NY/NJ Coastal Restudy

Community Meeting 3 | November 12, 2020

New York City

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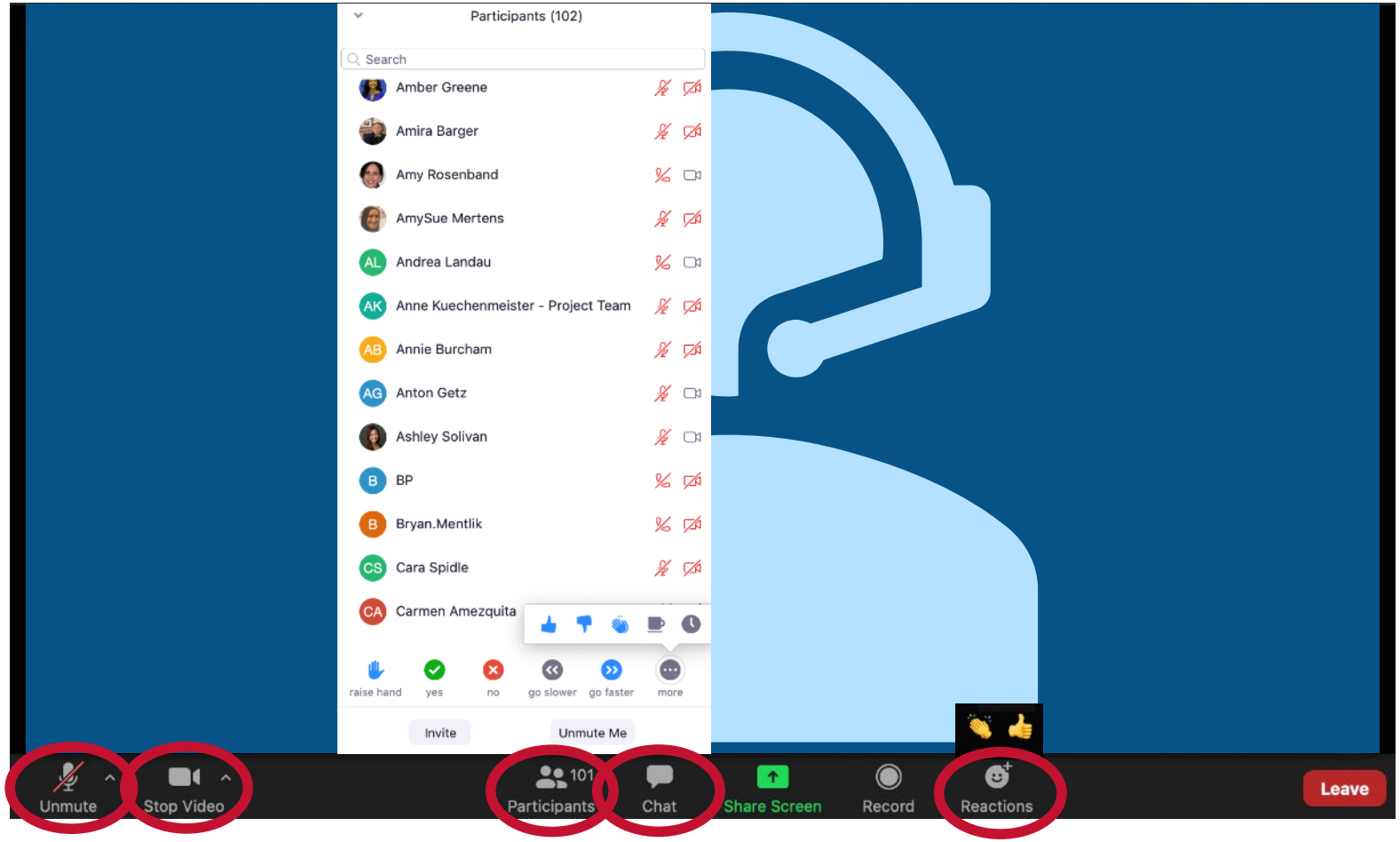
Photo credit NOAA/NASA

Today's Meeting: Zoom Features



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Use the Chat for Questions!

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Your Presenters

Michael P. Foley
Risk Analysis Branch Chief
FEMA Region 2

Chris Bender
Coastal Modeling Lead
Compass

Elena Drei-Horgan
Technical Manager
Compass

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Introductions – FEMA and State Agencies

	Title	Staff	Phone and Email
FEMA	Region 2 Risk Analysis – Branch Chief	Michael P. Foley	(212) 680-3634 michael.foley3@fema.dhs.gov
	Region 2 Risk Analysis – Project Monitor (NJ, NYC)	Robert Schaefer, P.E.	(212) 680-8808 robert.schaefer@fema.dhs.gov
	Region 2 Risk Analysis – Project Monitor (Westchester)	Alan Springett	(212) 680-8557 alan.springett@fema.dhs.gov
	Region 2 Risk Analysis – Civil Engineer	Shudipto Rahman	(202) 702-4273 shudipto.rahman@fema.dhs.gov
	Region 2 Mitigation Division – Resiliency Specialist	Thomas Song, CFM	(917) 374-5475 thomas.song@fema.dhs.gov
	Headquarters – Coastal Engineer	Lauren Schmied, P.E.	(202) 812-6164 lauren.schmied@fema.dhs.gov
State Agencies	NYSDEC NY State NFIP Coordinator's Office	Kelli Higgins-Roche, P.E.	(518) 402-8280 kelli.higgins-roche@dec.ny.gov
	NJDEP NJ State NFIP Coordinator's Office	Joe Ruggeri, P.E.	(609) 292-2296 joseph.ruggeri@dep.nj.gov

Introductions – Project Support

	Title	Staff	Phone and Email
Project Management	Floodplain Analysis and Mapping (Coastal Update, Storm Surge, and NJ and NYC Overland) – Compass	Jeff Smith, P.E.	(215) 789-2166 jeff.r.smith@aecom.com
	Floodplain Analysis and Mapping (Westchester Overland) – STARR II	Mike Salisbury, P.E.	(321) 775-6650 michael.salisbury@atkinsglobal.com
	Technical Manager – Compass	Elena Drei-Horgan, Ph.D.	(703) 682-1634 elena.drei-horgan@aecom.com
	Coastal Modeling Lead – Compass	Chris Bender, P.E.	(904) 256-1338 cbender@taylorengineering.com
Regional Support	Planner – STARR II	Rosemary Bolich, AICP	(646) 490-3848 rosemary.bolich@stantec.com
	Water Resources Engineer – STARR II	Trevor Cone, P.E.	(212) 330-6157 trevor.cone@stantec.com
Outreach	Community Engagement Lead – *Resilience Action Partners*	Melissa Herlitz, AICP	(646) 682-5558 melissa.herlitz@mbakerintl.com

We want to hear from you!

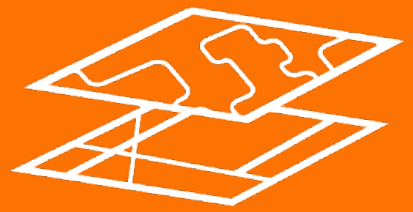
POLL

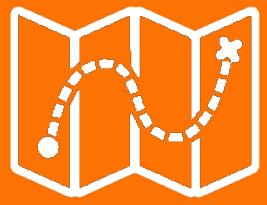
What are you hoping to learn during today's Coastal Restudy presentation?

1) General update
2) Study details
3) Deep dive into specific topics

Meeting Objectives

1	2	3
Review History	Provide Updates	Preview Milestones





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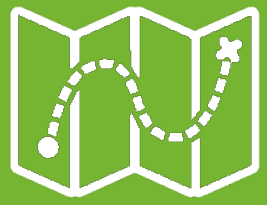
Meeting Outcomes

1	2	3
Know the Restudy History	Be Equipped to Answer Questions	Develop Confidence in the Process



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Meeting Agenda

1. Coastal Restudy Overview
2. Coastal Restudy Phase 1
3. Coastal Restudy Phase 2
4. Upcoming Milestones
5. Questions and Discussion

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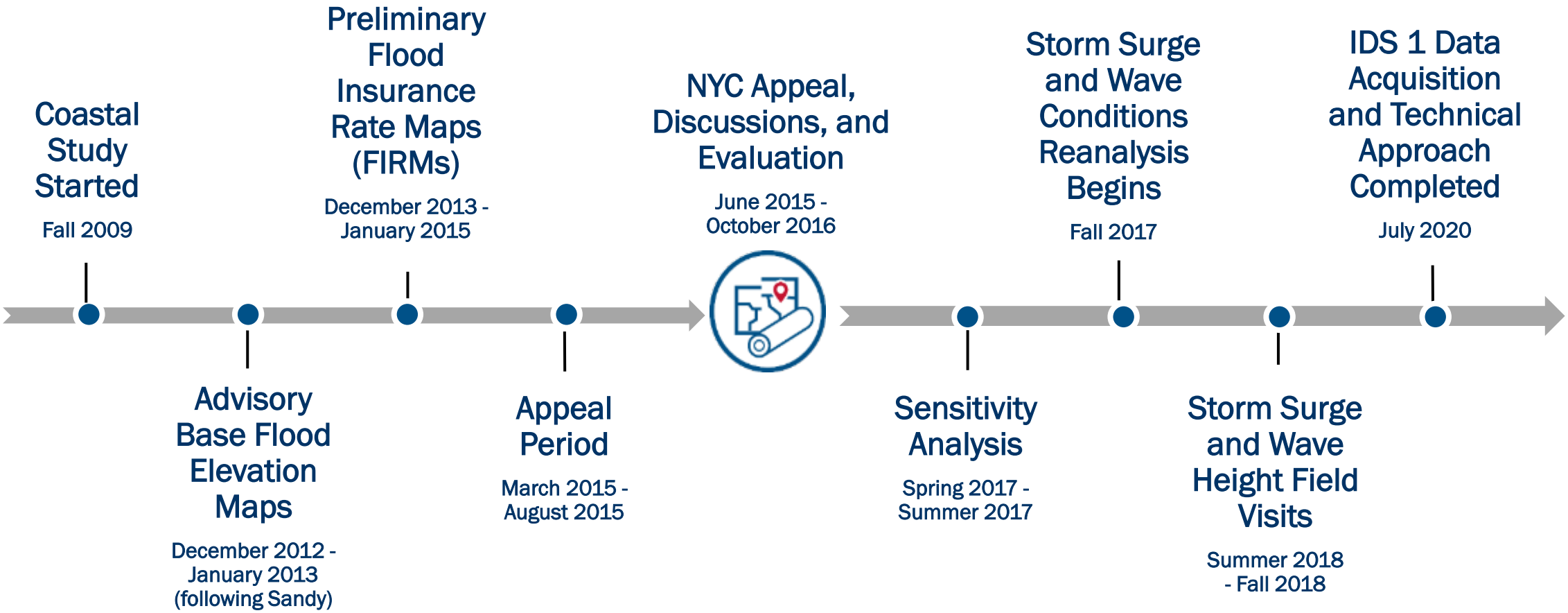
Coastal Restudy Overview

History

Study Area

Milestones

Coastal Restudy: A Brief History



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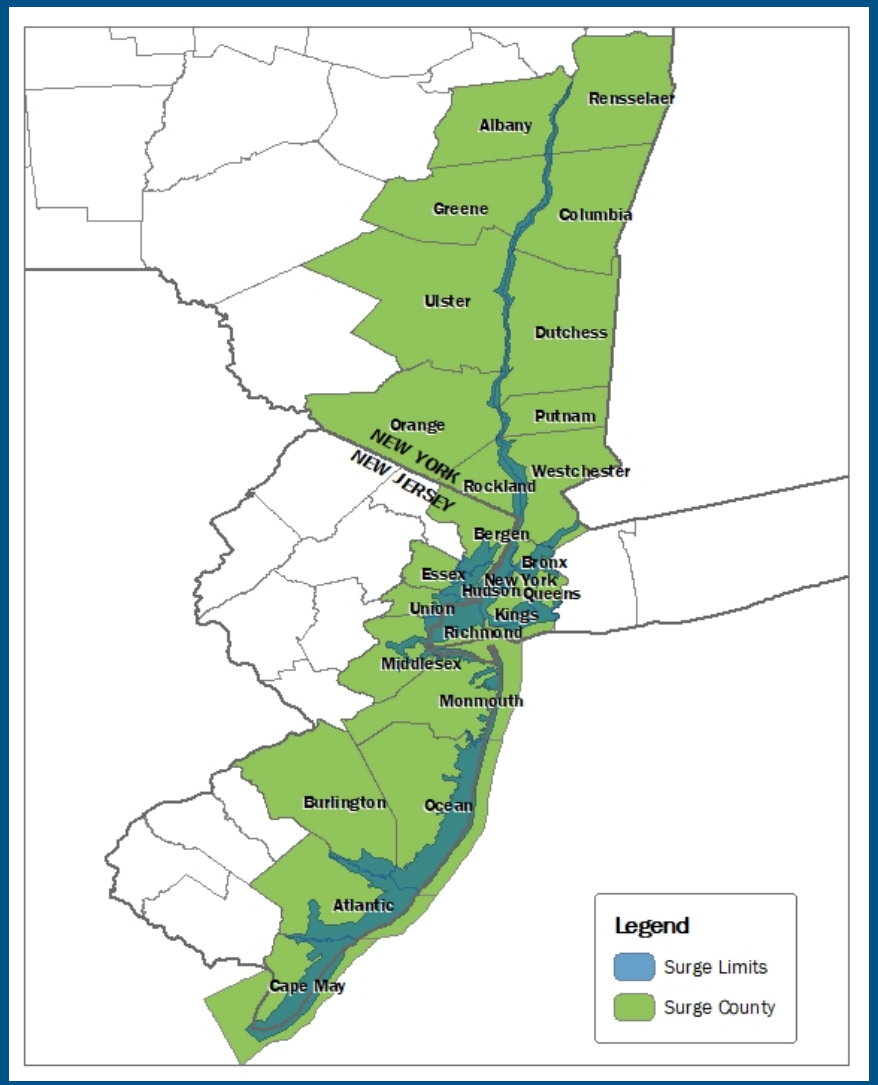
Overview of Restudy Area – Surge Study

- Tidal Hudson River
- Western Long Island Sound
- New York and Raritan Bay
- Atlantic Ocean
- Does not include Delaware Bay



