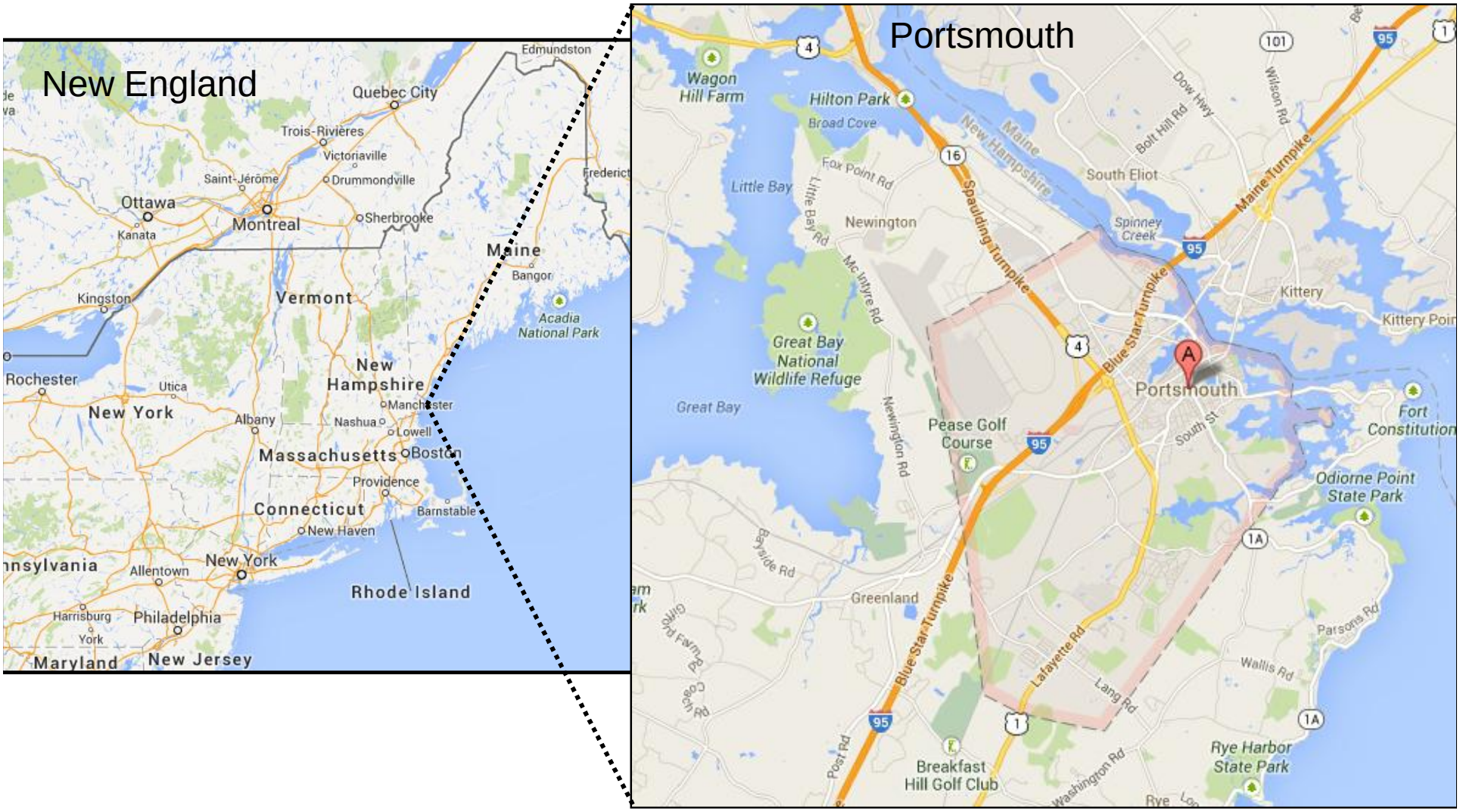
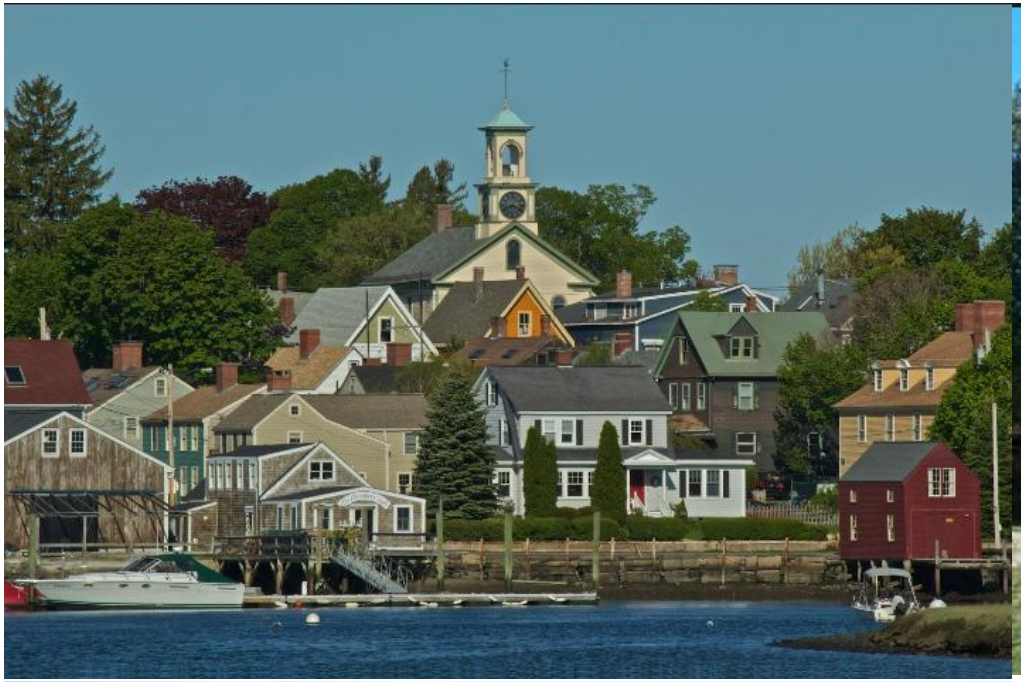
City of Portsmouth, NH





