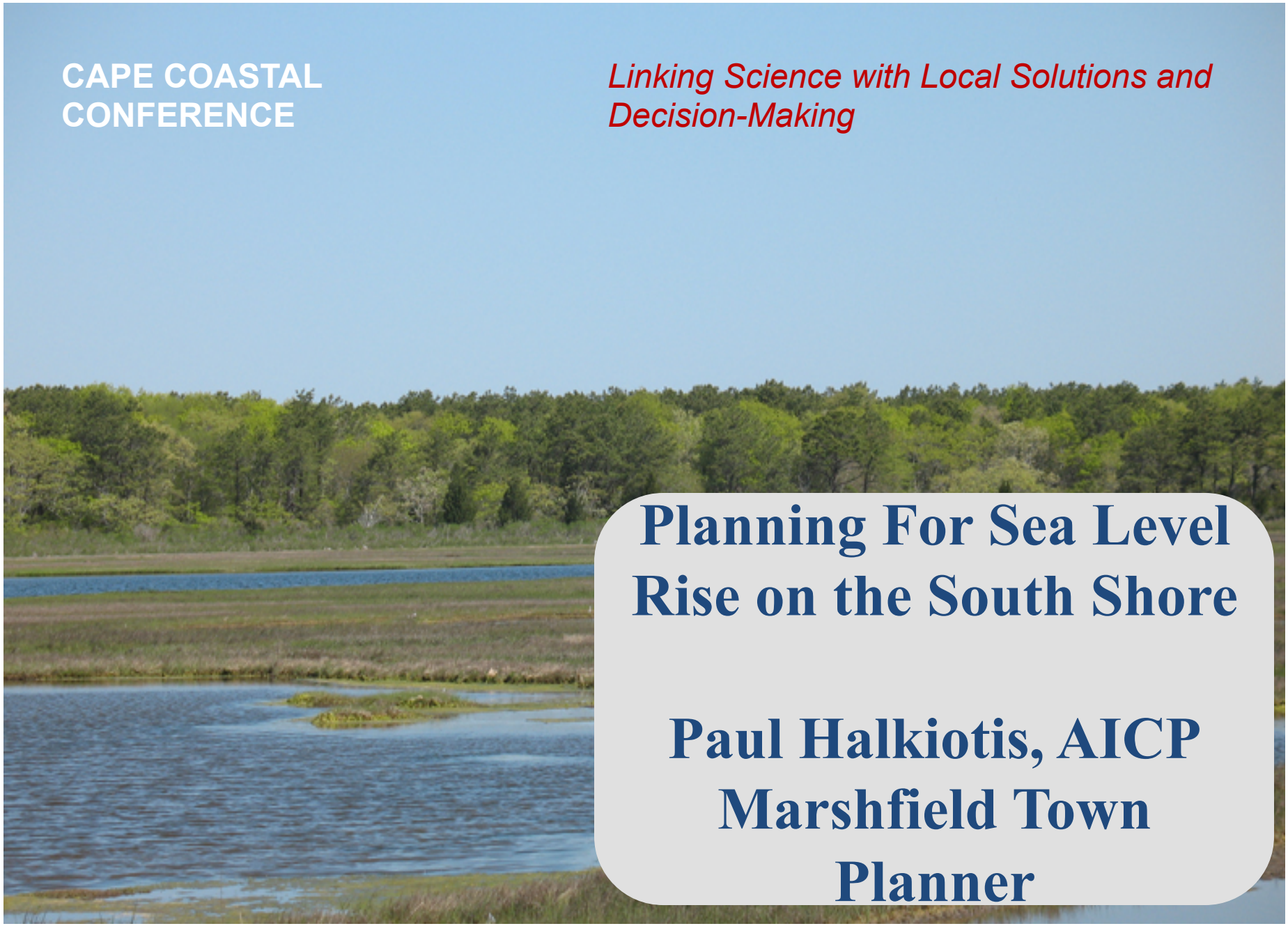


CAPE COASTAL CONFERENCE

Linking Science with Local Solutions and Decision-Making

Planning For Sea Level Rise on the South Shore

Paul Halkiotis, AICP
Marshfield Town Planner

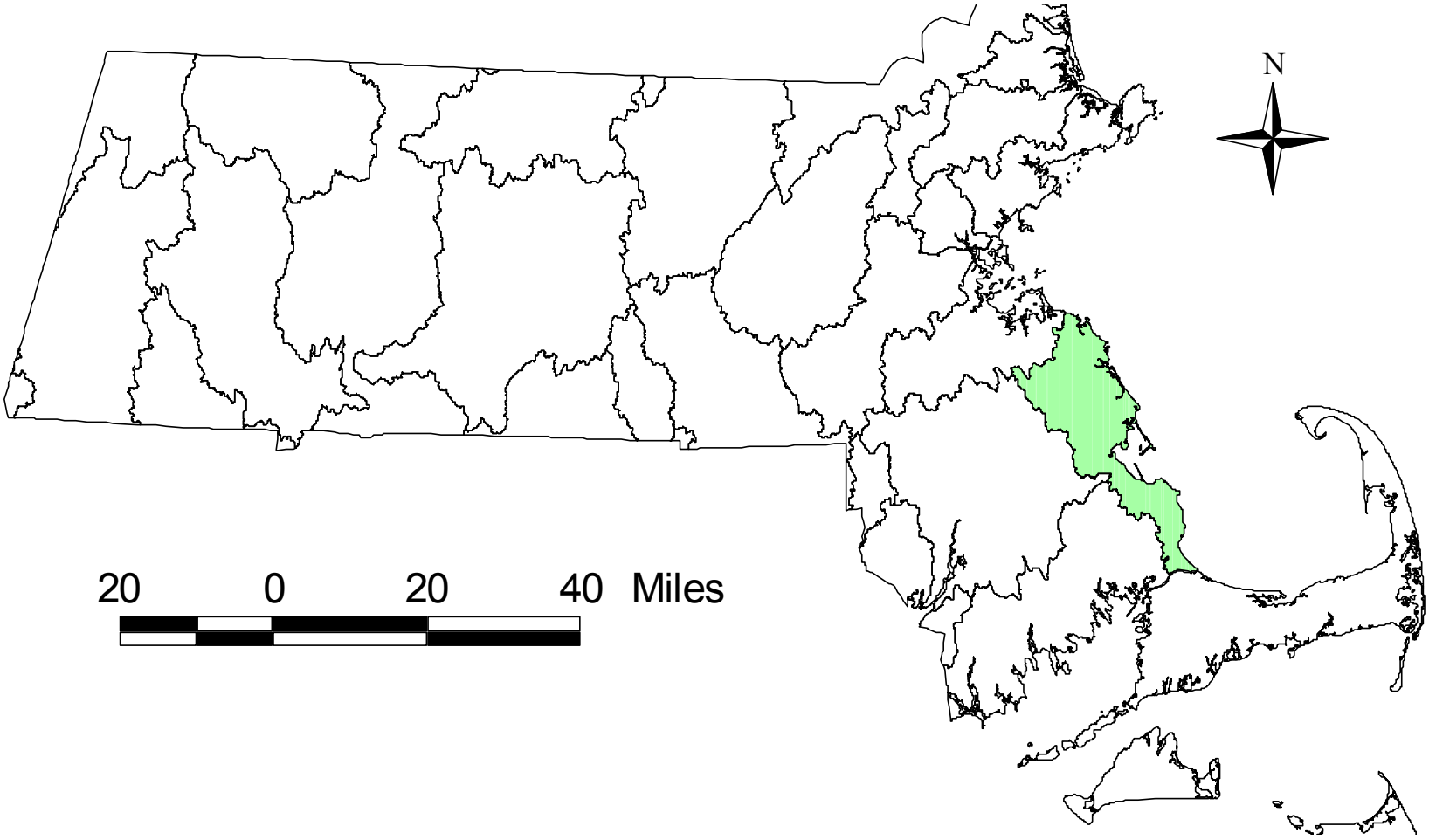
Cape Coastal Conference
June 14, 2013

Sea Level Rise Planning on the South Shore
Marshfield Scituate & Duxbury

Marshfield Sea Level Rise

- Direct Local Technical Assistance Grant- MAPC
- Gulf of Maine Coastal Municipal Resilience Grant
- Coastal Advisory Committee

