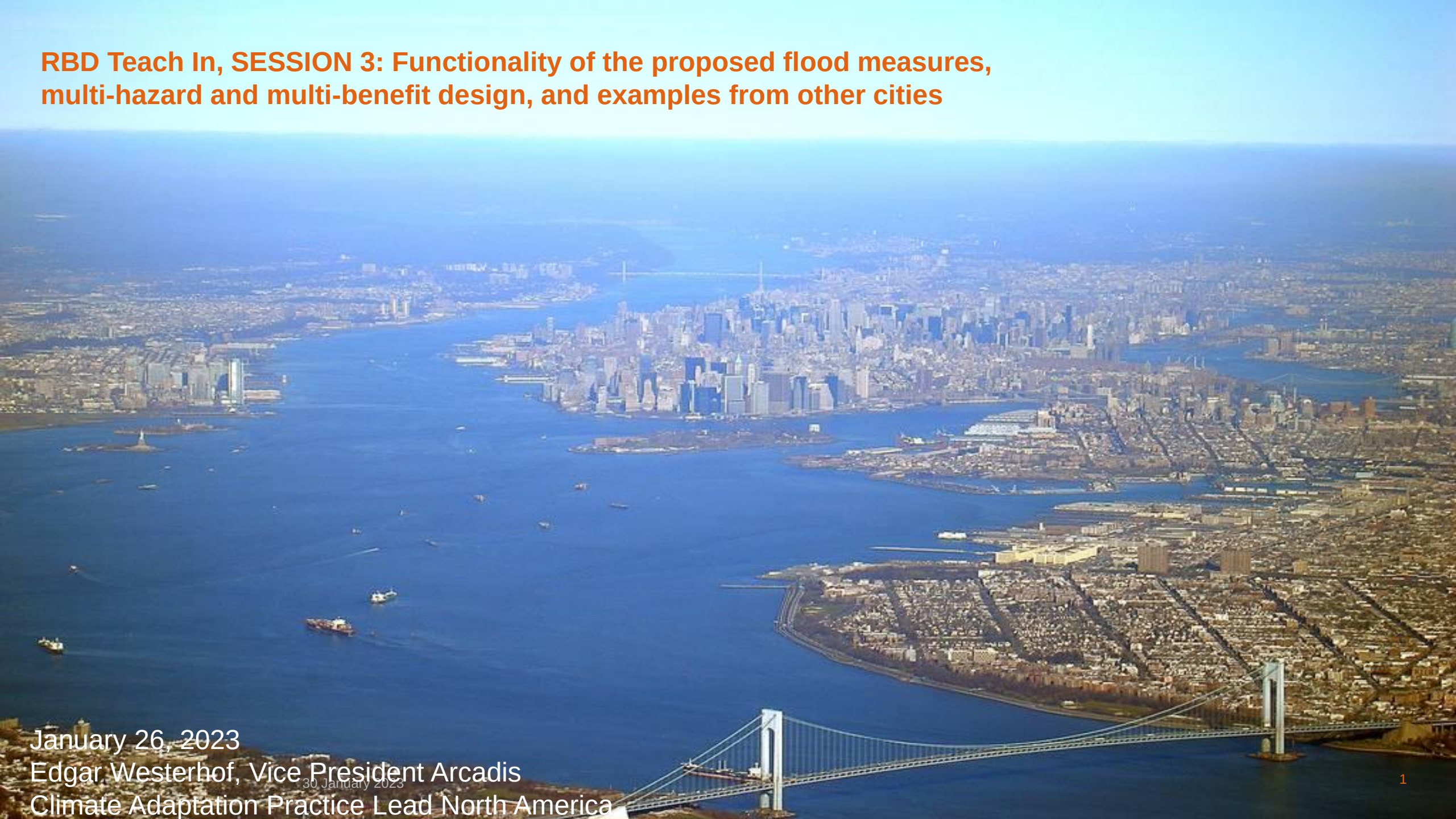
RBD Teach In, SESSION 3: Functionality of the proposed flood measures, multi-hazard and multi-benefit design, and examples from other cities



January 26, 2023

Edgar Westerhof, Vice President Arcadis
Climate Adaptation Practice Lead North America

