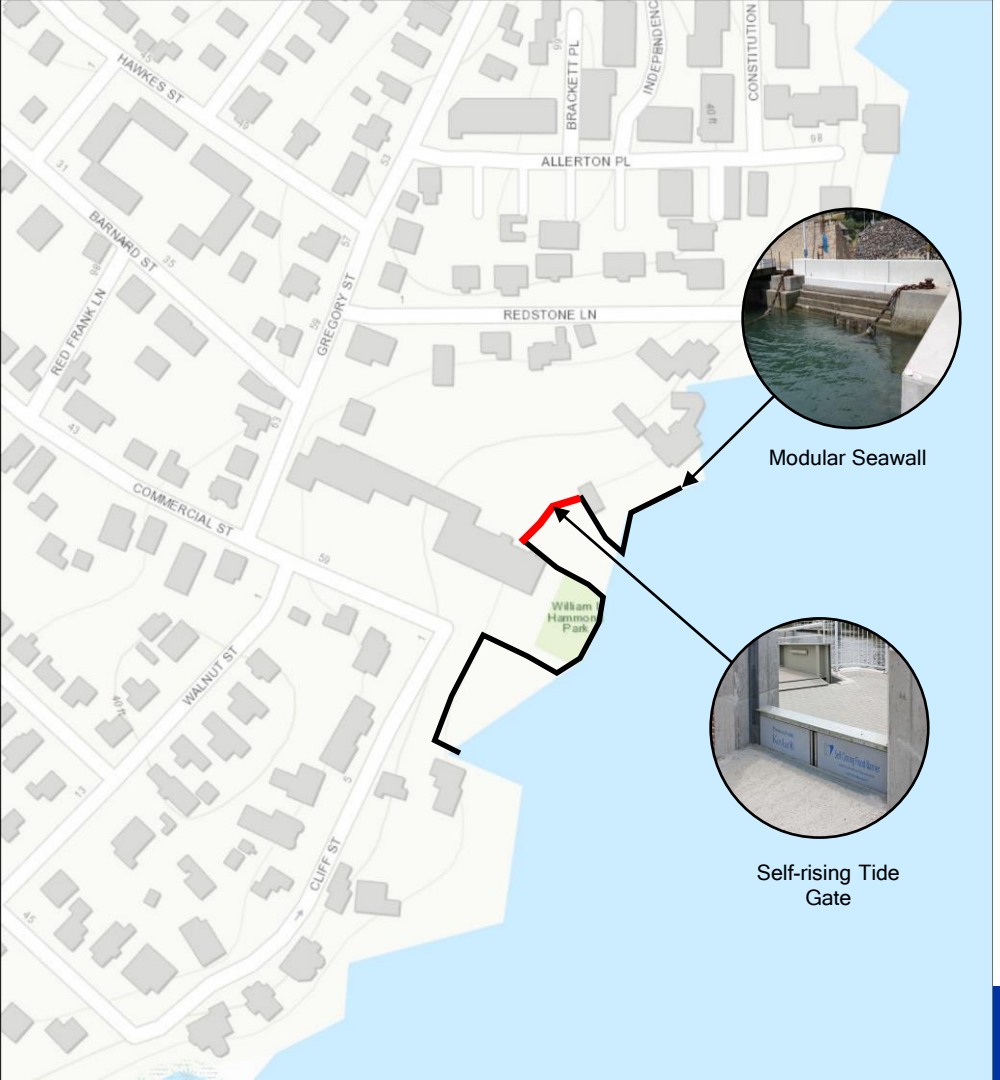
- Identification of critical assets and locations at risk
- Conceptual options and ideas for planning purposes
- Flexible and adaptive possibilities
- Individual elements that can be assembled in different ways
- Guidance on timing of actions – when they may be needed
- **Dialogue starters to expand thinking about what is possible**