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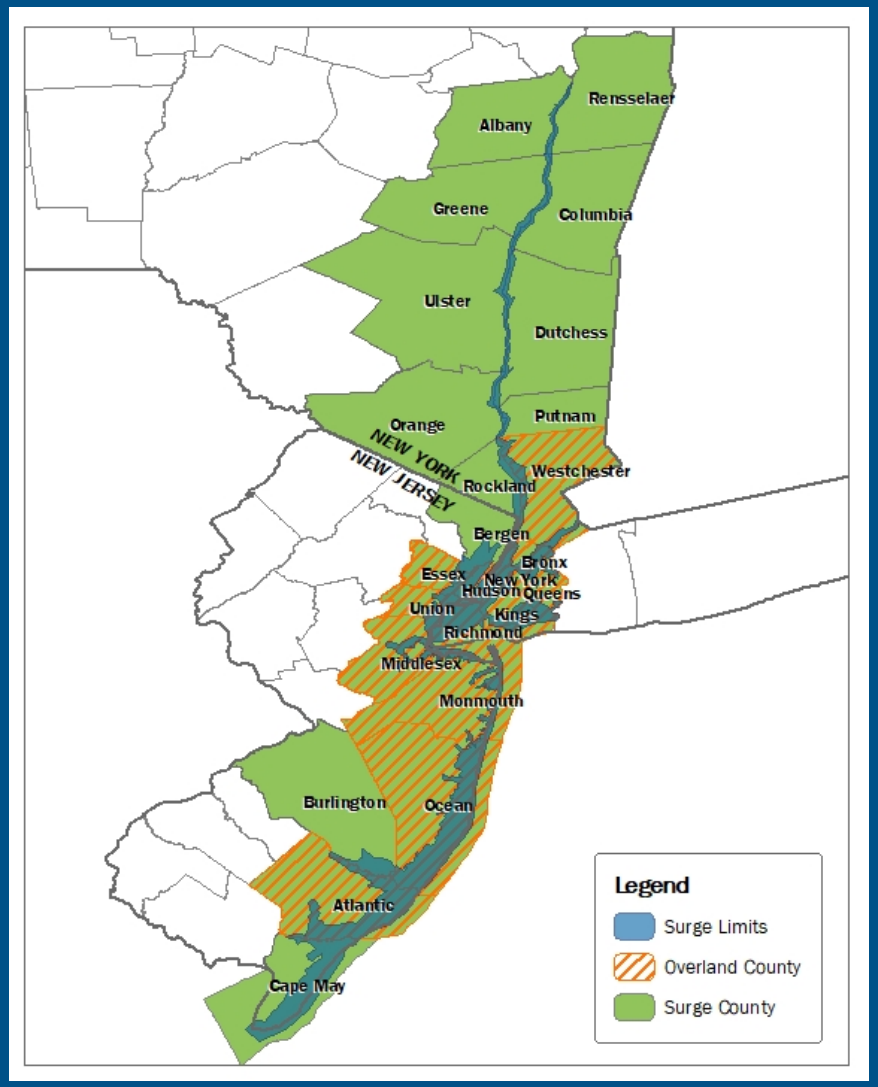
Overview of Restudy Area – Overland Analyses and Mapping

- NY: New York City boroughs and Westchester County
- NJ: Atlantic, Essex, Hudson, Middlesex, Monmouth, Ocean, and Union counties



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Quality Assurance

- **Coastal Advisory Panel (CAP)**
  - State of New Jersey, State of New York, Port Authority of New York and New Jersey, New York City, and FEMA
  - Internal group of experts in storm surge modeling and FEMA coastal study process
  - CAP meets bi-monthly and reviews deliverables at each project milestone

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Key Milestones

Summer 2017	2017-2021	2020-2023	2023	2024	2024-2025
Sensitivity Analysis	Storm Surge and Wave Conditions Reanalysis	Wave Hazard Analyses and Floodplain Mapping	Work Maps - Flood Risk Review Meeting	Preliminary Maps – CCO and Open House Meetings	Appeal Period Followed by Letter of Final Determination and Effective Maps

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COVID-19 Impacts

- Virtual outreach
- Delayed field reconnaissance – team is taking appropriate measures into account, including local quarantine
- The overall Coastal Restudy schedule is not impacted

Photo Credit: James Gathany

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Questions?

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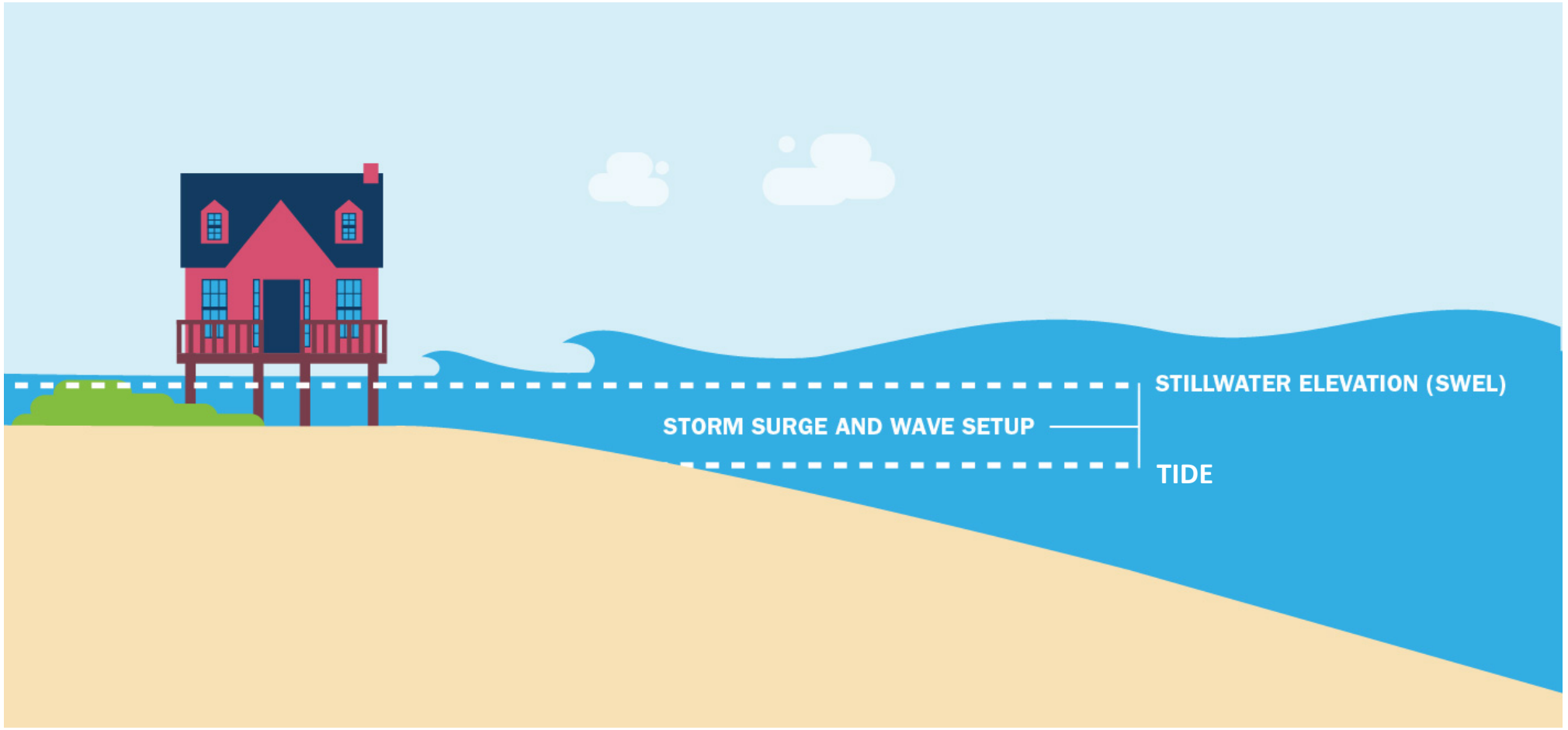
Coastal Restudy Phase 1

- Intermediate Data Submittals
- Tidal Validation
- Tropical Cyclone Storm Validation
- Extratropical Cyclone Storm Validation
- Tropical Cyclone Production Runs

Coastal Restudy Phase 1: Storm Surge Study



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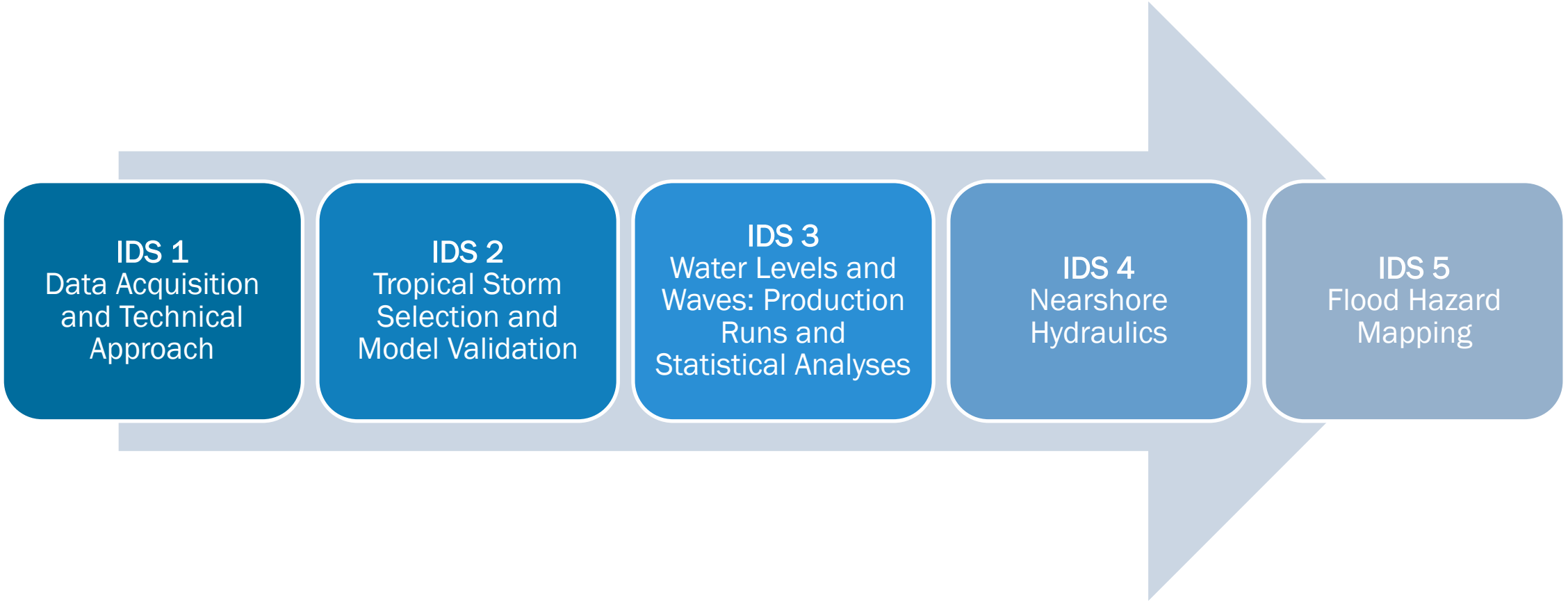
Intermediate Data Submittals (IDS)



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Storm Surge Study: IDS 1

IDS 1: Understanding the Data and Technical Approach for the Storm Surge Study – Approved July 2020	
1	Technical Approach
2	GIS Analysis of Coastal Features, Study Area Characteristics, and Site Reconnaissance
3	Review of STARR II Coastal Sensitivity Analysis Recommendations and Path Forward
4	Tropical Storm Validation Storm Selection
5	Extratropical Storm Validation Storm Selection
6	Topo-Bathy-Digital Elevation Model (DEM) Development
7	Storm Climatology and Initial Probabilistic Model Development
8	Storm Wind Field Methodology
9	Hydrodynamic and Wave Model Development

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Coastal Restudy Enhancements

Extensive model validation for all extratropical cyclones

Improved representation of tidal effects

Inclusion of additional and recent storm events

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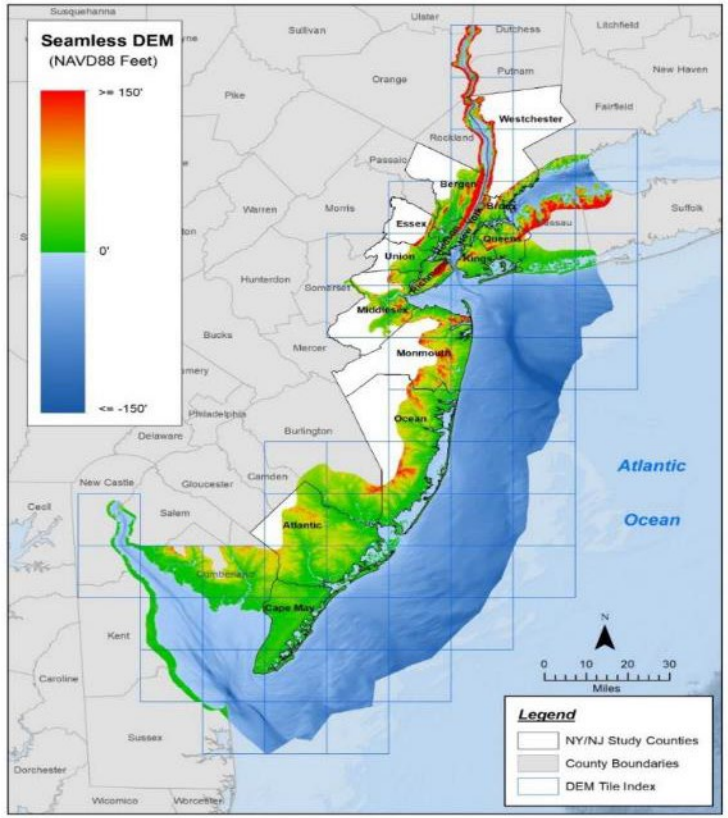
Topographic Datasets Captured in the ADCIRC + SWAN Model Mesh



Year	Description	Data Type	Source/ Owner
2017	New York City (NYC) LiDAR	LiDAR-based DEM	NYC
2017	2017 National Coastal Mapping Program LiDAR - *Incorporated in model mesh to capture dune crest elevation*	LiDAR-based DEM	USACE
2014	2014 Post-Hurricane Sandy New Jersey LiDAR Mapping for Shoreline Mapping	LiDAR-based DEM	NOAA
2014	Coastal and Marine Mapping Program New York Sandy LiDAR	LiDAR-based DEM	USGS
2013–2015	National Elevation Dataset DEM	LiDAR-based DEM	USGS
Varies	Con Edison	LiDAR-based DEM	USGS
Varies	FEMA Region 2 DEMs	LiDAR-based DEM	FEMA

DEM = Digital Elevation Model
LiDAR = Light Detection and Ranging, remote sensing
NOAA = National Oceanic and Atmospheric Administration
USACE = U.S. Army Corps of Engineers
USGS = U.S. Geological Survey

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Questions?