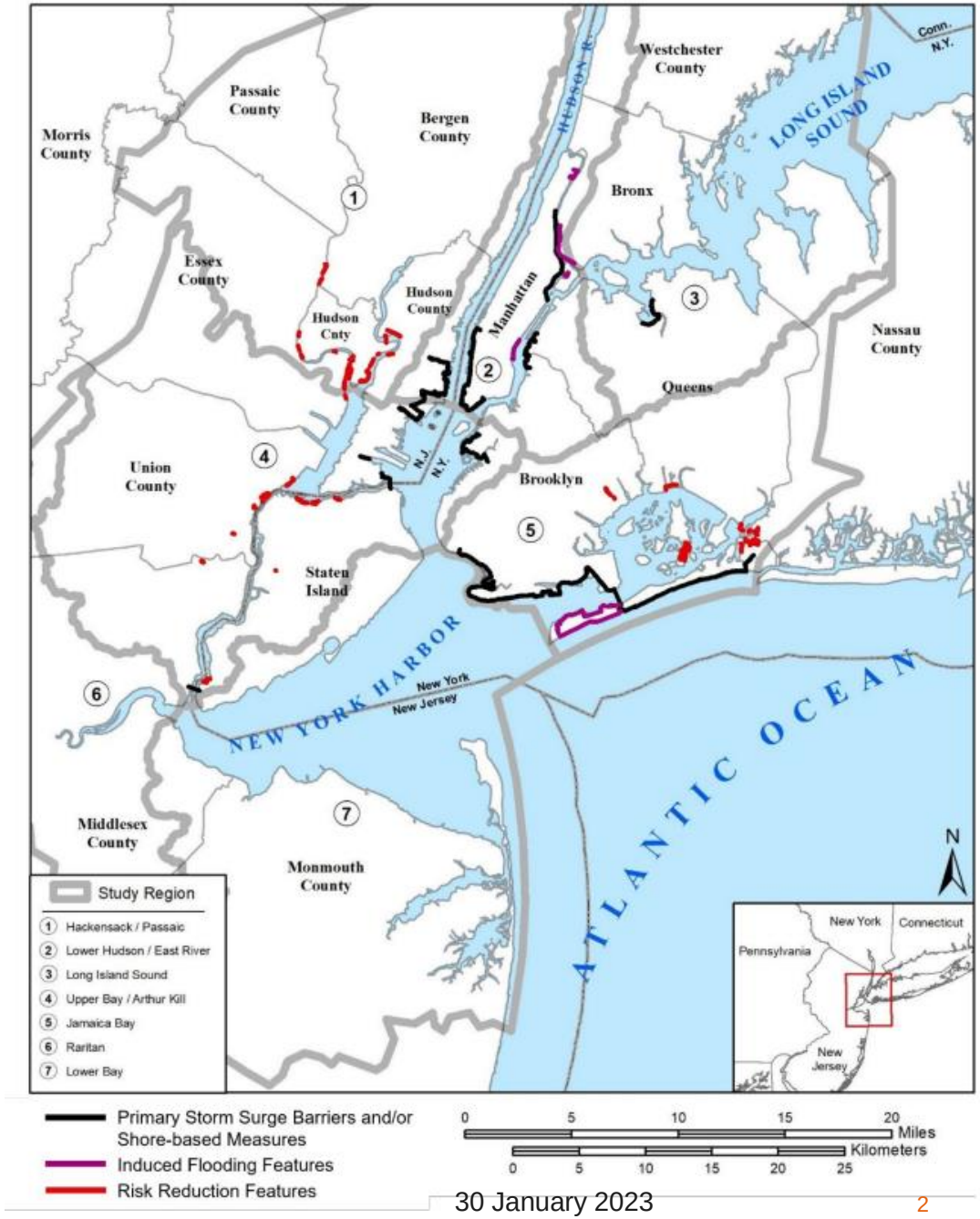
Agenda

1) General HATS Observations

2) New York Cities Climate Resilience Preparedness, near term risk and longer term planning

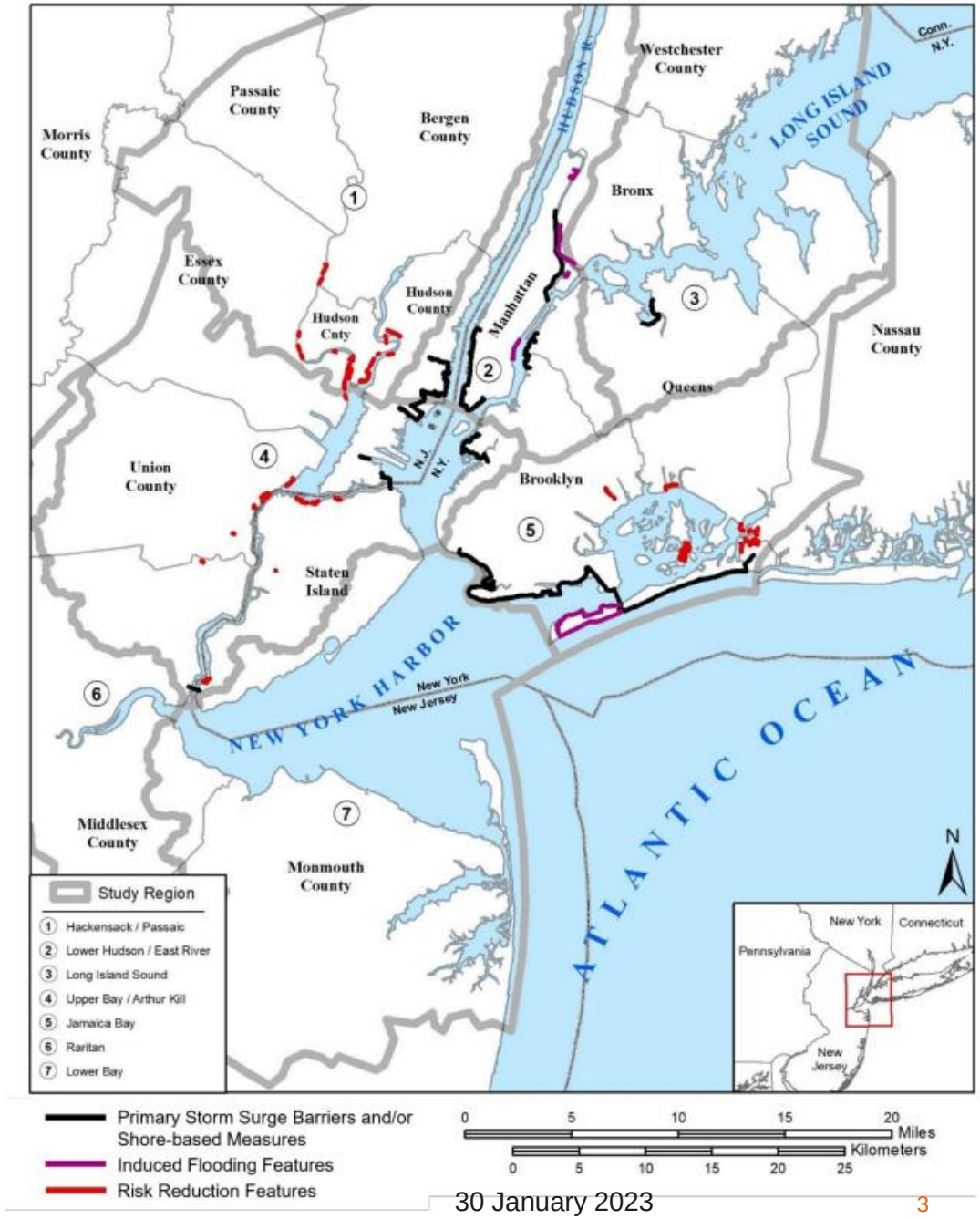
3) Dutch Water Management 101, systems interplay between engineered structural and natural solutions

