

**Boston University
Initiative on Cities + Pardee Center
Sea Level Rise and the Future of Coastal Cities**

**Cities
People
Vulnerabilities
Strategies**

**Jason Hellendrung
Sasaki Associates
jhellendrung@sasaki.com**



INDIANAPOLIS, INDIANA

CEDAR RAPIDS, IOWA





An exhibition curated by

Sasaki Associates

In partnership with the

Boston Architectural College

On view at District Hall

75 Northern Avenue

Boston, MA 02210

April 7–June 13 2014

SEA CHANGE BOSTON examines the city's vulnerabilities to sea level rise and demonstrates design strategies for resilience.

SEA CHANGE BOSTON

SEA CHANGE BOSTON

sea change noun (C, 1812)
(see + theyn)
a marked change; transformation

It is reported that the word *sea change* is first by Shakespeare and is used by Milton. The sea makes a transformation for us.

Sea Change: Boston examines the city's vulnerability to sea level rise and demonstrates design strategies for resilience.

Cooperating Institutions: Massachusetts Institute of Technology, Boston Architectural College, MIT City of Boston and The Boston Harbor Authority. The exhibition has received the approval for a design competition opportunity and will be designed by a team of local designers.



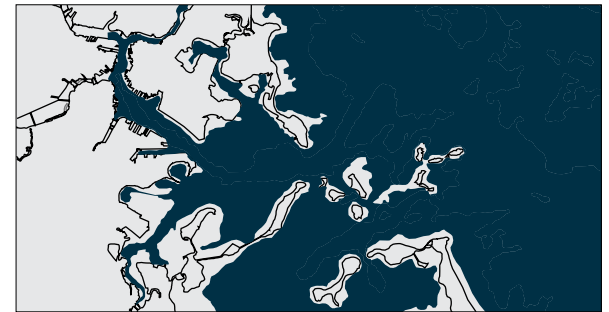
BOSTON HARBOR HAS EVOLVED SINCE THE ICE AGES



9,000 YEARS AGO



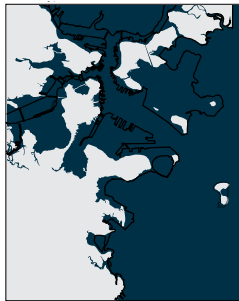
6,000 YEARS AGO



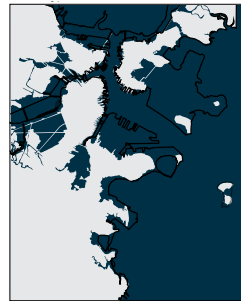
3,000 YEARS AGO



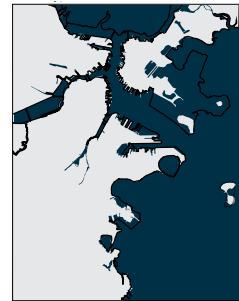
1630



1795



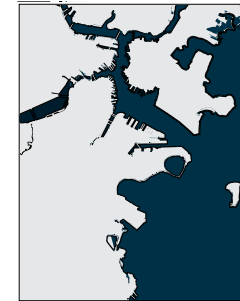
1852



1934



TODAY



2050: 2 FT OF
SEA LEVEL RISE

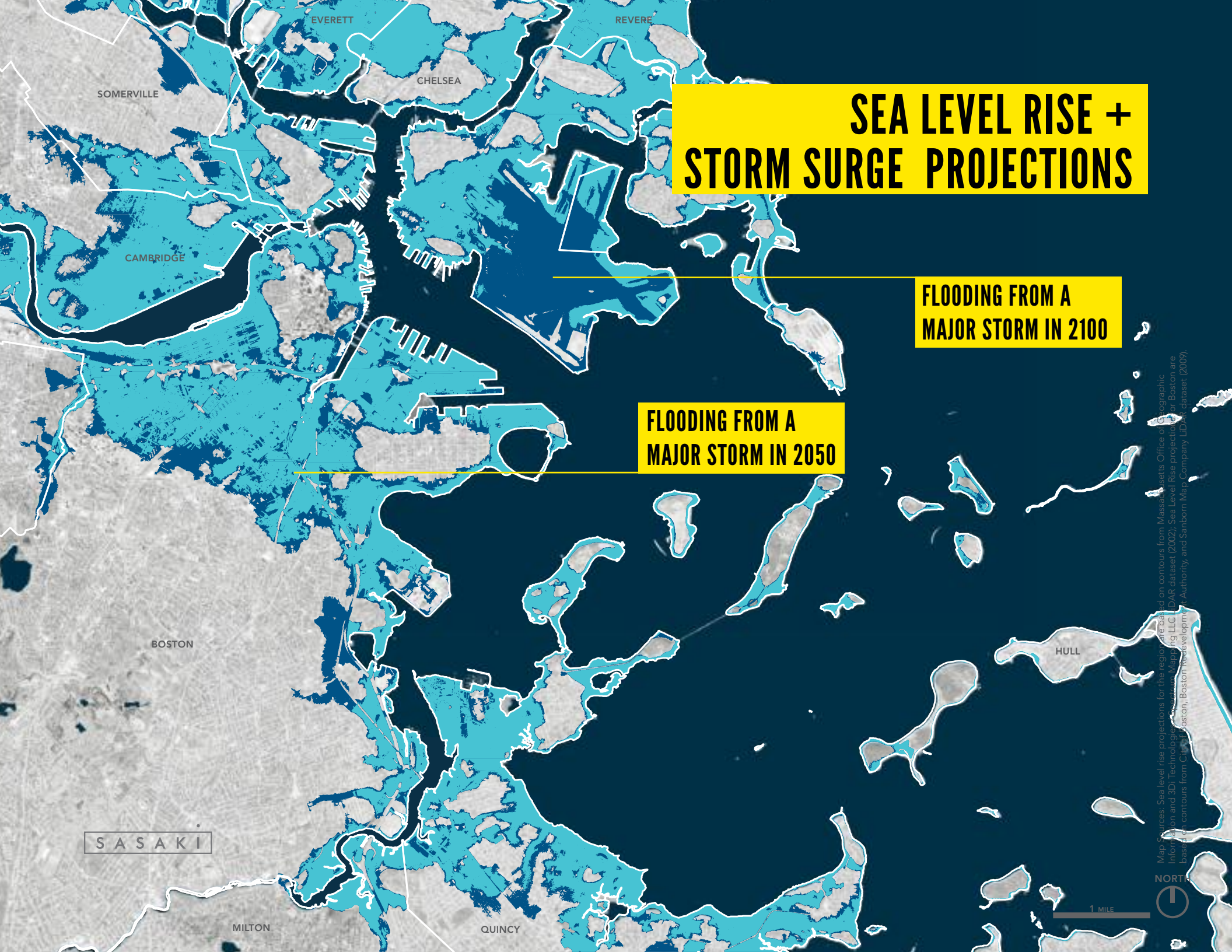


2100: 6 FT OF
SEA LEVEL RISE

SEA LEVEL RISE + STORM SURGE PROJECTIONS

FLOODING FROM A MAJOR STORM IN 2100

FLOODING FROM A MAJOR STORM IN 2050



Map sources: Sea level rise projections for the region are based on contours from Massachusetts Office of Geographic Information and 3D Technology Solutions Mapping LLC (DAR dataset (2022)); Sea Level Rise projections for Boston are based on contours from City of Boston, Boston Redevelopment Authority, and Sanborn Map Company (DAR dataset (2009)).