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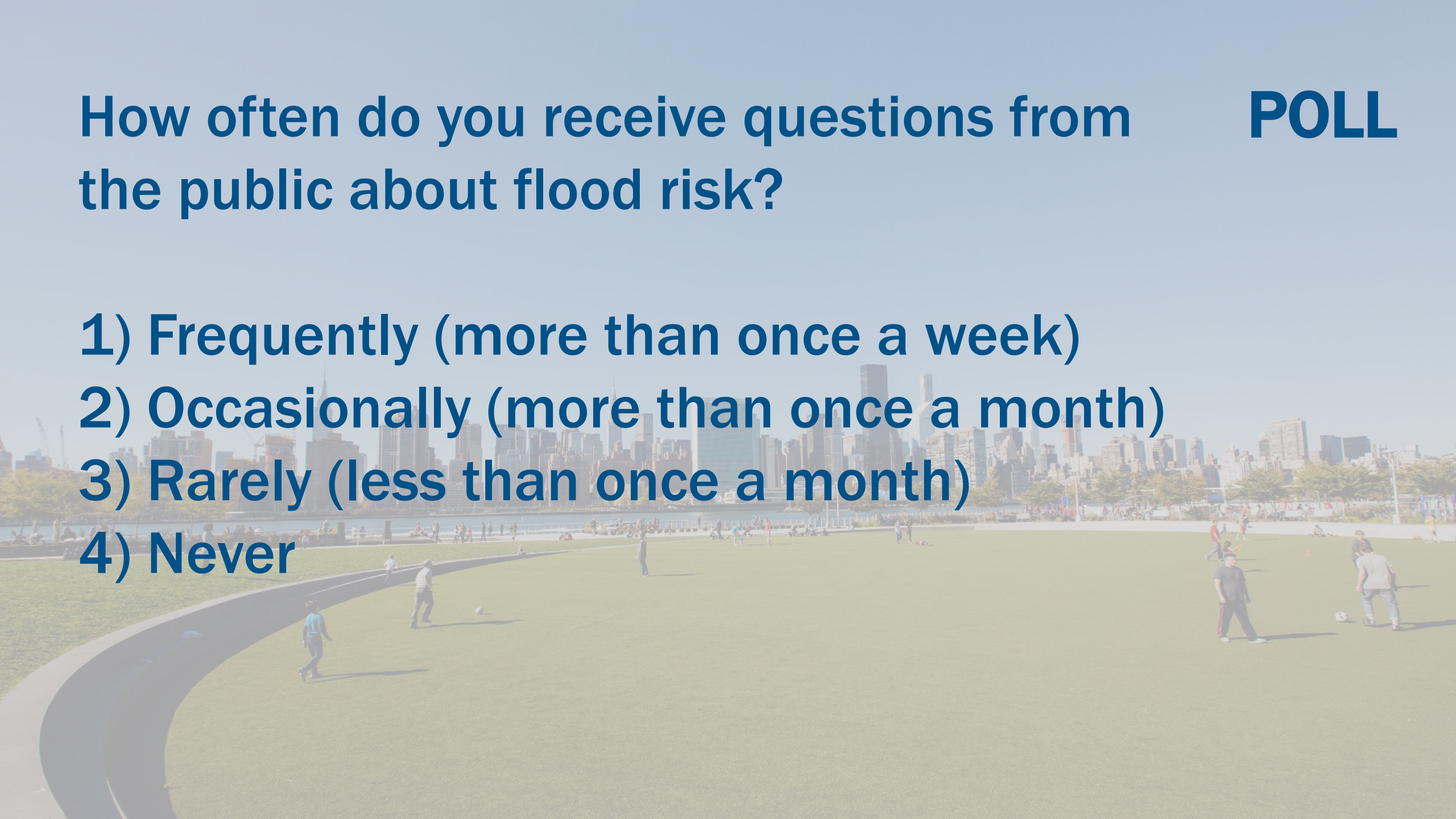
How often do you receive questions from the public about flood risk?

POLL

1) Frequently (more than once a week)
2) Occasionally (more than once a month)
3) Rarely (less than once a month)
4) Never



Storm Surge Study: IDS 2

IDS 2: Tropical Storm Selection and Model Validation	
1	ADCIRC + SWAN Model Validation – Reviewed and Approved
2	JPM-OS Tropical Storm Selection – In Development

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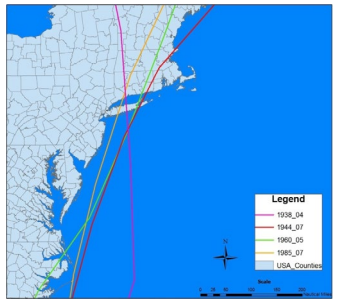
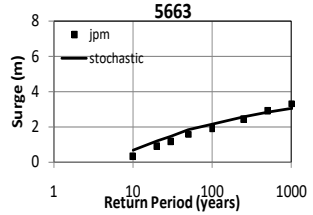
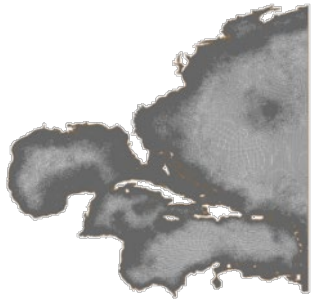
Storm Surge Study: Stillwater Elevation (SWEL)







Storm Forcing
Tropical and Extratropical Tracks

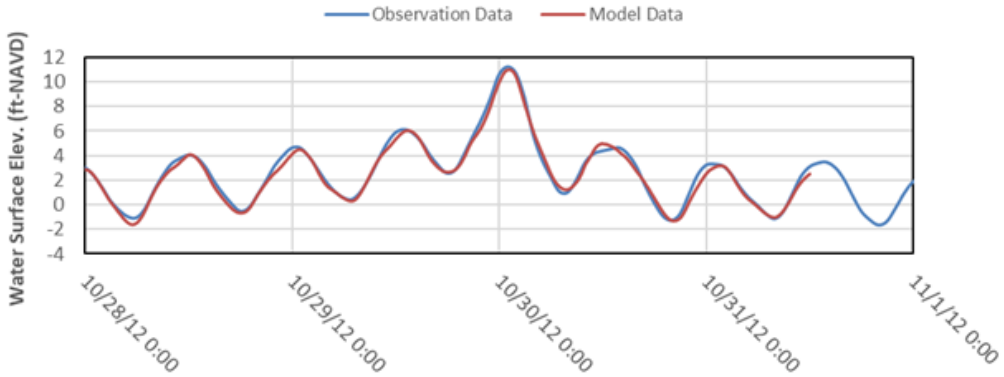
Storm Surge Modeling
Wind, Waves, Water Levels

Validation
Historical Storms and Tides

Return Period Analysis
Statistical Analysis for Tropical Storms (low freq.)
Statistical Analysis for Extratropical Storms (high freq.)
Analysis to Develop Combined Probability

Stillwater Elevation

The Battery, Hurricane Sandy



Model validation results showing how modeled data aligns well with water levels observed during Hurricane Sandy.

Storm Surge Study: Storm Climatology

- Reviewed historical storms
- Selected five tropical cyclones and 50 extratropical cyclones to validate the surge model
- Analyzed important tropical cyclone parameters
  - **Central pressure**
  - **Radius to maximum winds**
  - **Forward speed**
  - **Storm heading**
  - **Holland B (shape parameter)**
- Will generate hundreds of hypothetical tropical cyclones

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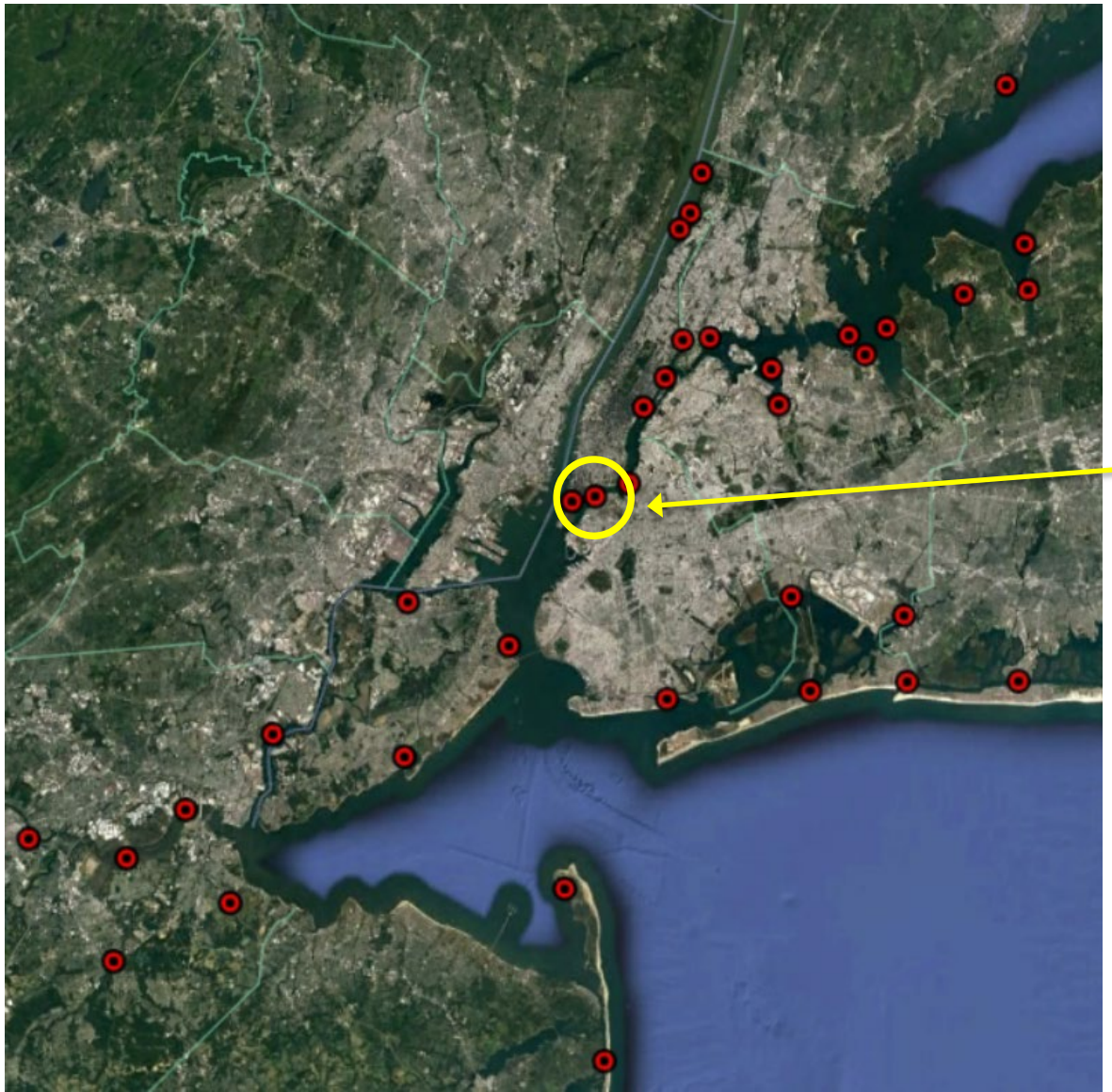
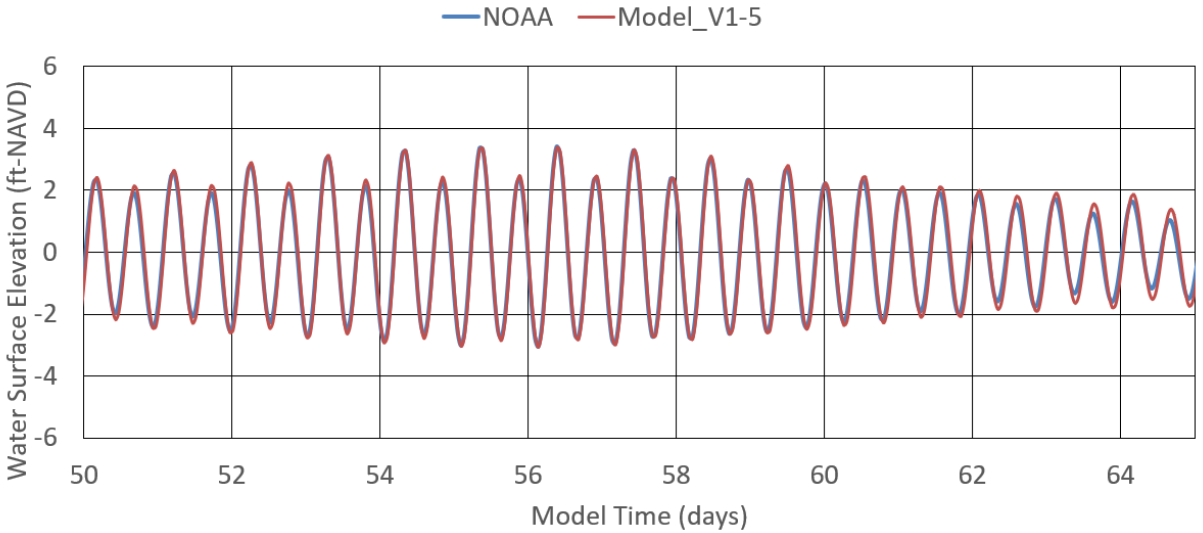
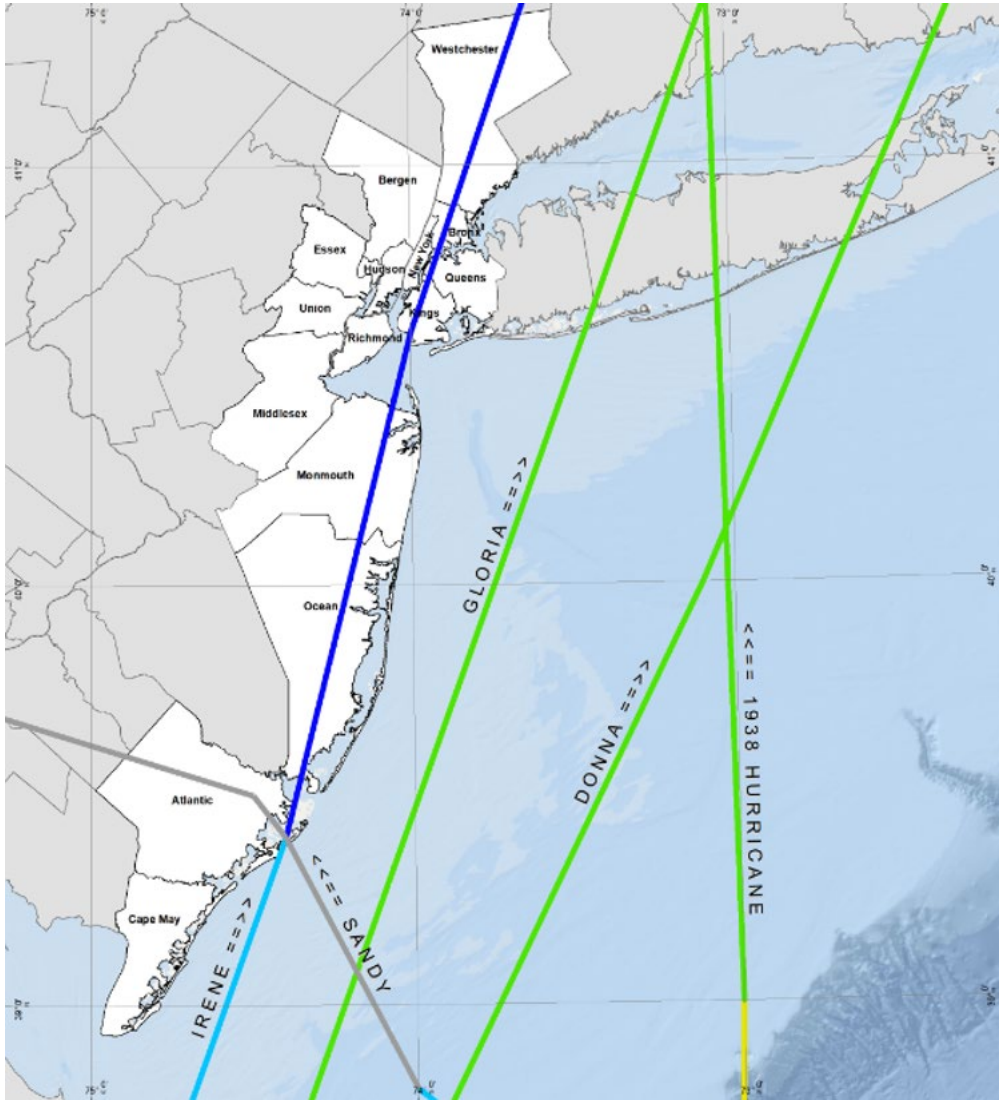
Storm Surge Study: Tidal Validation - New York City