4) Q&A

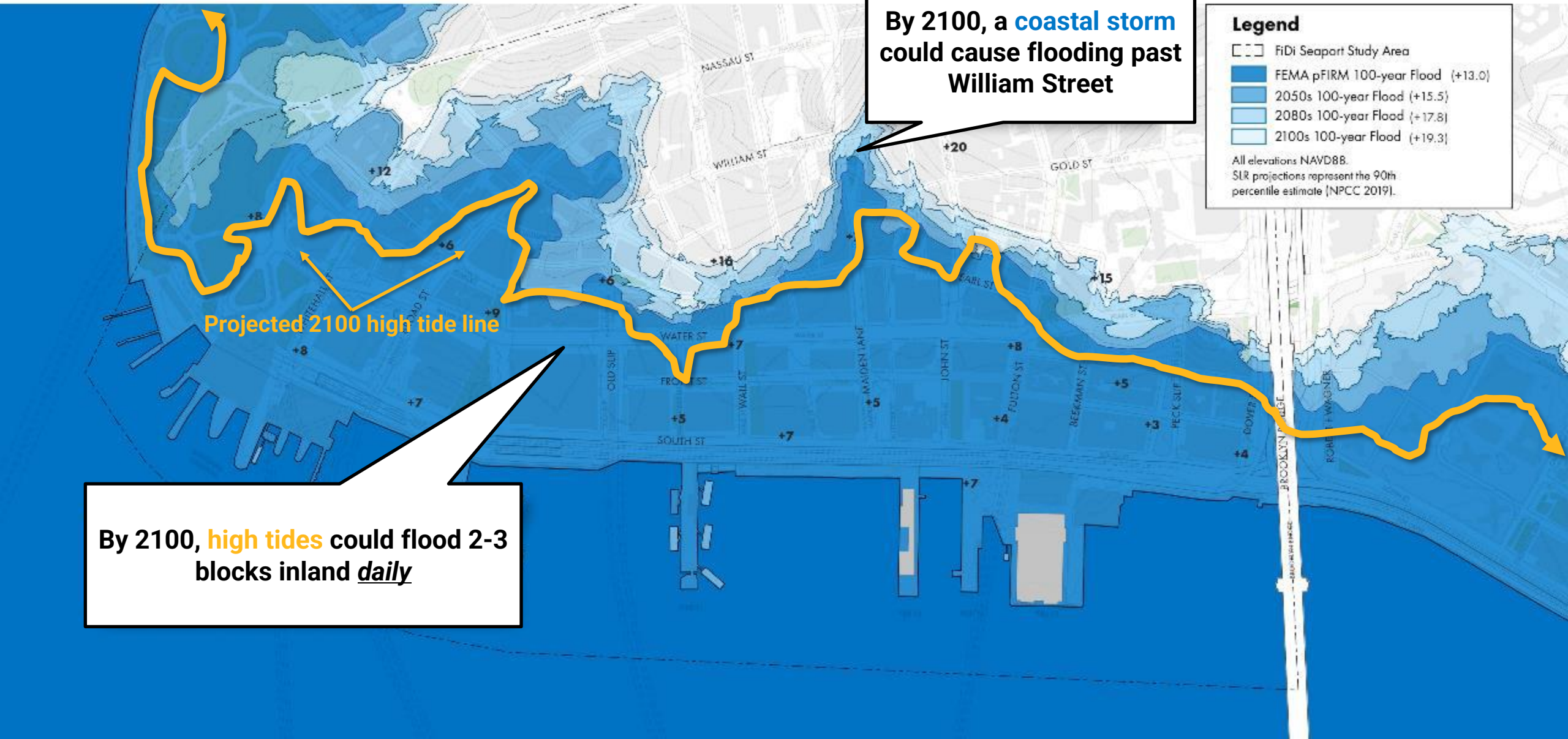


General HATS Observations

- Plan components show high level of integration with existing / planned strategies, a systems approach that gives the study regional potential.
- Coastal protection through shore based and off shore barrier solutions aiming to protect long waterfront stretches of exposed communities.
- The evaluation of applying storm surge barriers has matured.
- The work does not stop if 3B were to be implemented, what plan components from other strategies may apply over time?
- Drainage outfall and backflow issues, causing severe high tide inundation of low lying communities?
- What is the plan for waterfront communities who currently don't and may not get have a plan, what would the process of retreat look like?

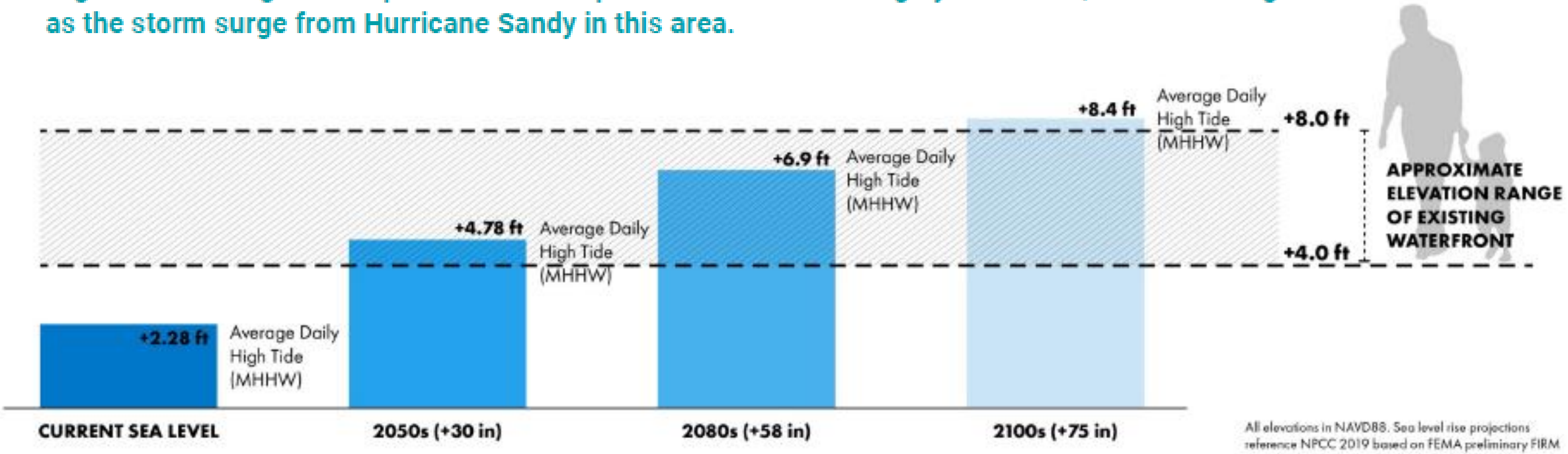


Two types of climate risks - daily tidal flooding and coastal storms, Financial District, Manhattan.