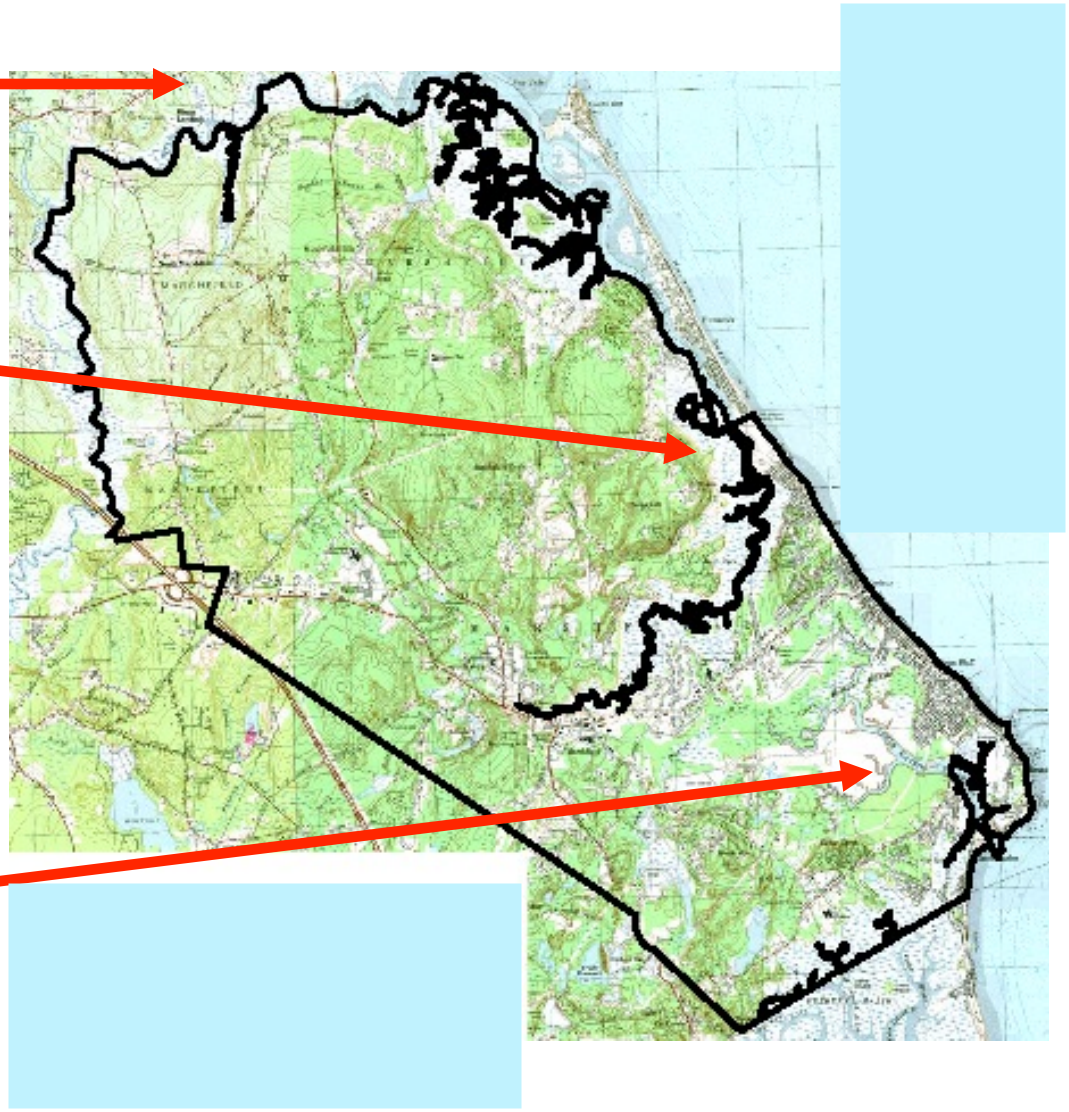
South Shore Region Marshfield – Duxbury - Scituate



3 Rivers in Marshfield

- North
- South

Green Harbor



Marshfield is More Vulnerable to Sea Level Rise

Why ?

- Geography – 3 Rivers that reach inland into the interior of our town.
- Extensive floodplains and marshes
- North & South River Watersheds cover 12 towns over an area of 93 square miles.
- This large watershed area drains to the mouth of the rivers.

Marshfield is More Vulnerable to Sea Level Rise

- Barrier beach narrow fragile landform
- Densely populated coast
- Exposure to high energy surf from Massachusetts & Cape Cod Bay

2.4 miles of sea walls

Densely developed shoreline

Flooding Hot Spot

- The three town region Marshfield, Scituate & Duxbury has received 23% of the total FEMA Flood Insurance Claims for the entire state.

- This totals $72,088,437 for the three town area. (2010)

- From Gloucester to Provincetown to New Bedford. Our 3 towns had 23% of the total flood loss claims.

Flooding in Marshfield

- 156 flood damage claims in the Town of Marshfield
- 87 have had repetitive losses
- 37 have had flood insurance claims at least 3 times
- 11 claims have been for over $ 100,000 in damage
- $14,347,458 total for Marshfield (2010)

May 2010 – Sea Wall Failure

- A 500’ section of sea wall failed at the end of Farragut Rd.
- Although the wall was old, built in the 1930’s
- I believed sea level rise was a factor
- The DPW has historically managed the coastal infrastructure
- I decided to get more involved because this is a long range environmental planning issue.

September 2010 Selectmen's Meeting

- Town needs to take a more proactive approach to managing our coastal infrastructure.
- Sea Level Rise was one of the factors for the collapse.
- Sea Level Rise will make this a more common event
- We need to plan ahead and account for the impacts of sea level rise.

Initial Reaction - What can we do?

- Climate Change and sea level rise are such big issues.

- What can we do at the local level, with little staff or money to scratch the surface on a huge global issue?

- Response - Apply for a grant to get some outside assistance.

Direct Local Technical Assistance Grant (DLTA)

- Contacted Planners from Duxbury & Scituate
- Regional problem – Regional approach
- Applied for a (DLTA) grant from the Metropolitan Area Planning Council (MAPC)
- Duxbury, Scituate & Marshfield awarded a grant to study adaptation & mitigation options for sea level rise.

