

# **In the Wake of Hurricane Sandy**

**Presented by:**

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Port Authority Of New York and New Jersey**

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# Port Authority of NY & NJ



## Aviation

John F. Kennedy International Airport  
LaGuardia Airport  
Newark Liberty International Airport  
Stewart International Airport  
Teterboro Airport

## Bridges

Bayonne Bridge  
George Washington Bridge  
Goethals Bridge  
Outerbridge Crossing

## Bus Terminals

Port Authority Bus Terminal  
George Washington Bridge Bus Terminal  
Journal Square Transportation Center

## Port Commerce

Port Jersey-Port Authority Marine Terminal  
Brooklyn-Port Authority Marine Terminal  
Elizabeth-Port Authority Marine Terminal  
Howland Hook Marine Terminal  
Port Newark

## Tunnels

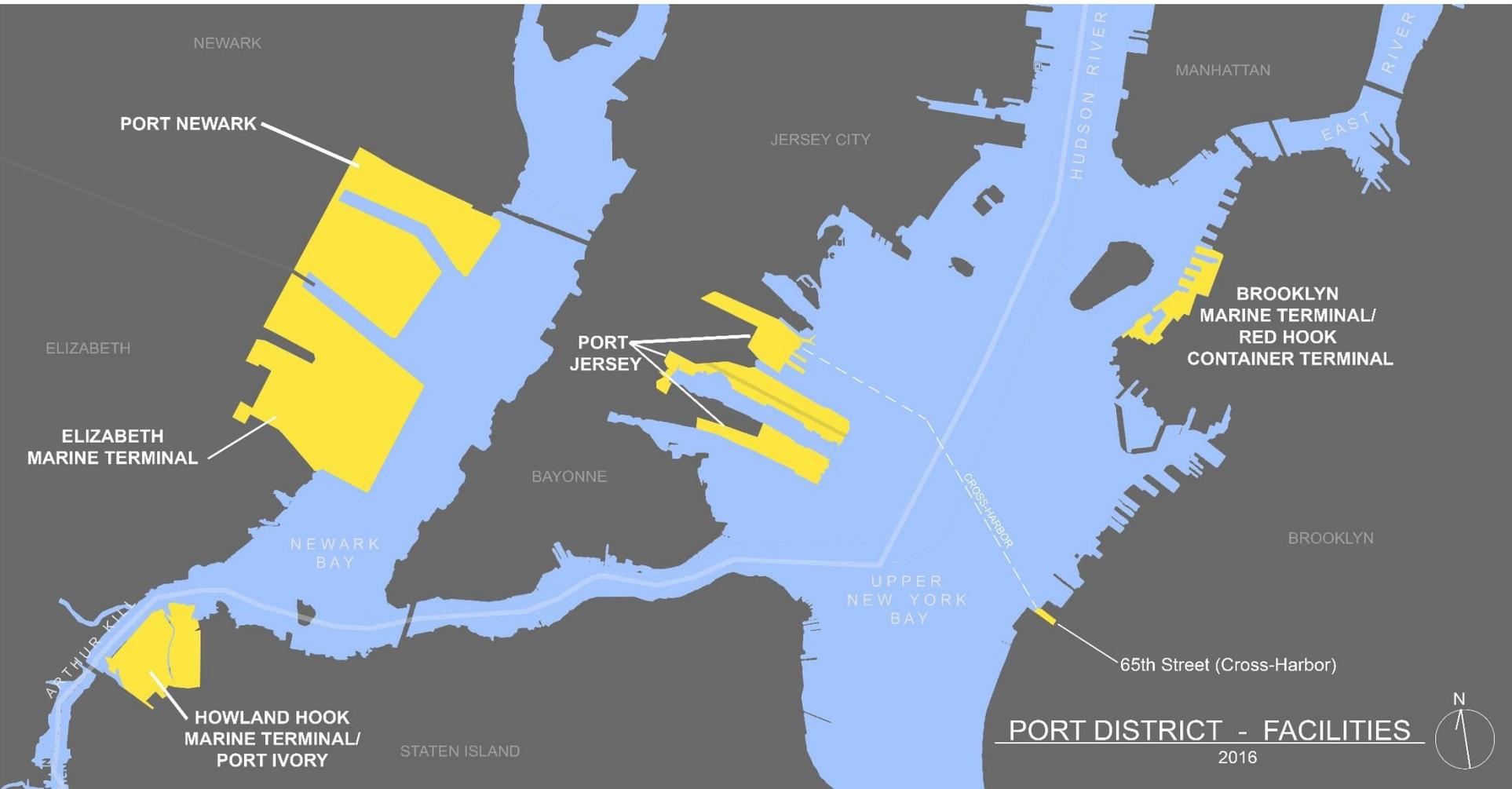
Holland Tunnel  
Lincoln Tunnel

## Rail

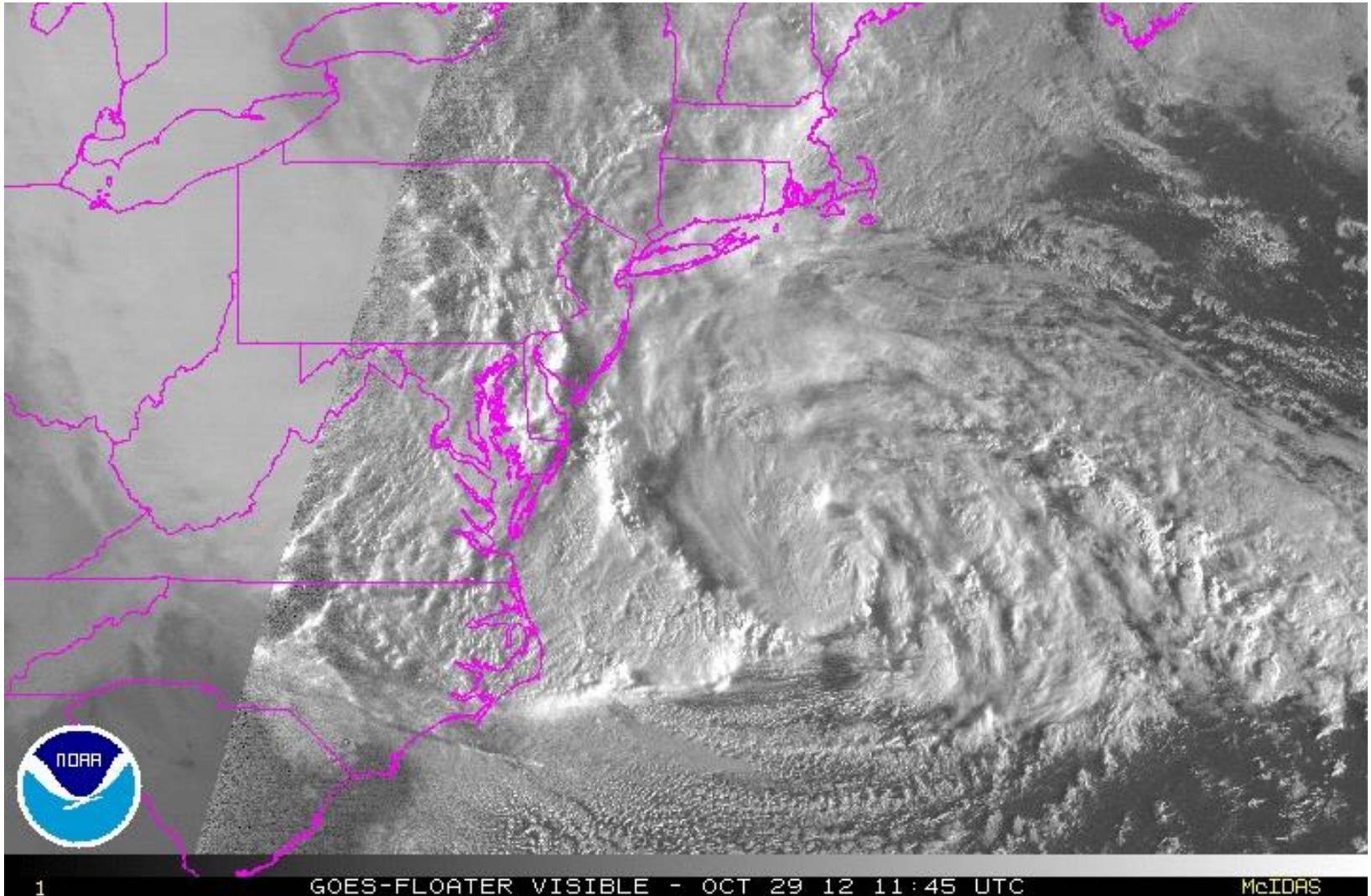
Journal Square Transportation Center  
PATH Rail Transit System