Sea Level Rise & High Tide

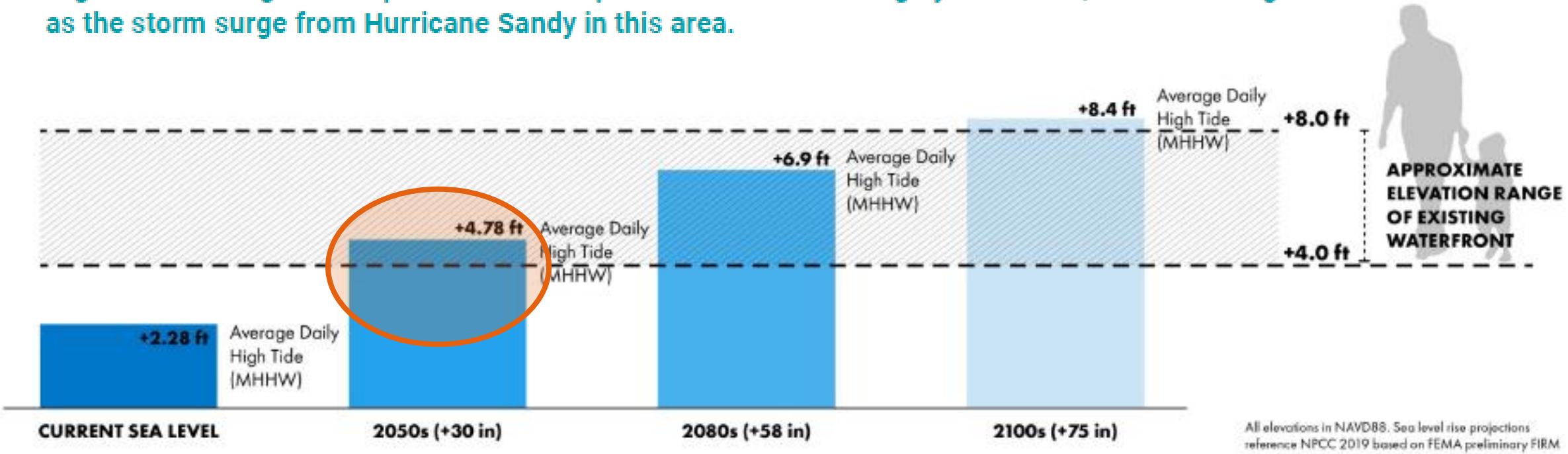
High tide flooding is anticipated to cause up to four feet of flooding by the 2100s, the same height as the storm surge from Hurricane Sandy in this area.



All elevations in NAVD88. Sea level rise projections reference NPCC 2019 based on FEMA preliminary FIRM data. MHHW is based off of the 2001 NOAA National Tidal Datum Epoch (NTDE). Additional modeling / wave studies to be completed later in Phase II.

Sea Level Rise & High Tide

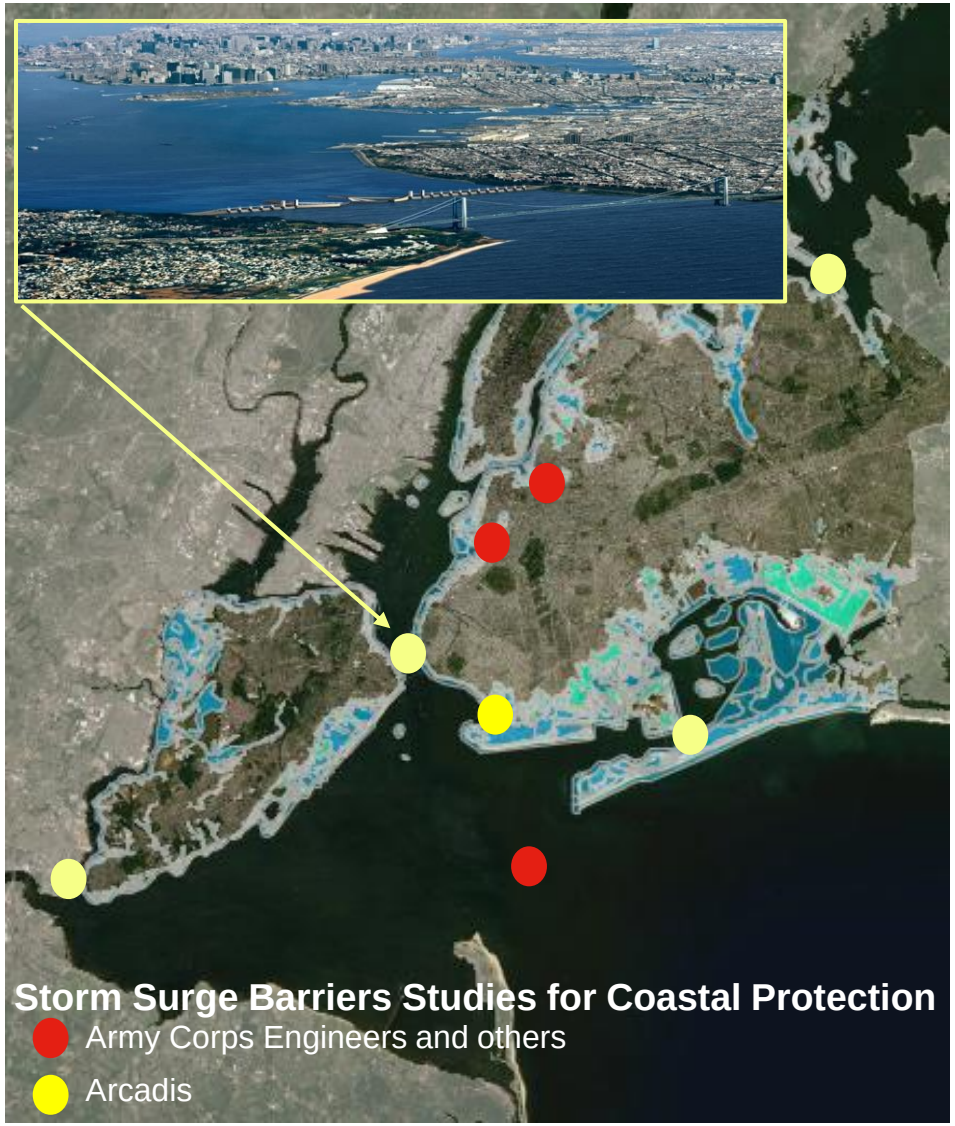
High tide flooding is anticipated to cause up to four feet of flooding by the 2100s, the same height as the storm surge from Hurricane Sandy in this area.