What they are NOT…

- Final recommendations on how to proceed
- Design plans

What they Ignore…

- Permitting regulations
- Public and private property restrictions

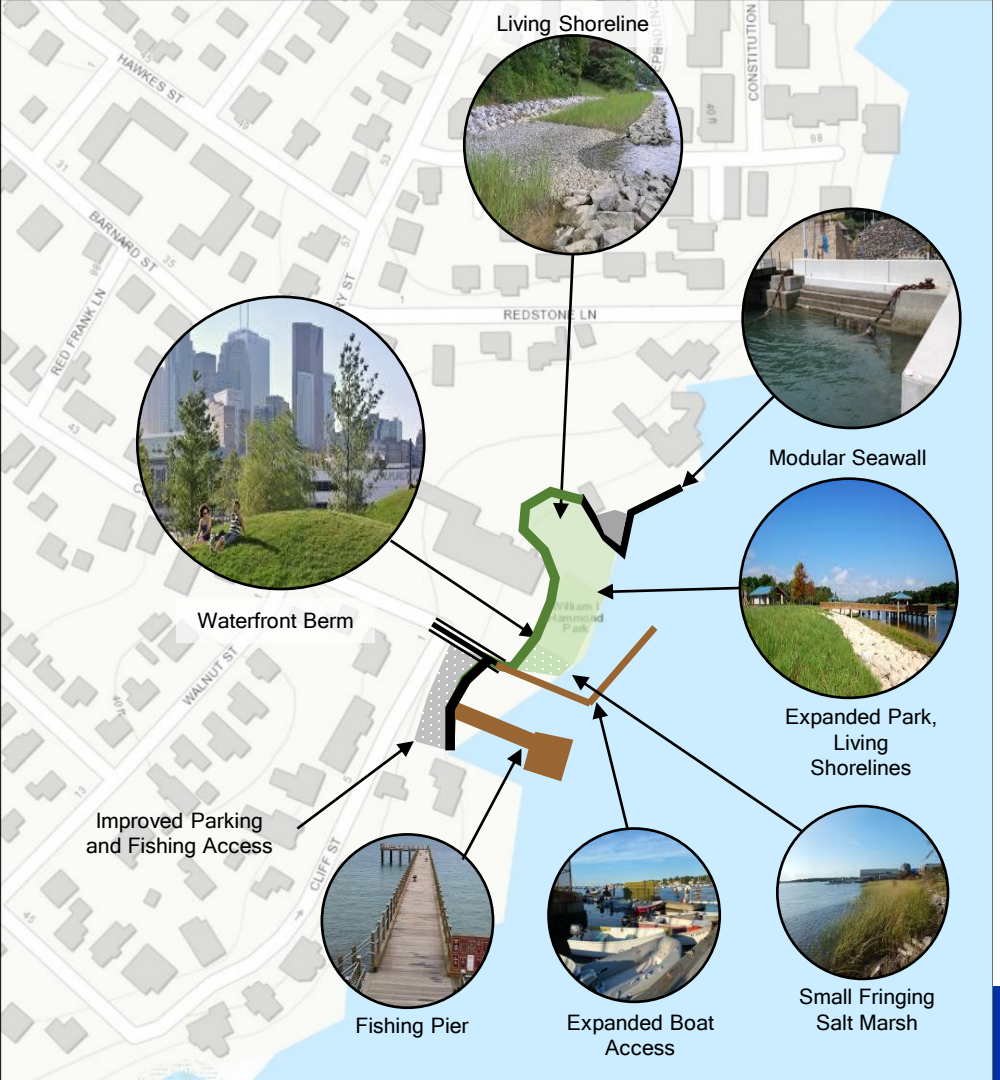


PROTECTION

Emphasize protection and maintenance of infrastructure and current use

Flexible, Phased Adaptation and Implementation Plan

Time Horizon	Adaptation Measures
Near-Term (Now - 2030)	▪ Initial Planning for self-rising tide gate and Modular Seawall ▪ Install self rising tide gate and Phase 1 of Modular Seawall
Mid-Term (2030 - 2070)	▪ Construct Phase II of Modular Seawalls (sections) ▪ Install self rising tide gate
Long-Term (2070 +)	▪ Construct Phase III of Modular Seawalls (sections) ▪ Abandon Boat Launch