S A S A K I



1 MILE

SEA LEVEL RISE + STORM SURGE PROJECTIONS



THIS IS WHERE HIGH TIDE COULD BE DURING A STORM IN 2050

Map Sources: Sea level rise projections for the region are based on contours from Massachusetts Office of Geographic Information (mass.gov/technology/infrastructure/sea-level-rise) and NOAA (www.noaa.gov/sea-level-rise). Land use data is based on the Massachusetts Department of Transportation's Boston to development Authority and Sanborn Fire Company's LIDAR dataset (2013). Base map is from Google Earth Pro 2015.



- Flooding during a major storm in 2050
- Residential parcels at risk

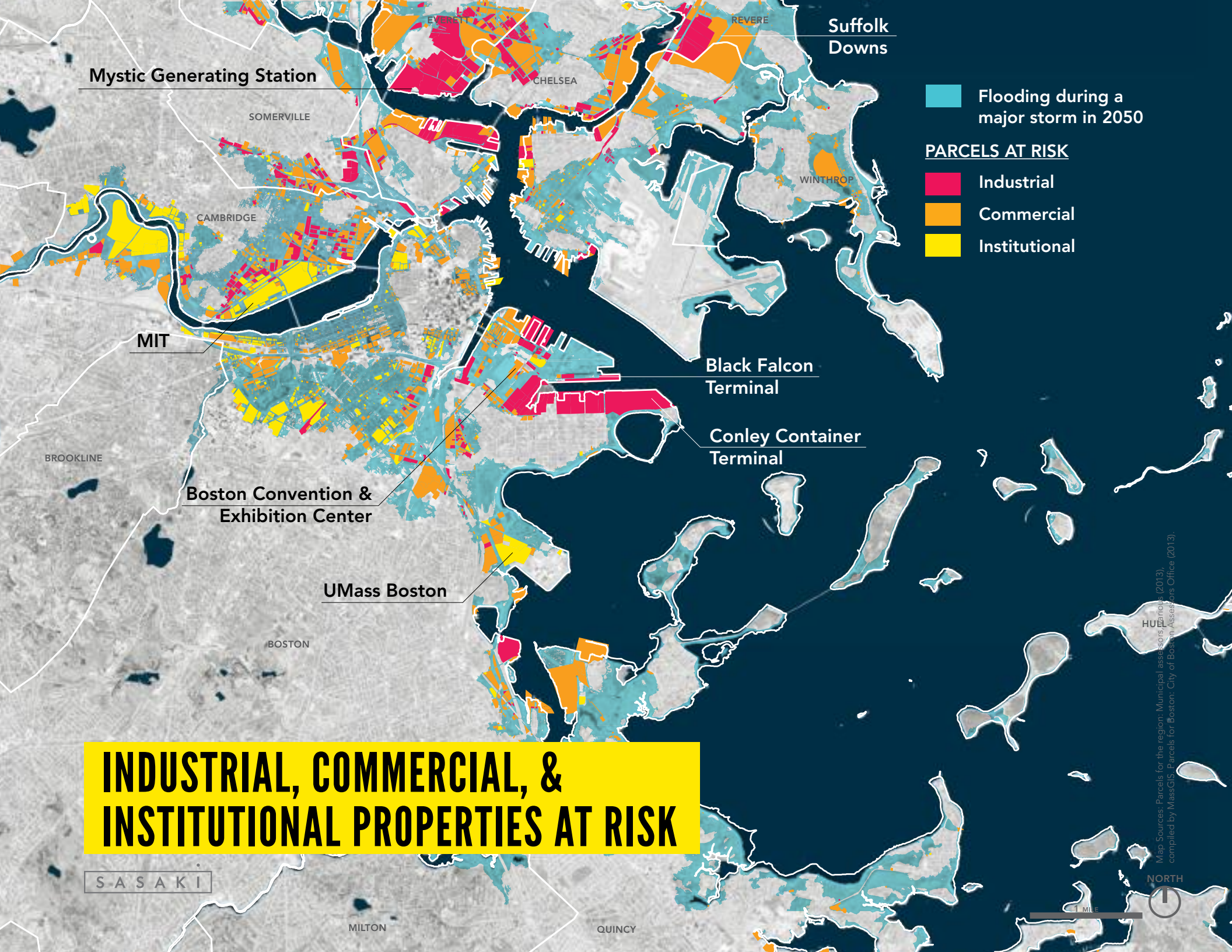
RESIDENTIAL POPULATIONS AT RISK

Map Sources: Parcels for the region: Municipal assessors' records (2013), compiled by MassGIS; Parcels for Boston: City of Boston Assessors Office (2013).

S A S A K I

NORTH

1 MILE



Suffolk
Downs

Mystic Generating Station

Flooding during a major storm in 2050

PARCELS AT RISK

- Industrial
- Commercial
- Institutional

MIT

Black Falcon Terminal

Conley Container Terminal

Boston Convention & Exhibition Center

UMass Boston

INDUSTRIAL, COMMERCIAL, & INSTITUTIONAL PROPERTIES AT RISK

S A S A K I

Map Sources: Parcels for the region: Municipal assessors (2013), compiled by MassGIS; Parcels for Boston: City of Boston Assessors Office (2013).