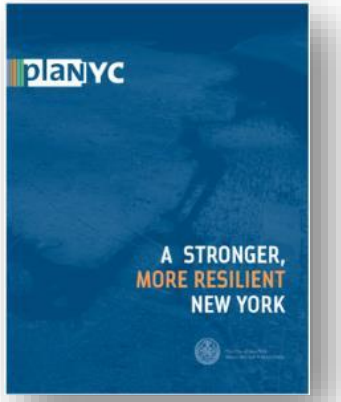
All elevations in NAVD88. Sea level rise projections reference NPCC 2019 based on FEMA preliminary FIRM data. MHHW is based off of the 2001 NOAA National Tidal Datum Epoch (NTDE). Additional modeling / wave studies to be completed later in Phase II.

Rockaways
Bronx
Coney Island
Newton Creek
Jamaica Bay etc.

Regional Protection – Storm Surge Barriers versus Community and Nature Based Strategies



Special Initiative Rebuild & Resilience



ARCADIS Design & Consultancy for natural and built assets

Coney Island Creek

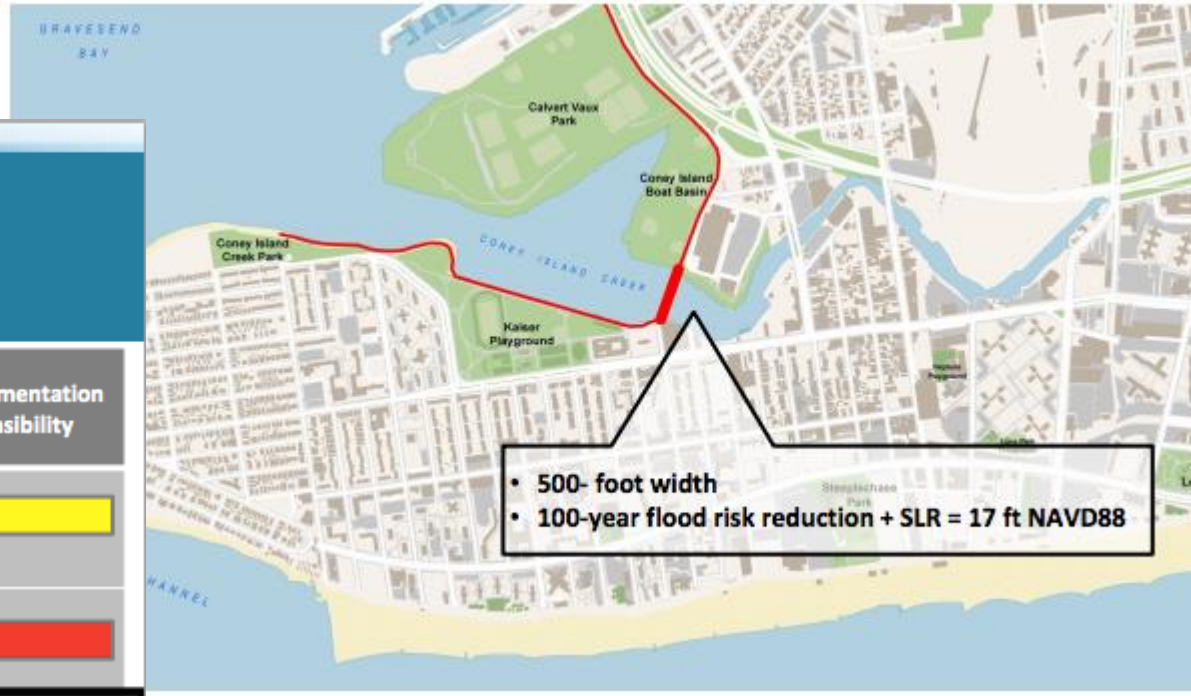
Barrier and Wetland Feasibility Study

Flood Protection Strategies Comparison

Strategy	Flood Risk Reduction	Ecological Impact	Drainage	Recreation & Connectivity	Economic Opportunities	Implementation Feasibility
West Barrier						
West Barrage + Wetlands						
East Barrier						
East Barrage + Wetlands						
Perimeter Protection						
All Wetlands						

Providing Integrated Solutions for a Resilient Coney Island Creek

22



Coney Island Creek - Report

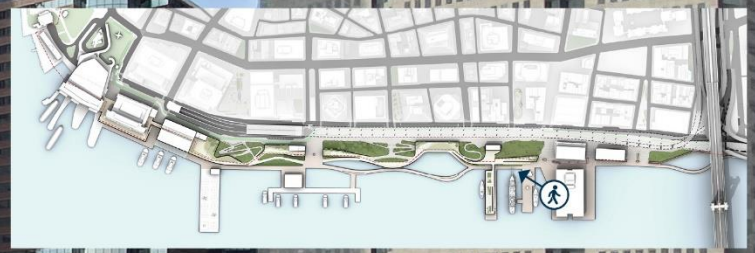
South Street Seaport, Existing Conditions