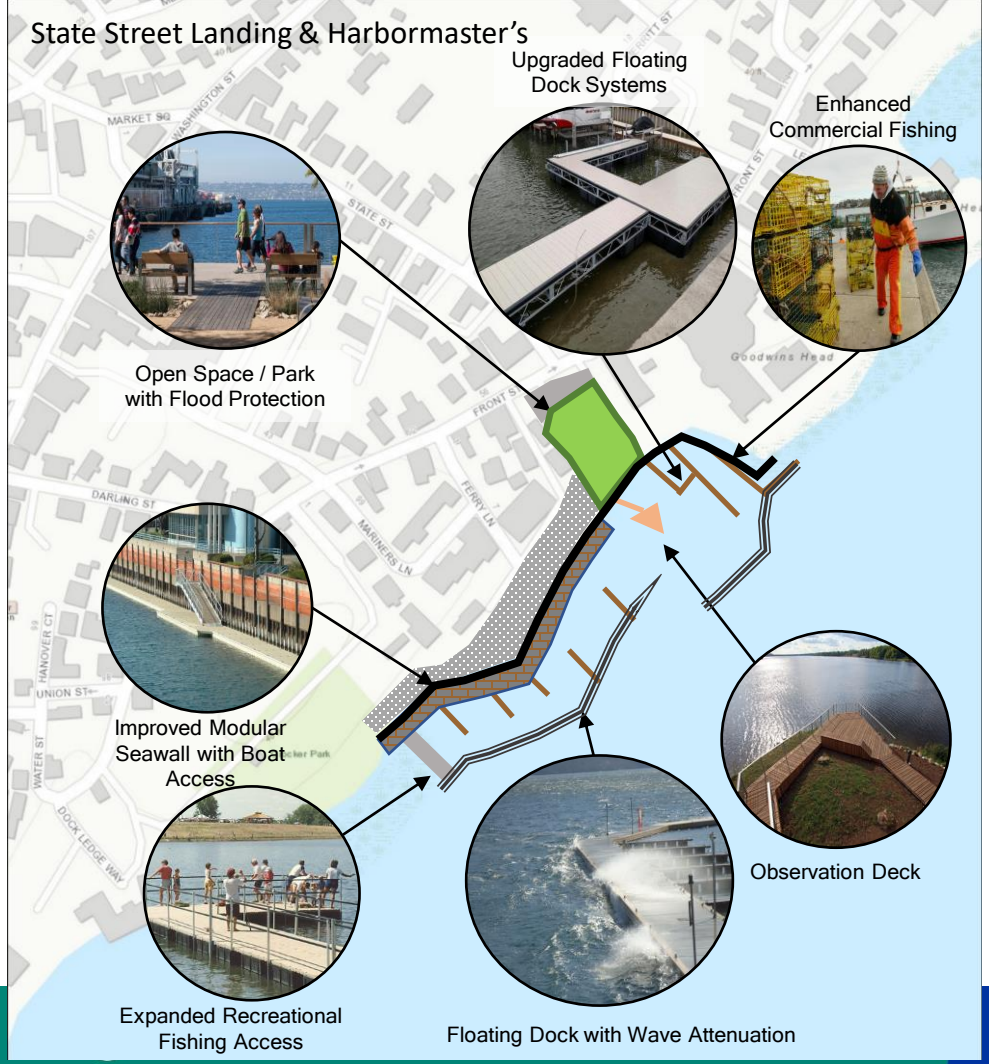


NATURAL RESOURCES

Emphasize ecosystem health and resilience

Flexible, Phased Adaptation and Implementation Plan

Time Horizon	Adaptation Measures
Near-Term (Now - 2030)	▪ Initial Planning for Expanded Park and Modular Seawall ▪ Abandon Boat Launch; Install Living Shoreline Element at Parker's Boat Yard ▪ Construct Phase I of Modular Seawall ▪ Expanded Boat Access at Commercial St.
Mid-Term (2030 - 2070)	▪ Construct Phase II of Modular Seawall ▪ Construction of Expanded Park ▪ Planning for Waterfront Berm addition to Park ▪ Construct Improved Fishing Pier and Access
Long-Term (2070 +)	▪ Construct Phase III of Modular Seawalls ▪ Construction of Waterfront Berm



