

Vulnerability and Adaptation



Kevin Walsh
AASHTO

Extreme Weather Symposium
May 2013



Vulnerability & Adaptation

- ◆ Flood Inventory – Learn From The Past
- ◆ FHWA/MassDOT Climate Change Pilot for the Central Artery



March 2010



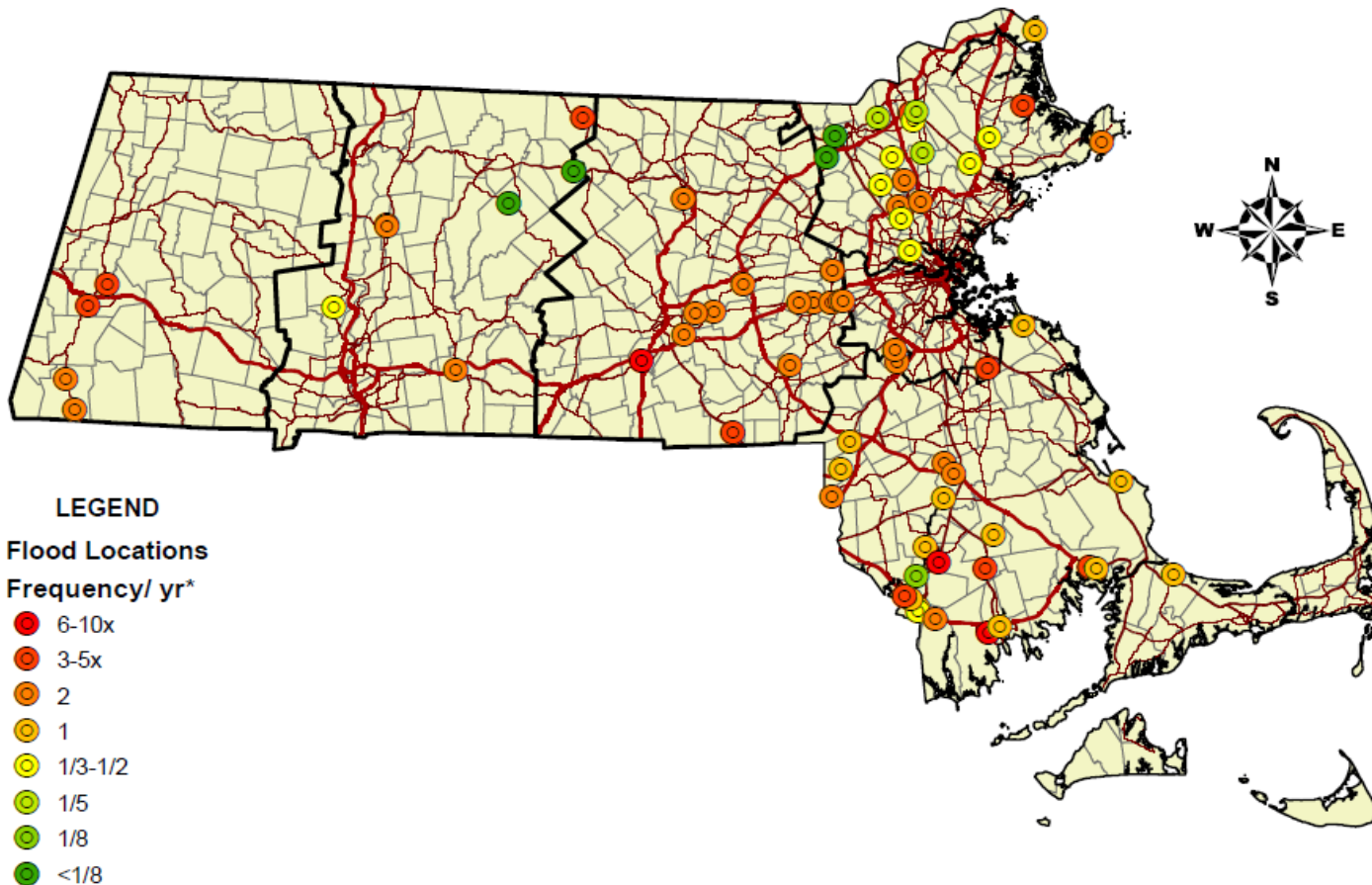
Findings: Causes

Potential Cause	Times Cited
Insufficient Drainage	40
Flooding Water Body	29
Low Elevation/ High Water Table	7
High Tides	6
Debris Clogging	6
Beavers	6
Runoff from Development	5

Note:
Multiple
causes
possible.
Causes not
verified.