Portsmouth, NH

Current Population 21,000

Settled 1623

City of Portsmouth, New Hampshire

COASTAL RESILIENCE INITIATIVE

Climate Change Vulnerability Assessment and Adaptation Plan

April 2, 2013

This project was funded by the Gulf of Maine Council through a grant from the National Oceanic and Atmospheric Administration (NOAA).

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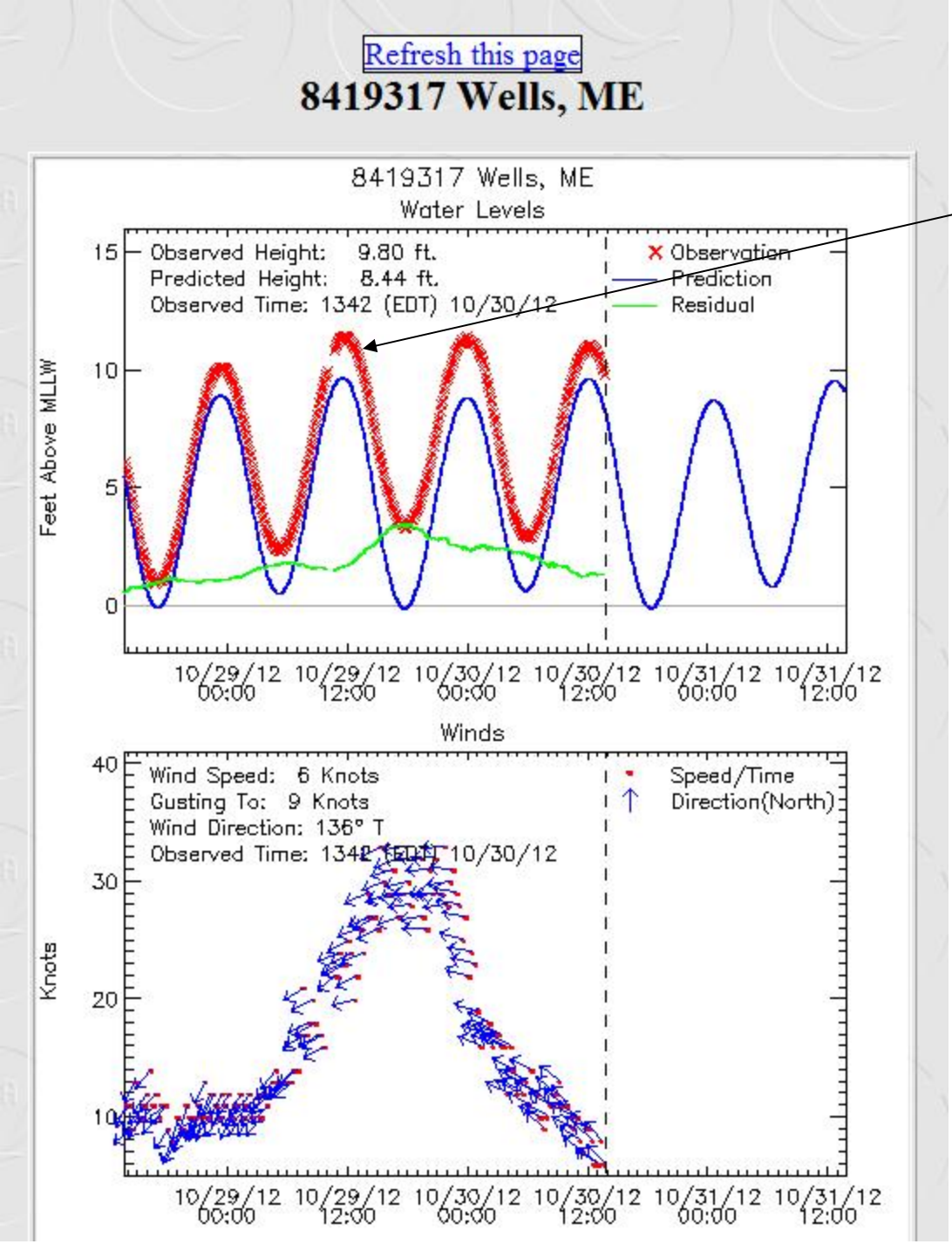

- Tidal Surge as recorded in Wells, ME at the outset of Hurricane Sandy as shown in photos.

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PROTECT.
PORTSMOUTH.

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PROTECT.
PORTSMOUTH.