## World Trade Center

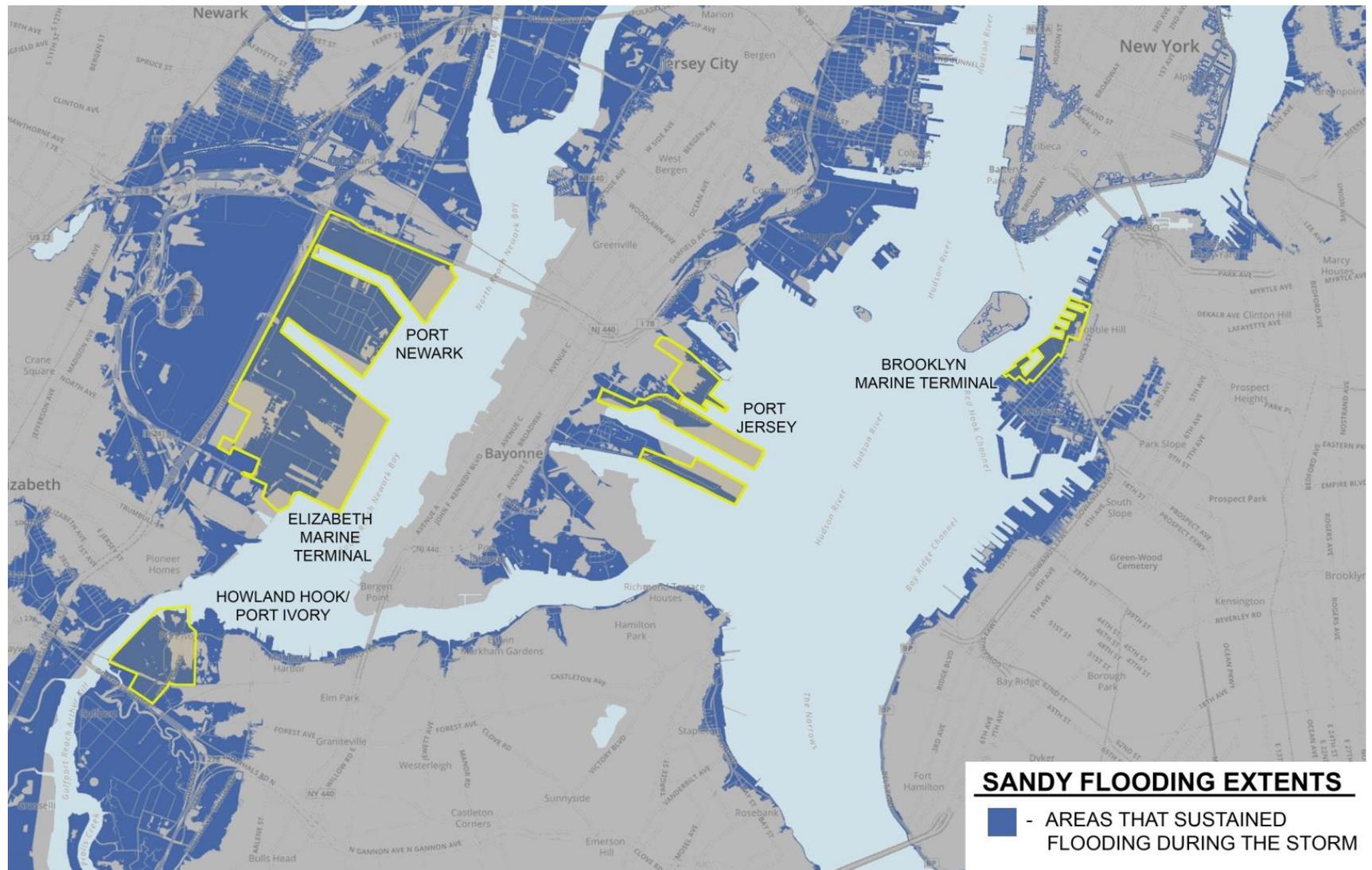
# Our Port Facilities



# Sandy - Preparation



# Storm Surge Map



Map Source: WNYC - [project.wnyc.org/flooding-sandy-new](http://project.wnyc.org/flooding-sandy-new)

Based on Nov. 11, 2012 interim data from the FEMA Modeling Task Force Hurricane Sandy Impact Analysis, which combines detailed elevation data with U.S. Geological Survey inspections of high water marks.

## *During the Storm*

- Not much could be done
- Keep staff safe
- Hunker down

# Damages Incurred



# Recovery Timeline

- Tues, Oct. 30 - Assessment, response, recovery and restoration begins
- Friday, Nov. 2 – USCG re-opens Port to deep draft commercial traffic
- Friday, Nov. 2 - First vessel arrival at PA facilities = *Brilliance of the Seas at Cape Liberty*
- Sat. Nov. 3 - Power restored at Elizabeth
- Sun. Nov. 4 – Maher / APM work 5 vessels
- Mon. Nov. 5 – Truck gates at all container terminals opened for business
- Mon./Tues. Nov. 5 & 6 – All remaining container terminals work their first vessels

# *What We Learned*

- We can do a better job protecting some critical infrastructure but will not be able to prevent all threats
- Fuel and Electrical Power were key to restoration
- Keeping all personnel out of harms way until after the storm allowed us to quickly get refocused and response was effective
- Communications with other government agencies, tenants and our own work force was vital
- Effective control over the port by Port Authority Police resulted in no deaths or serious injuries and no criminal activity during restoration
- Hurricane Plans, based on previous sever weather events were useful but needed updating.