- Tidal validation applied the eight most important tidal components
- Across the entire study area, examined tide amplitude and phase at 74 stations
- Example station at Brooklyn Bridge:



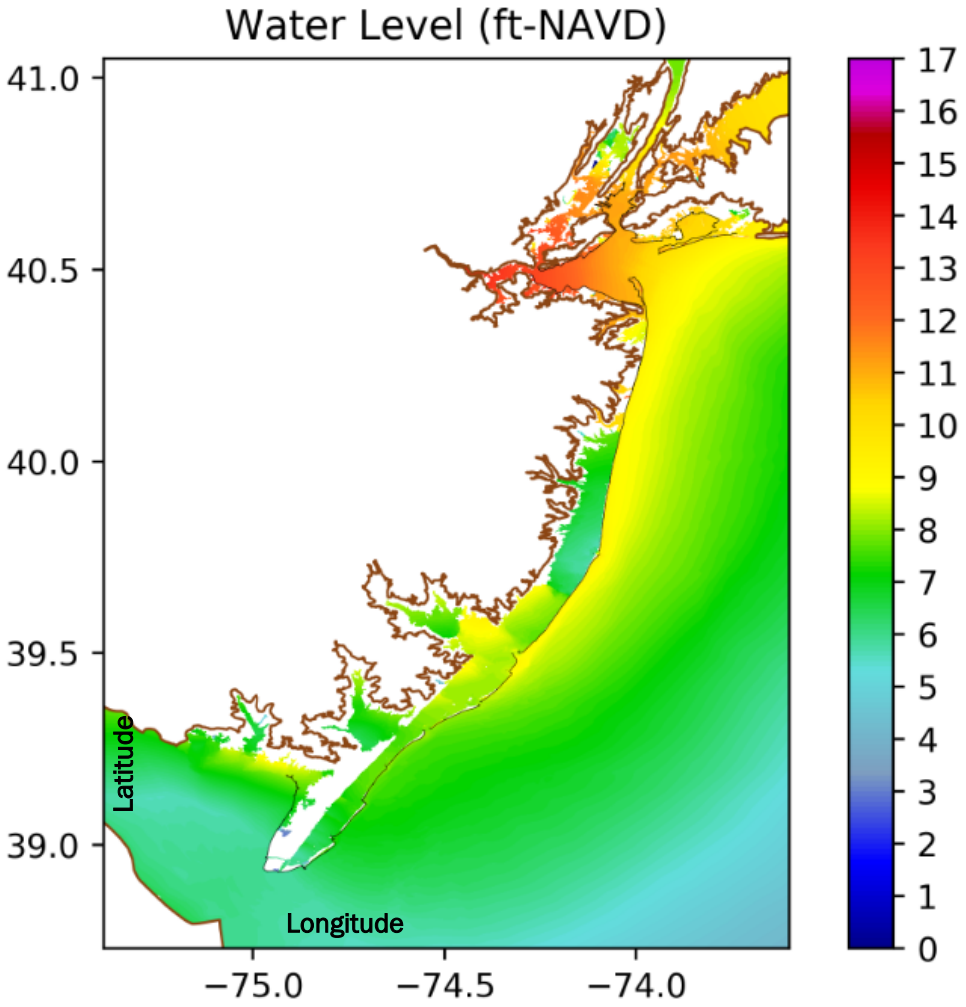
Storm Surge Study: Tropical Cyclone Storm Validation



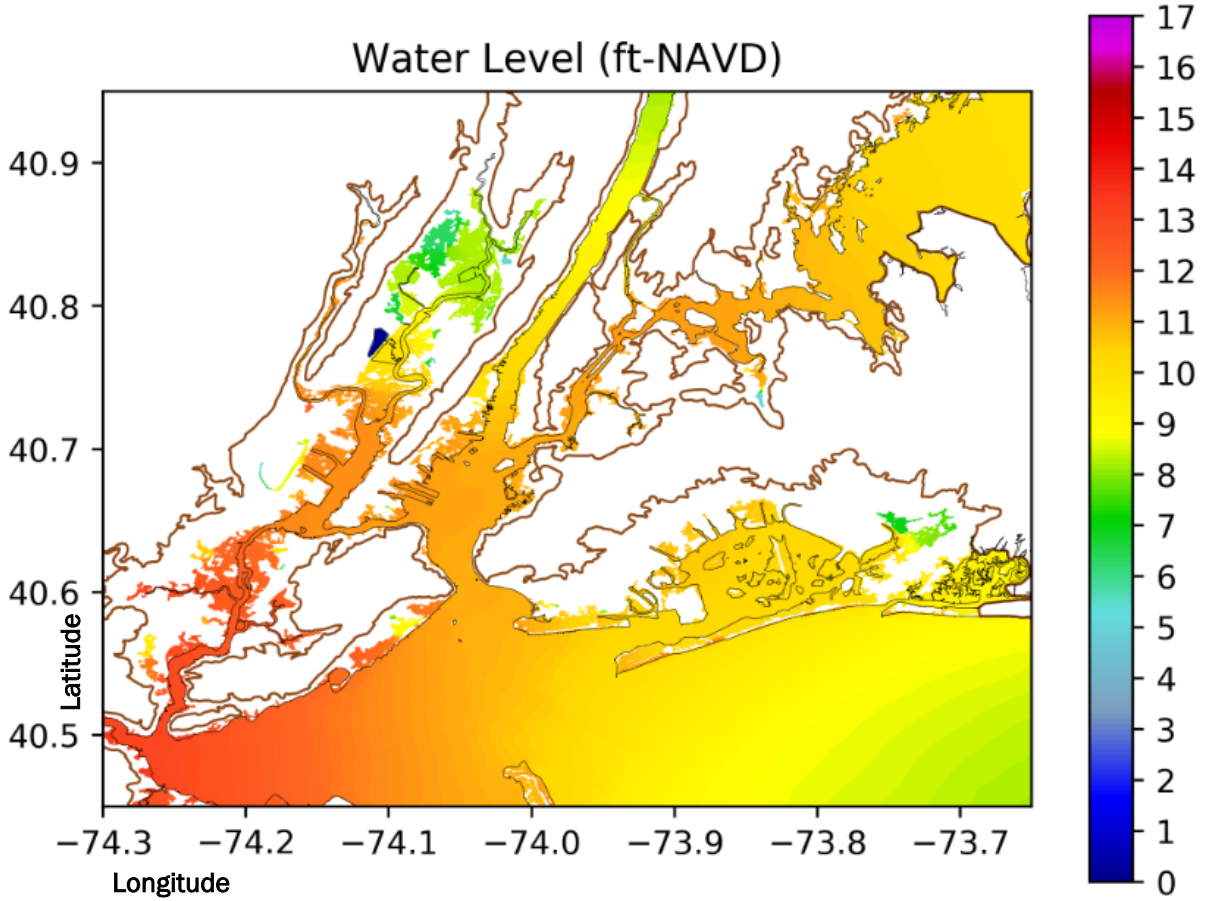
- Hurricane of 1938 (Long Island Express)
- Hurricane Donna (1960)
- Hurricane Gloria (1985)
- Hurricane Irene (2011)
- Hurricane Sandy (2012)

Storm Surge Study: Tropical Cyclone Storm Validation, Water Levels

- Hurricane Sandy, Maximum Water Level - New York City



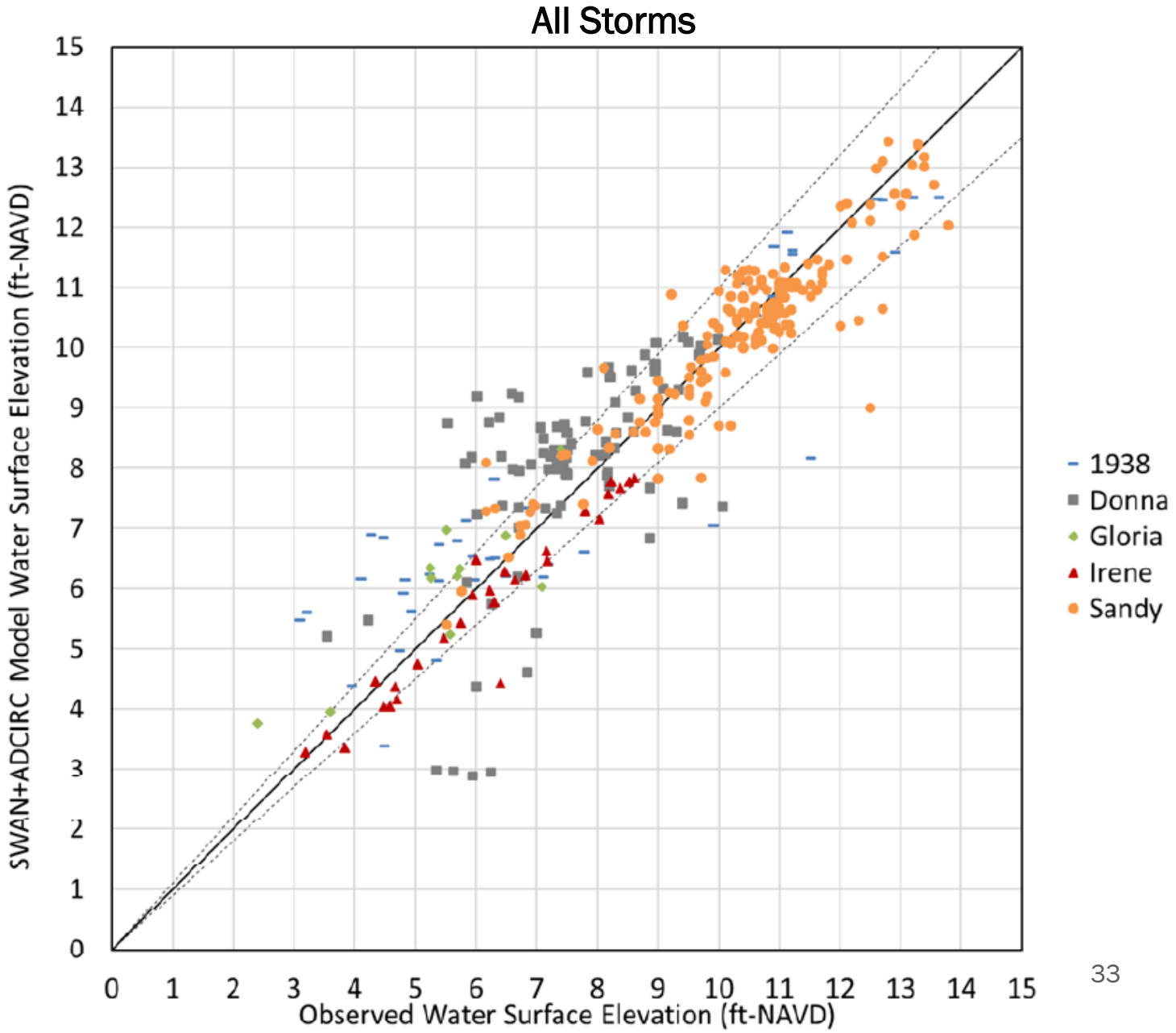
Coastal Restudy Project Area



New York City

Storm Surge Study: Tropical Cyclone Storm Validation, Water Levels

- Compare measured and modeled maximum water levels
- 459 measurement points across all five tropical cyclones



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Storm Surge Study: Tropical Cyclone Storm Validation, Water Levels - New York City

- Hurricane Sandy – compared measured and modeled data
- GIS plots of each measured water level
  - Location
  - Measured/modeled water level
  - Color-coded difference value
- Complete analysis for each of the validation cyclones