South Shore Coastal Hazards Adaptation Study

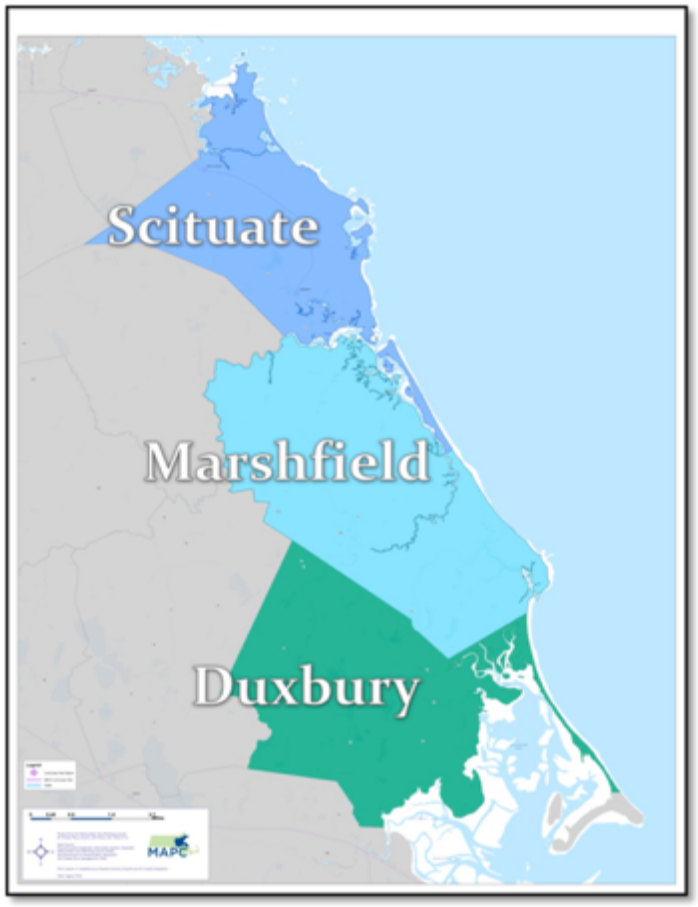
Funding provided by the
District Local Technical Assistance program

Prepared for the

Towns of Duxbury, Marshfield, and Scituate

December 31, 2011

Prepared by
Metropolitan Area
Planning Council
60 Temple Place, 6th Floor
Boston, Massachusetts 02111
Tel (617) 451-2770
www.mapc.org



Coastal Hazard Adaptation Study

- ✓ Review and analysis of existing reports & studies.
- ✓ Explored current and potential future coastal vulnerabilities.
- ✓ Identified a range of possible adaptation options.
- ✓ Provided information about resources that could support local actions and strategies.

Other Goals - Public Education

- ✓ Analysis of the 40 year history of flooding in the South Shore region, since the National Flood Insurance Program started.
- ✓ Study served as a primer on climate change and sea level rise.
- ✓ A tool to educate the public on potential impacts of sea level rise.

The Study followed Standard Planning Process

- **Inventory** – Coastal infrastructure
- **Assessed** – Condition of Infrastructure, historical trends, geography and natural resources
- **Alternatives** – Provided Mitigation & Adaptation Strategies
- **Recommended Actions** – Such as flood proofing
- **List of resources –** Grant opportunities
- **Public Education**

Adaptation Strategies
Three major categories of adaptation

- **Protect** – Measures to shield land uses from the impacts of sea level rise such as sea walls.

- **Accommodate** – Measures that adjust to the impacts of a rising sea while maintaining existing land uses, flood proofing / elevating structures.

- **Retreat** – Measures that accept the impacts of sea level rise and move land uses farther inland.

Recommended Actions

- Regulations – Greater setbacks
- Land Acquisition – Buying properties
- Development/Building guidelines – Locating out of the flood zone
- Flood proofing – Elevating structures

Gulf of Maine Council Grant

- Planners from the 3 towns applied for a second grant from Gulf of Maine Council on the Marine Environment & Northeast Regional Ocean Council

- One Pilot project was selected from Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut.

- Our 3 town region was awarded the $30,000 grant for Massachusetts.

Marshfield-Scituate-Duxbury
Municipal Coastal Resilience Initiative

- NOAA recently completed new LiDAR maps for the New England coastal region.

- LiDAR – Light Detection and Ranging

- Aerial Photos with higher vertical accuracy

Step 1. Mapping Hazard Areas

- NOAA has provided our towns with flood inundation maps. Our 3 towns were the first in the state to receive these maps from NOAA.

- They project where areas may flood at 1’ contour intervals.