2010 Survey

Locations of Repeat Flooding



Good Night “Irene”

- ◆ Hurricane downgraded to Tropical Storm
- ◆ 10 inches in 18 hours
- ◆ Deerfield River, Millers River and Cold River stages broke records.
- ◆ Particularly wet months in July and August prior to Irene.

River Stage about 20 feet!



Wall Failures due to Scour



Luckily, No Injuries!

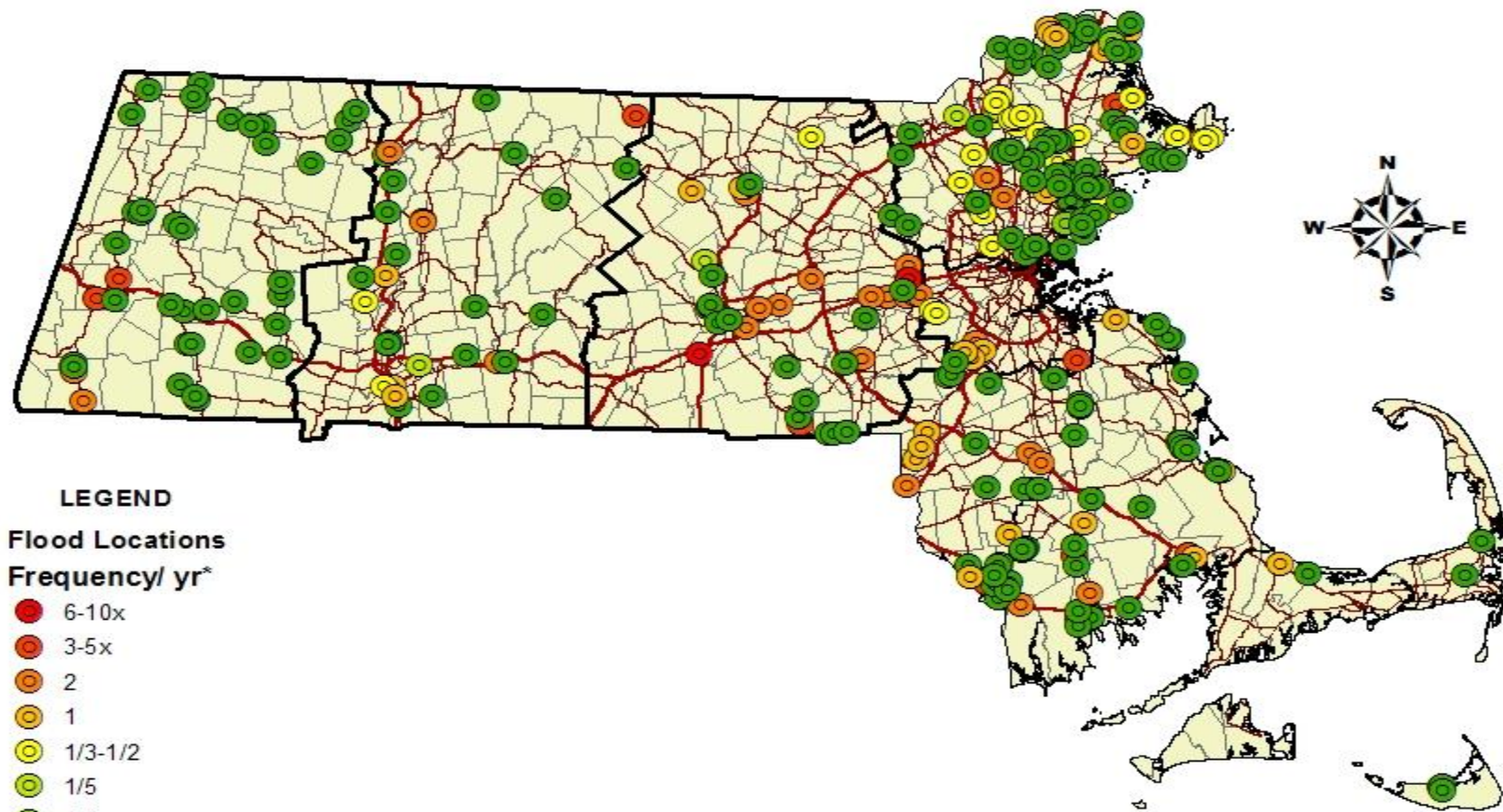


DRAINAGE!