NATURAL RESOURCES

Emphasize ecosystem health and resilience

Flexible, Phased Adaptation and Implementation Plan

Time Horizon	Adaptation Measures
Near-Term (Now - 2030)	▪ Evaluate geotechnical and sub-surface conditions at seawall and bulkheads ▪ Planning for seawall/bulkhead improvement and repairs and integration of open space ▪ Construction of new concrete floating dock system with wave attenuation ▪ Improve Fishing Access
Mid-Term (2030 - 2070)	▪ Repair subsurface conditions under parking and State St. Landing areas. ▪ Design and construct new modular industrial seawall and floating dock systems ▪ **Construction of open space and observation dock area** ▪ **Design of berm around edge of park / open space**
Long-Term (2070 +)	▪ Add modular sections to seawall and bulkhead systems to provide added protection under climate change conditions ▪ **Integration of berm to reduce elevated seawall in areas**

Terraced Waterfront integrated with Hammond Park

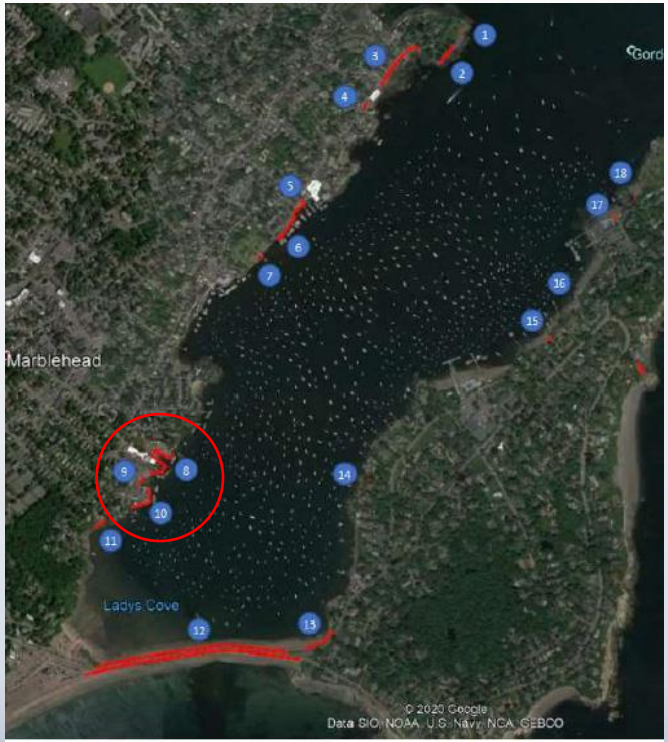
TRANSFORM

Emphasize a balance of uses now with a vision of potential transformation of future flood prone areas.

Flexible, Phased Adaptation and Implementation Plan

Time Horizon	Adaptation Measures
Near-Term (Now - 2030)	▪ Construct upper portion of terraced waterfront with plan for future expansion ▪ Develop design layout for entire waterfront
Mid-Term (2030 - 2070)	▪ Construct waterfront terracing (expands into harbor)
Long-Term (2070 +)	▪ Modifications to terracing levels based on sea level rise

Marblehead Harbor Municipal Structures Visual Assessment Report



Location map of 18 municipal structure locations around Marblehead Harbor

Also completed during the first CZM grant:

An Evaluation of the current condition of Marblehead Harbor municipal seawalls as of June 2020

- 24 structures at 18 locations

Marblehead Municipal Light Department and Adjoining Public Lands Coastal Resilience Implementation and Expanded Analysis and Design

FY2022 – to be completed by June 30, 2022

CZM Coastal Resilience Grant funded: $151,705 Town/MMLD match amount: $51,998 Total project cost: $203,703