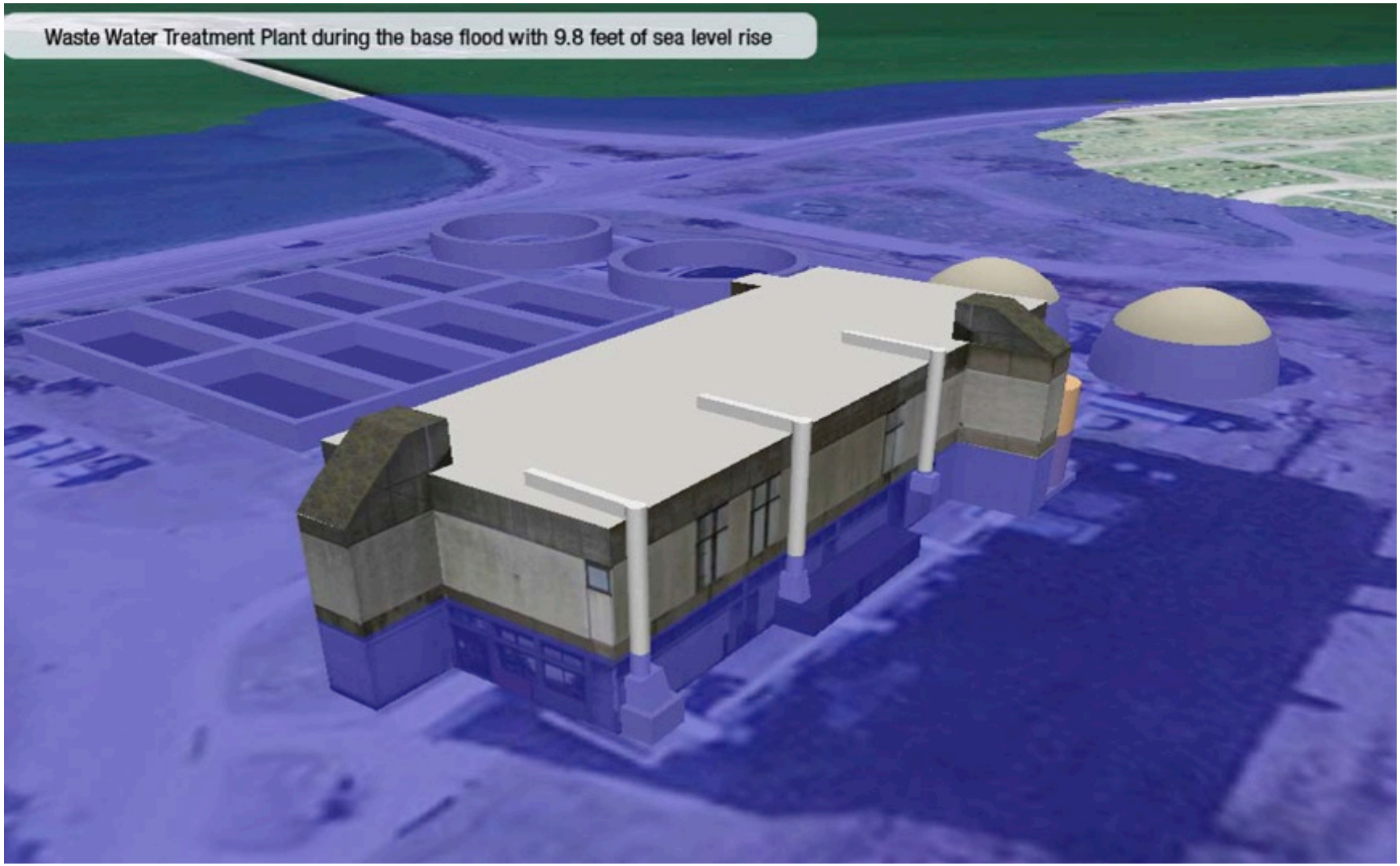
- Consultants will use these maps to project where the mean high water line will be in 25, 50 & 75 years from now.

- Worst Case 100 yr storm 25, 50 & 75 years from now.

Step 2. Vulnerability Assessment

- Identify key public & private properties and natural resources in projected areas of flooding.
- Conduct a risk or vulnerability assessment in flood prone areas.
- We selected 5 public buildings & facilities for 3-D inundation imaging in each town.
- The 3-D images will show the projected depth of flooding for the three specified time periods

Hull MA Inundation Projection



Step 3. Project Impacts to Natural Resource

- Consultants will assess the impacts to natural resources in the three town area based on the inundation models produced for the three time frames.

- Planners will assist the consultants by identifying sensitive resource areas that should be analyzed for potential flooding impacts such as salt marsh and shellfish beds.

Step 4. Develop Adaptation & Mitigation Options

Consultants will provide:

- Location-specific recommendations to minimize and mitigate the effects of sea level rise in areas that are projected to be flooded in each town.

- List possible mitigation or adaptation options and discuss the pros and cons of each recommended option.

- Provide cost estimates for each option in a general way such as low, medium and high.