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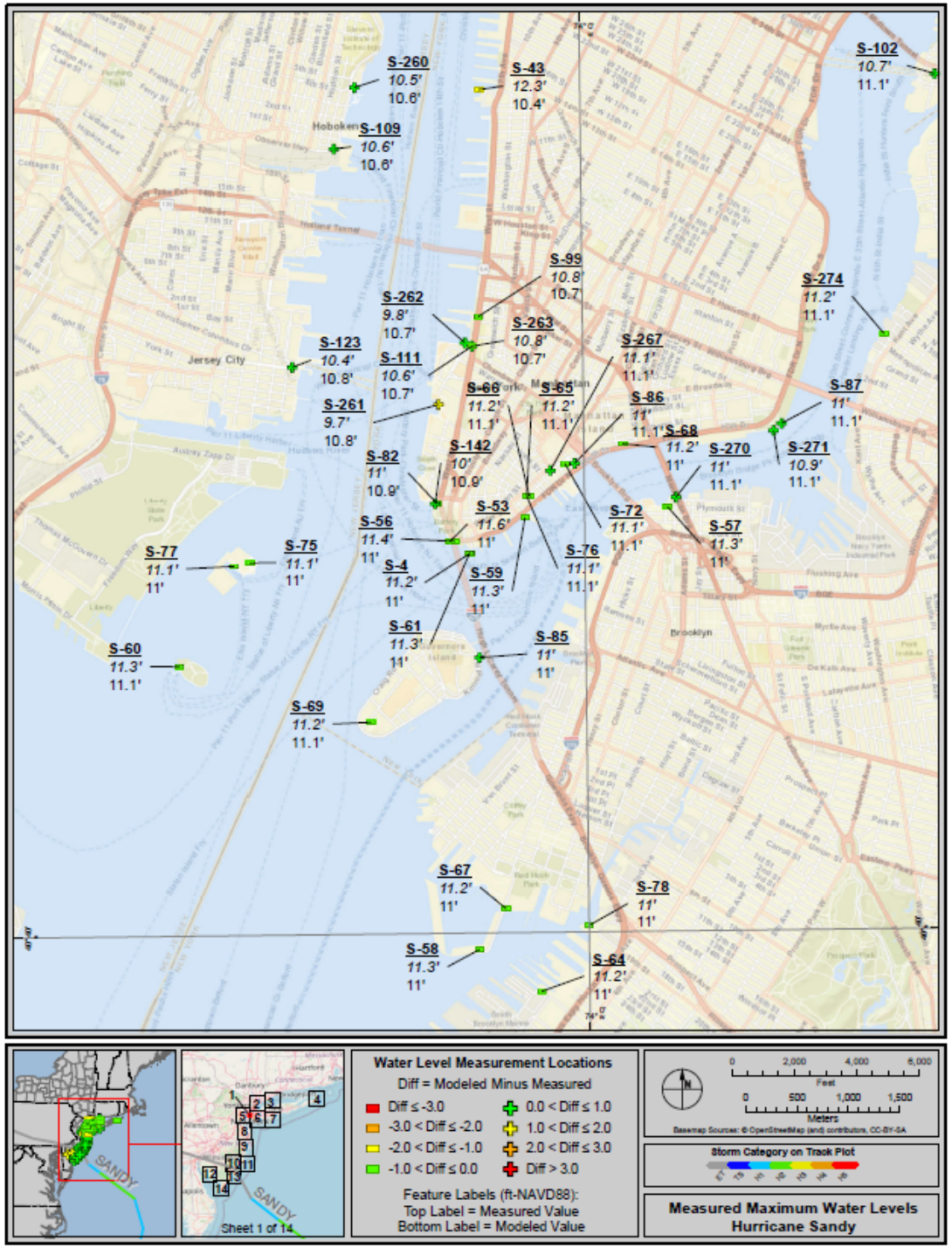

Storm Surge Study: Tropical Cyclone Storm Validation, Water Levels - New York City

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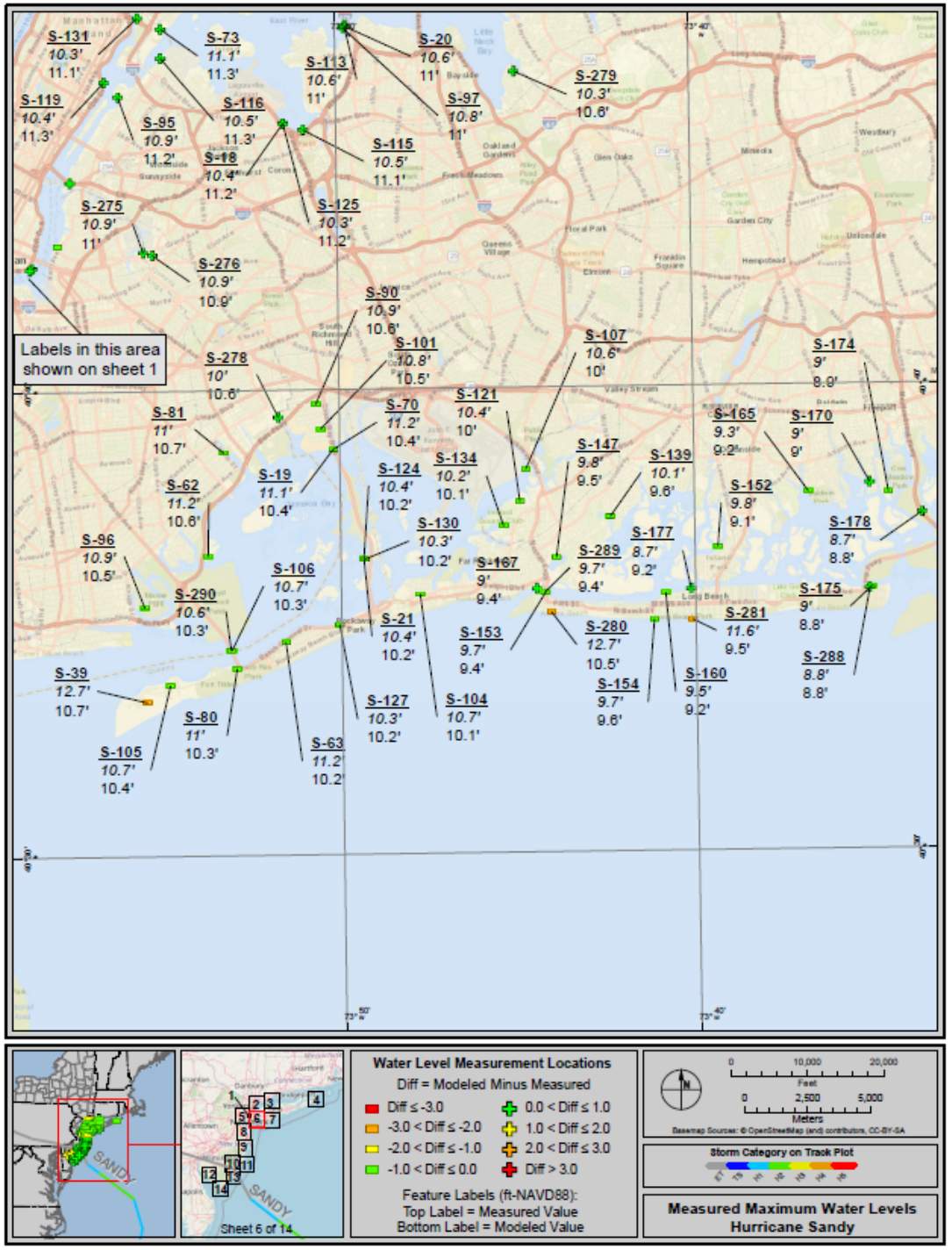

Storm Surge Study: Tropical Cyclone Storm Validation, Water Levels - New York City

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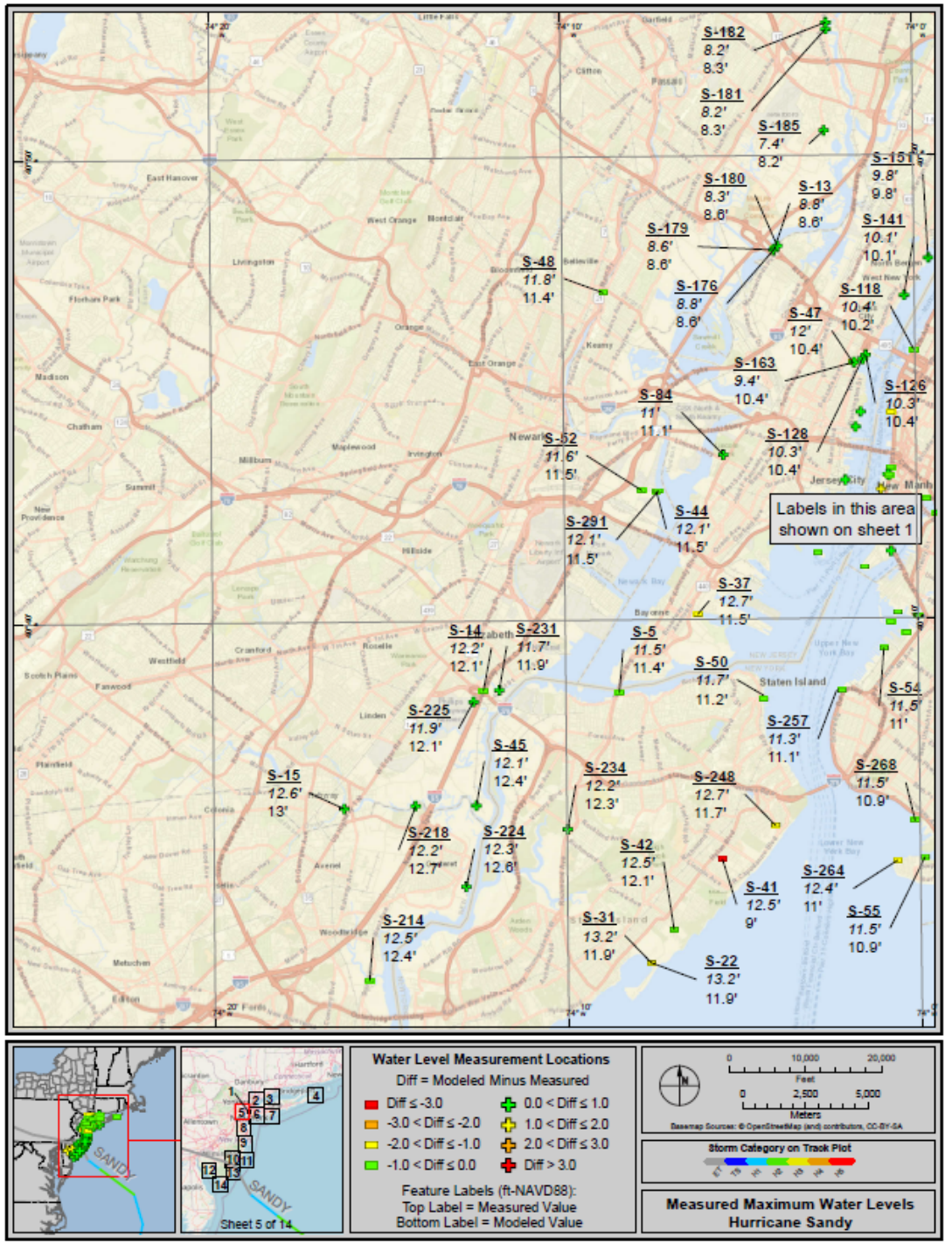

Storm Surge Study: Tropical Cyclone Storm Validation, Water Levels

- Summary Review
  - All five cyclones
  - Holistic view across all cyclones and study area with multiple error metrics developed for each storm and for the entire five-storm validation suite
  - Comparisons made to adjacent FEMA Coastal Storm Surge Studies to demonstrate the Coastal Restudy validation metrics are appropriate
- Error metrics for all 459 measurement stations across the five-storm validation suite
  - Mean Error = 0.05 feet
  - Mean Absolute Error = 0.68 feet

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Questions?

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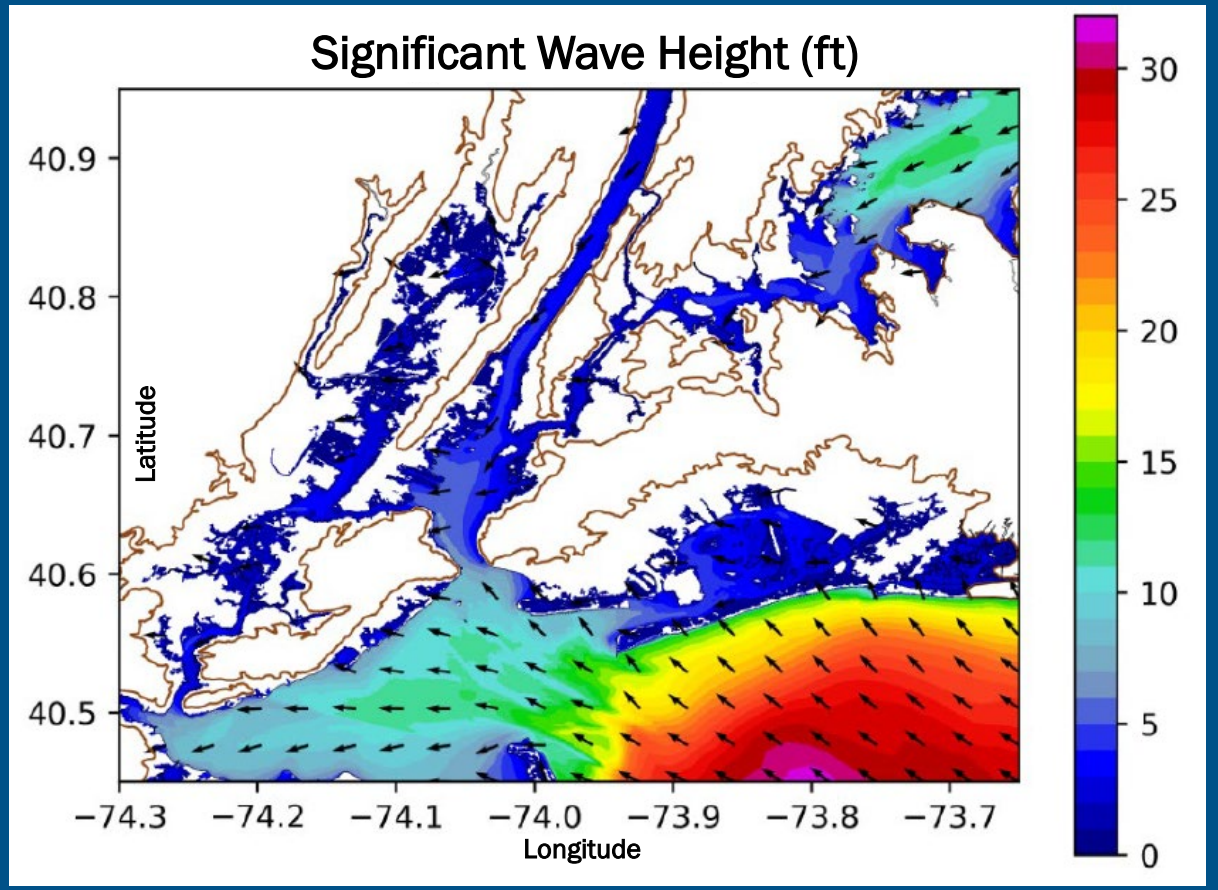
Storm Surge Study: Tropical Cyclone Storm Validation, Waves – New York City