# *Two Track Approach*

Harden the Target

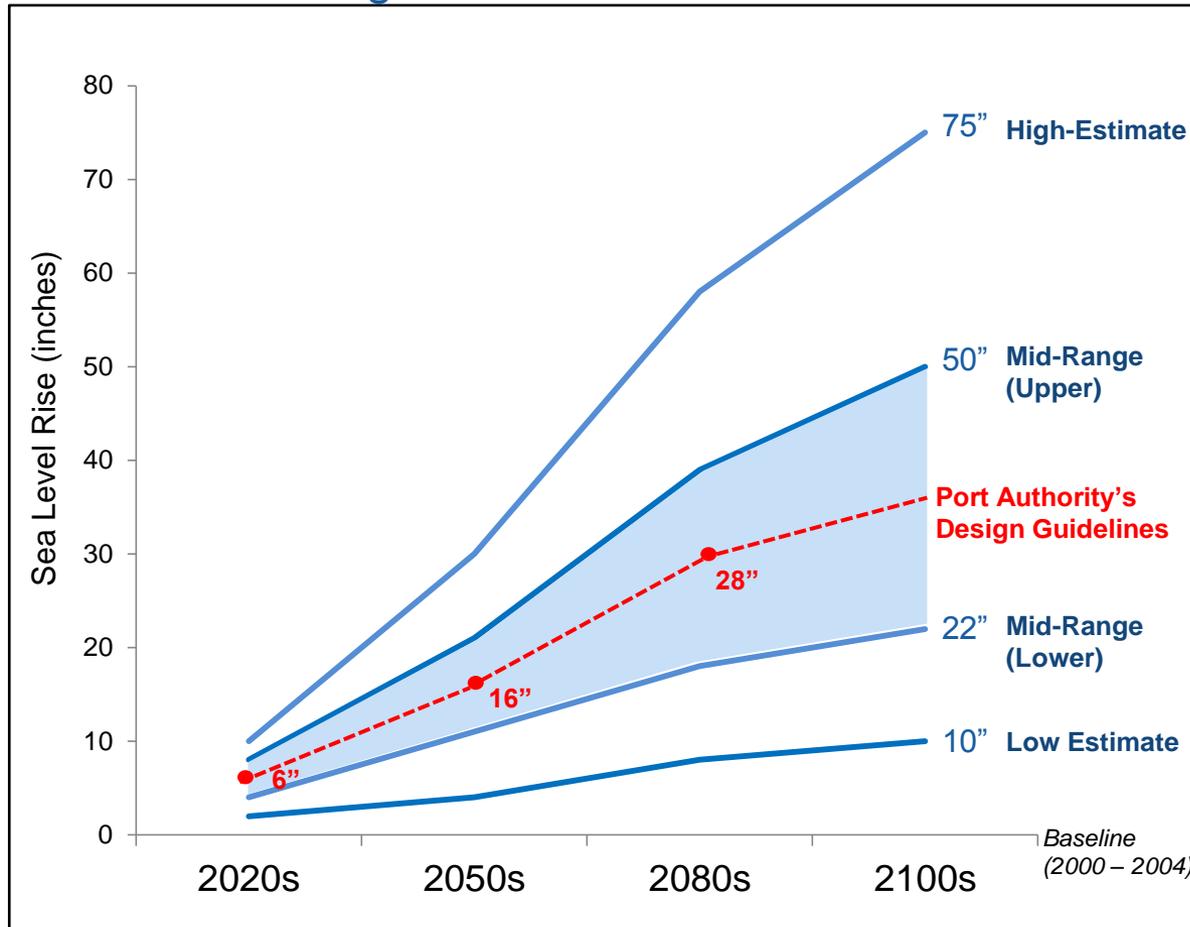
Improve Planning and Organization

# *Infrastructure Improvements*

- Repaired, Restored, Replaced actual damage
- Undertook certain mitigation measures
- Taking a long term view with Resiliency as the goal
  - Working with Regional, State and Federal Agencies