NORTH

1 MILE



MILTON

QUINCY

SOMERVILLE

CAMBRIDGE

BROOKLINE

BOSTON

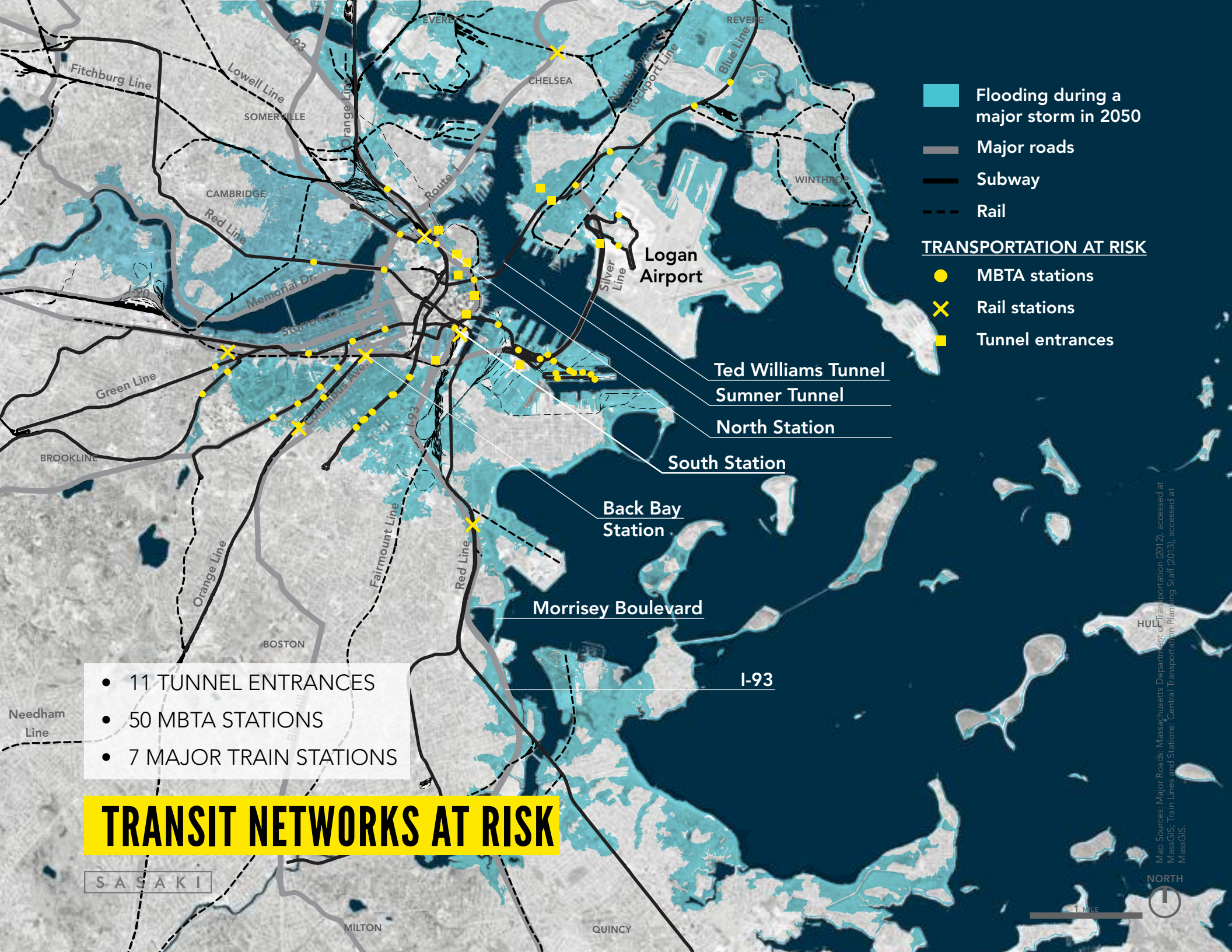
EVERETT

CHELSEA

REVERE

WINTHROP

HULL



- Flooding during a major storm in 2050
- Major roads
- Subway
- Rail

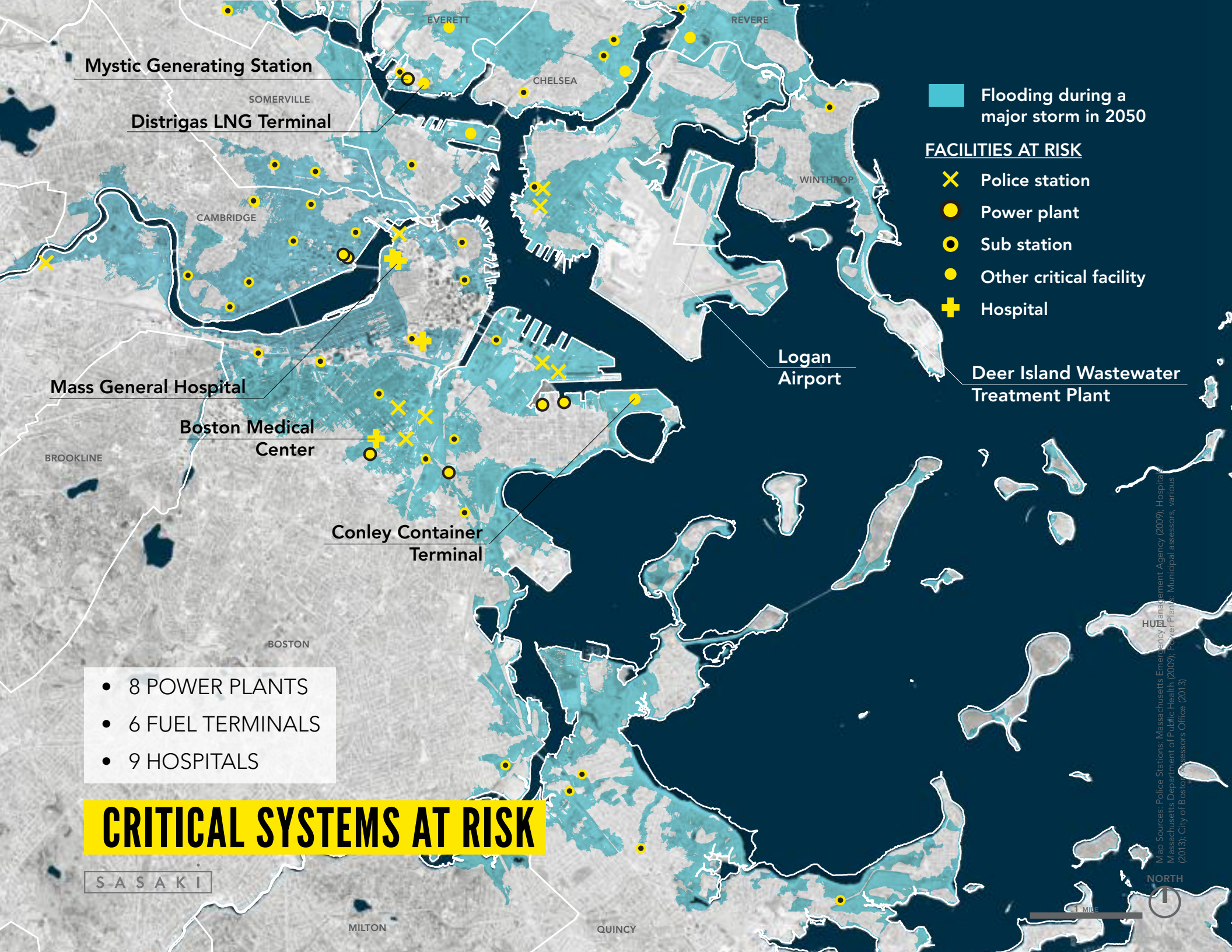
TRANSPORTATION AT RISK

- MBTA stations
- Rail stations
- Tunnel entrances

- 11 TUNNEL ENTRANCES
- 50 MBTA STATIONS
- 7 MAJOR TRAIN STATIONS

TRANSIT NETWORKS AT RISK

Map Sources: Major Roads: Massachusetts Department of Transportation (2012), accessed at MassGIS; Train Lines and Stations: Central Transportation Planning Staff (2013), accessed at MassGIS.