6.8’ Storm Surge
100 Year Coastal Flood Elevation
100 Year Coastal Flood
MHHW
MSL

CARBON SOLUTIONS
NEW ENGLAND
CarbonSolutionsNE.org

GREAT BAY STEWARDS

Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future

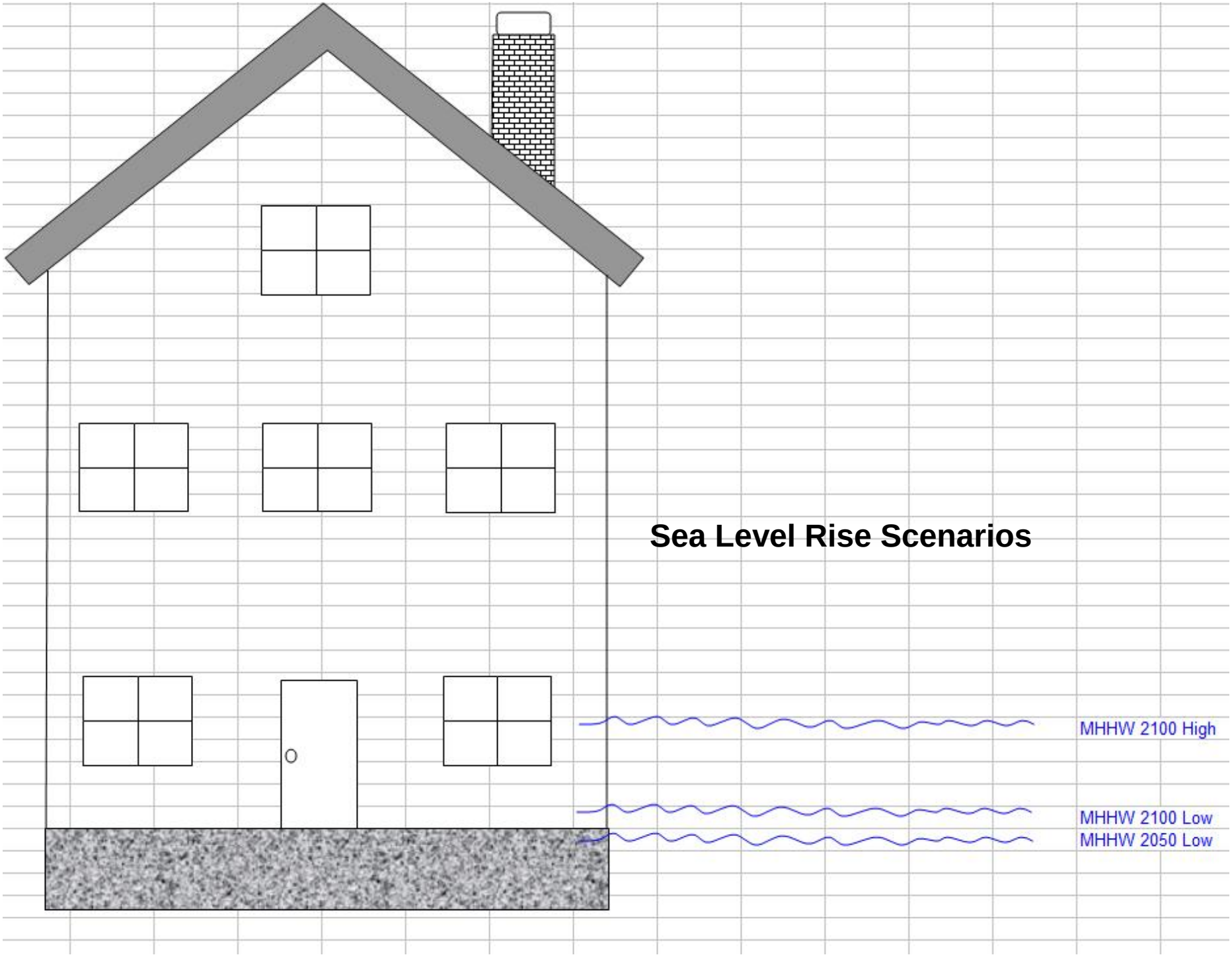
UNIVERSITY of NEW HAMPSHIRE

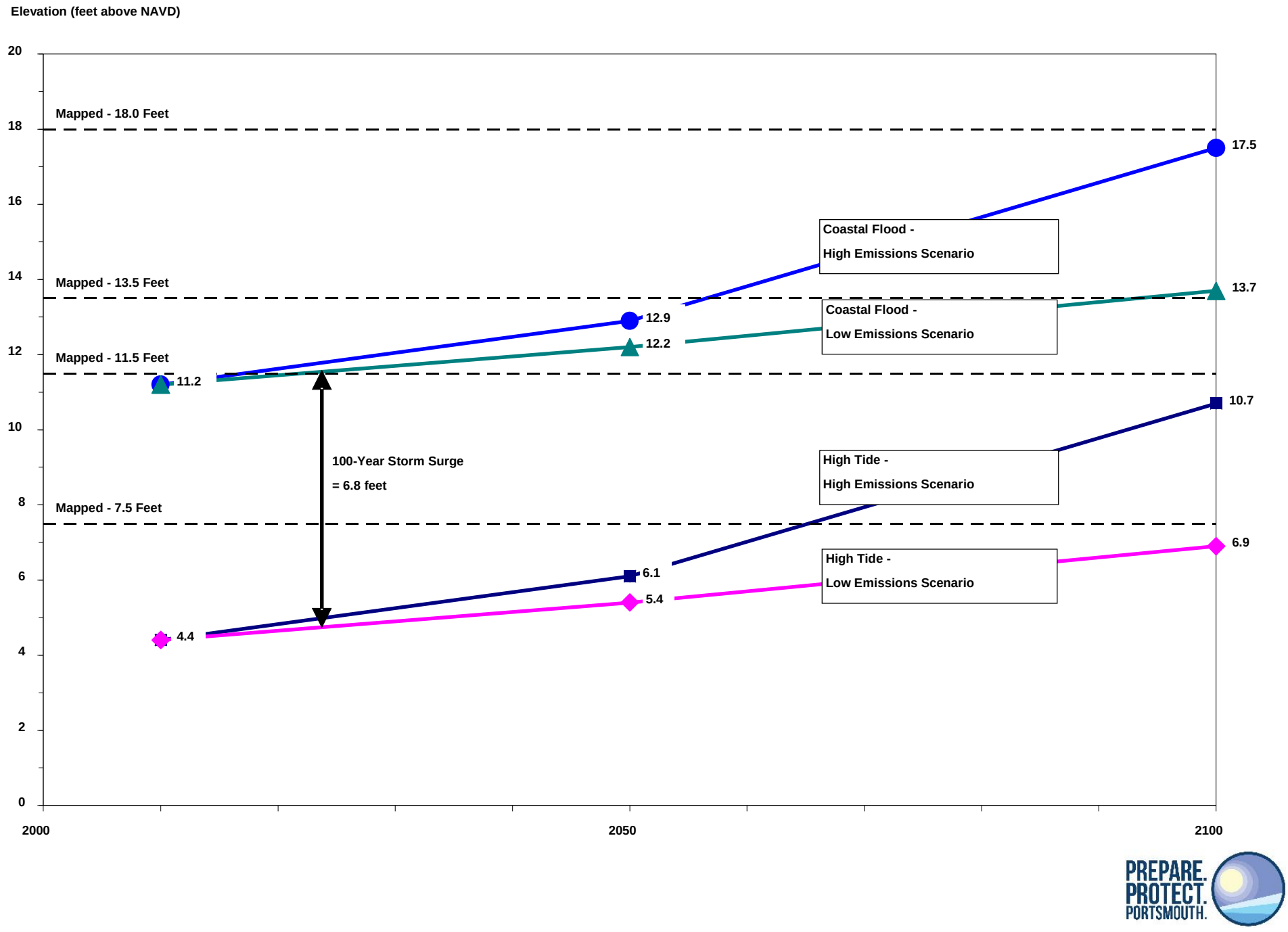
Cameron P. Wake
Elizabeth Burakowski
Earth Systems Research Center
Institute for the Study of Earth, Oceans, and Space
University of New Hampshire, Durham, NH

Katharine Hayhoe
ATMOS Research & Consulting
Department of Geosciences, Texas Tech University
Lubbock, Texas

Anne Stoner
ATMOS Research & Consulting
Lubbock, Texas

Chris Watson
Ellen Douglas
Environmental, Earth and Ocean Science Department
University of Massachusetts
Boston, Massachusetts