- Contour plots of maximum wave parameters (wave height and wave period)

- Hurricane Sandy - maximum significant wave height at time of maximum water level



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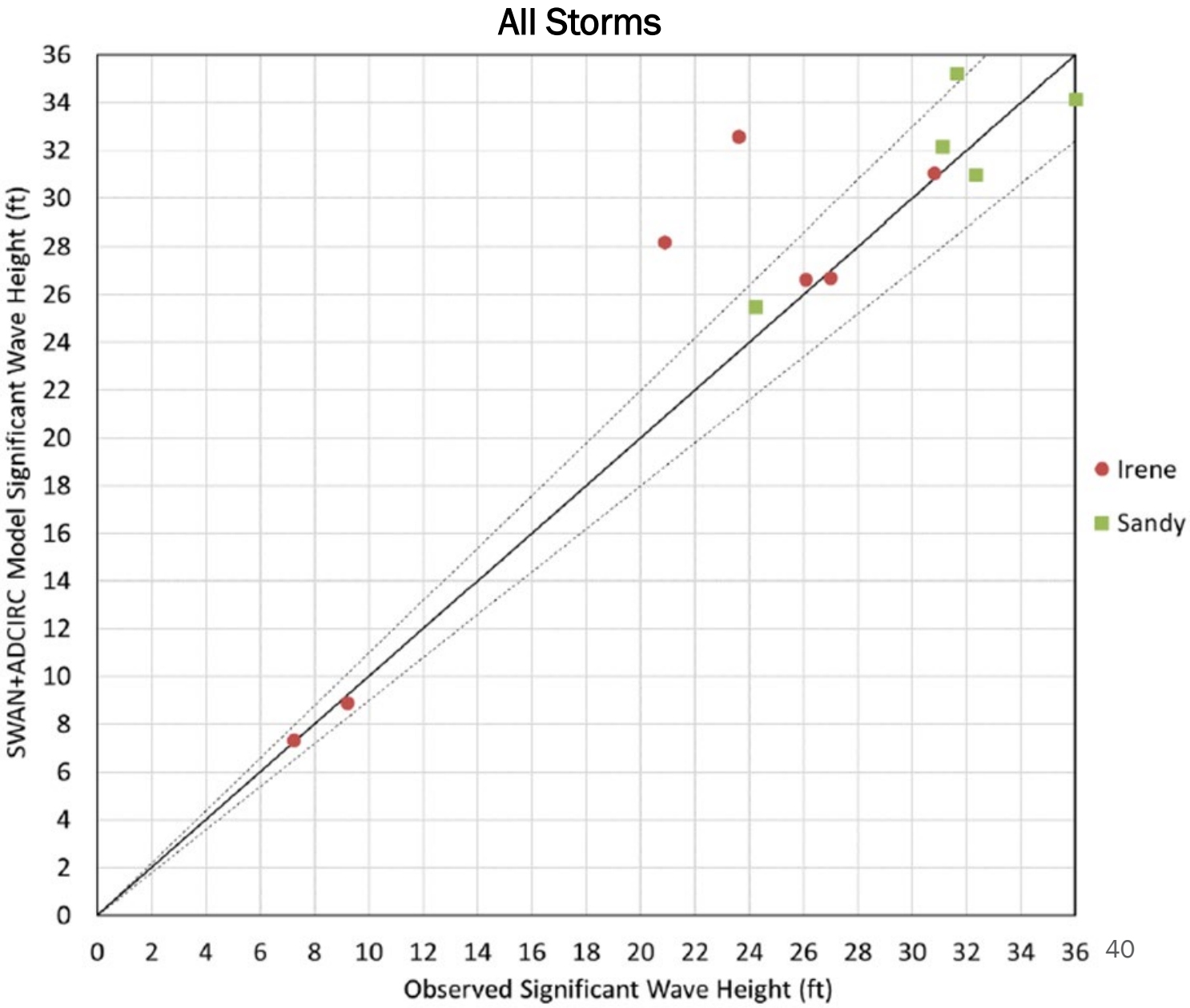
Storm Surge Study: Tropical Cyclone Storm Validation, Waves

- Compare measured and modeled maximum significant wave heights
- Twelve stations for two most recent tropical cyclones
  - No buoys with data near project area for older storms
- Also develop for Peak Wave Period



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Questions?

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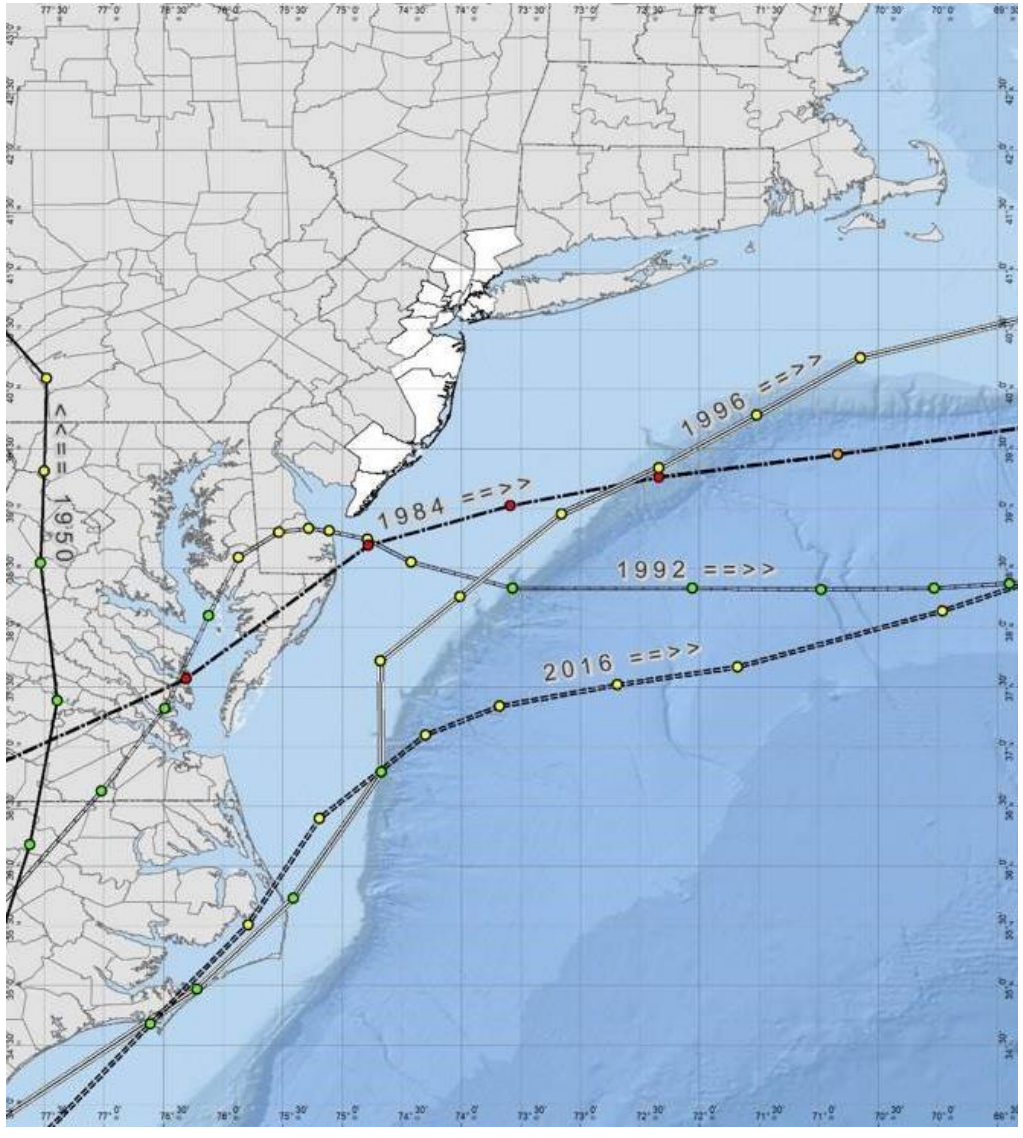
3-Minute Break

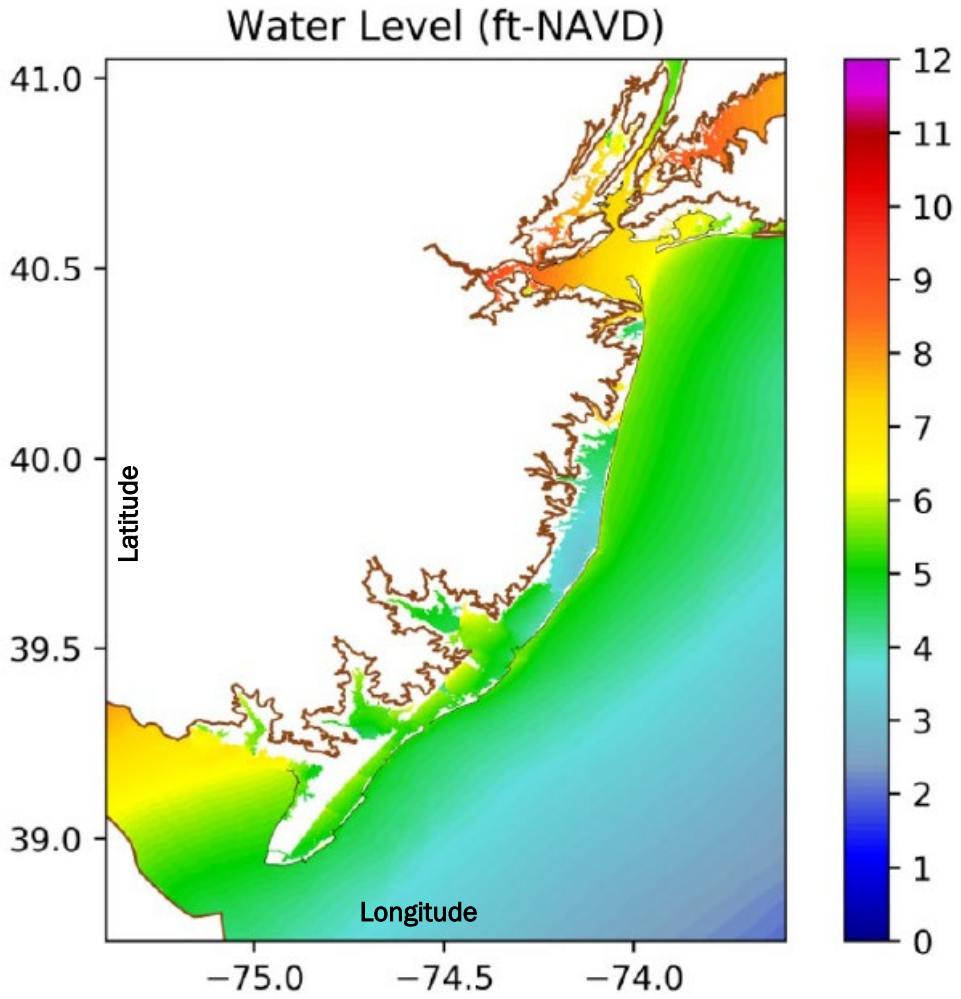
Storm Surge Study: Extratropical Cyclone Storm Validation



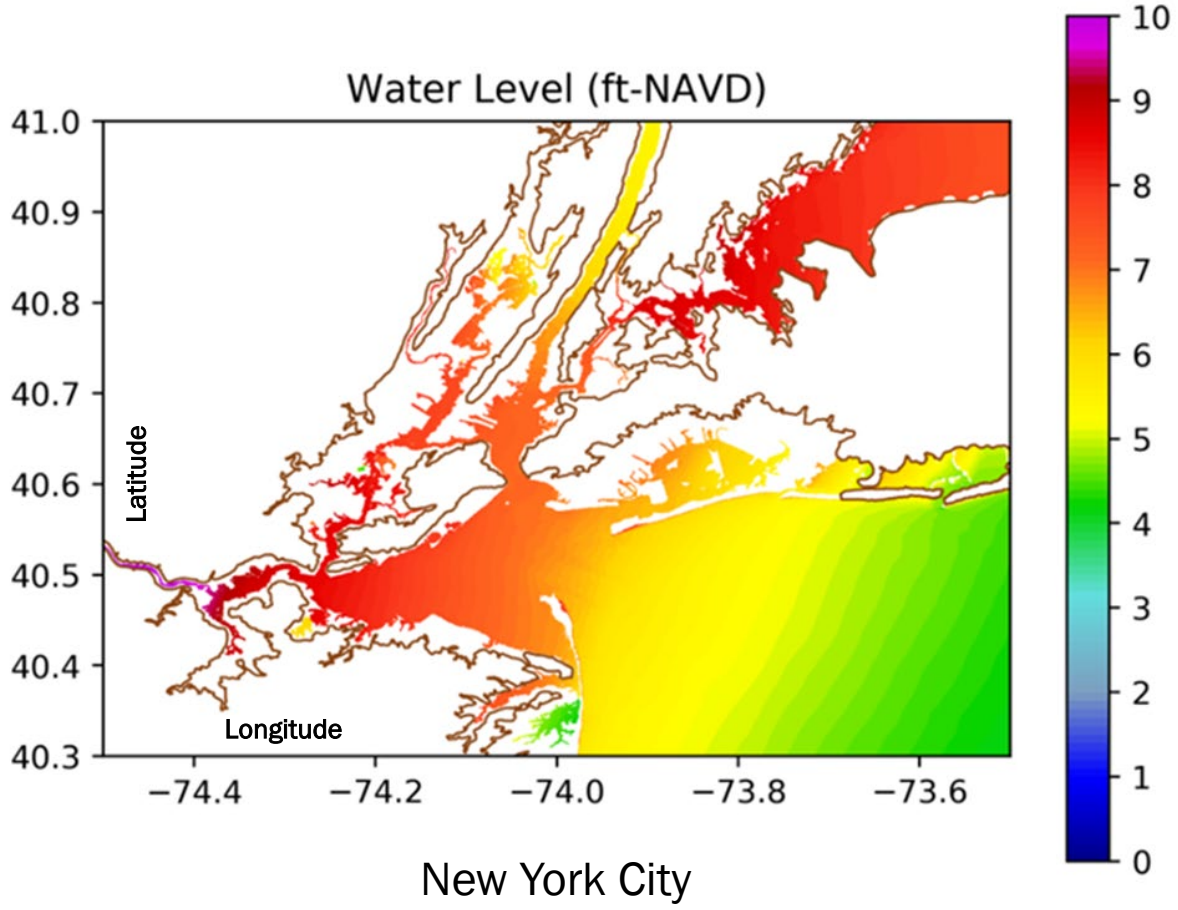
- 50 historical extratropical cyclones identified in IDS 1 as important for the project area
- Select five extratropical cyclones from the suite of 50 cyclones for the initial model validation
- During production runs, validate the model results for the other 45 extratropical cyclones and develop the uncertainty term applied in the statistical processing