Flooding during a major storm in 2050

FACILITIES AT RISK

- ✕ Police station
- Power plant
- ⦿ Sub station
- Other critical facility
- + Hospital

Mystic Generating Station

Distrigas LNG Terminal

Logan Airport

Deer Island Wastewater Treatment Plant

Mass General Hospital

Boston Medical Center

Conley Container Terminal

- 8 POWER PLANTS
- 6 FUEL TERMINALS
- 9 HOSPITALS

CRITICAL SYSTEMS AT RISK

S A S A K I

Map Sources: Police Stations: Massachusetts Emergency Management Agency (2009); Hospital: Massachusetts Department of Public Health (2009); Power Plants: Municipal assessors, various (2013); City of Boston assessors Office (2013)

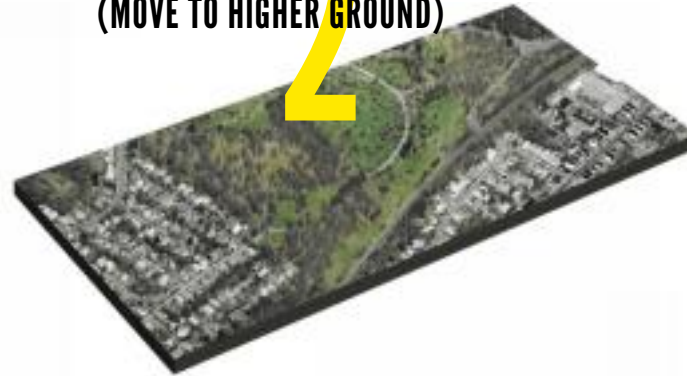


WHAT ARE THE OPTIONS?

1 FORTIFY
(KEEP WATER OUT)



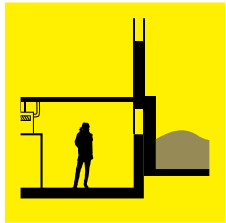
2 RETREAT
(MOVE TO HIGHER GROUND)



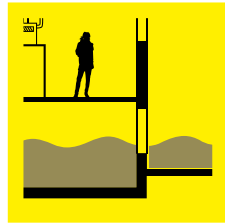
3 ADAPT
(LIVE WITH WATER)



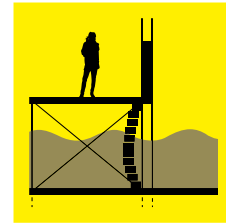
CATALOG OF DESIGN STRATEGIES



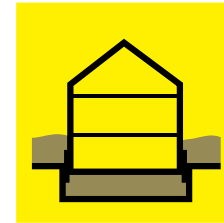
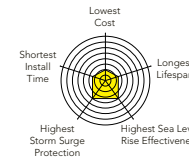
Dry Flood-Proofing



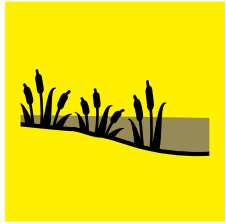
Wet Flood-Proofing



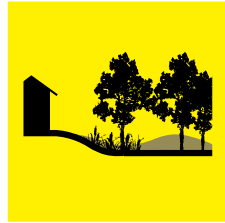
Elevated Building



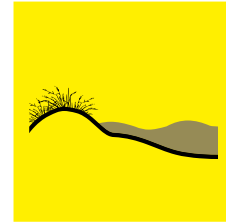
Floating Building



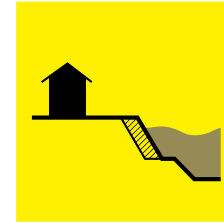
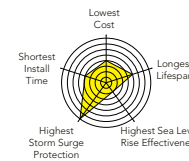
Living Shoreline



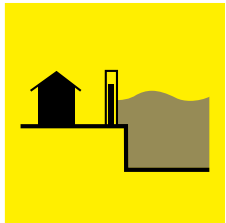
Floodable Park



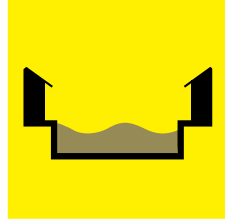
Dune Restoration



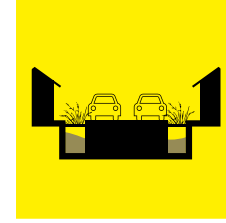
Revetment



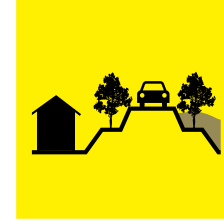
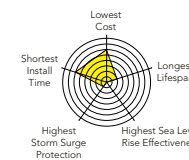
Temporary Floodwall