Sea Level Rise Scenarios
MHHW 2100 High
MHHW 2100 Low
MHHW 2050 Low



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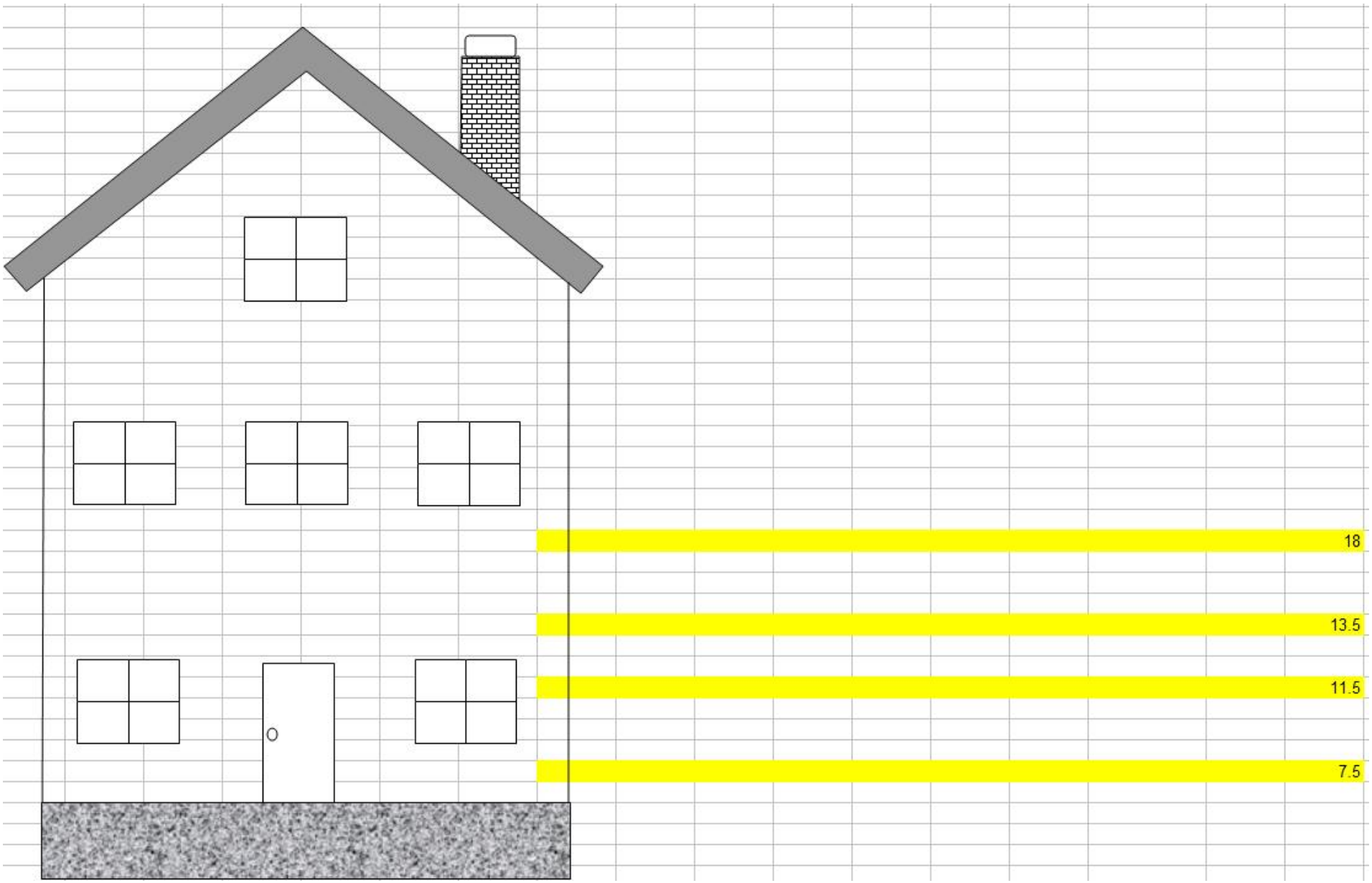
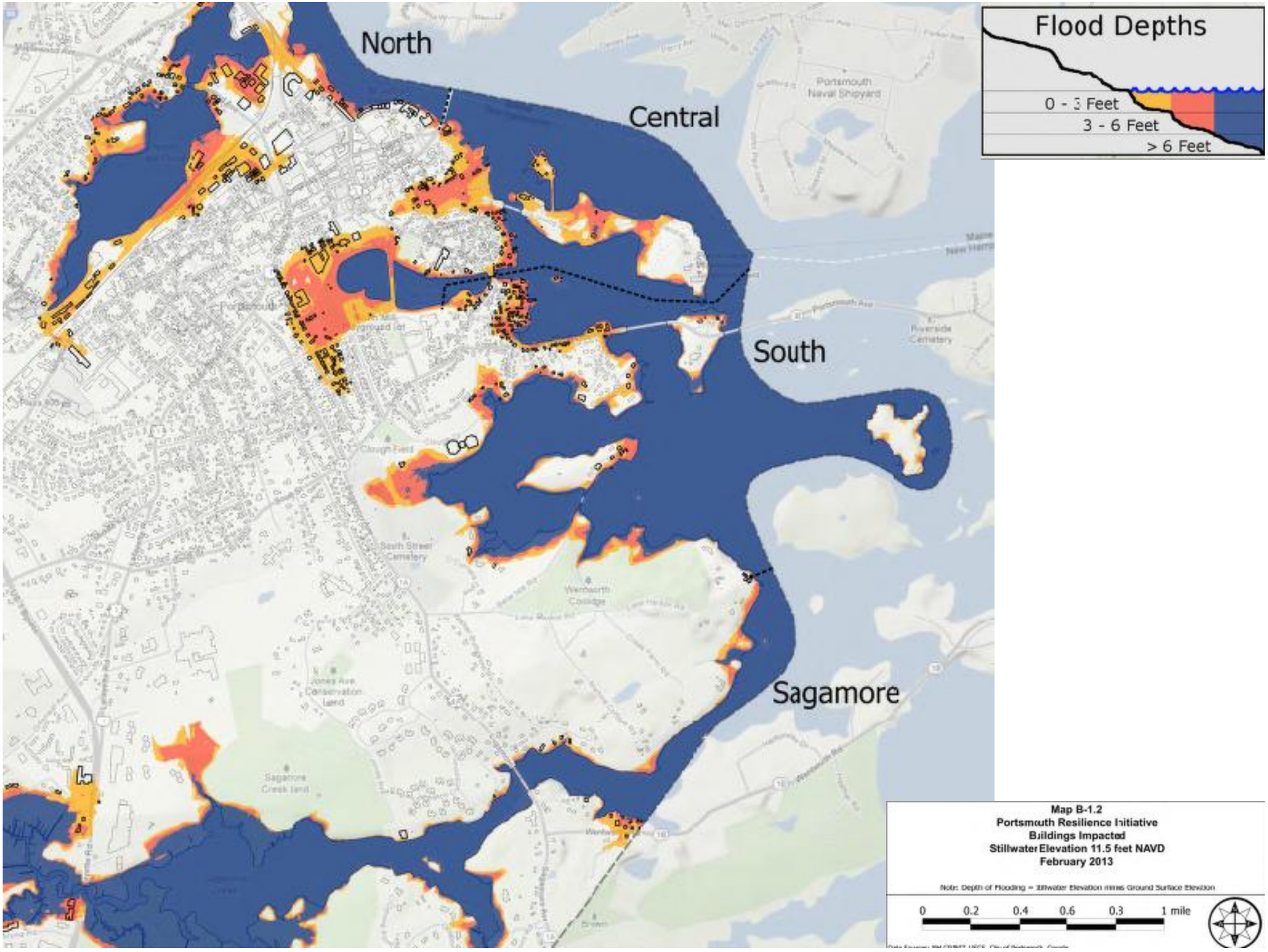
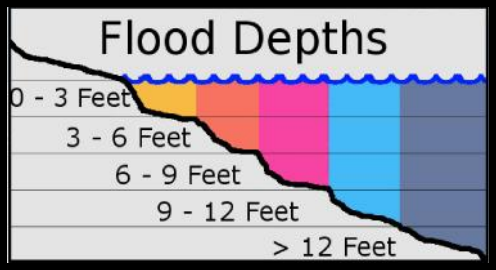
PROTECT.
PORTSMOUTH.