Storm Surge Study: Extratropical Cyclone Storm Validation, Water Levels

- 1950 Extratropical Cyclone, Maximum Water Level - New York City



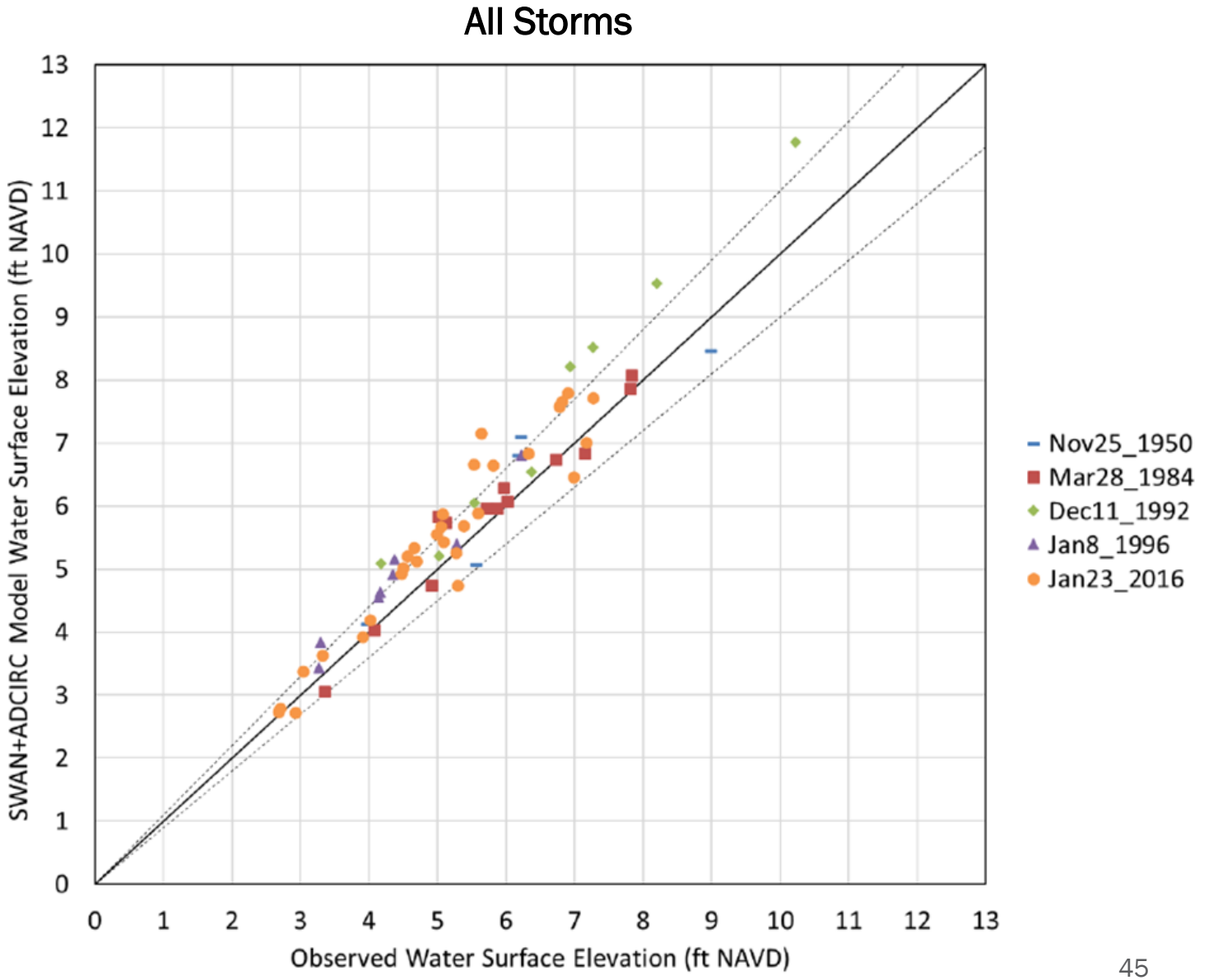
Coastal Restudy Project Area



New York City

Storm Surge Study: Extratropical Cyclone Storm Validation, Water Levels

- Compare measured and simulated maximum water levels
- 64 measurement stations across all five extratropical cyclones



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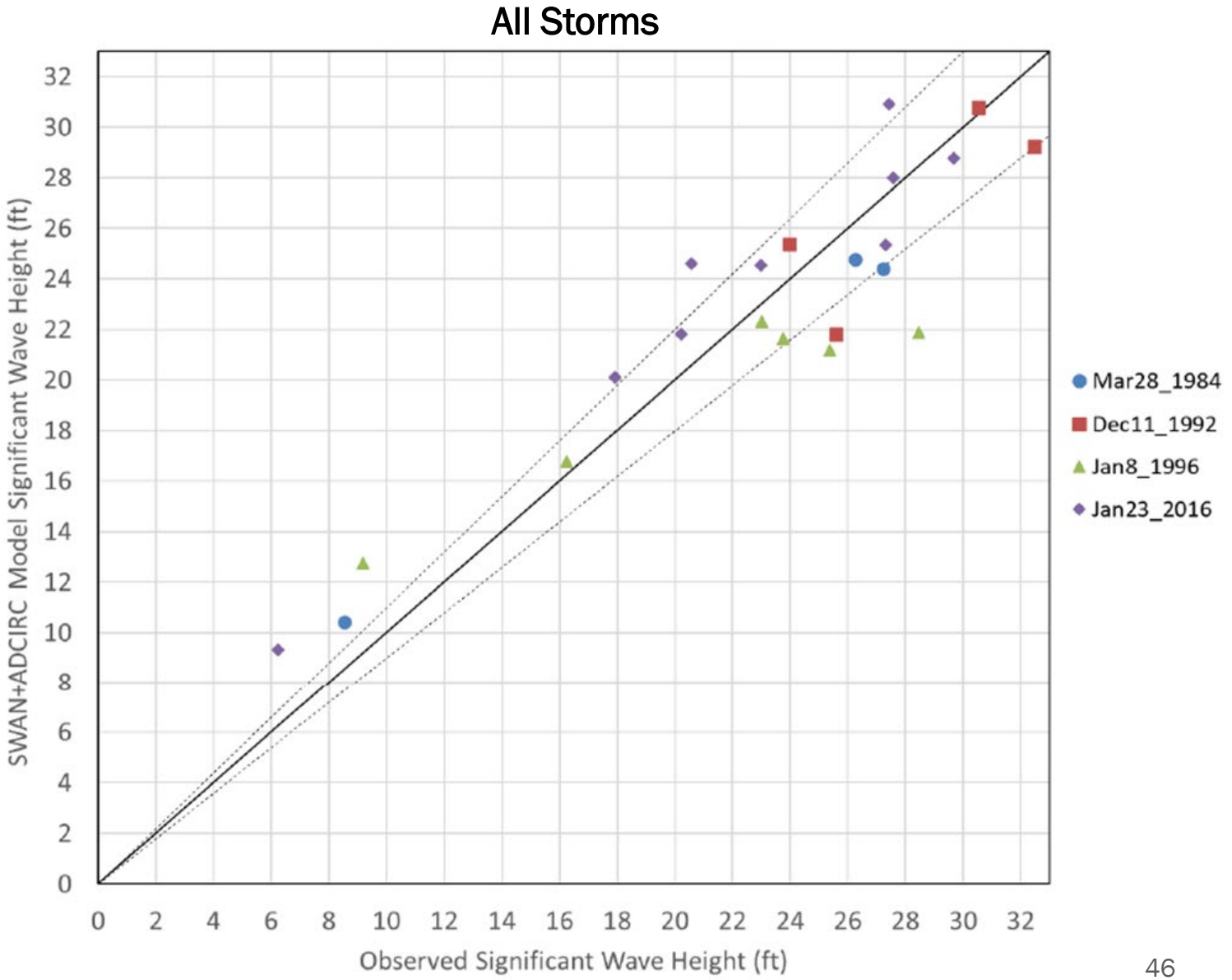
Storm Surge Study: Extratropical Cyclone Storm Validation, Waves

- Compare measured and simulated maximum significant wave heights
- 22 measurement stations for four extratropical cyclones
  - No buoys with data near project area for November 1950 storm
- Also develop for Peak Wave Period



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Storm Surge Study: Extratropical Cyclone Storm Validation

- Summary Review
  - Five extratropical cyclones as part of initial validation set
  - Holistic view of extratropical cyclones and study area with multiple error metrics developed for each storm and for entire five-storm suite
  - Comparisons made to adjacent FEMA Coastal Storm Surge Studies to demonstrate the Coastal Restudy validation metrics show proper model validation
- Error metrics for all 64 measurement stations across the five-storm suite
  - Mean Error = 0.40 feet
  - Mean Absolute Error = 0.50 feet

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Tropical Cyclone Production Runs
Joint Probability Method – Optimum Sampling (JPM-OS)

- Once the ADCIRC + SWAN model is validated, move into production runs for extratropical and tropical cyclones
- Tropical cyclone analysis will feature synthetic tropical cyclones based on parameters recorded in historical record of tropical cyclones for project area
- Study will apply a JPM approach to handle this
- Initial JPM-OS storm suite will contain approximately 150 to 180 tropical cyclones
  - Based on IDS 1 Section 7 Tropical Cyclone parameter distributions
  - IDS 2 Section 2 will document JPM development
- Execute initial JPM storm suite, examine results, and develop next iteration of storms (~100 storms)

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Preview of Intermediate Data Submittal (IDS) 3 and 4

IDS 3

- Summarizes storm surge runs and frequency analysis
- Expected release in winter 2021/2022

IDS 4

- Summarizes nearshore hydraulics
- Expected release in 2022

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Update on Production Runs

Tropical Cyclone Production Runs

Not started

+

Extratropical Cyclone Production Runs

Plots in review

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Questions?

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Coastal Restudy Phase 2

Data Collection

Field Reconnaissance

Transect Layout

Coastal Restudy Phase 2: Wave Hazard Analysis

Define cross-shore transects

Evaluate storm-induced erosion and shore protection structures

Wave hazard modeling: overland wave propagation and wave run-up/ overtopping

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Ongoing Data Tracking

- Monitor new release of topographic datasets:
  - Available: 2020 USACE NAN Topobathy LiDAR DEM NJ/NY, 2020 Compass Fugro LiDAR for NJ shoreline sections
  - Not Available Yet: 2020 NFWF Coastal Wetland NJ Topobathy LiDAR, 2018 South New Jersey 3DEP QL2 LiDAR, 2018 Westchester 3DEP QL2 LiDAR
- Monitor new release of aerial imagery
- Leverage appeal information
- Catalogue effective and in-process LOMRs
- Track evolution of beach nourishment projects in coordination with NJDEP/USACE Philadelphia/USACE New York

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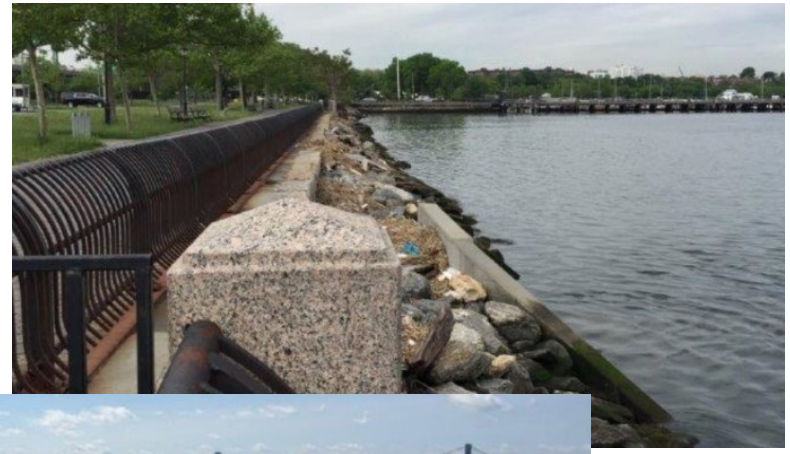
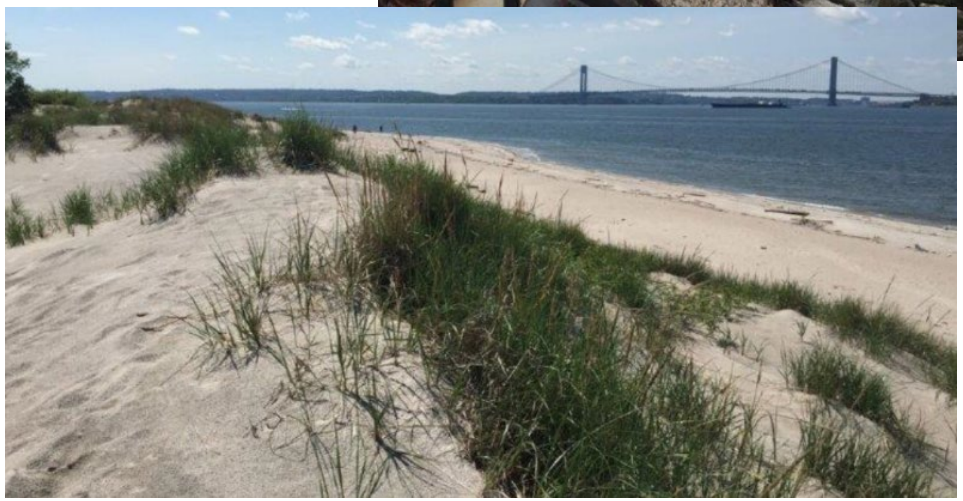
Field Reconnaissance Preparation – New York City