  - Taking advantage of outside resources
  - Established Agency Steering Committee
  - Prioritizing projects and integrating into future operating and capital budgets

# Addressing Climate Risk at Port Commerce

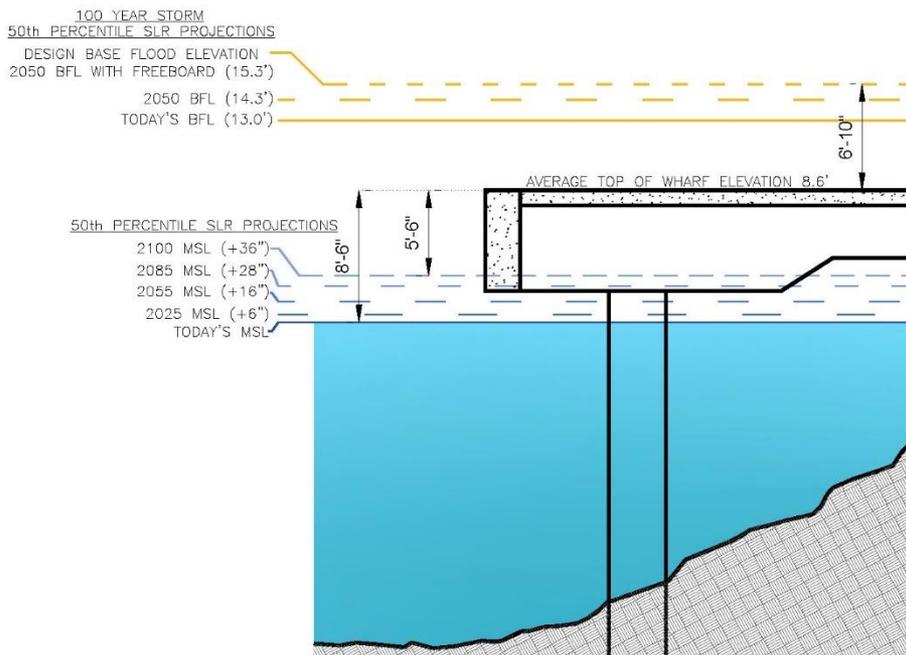
## New York City Panel on Climate Change 2015 Regional Mean Sea Level Rise