Image Credit: FiDi Project Team
Rijkswaterstaat

South Street Seaport, Proposed New Waterfront

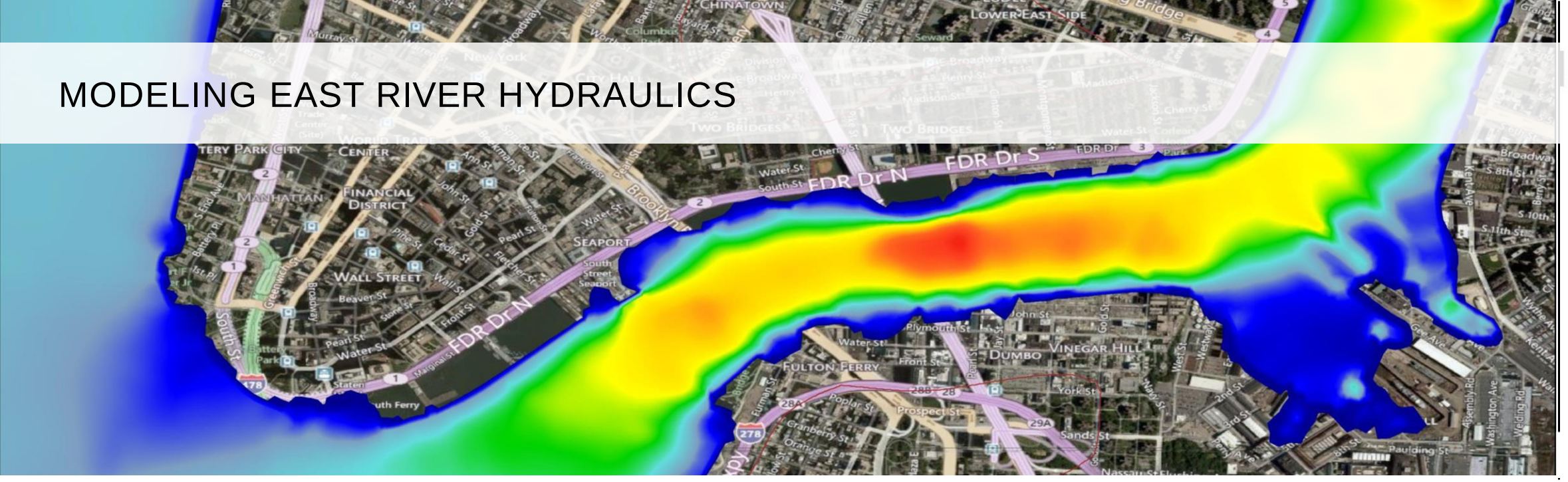
Image Credit: FiDi Project Team
Rijkswaterstaat

South Street Seaport,
Proposed New Waterfront

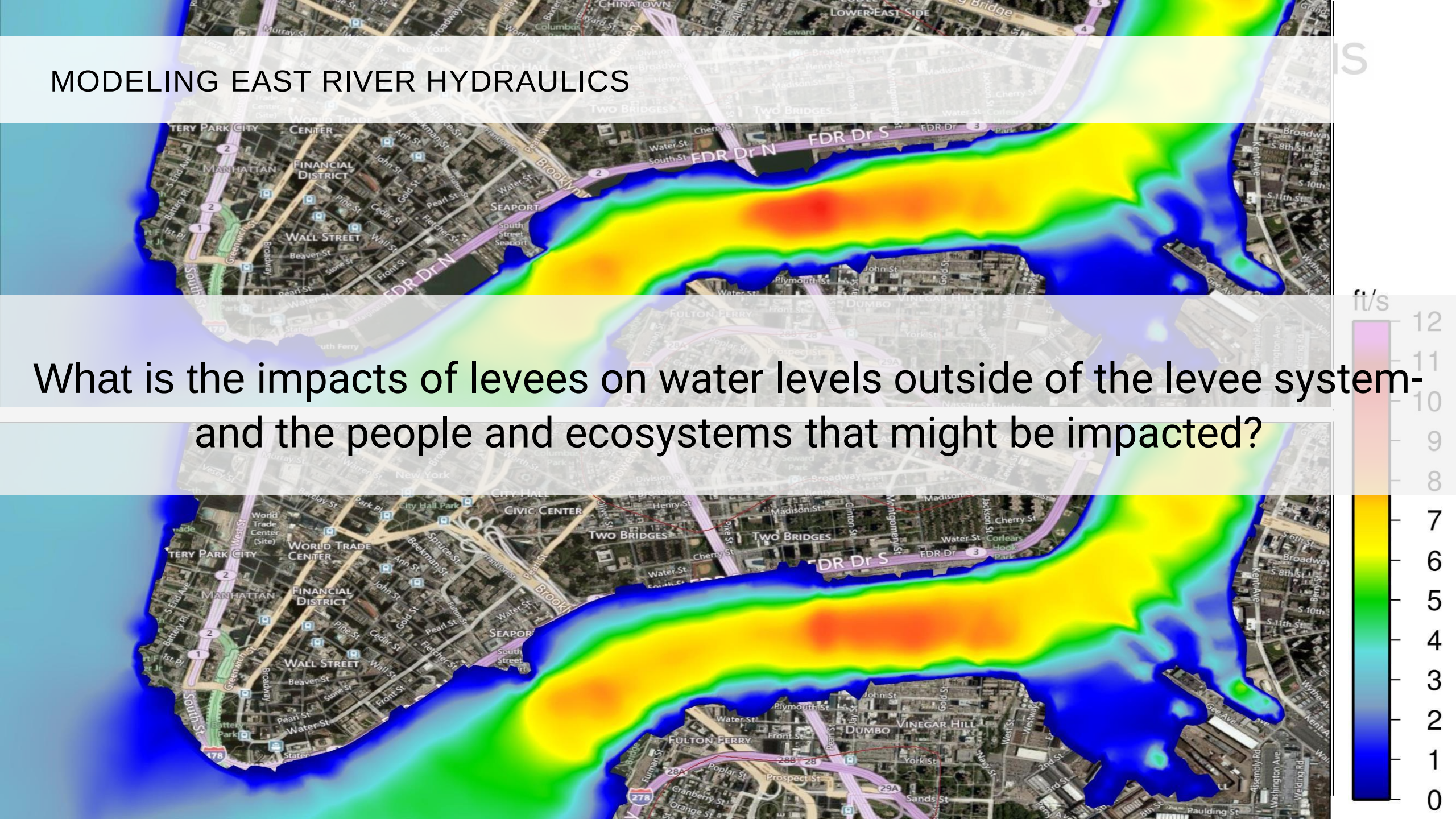


How could protection be integrated into a parks experience vs just being a giant wall