- Field visits planned for spring 2021
- Reconnaissance sites prioritized based on a tiered approach (high, medium, low)
- Coordination with local officials will occur ahead of the field work to ensure awareness of the crews in the field
- Web-based portal will be used for instant upload and data review
- Crew members will enforce COVID-19 health prevention measures





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Preliminary Transect Layout – New York City

- Preliminary transect layouts have been developed to account for:
  - Topographic changes
  - Land use changes (buildings, vegetation, etc.)
  - New coastal structures/waterfront development
  - Better representation of waves in sheltered areas
  - Areas of prior appeals
- Increased transect density: 18% Bronx County, 11% Kings County, 25% New York County, 9% Queens County, 18% Richmond County
- CAP provided review and concurrence

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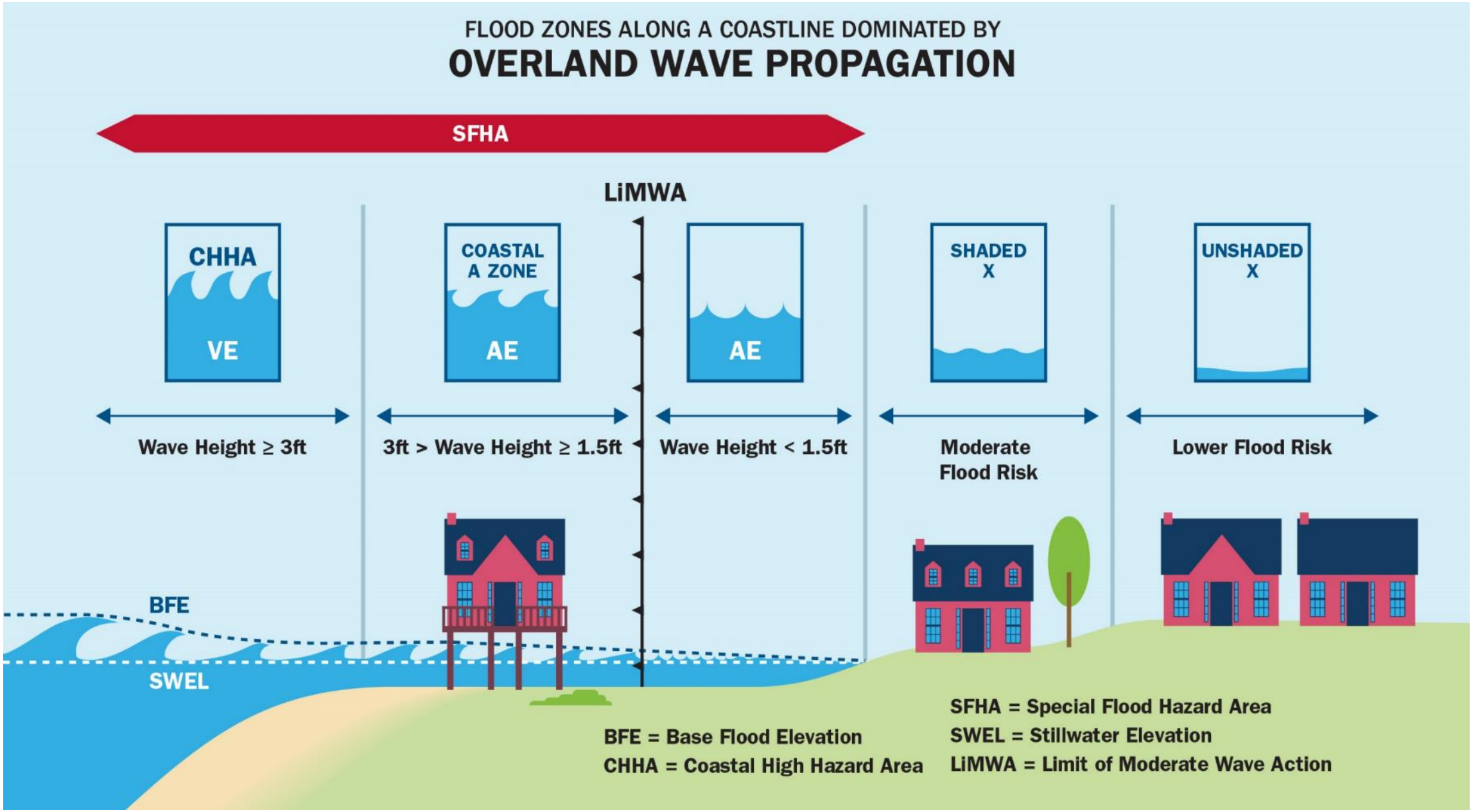
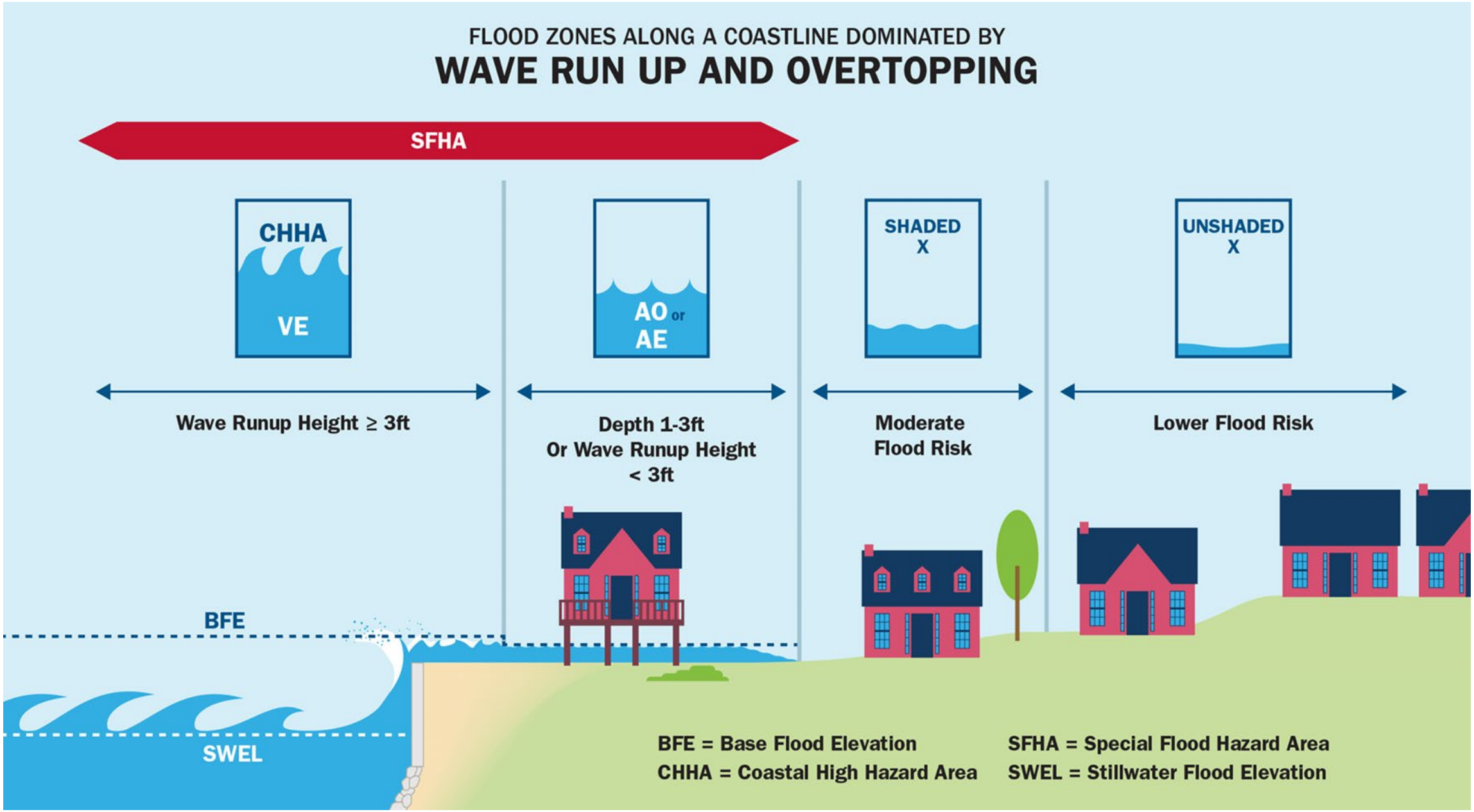
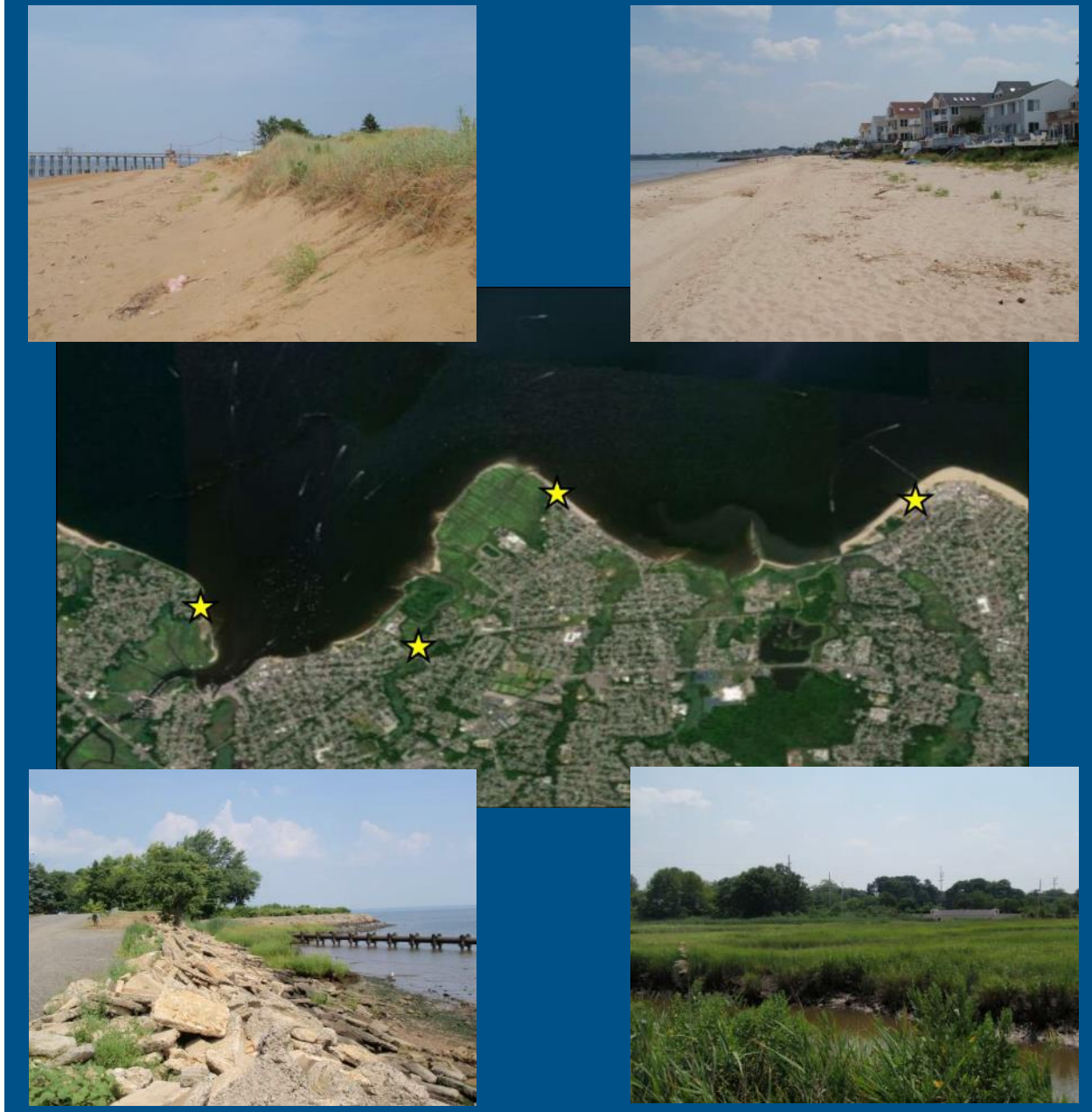

FLOOD ZONES ALONG A COASTLINE DOMINATED BY
OVERLAND WAVE PROPAGATION
SFHA
LiMWA
CHHA
VE
COASTAL A ZONE
AE
AE
SHADED X
UNSHADED X
Wave Height ≥ 3ft
3ft > Wave Height ≥ 1.5ft
Wave Height < 1.5ft
Moderate Flood Risk
Lower Flood Risk
BFE
SWEL
BFE = Base Flood Elevation
CHHA = Coastal High Hazard Area
SFHA = Special Flood Hazard Area
SWEL = Stillwater Elevation
LiMWA = Limit of Moderate Wave Action


FLOOD ZONES ALONG A COASTLINE DOMINATED BY
WAVE RUN UP AND OVERTOPPING
SFHA
CHHA
VE
AO or
AE
SHADED
X
UNSHADED
X
Wave Runup Height ≥ 3ft
Depth 1-3ft
Or Wave Runup Height
< 3ft
Moderate
Flood Risk
Lower Flood Risk
BFE
SWEL
BFE = Base Flood Elevation
CHHA = Coastal High Hazard Area
SFHA = Special Flood Hazard Area
SWEL = Stillwater Flood Elevation

Upcoming Milestones

Coastal Restudy: Upcoming Milestones

- **Fall 2020-Spring 2021** – Ongoing Field Reconnaissance
- **Winter 2020-2021** – Finalization of IDS 2
- **Winter 2021-2022** – IDS 3 Water Levels and Waves
- **2021-2023** – IDS 4 Nearshore Hydraulics and IDS 5 Flood Hazard Mapping
- **Fall 2021** – Next Outreach Meetings
- **Ongoing** – Bi-annual Newsletters



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Questions and Discussion

We want to hear from you!

POLL

Did today's presentation share the right level of detail on the Coastal Restudy?

1) Yes
2) No, I wanted more detail
3) No, I prefer a general update

Let's stay connected!

POLL

Have you received our bi-annual newsletters?

1) Yes
2) I don't know - I will share my email in the chat!
3) No - I will share my email in the chat!

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Thank You!

Challenges, Innovation, The Way Forward