Step 5. Public Education & Outreach Meetings

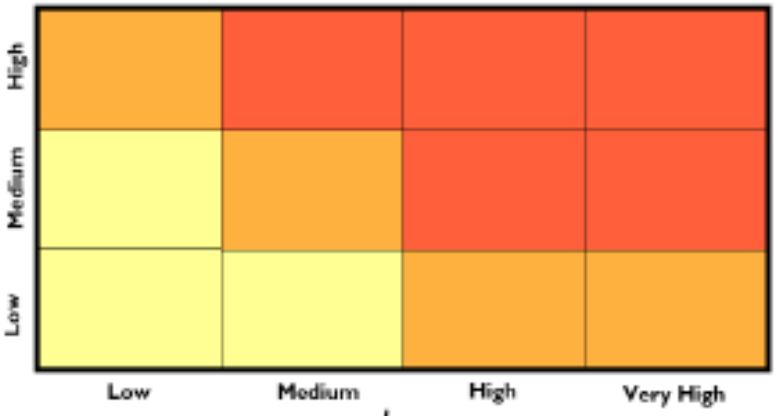
- Public meetings will be held to present the results of the study to the Selectmen in the 3 towns.

- Maps will be displayed in 3 towns at public places such as Town Halls, libraries and web sites.

- Information will be provided to public officials, environmental groups and the media in the region in an effort to educate them about the potential impacts of sea level rise.

Consultant - Kleinfelder North East

Climate Change Projections



Step 1

Climate Projections

Scenario Development

Step 2

Vulnerability & Risk Assessment

Step 3

Adaptation Planning

Current Status

- On 5/16/13 a public meeting was held in Scituate to present the preliminary inundation maps.

- Over 150 people were in attendance.

- Several Scituate residents spoke about the more immediate problem of replacing the ageing sea walls.

Short Term – Long Range Planning Connection

- I explained the importance of knowing where the high tide line will be in 25 - 50 years.

- The design engineers need to know if the footings of the walls will be in standing water.

- If the design life of the structure is 50 years, we need to know if the walls will be occasionally subjected to wave action or constantly hit by waves.

Next Steps

- The 3 towns are reviewing the inundation maps.
- The consultants are completing the 3-D inundation images
- Consultants are assessing the natural resource impacts

Next Steps

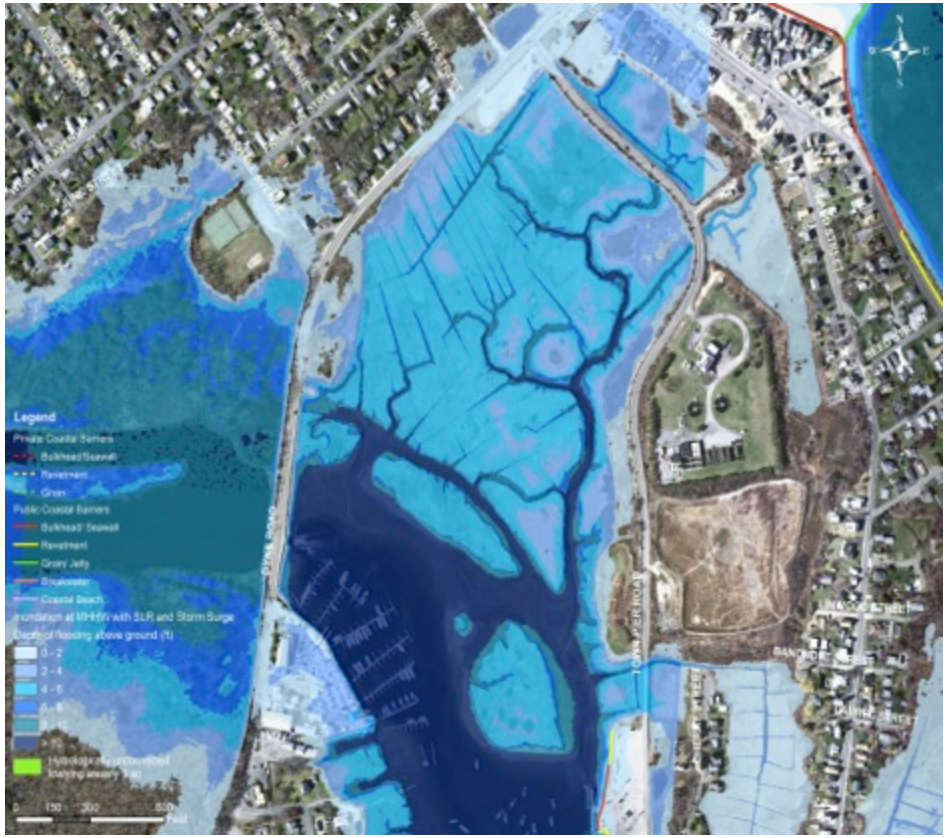
- Meetings with the Selectmen from the 3 towns to present the final report.
- Meeting with State legislators
- Meeting with the media to educate them about the sea level rise projections.