Canal Street



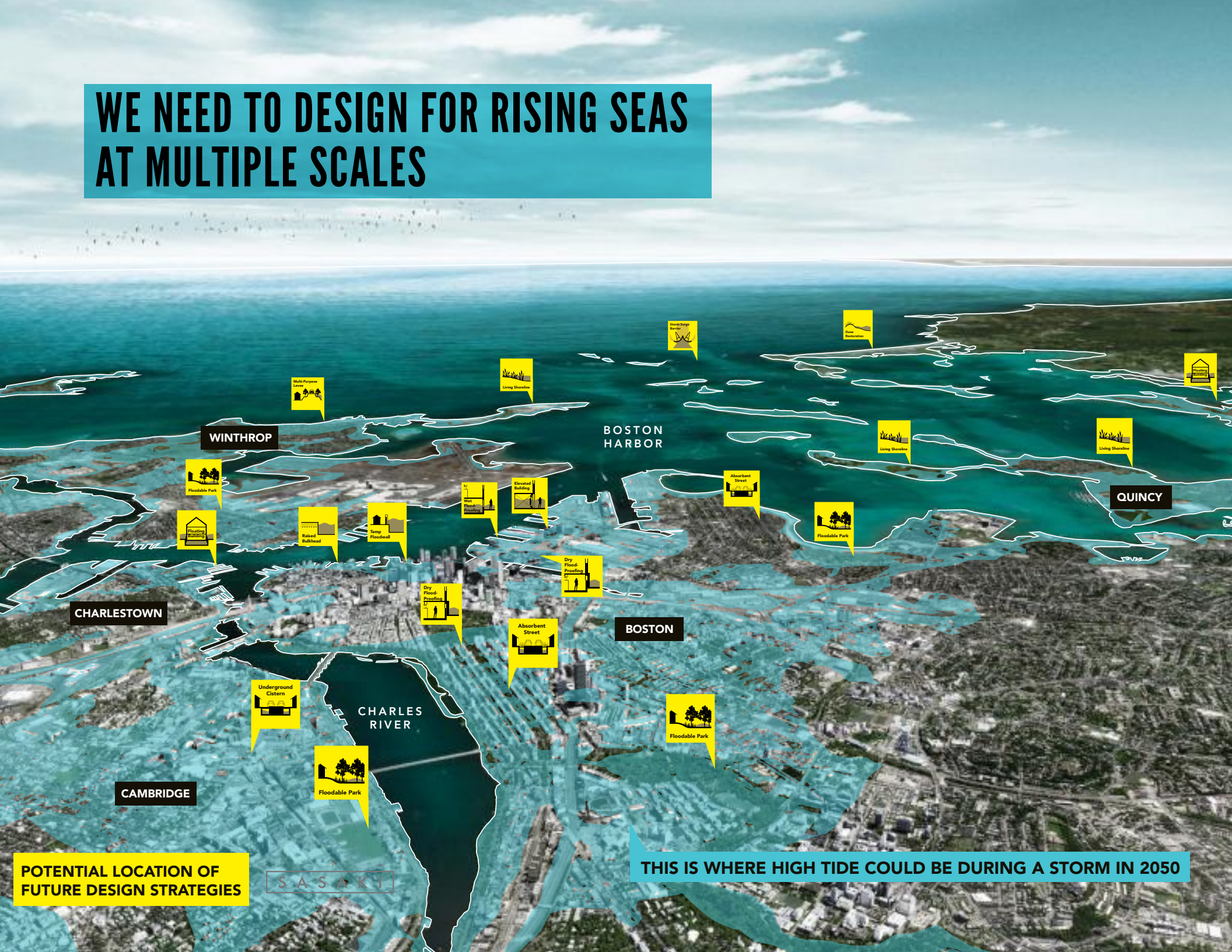
Absorbent Street



Multi-Purpose Levee

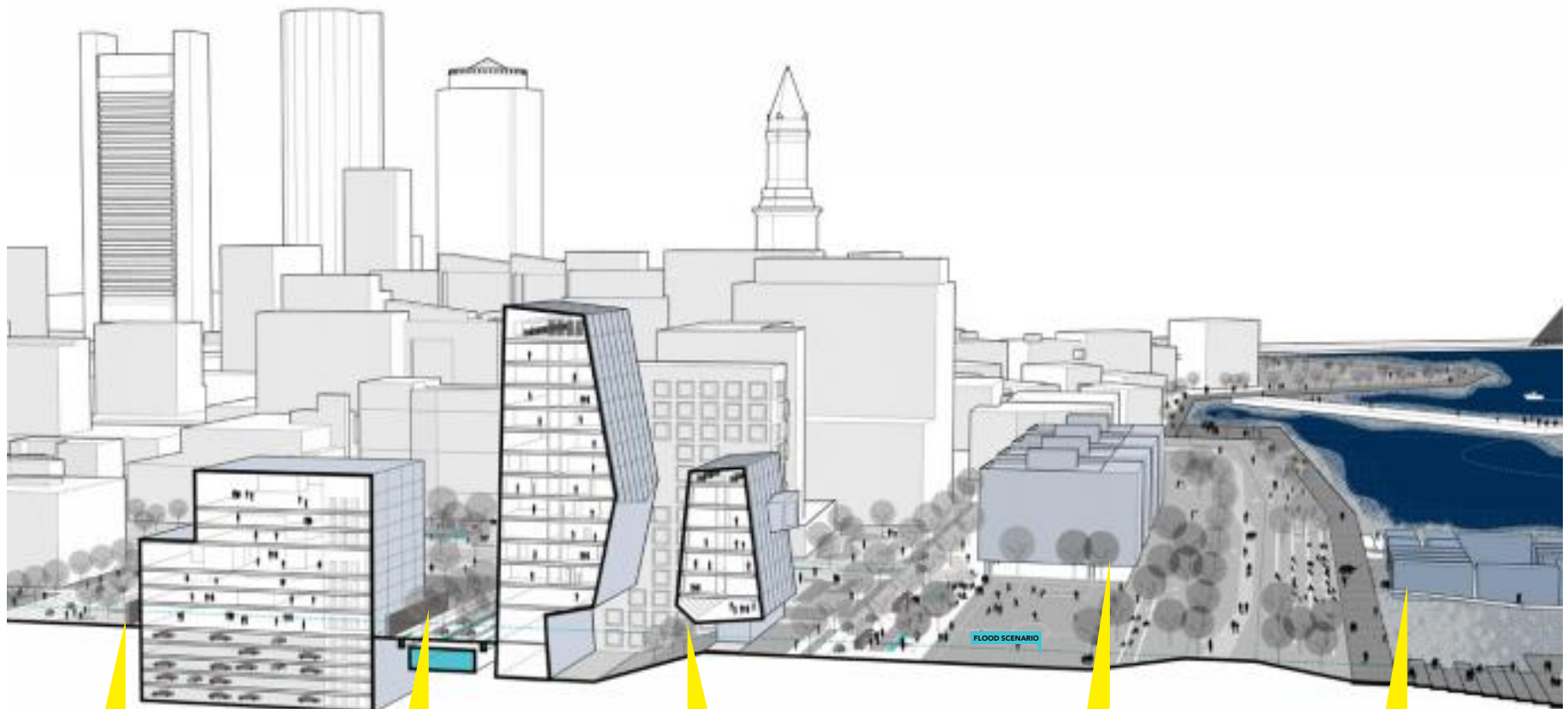


WE NEED TO DESIGN FOR RISING SEAS AT MULTIPLE SCALES



BUILDING A NEW STANDARD IN BOSTON

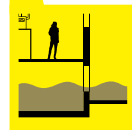
BUILDINGS



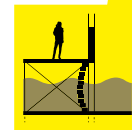
Dry Flood-Proofing



Temporary Floodwall



Wet Flood-Proofing



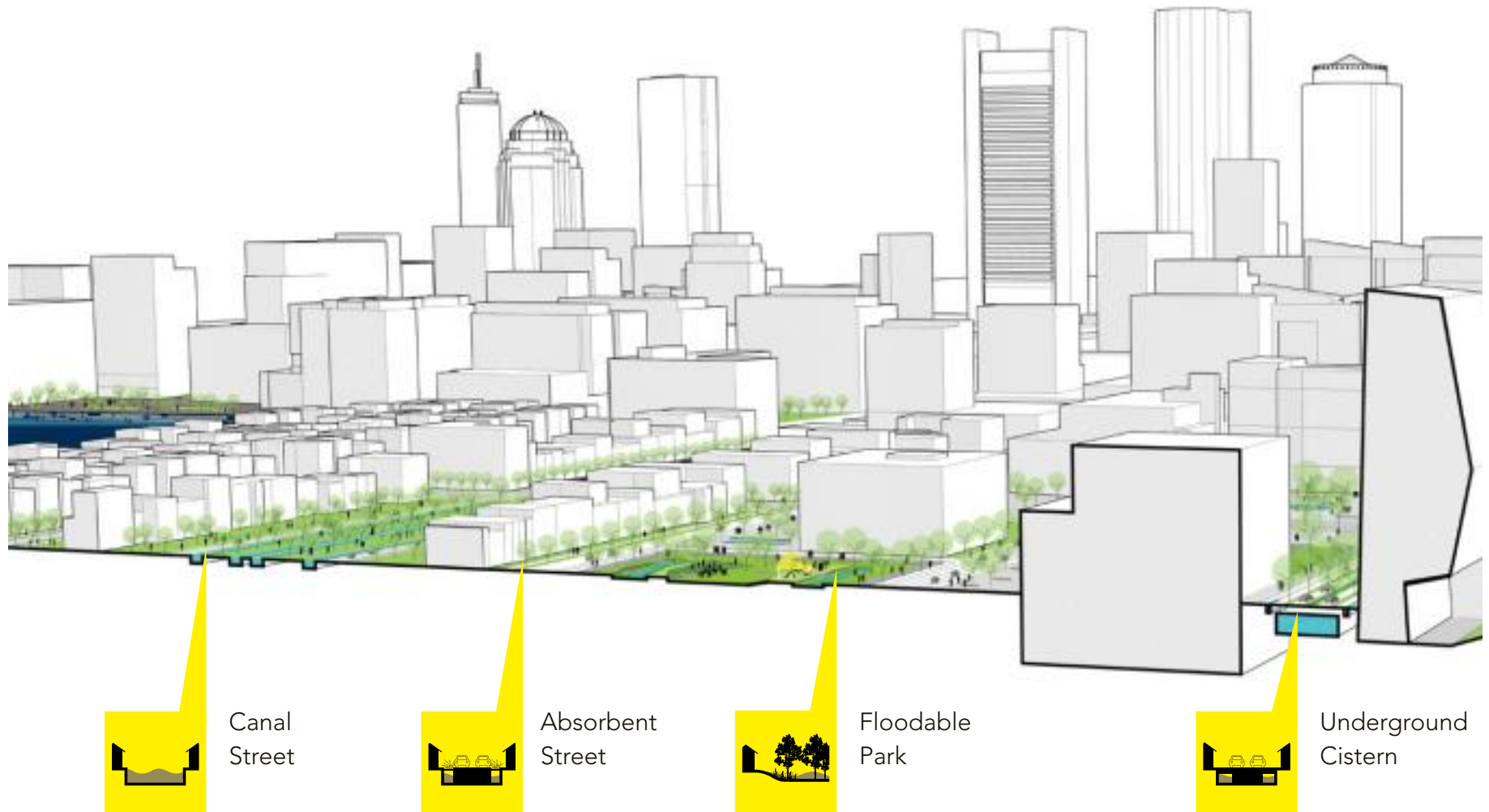
Elevated Building



Floating Building