MMLD-MH Expanded Analysis and Design

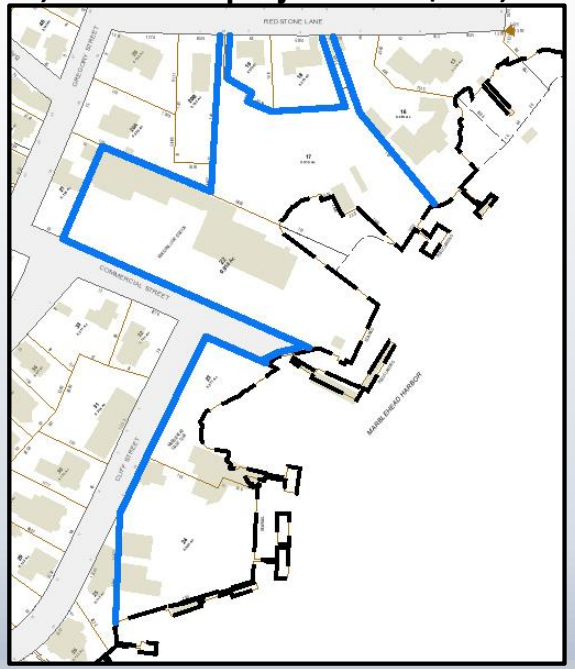
Parkers Boat Yard

Marblehead Municipal Light Department

Hammond Park

Marblehead Yacht Club

Marblehead Trading Company



Marblehead Municipal Light Department and Adjoining Public Lands Coastal Resilience Implementation and Expanded Analysis and Design

FY2022 – Project Goals

Design options will include long-term retrofits and adaptations to reduce flooding given projected climate impacts from higher tides and greater storm surge,

while expanding public access and water-related activities along the harbor.

MMLD-MH Expanded Analysis and Design

PROTECTION - Near-Term Floodproofing Readiness Measures for MMLD

Ryan McCoy - Collins Engineering; Nasser Brahim – WHG and Joe Kowalik - MMLD

Examining appropriate flood barrier products

MMLD match = $6,720 (staff) + $20,000 (direct cost)

$20,000 for resilience measures: flood panels, installation, water level sensors, pumps, signage, etc.

MMLD-MH Expanded Analysis and Design Project Scope

1. *Site-Specific Data Collection - elevation and wetland survey plus geotechnical borings*

MMLD-MH Expanded Analysis and Design

Seawall Heights and Conditions Vary

Parker Boat Yard seawall

Hammond Park

MMLD-MH Expanded Analysis and Design

Important Services for the Boating Community – Geotechnical Borings

Marblehead Trading Company

MMLD-MH Expanded Analysis and Design Project Scope

2. *More Refined Modelling for the MC-FRM Flood Risk Analysis by Woods Hole Group*

We NEED more photos of storms
at Commercial Street and in the harbor.

Taken by Light Department - 2018 Nor'easter

MMLD-MH Expanded Analysis and Design Project Scope

3. *Long-Term Implementation Pathway Conceptual Designs – 25% Design Drawings, Cost Estimate and Permitting Matrix for proposed actions on the four town-owned parcels*

Long-term retrofits and adaptations to reduce flooding

MMLD-MH Expanded Analysis and Design Project Scope

4. Public and Stakeholder Engagement – All parcels will need Chapter 91 licenses

Public Survey , Community Meetings, Walks in the Spring

Parkers Boat Yard, MMLD, Hammond Park, Marblehead Yacht Club, and Marblehead Trading Company

MMLD-MH Expanded Analysis and Design

Dialogue with the Commercial Fishing Fleet

Improve commercial fishing activities

Commercial Street and Docks

MMLD-MH Expanded Analysis and Design

Parkers Boat Yard, MMLD, Hammond Park, Marblehead Yacht Club, and Marblehead Trading Company

Dialogue with Recreational Boaters - expanding water-related activities along the harbor

Self-Pump Out

Marblehead Yacht Club

MMLD-MH Expanded Analysis and Design

Parkers Boat Yard, MMLD, Hammond Park, Marblehead Yacht Club, and Marblehead Trading Company

Dialogue with Residents - expanding public access along the harbor

Hammond Park

Is it possible to connect to Parker Boat Yard?

Building Community Resilience
with Climate Change as a DRIVER

Design options will include long-term retrofits and adaptations to reduce flooding given projected climate impacts from higher tides and greater storm surge, while expanding public access and water-related activities along the harbor.

Barbara Warren| barbara.warren@salemsound.org | 978-741-7900

Photo credit: Salem Sound Coastwatch