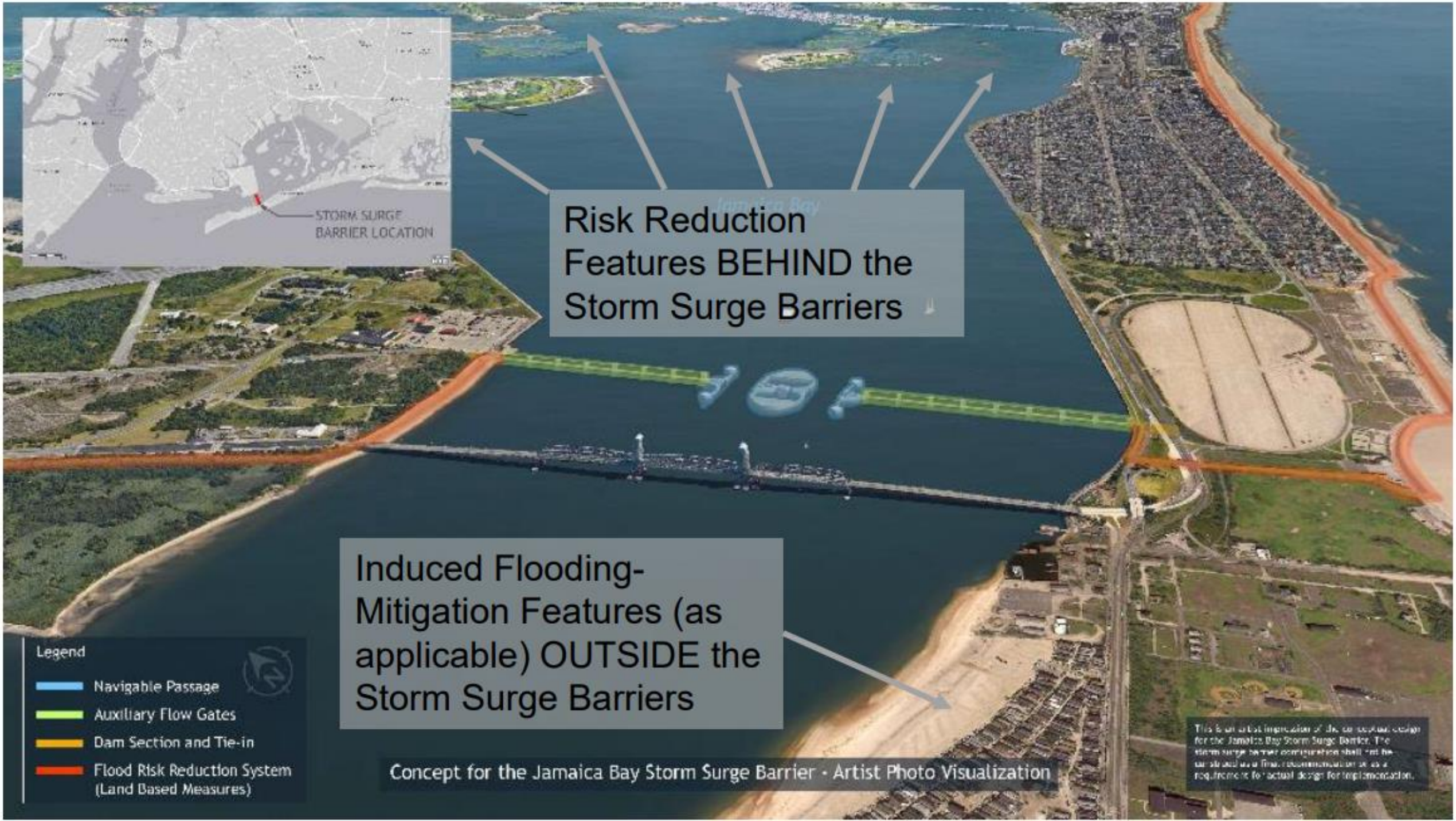
MODELING EAST RIVER HYDRAULICS



MODELING EAST RIVER HYDRAULICS



What is the impacts of levees on water levels outside of the levee system- and the people and ecosystems that might be impacted?


STORM SURGE BARRIER LOCATION
Risk Reduction Features BEHIND the Storm Surge Barriers
Induced Flooding-Mitigation Features (as applicable) OUTSIDE the Storm Surge Barriers
Legend
Navigable Passage
Auxiliary Flow Gates
Dam Section and Tie-in
Flood Risk Reduction System (Land Based Measures)
Concept for the Jamaica Bay Storm Surge Barrier - Artist Photo Visualization

How do the reliability and effectiveness of offshore storm-surge barriers compare with the reliability and effectiveness of onshore barriers? How often would gates need to be closed?

Water Management Best Practices from the Netherlands

Image Credit: City of Rotterdam

Multifunctional Urban Coastal Protection

Multifunctional urban resilience solutions combining shoreline extension and community resources