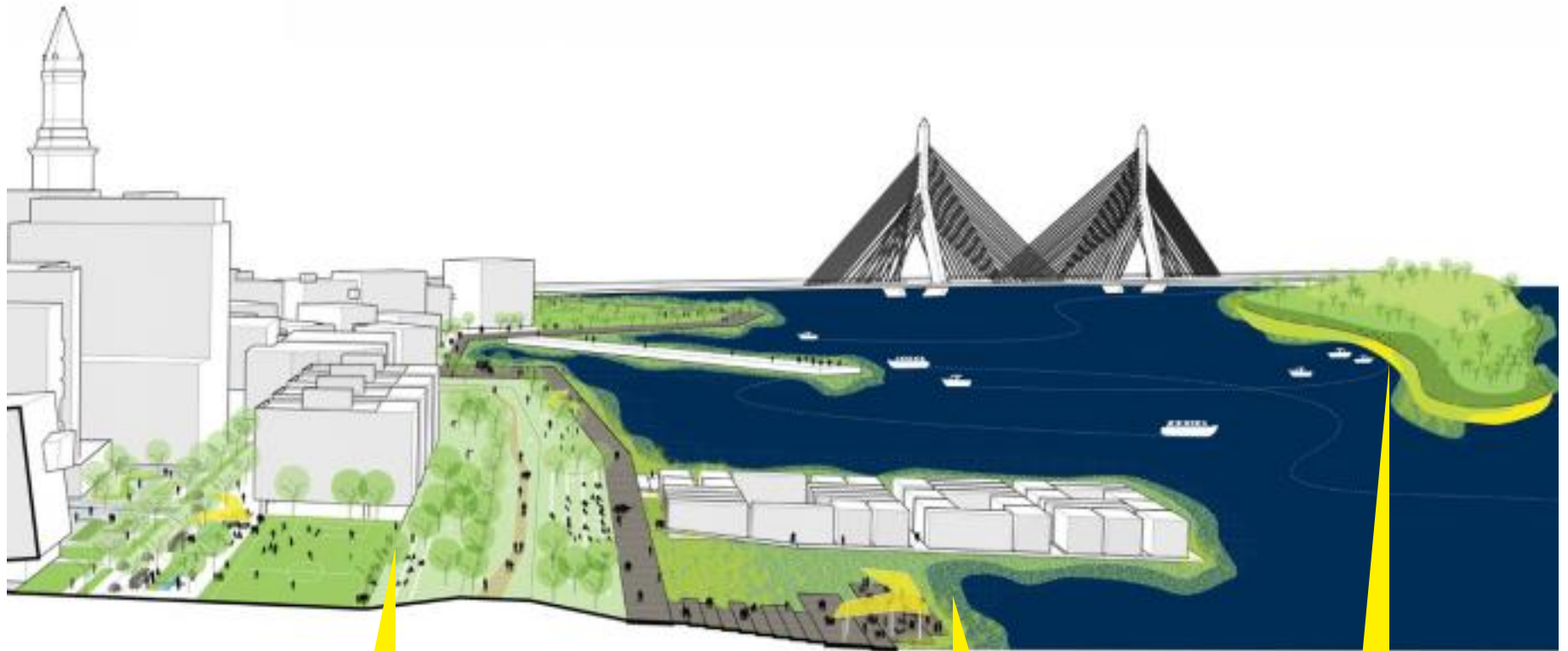
MAKING ROOM FOR WATER IN THE CITY

PUBLIC SPACE



RETHINKING THE BOSTON HARBOR EDGE

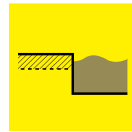
COAST



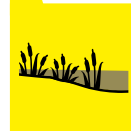
Storm
Surge
Barrier



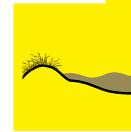
Multi-
Purpose
Levee



Raised
Bulkhead



Living
Shoreline



Dune
Restoration

SEA LEVEL RISE CROSSES POLITICAL BOUNDARIES, SO SHOULD OUR PLAN



DESIGNING WITH WATER
CREATIVE SOLUTIONS FROM