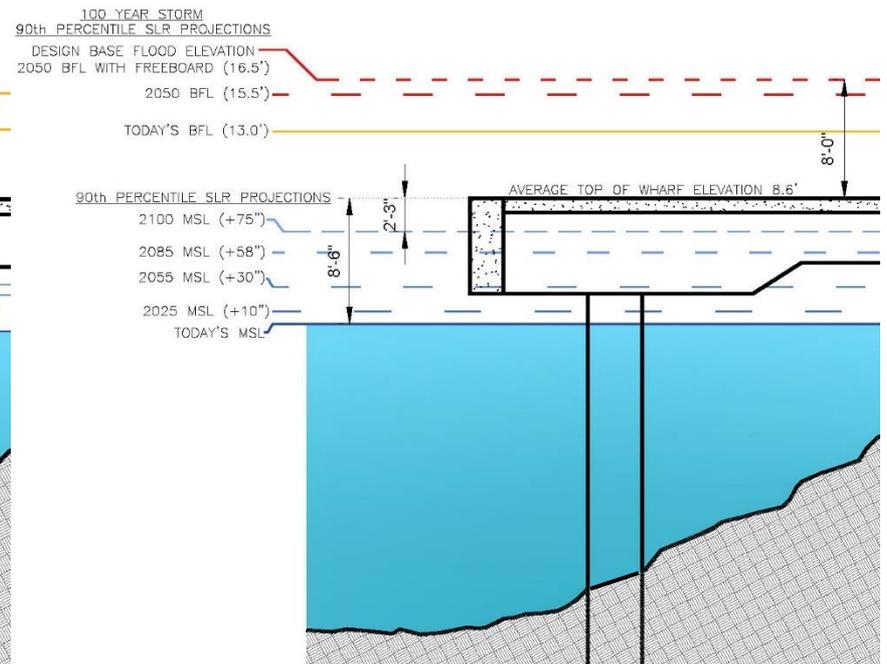
Source: NASA Goddard Institute, Columbia University (2015),  
Applicable to Port District and Recommended for Port Authority adoption by OEEP

# 2014 Hurricane Mapping – Port Jersey

- Typical at grade elevation is 8.6 ft. (NAVD88) at our wharf structures
- 100 year flood elevation for this area 13 ft. – not including sea level rise (PFIRM, 2014)
- Need to elevate equipment nearly 7 ft. based upon PA design guidelines



**Wharf Structure with 50<sup>th</sup> Percentile SLR**



**Wharf Structure with 90<sup>th</sup> Percentile SLR**

## ***What We Are Doing Differently***

- Incorporate Design Resiliency Guidelines in all capital projects going forward
- Evaluate electrical substations, traffic and rail signals, pump stations and other fire protection systems for latent damage
- Evaluate localized power/electric stations fueled by natural gas and/or diesel to service key infrastructure
- Evaluate vertical parking structures
- Perform a complete asset inventory, assess useful remaining life and replacement costs

# *What We Are Doing Next*

- Sharing data
- Utilizing various resiliency strategies
  - Adapting systems
  - Relocating when possible/ needed
  - Elevating new equipment
  - Retrofitting existing structures to better protect them
- Assessing increased sea level data affects on our business planning
- Integrating the these sea level rise projections into our long term vision and in our current master planning effort

# *Facility Improvements*

- Elevated terminal electrical infrastructure
- Protected backup data centers
- Doubled backup transformer capacity
- Elevated refrigerated cargo storage racks
- Reinforced shore crane hurricane tie downs



Global Container Terminal  
Elevated Generator and  
Electrical Systems

# *Adaptation Options*



Elevation



Relocation



Protection



Adaptation

## *Improving Planning and Organization*

- **All Hazards Approach to Planning**
- **Upgraded Contingency Plans**
- **Improved Training and Exercise Protocols**
- **Closer Coordination with Partners Before the Event**
- **Better Use of Data**

# ***RESILIENCE***