18
13.5
11.5
7.5

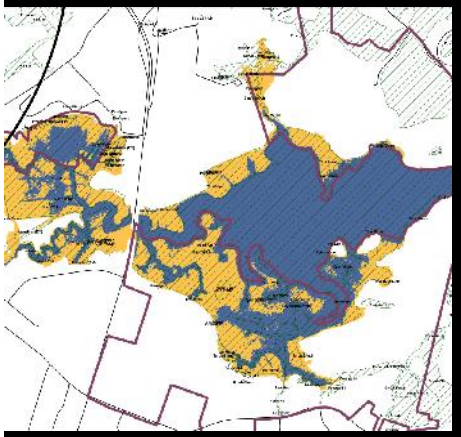

North
Central
South
Sagamore
Flood Depths
0 - 3 Feet
3 - 6 Feet
> 6 Feet
Map B-1.2
Portsmouth Resilience Initiative
Buildings Impacted
Stillwater Elevation 11.5 feet NAVD
February 2013
Note: Depth of Flooding = Stillwater Elevation minus Ground Surface Elevation
0 0.2 0.4 0.6 0.3 1 mile

Flood Scenarios Buildings – South End

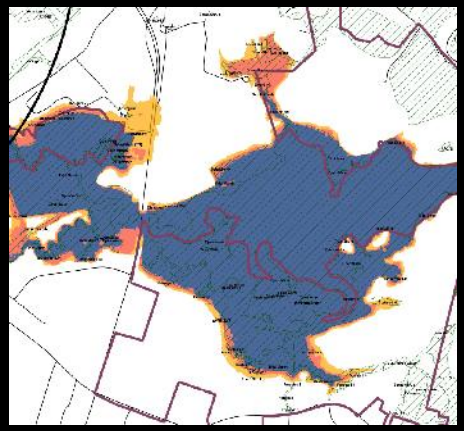
7.5 Feet **11.5 Feet** **13.5 Feet** **18.5 Feet**



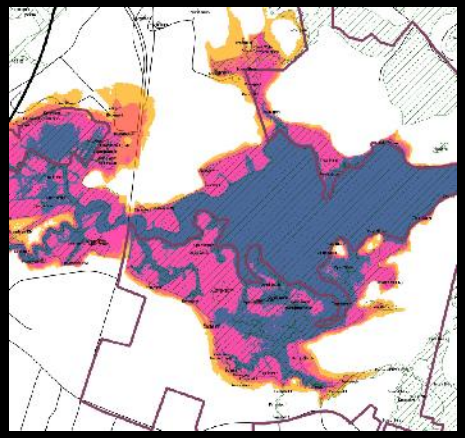
Flood Scenarios Wetland Impacts: Sagamore Creek