2011-2012 Survey Results

Locations of Repeat Flooding



LEGEND

Flood Locations

Frequency/ yr*

- 6-10x
- 3-5x
- 2
- 1
- 1/3-1/2
- 1/5
- 1/8
- <1/8

- Interstate Hwy
- Major Roads
- Town Lines

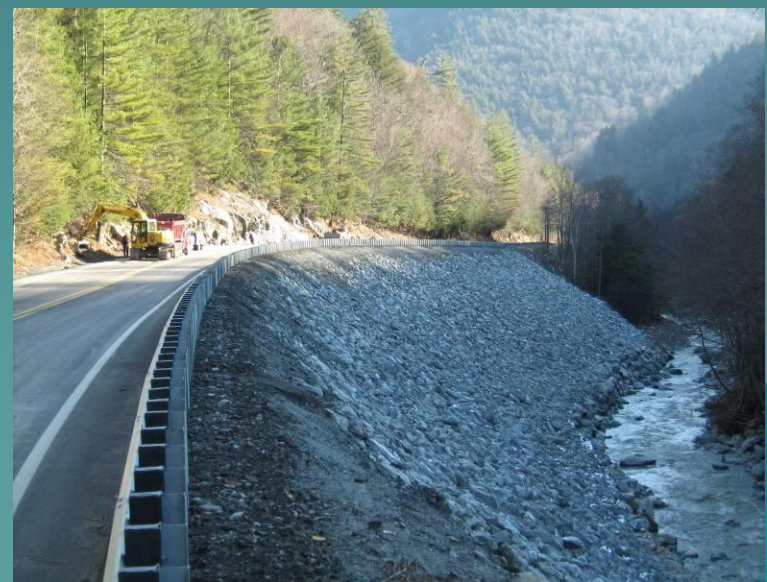
0 5 10 20 30 40

Miles

*Note: Color scale does not correspond to severity of impact (insufficient data)

Adaptation Strategies

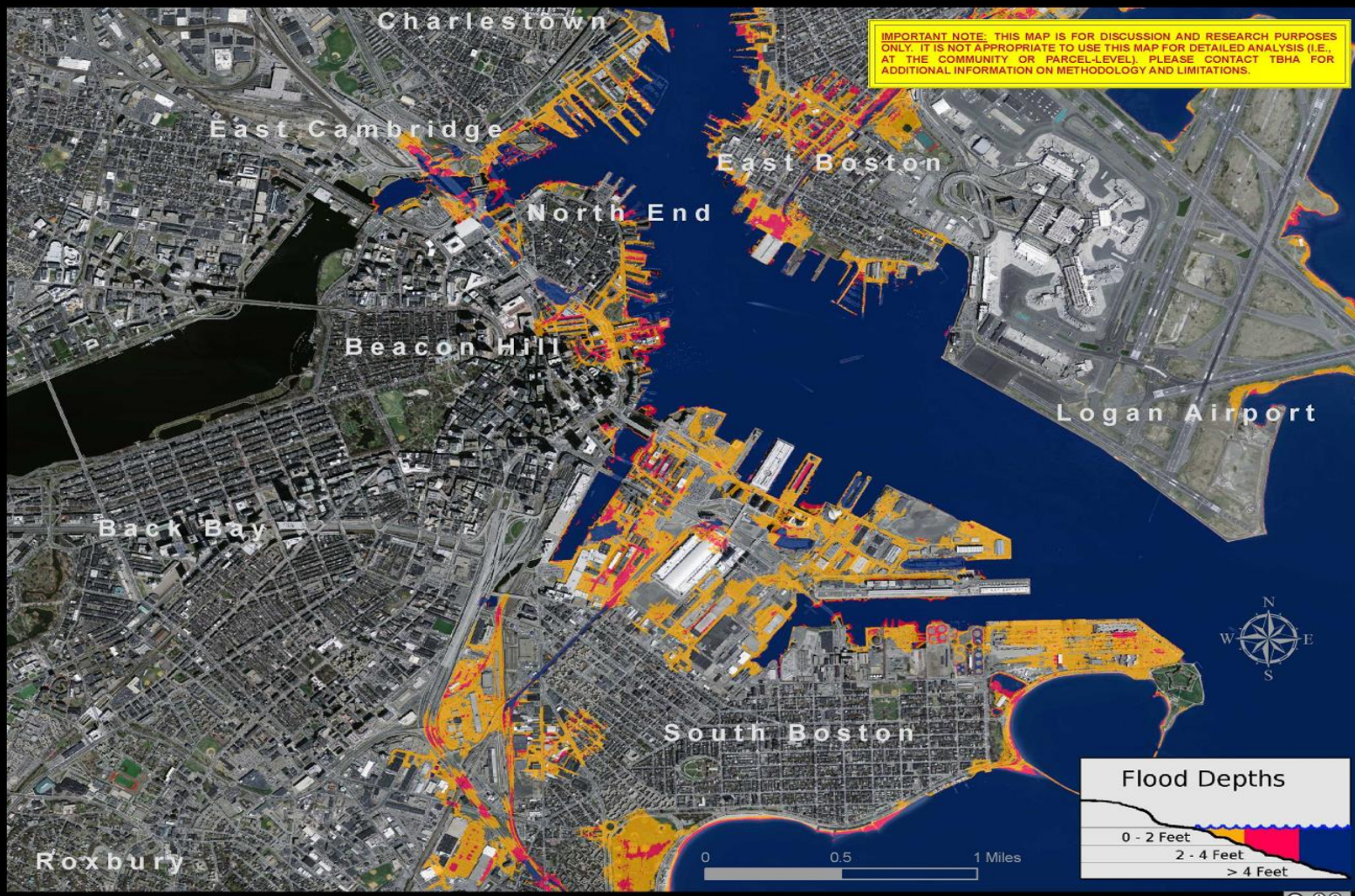
- ◆ Complete Mapping (Maximo)
- ◆ Designs for future events
- ◆ Prioritize Maintenance