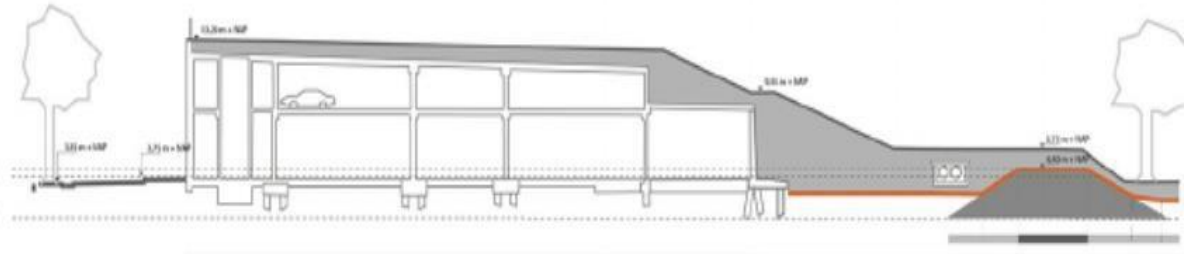



Image Credit City of Katwijk


Image Credit: City of Rotterdam

Multifunctional urban flood protection
Rotterdam Roofpark Dike

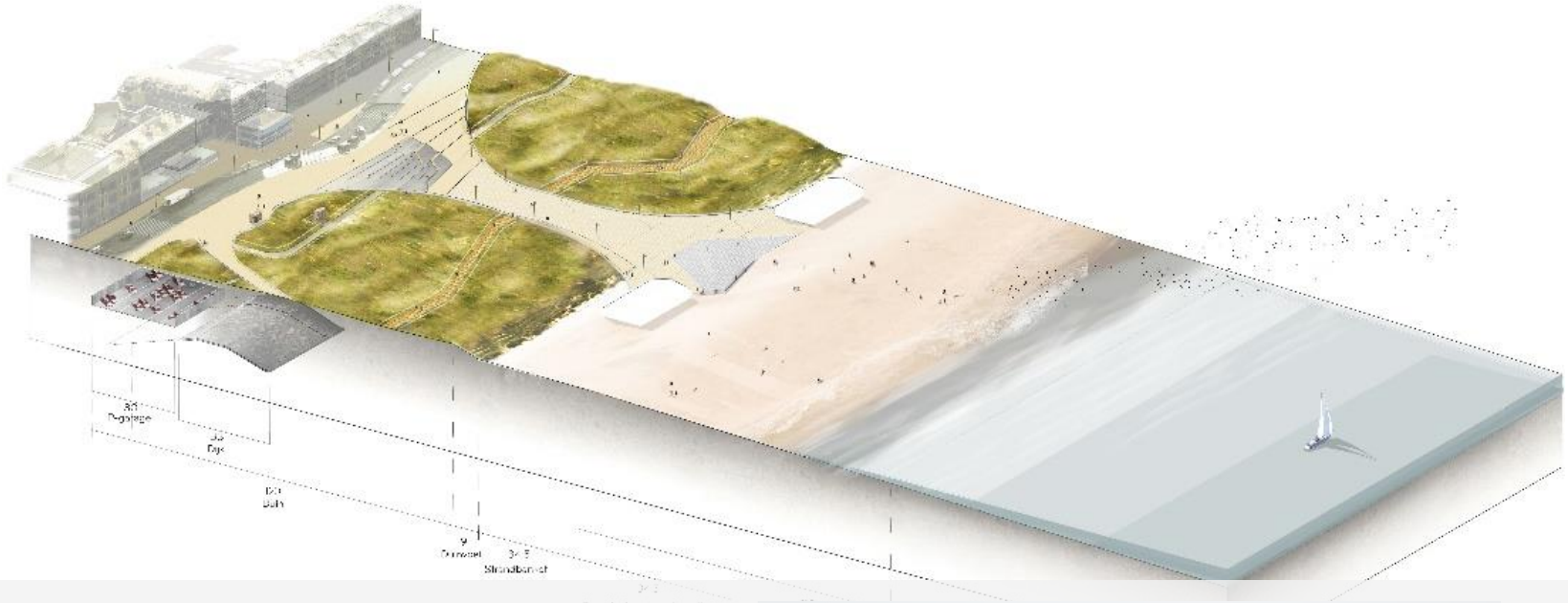
Image Credit: City of Rotterdam

Multifunctional flood protection Katwijk

dike with adjacent parking garage constructed under a dune

Multifunctional flood protection Katwijk

dike with adjacent parking garage constructed under a dune



How can we preserve the reasons that we moved to the coast - beach access, views of shore?

Dutch Stormsurge Barriers

Rotterdam Maeslant Barrier

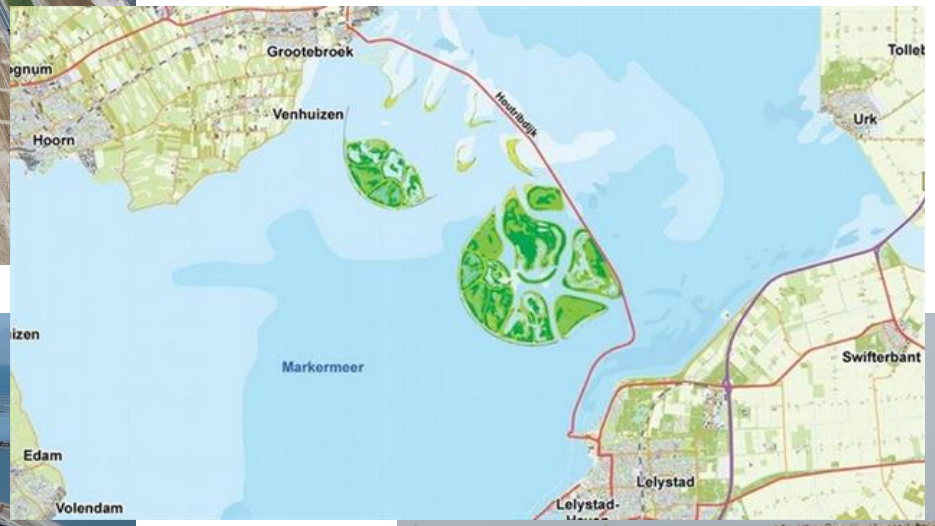
- Floating Sector Gates
- Little impact on coastal/river system
- Large navigational opening (1200') , little hindrance to shipping
- Operational since 1997, closed for storms in November 2007 (picture) and January 2018; yearly test closures
- Complex barrier to operate, dynamic ballast distribution (stable lowering and rising)
- Dynamic gate behavior and negative head difference critical attention points
- Barrier interacts with, and needs to perform within, the overall water system

Image Credit: Rijkswaterstaat / Deltares

Markerwadden, Building with Nature


Image Credit: Ecoshape

- New islands created
- Foreshore flood protection
- Unique ecosystem
- Multipurpose, economic benefits
- Visitors, leisure, education
- Pioneer vegetation developing



Risk based decisions require strategies and economic understanding of scale

Image Credit: City of Rotterdam, Rijkswaterstaat

Image Credit: USACE