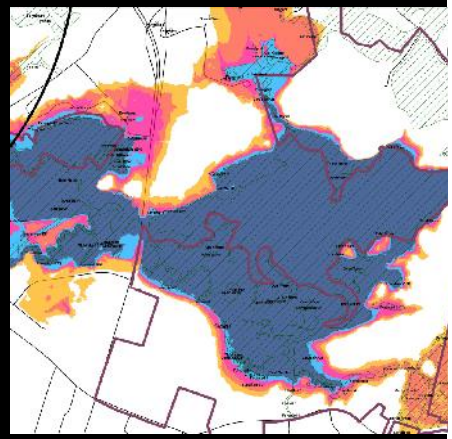
7.5 Feet



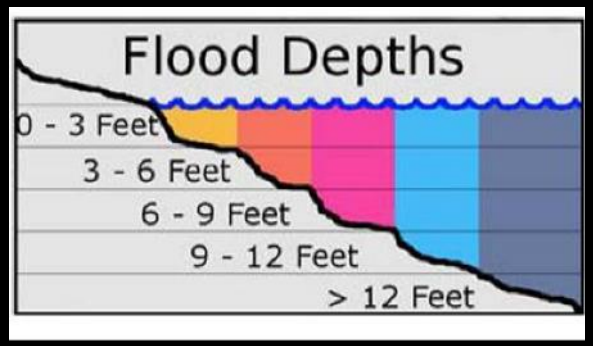
11.5 Feet

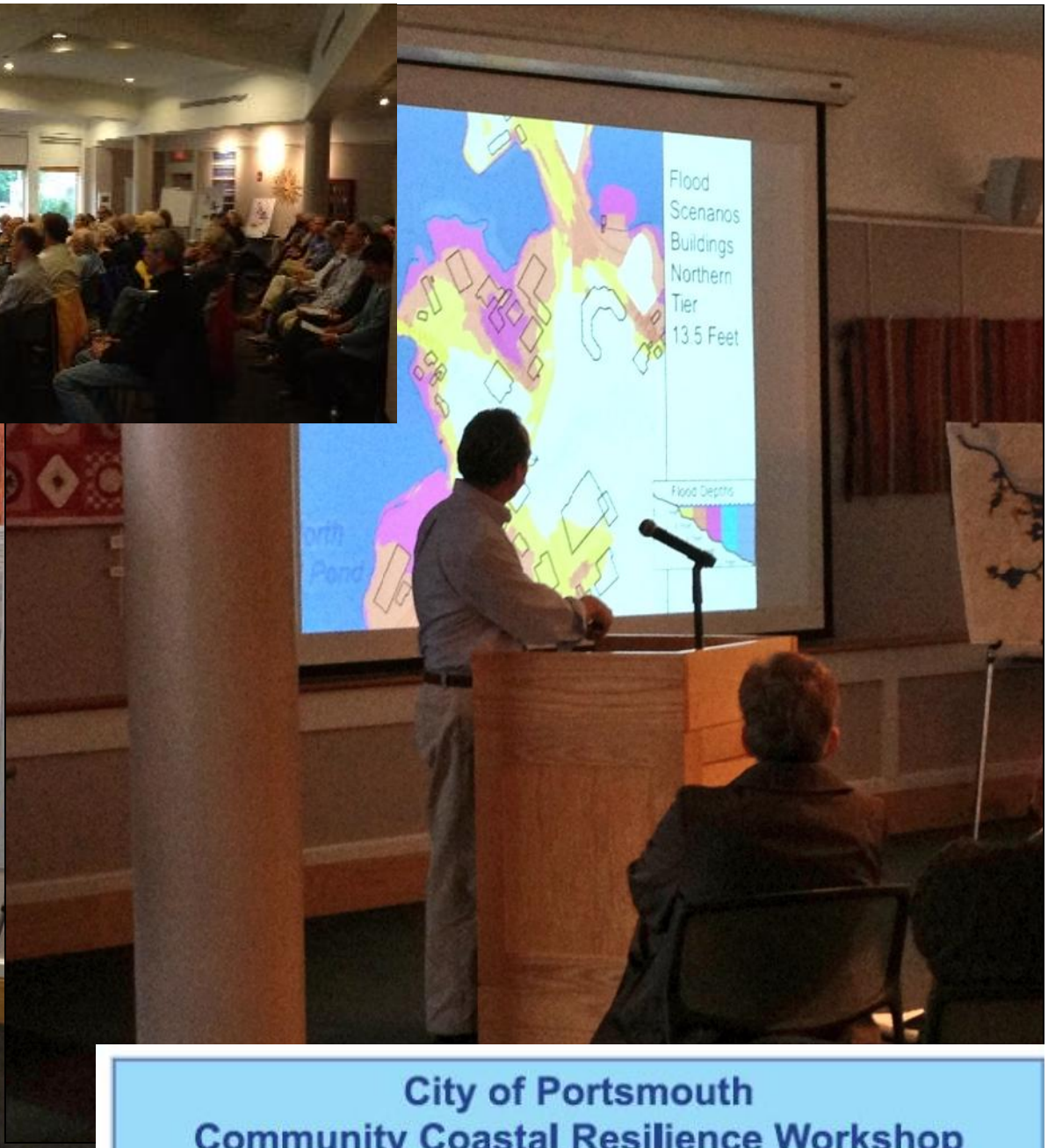


13.5 Feet



18.5 Feet





City of Portsmouth
Community Coastal Resilience Workshop

May 29, 2013; 5:30-8:00p.m.
Portsmouth Public Library Levenson Community Room

Join a Walking Tour of Flood Risk Areas

October 22, 2013; 4:00-6:30p.m.
Player's Ring Theatre on Prescott Park
105 Marcy Street, Portsmouth, N.H.

PREPARE. PROTECT. PORTSMOUTH.

PREPARE. PROTECT. PORTSMOUTH.