MassDOT-FHWA Pilot Project:
***Climate Change and Extreme
Weather
Vulnerability Assessments and
Adaptation
Options of the Central Artery***

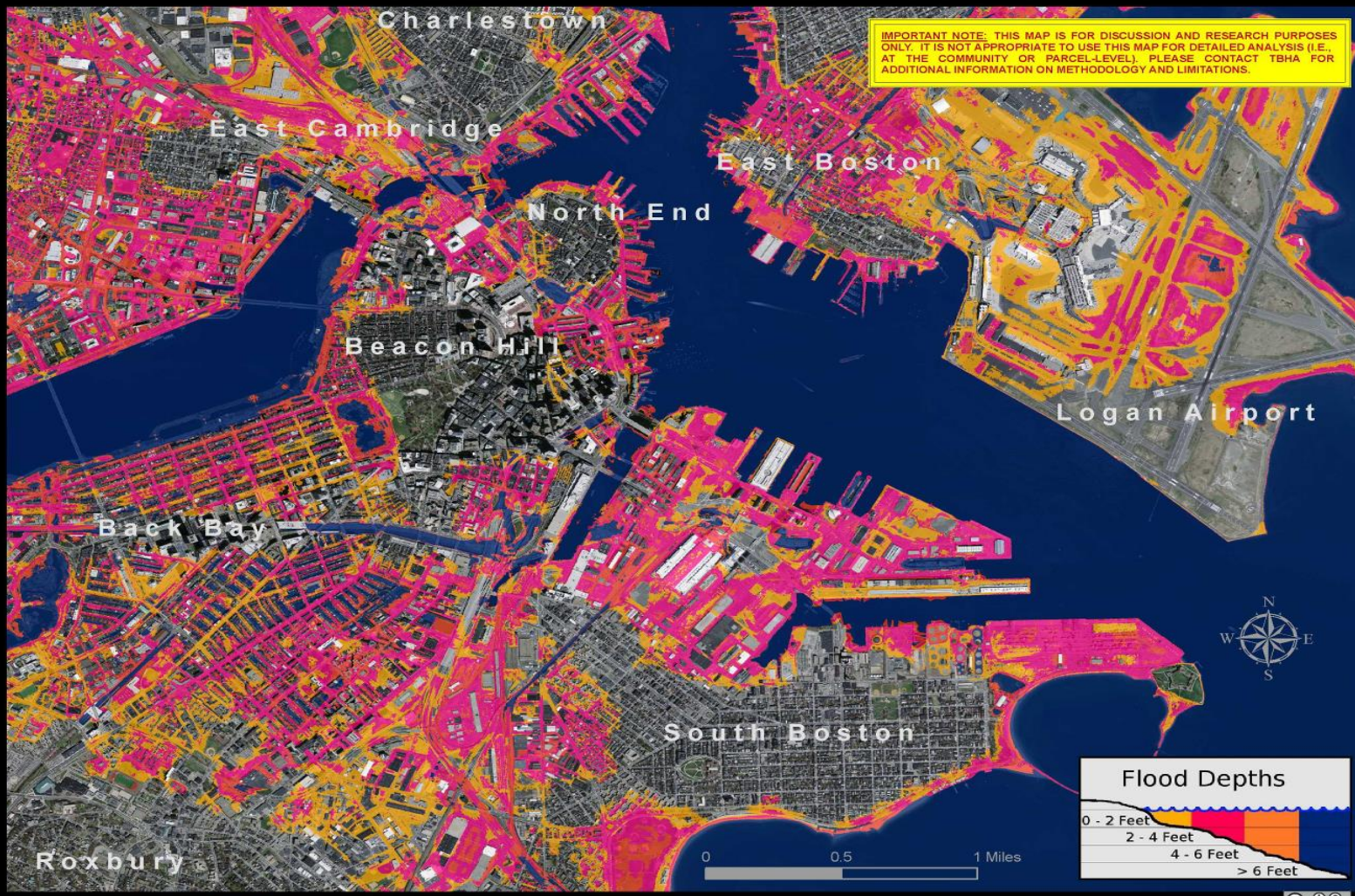
Steven Miller, MassDOT
Katherin McArthur, MassDOT
Ellen Douglas, UMass Boston
Paul Kirshen, UNH