AROUND THE GLOBE



S A S A K I

PREPARING FOR THE RISING TIDE SERIES
VOLUME 2 | AUGUST 2014



JERSEY SHORE
Deeper Than The Beach

**SASAKI
RUTGERS
ARUP**



ECOLOGY

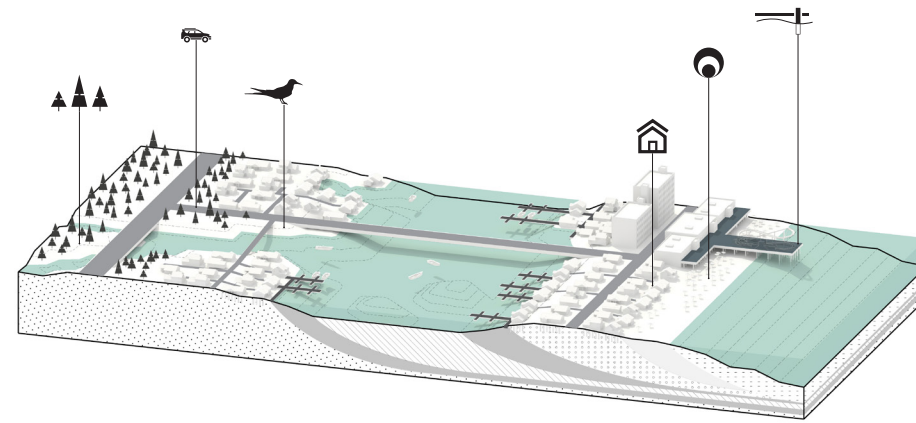
ECONOMY

CULTURE



THREE COASTAL TYPOLOGIES

BARRIER ISLAND



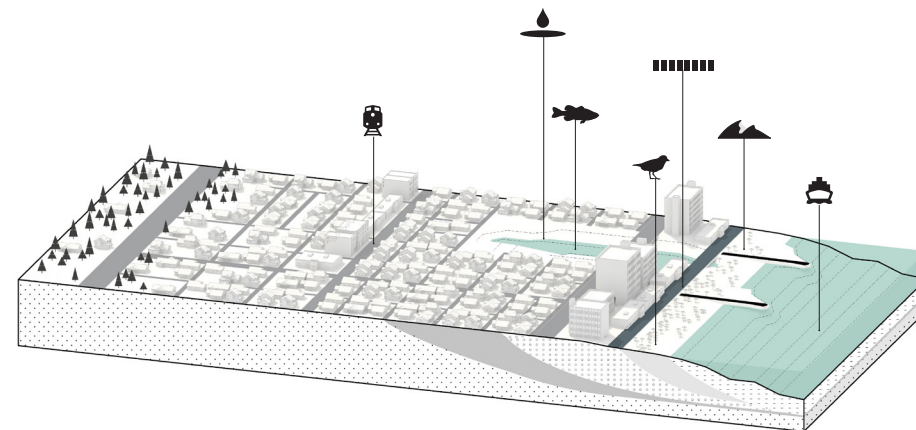
PIER



PINE BARRENS



HEADLANDS



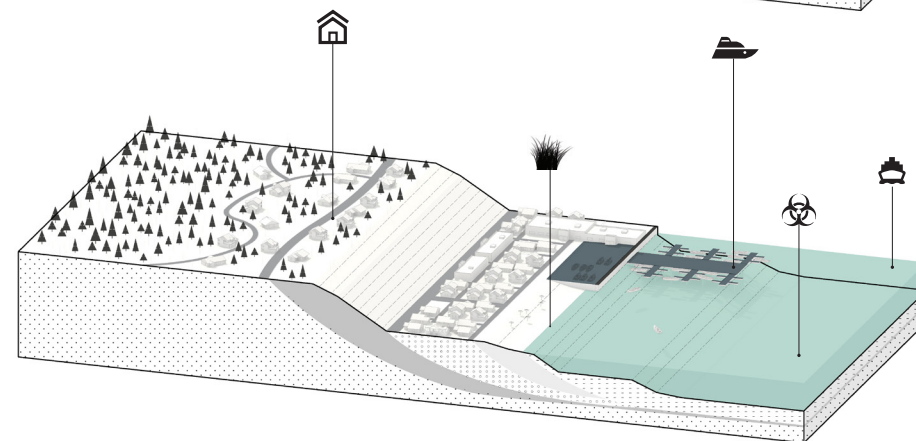
BOARDWALK



SAND DUNE



INLAND BAY



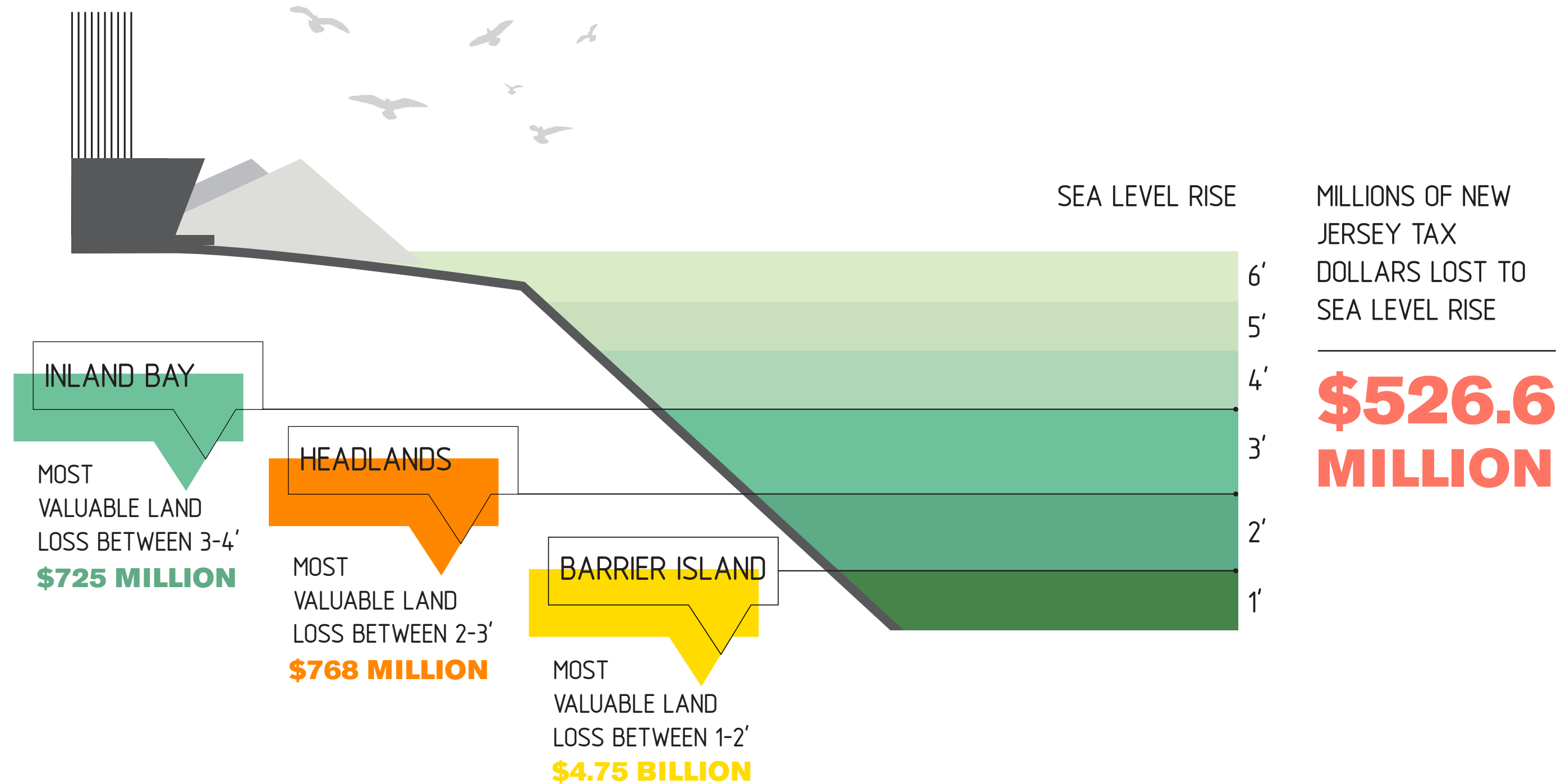
MARINA