Next Steps

- Project completed by June 30th 2013
- Study's recommendations will be incorporated into the Master Plan update

Dyke Rd & Waste Water Treatment Plant
Sea Level Rise Only

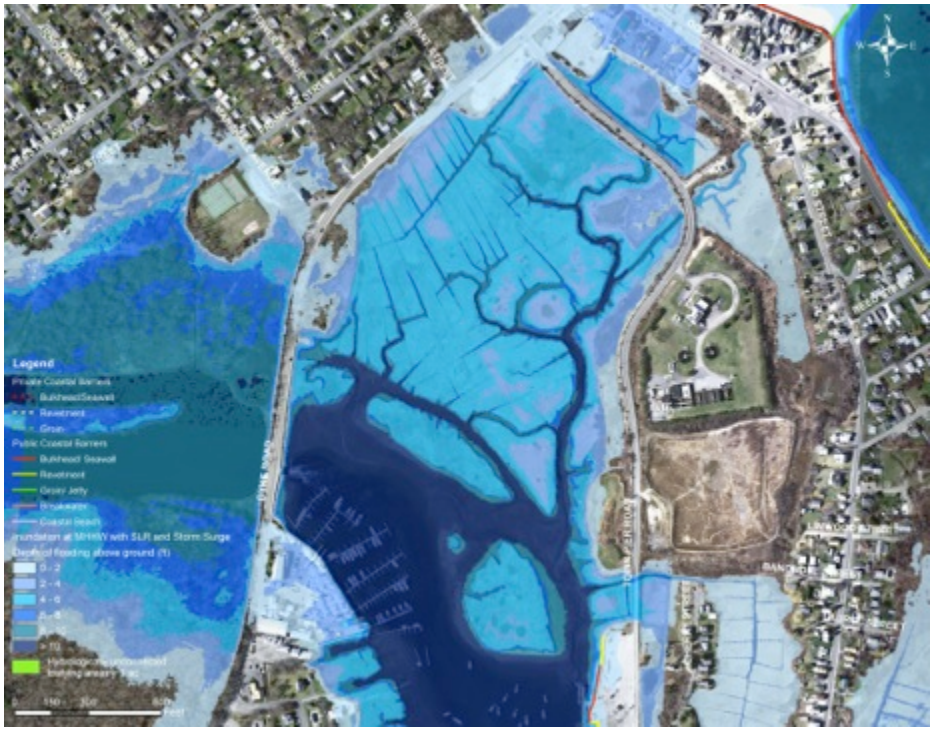
SLR of 1.08 ft by 2038



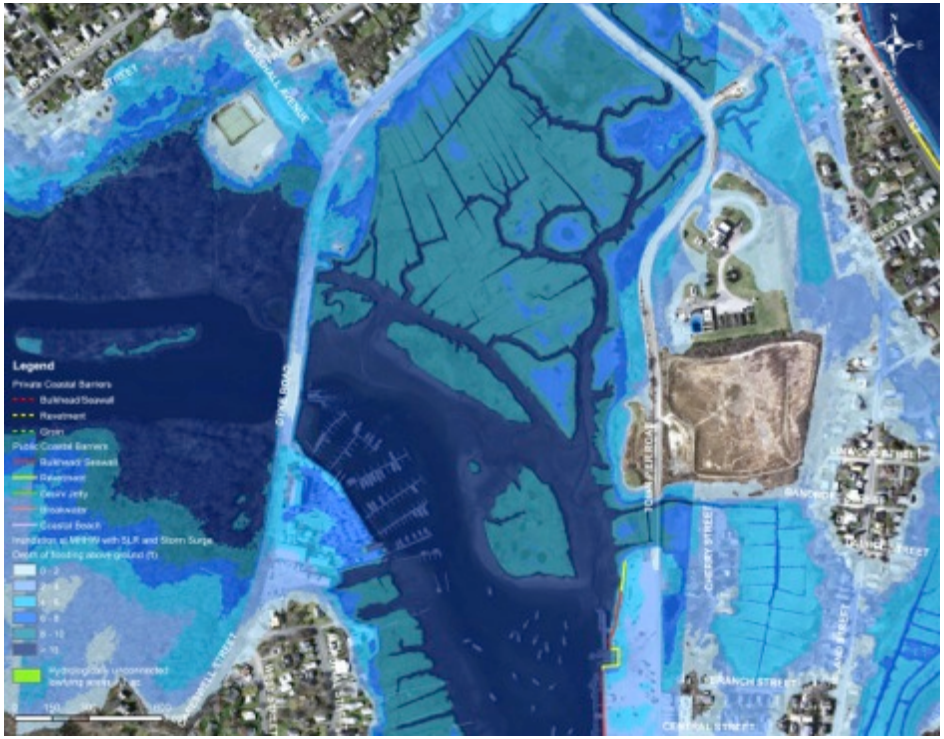
SLR of 5.61 ft by 2088

Sea Level Rise & Storm Surge

Dyke Rd & Waste Water Treatment Plant

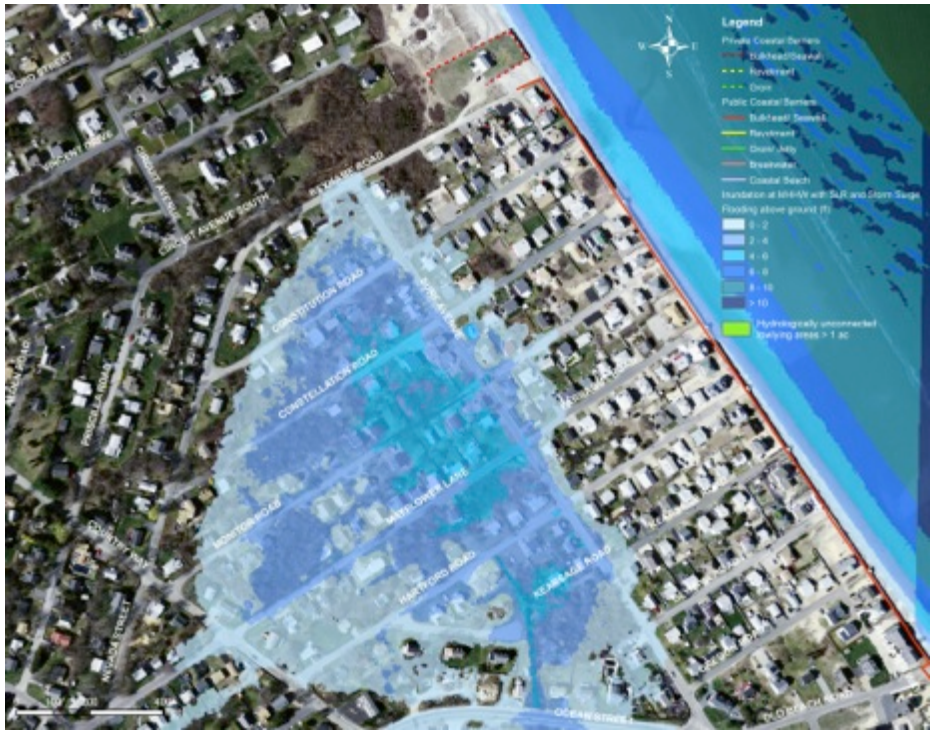


SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane

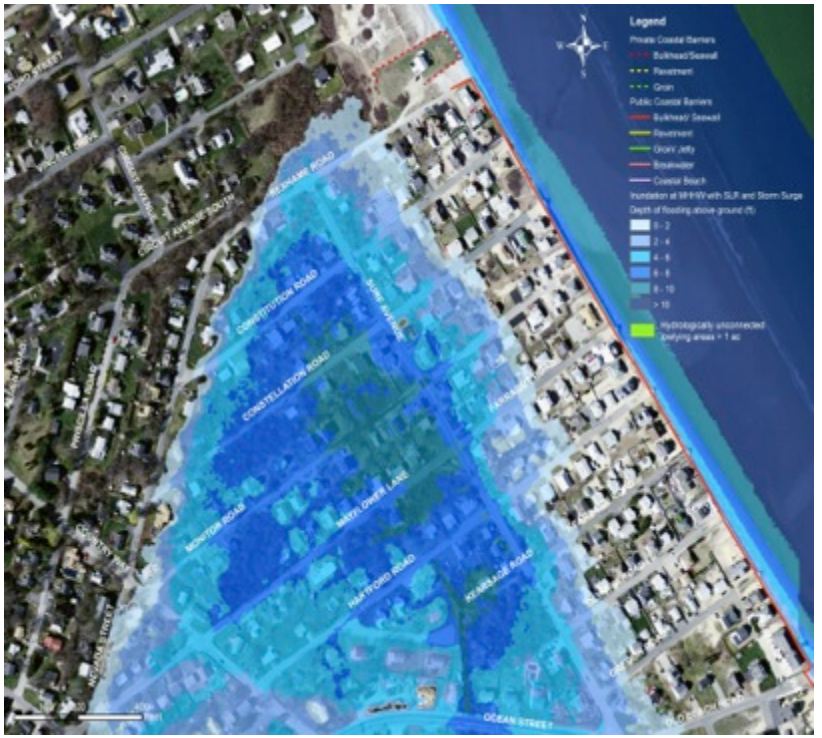


SLR of 5.61 ft by 2088 and
Storm Surge from Category 1 Hurricane

Rexhame Road Area
Sea Level Rise & Storm Surge



SLR of 1.08 ft by 2038 and
Storm Surge from Category 1 Hurricane



SLR of 5.61 ft by 2088 and
Storm Surge from Category 1
Hurricane

Coastal Advisory Committee

March 2013 Selectmen appoint a new committee.

- Advise the Town on sea level rise adaptation strategies that include but are not limited to protection, accommodation or retreat so as to enable sustainable living in our coastal community

Committee Charge

- To proactively promote a research-based approach to making local decisions about various sea level rise adaptation strategies that include but not be limited to: flood-proofing, beach nourishment, armoring sea walls, tactical retreat and land acquisition.

- Develop policies that will help to minimize the Town's exposure to coastal storms in an effort to protect public safety, infrastructure, natural resources and private property.

- Develop various bench mark indicators to measure sea level rise, coastal storm frequency and intensity.

Sandy

Brant Rock - Nemo