◆ How it all began



TBHA_2010_SLR_Forum_16-Jul-2011_cvr

◆ What if it happened here?



TBHA_2010_SLR_Forum_18-Jul-2011_cw

FHWA Pilot Project Central Artery Overlay with Proposed Study Areas Figure 2



Legend

Central Artery Facilities

Facility Type

- Administration Building
- Air Intake
- Electrical Substation
- Emergency Response Station
- ▲ Fan Chamber
- Low Point Pump
- Maintenance
- Operations Center
- Storm Water Pump
- Tunnel Drainage
- Vent Building
- ▲ D Street Facility

MHS Roads Boston Area

Facility Type

- Mainline
- Tunnel
- Viaduct

CAD Feature

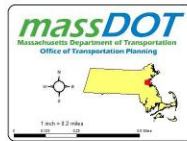
- Facility
- Buildings

Other Feature

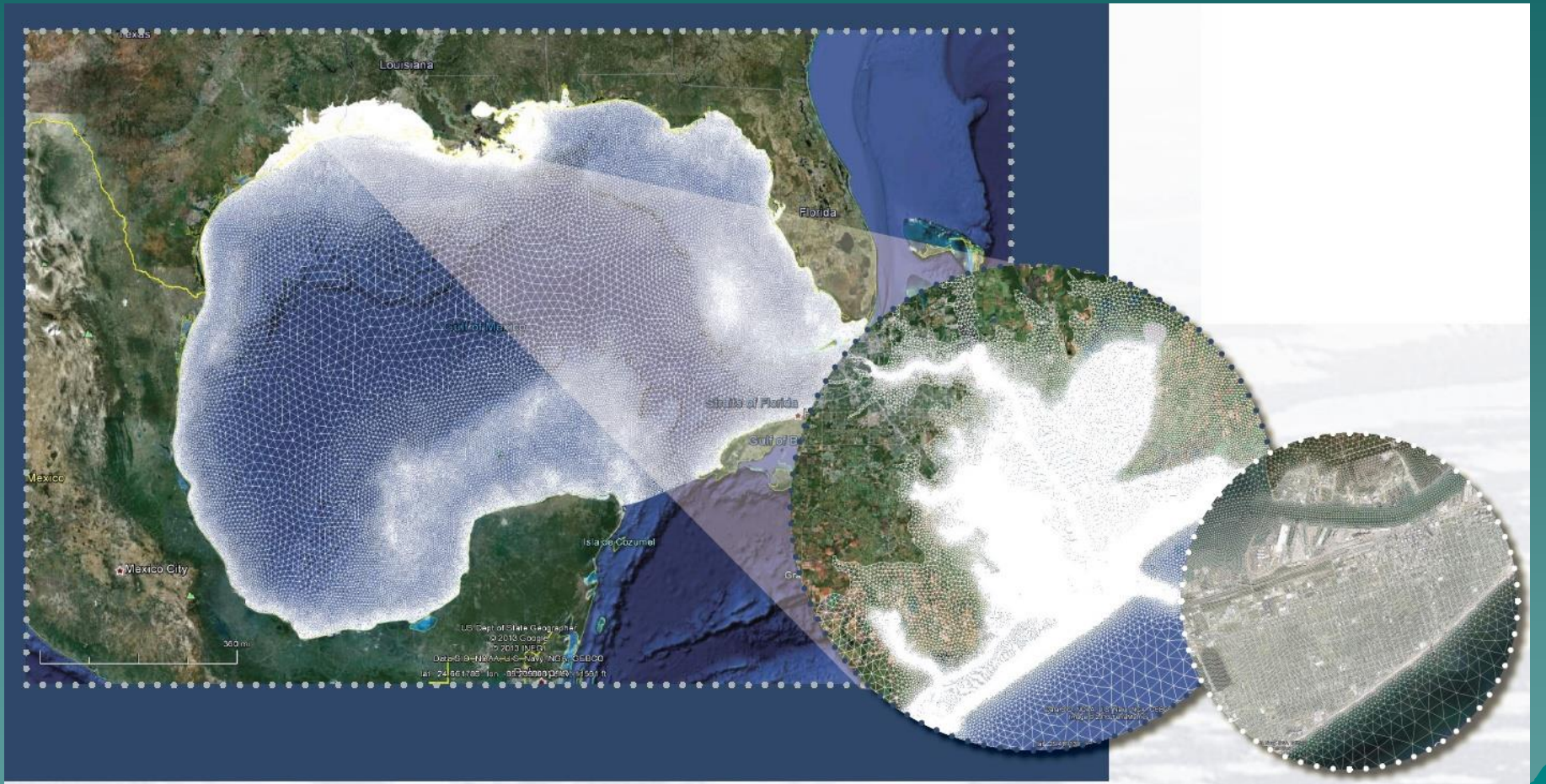
- Study Area



Data Source:
Roads: 1:5,000 Massachusetts Road Inventory Centerline File, January 2011; Rev# 1:5,000 Massachusetts Real Inventory Centerline File, January 2013; Transportation Access: Planning maintained files; Boundary signs: MassGIS 1:5,000 maintained files; Parks, streams and other environmental layers: MassGIS 1:5,000 maintained files.
Note:
This map was produced by the Office of Transportation Planning. The Federal Highway Administration provided funding for the production of this map through the State Planning and Research Program. The location of the boundaries and features shown on this map are approximate and are intended for planning purposes only. This map is not intended to be used for survey, engineering or legal purposes. For more information call (617) 972-2111.