MARSH

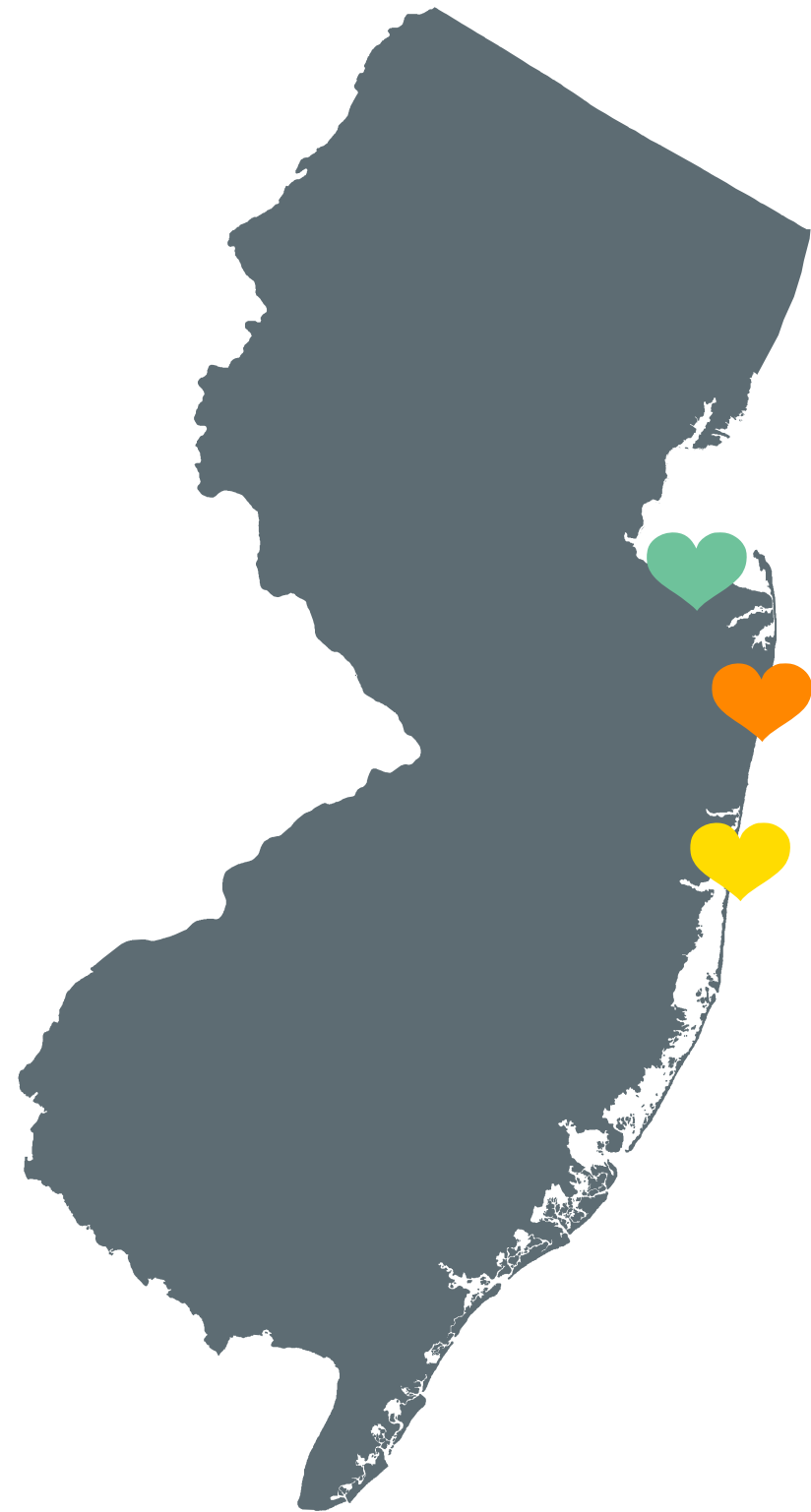
SHORE IS AT RISK

VARIED DYNAMICS OF SEA LEVEL RISE AND LAND VALUE



A RESILIENT JERSEY SHORE

THREE CATALYSTS TO DRIVE INNOVATION IN RESILIENCY



INLAND BAY



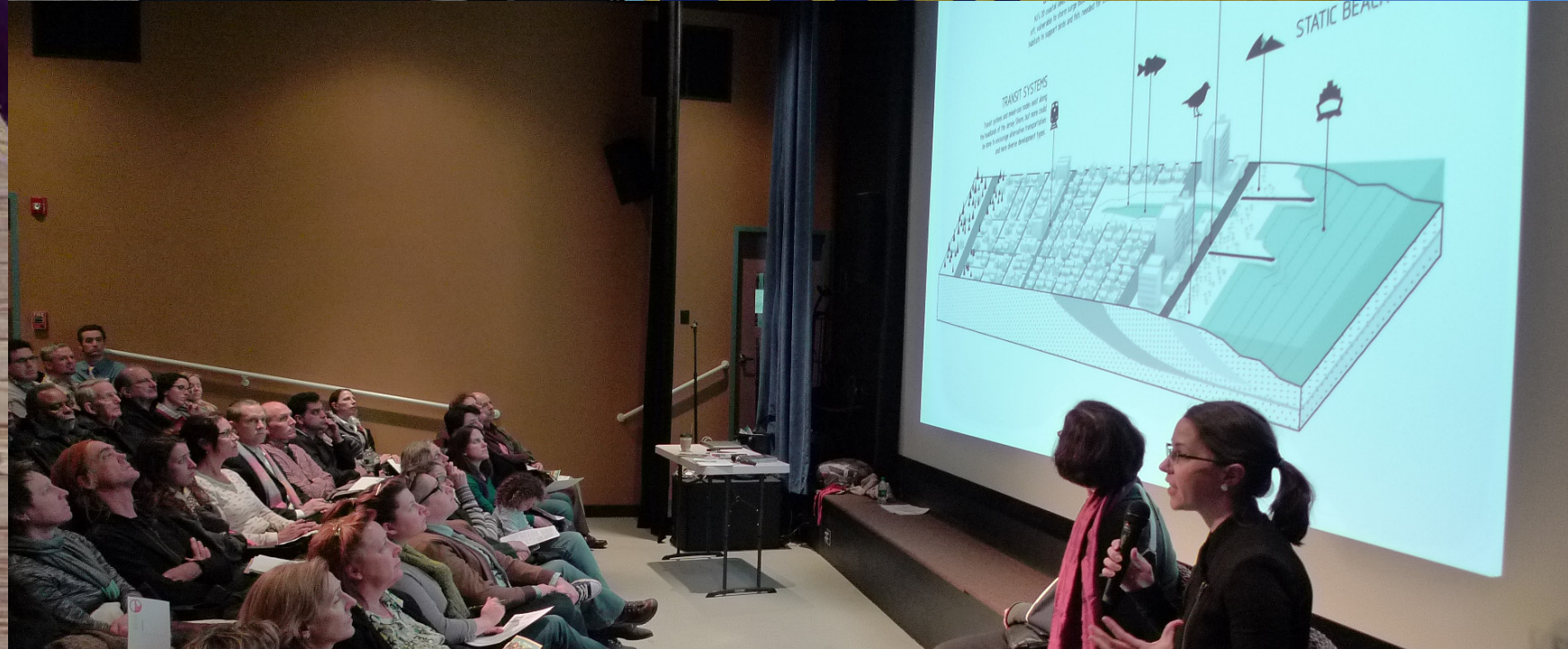
HEADLANDS



BARRIER ISLAND



ASBURY PARK



THANK YOU!

Jason Hellendrung

Sasaki Associates

jhellendrung@sasaki.com

[@jhellendrung](#)

[@SasakiDesign](#)

<http://www.tbha.org/designing-water-report>

Sasaki.com/seachange