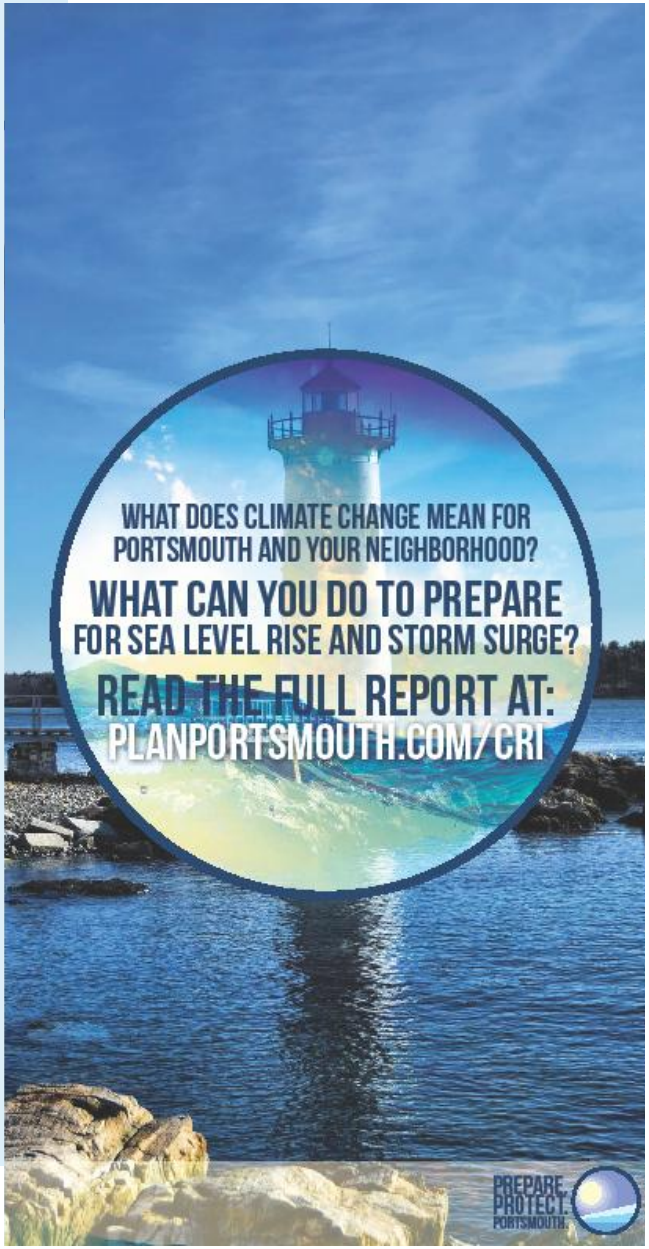
How will sea level rise and climate change affect Portsmouth? How do we protect our historic City and avoid future property damage? Good news: Portsmouth was one of five communities selected for a pilot program with $30,000 in funding from the Gulf of Maine Council, through a grant from the National Oceanic and Atmospheric Administration (NOAA). This grant funded a research study, The "Coastal Resilience Initiative" prepared for the City by a team of researchers from the University of New Hampshire and the Rockingham Planning Commission. This detailed, 50-page report provides the starting point for understanding the impacts of climate change and offers a number of possible adaptation measures that the City can take over time to protect private property and public infrastructure. You can view the full report by visiting planportsmouth.com/cri

Below are key pieces of information that Portsmouth businesses and residents should know.

DRIVING FORCES:

Storm Surge is an abnormal rise of water generated by offshore storms, over and above the predicted astronomical tides. This rise in water level can cause extreme flooding in coastal areas particularly when storm surge coincides with normal high tide.

Sea Level Rise is the increase in the average height of the ocean's surface.



Categories of Recommendations

Zoning Ordinance Overlays

- Floodplain Standards
  - *i.e: Extended Flood Hazard Overlay District*
- Historic District
  - *i.e: Inventory historic properties*
- Setbacks and Buffers
  - *i.e: Larger buffers adjacent to saltmarsh areas*
- Redevelopment Standards
  - *i.e. Cost benefit analysis of infrastructure improvements*
- Shoreland Protection Options
  - *i.e. Begin discussion and approval requirements for shoreline protection*

Master Plan

i.e. include results of coastal resilience study

Coastal Wetlands

i.e. inventory key conservation parcels to plan for marsh migration

Public Health

i.e. develop and implement response plans for changing health impacts

Emergency Management and Hazard Mitigation Planning

i.e. amend hazard mitigation plan and evacuation routes.

PREPARE. PROTECT. PORTSMOUTH.

Thank You

For more information:

- City of Portsmouth Planning Department

  Planportsmouth.com/CRI

- NH Coastal Adaptation Workgroup

  nh.stormsmart.org

- **Peter Britz, plbritz@cityofportsmouth.com**

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Water Level	Elevations Relative to NAVD (North American Vertical Datum)				
	Present Day Elevations (feet)	*Future Scenarios (feet)			
		2050 Low	2050 High	2100 Low	2100 High
Projected SLR	--	1	1.7	2.5	6.3
MHHW	4.4	5.4	6.1	6.9	10.7
100 Year Flood Estimate		6.8	6.8	6.8	6.8
MHHW Flood	11.2	12.2	12.9	13.7	17.5

Cost of Adaptation Actions

Scenario	Total Capital Costs – Low	Total Capital Costs – High	Total Operating Costs (low)	Total Operating Costs (range)
7.5 feet	$4,370,000	$7,287,000	$0	$2,000 ($30,00 Prescott Park tide barrier)
11.5 feet	$62,670,000	$66,595,000	$0	$4,000-$70,000 ($120,000 North Mill Pond)
13.5 feet	$93,650,000	$98,393,000	$0	$7,000-$100,000 ($160,000 North Mill Pond)
18.0 feet	$169,447,000	$178,247,000	$0	$10,000-$140,000 ($250,000 North Mill Pond)

Subarea	7.5 feet	11.5 feet	13.5 feet	18.0 feet
North	$22,667,533	$162,790,228	$180,273,596	$307,903,360
Central	$3,175,938	$61,599,338	$84,880,151	$178,798,579
South	$5,907,856	$26,393,580	$36,711,040	$58,196,538
Sagamore	$484,939	$5,134,649	$7,615,214	$54,830,986
Total	$32,236,266	$255,917,795	$309,480,001	$599,729,464

Table 4: Summary of flood impacts based on assessed value per building.