File: MHS_Roads_StudyArea - Boston
Date: January 28, 2012



- ◆ **PHASE 1: Initial Determination of Geographical Scope**
- ◆ **PHASE 2: Detailed Surveys of Assets within the Project Area**
- ◆ **PHASE 3: Surveys of Critical Areas of Central Artery**
- ◆ **PHASE 4: Hydrodynamic Analysis (December. 2013)**



◆ PHASE 5: Vulnerability Assessment

- Exposure: what features, assets, properties will be impacted under each scenario.
- Sensitivity: how much effect will the impacts have on current and future operations.
- Adaptive capacity: how quickly can the system recover from impacts. Evaluate alternative routes, costs of restoring service, and other metrics.

Anticipated completion: Mar 31, 2014.

◆ PHASE 6: Adaptation Strategy

- Mix of local and regional actions – coordinated with other organizations.
- Here and now: Adaptation action implemented now as presently vulnerable or new infrastructure.
- Prepare and monitor: implemented when climate and /or socio-economic thresholds or trigger points reached.
- Periodic re-evaluation and progressive adaptation

Anticipated completion: Jun 30, 2014

◆ **PHASE 7: Present Results and Prepare Final Report to MassDOT Senior Management**

- Results will be available to other stakeholders (ie., BWSC, Massport, MBTA, Cambridge and others).

Anticipated completion: Oct 31, 2014.

Contacts



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