

Image: National Hurricane Center

Super Storm Sandy

The Port Authority of NY & NJ



Presentation Outline

- Overview of Port Authority Facilities
- The Storm
- Facility Damage
- Resiliency Efforts

Port Authority District Map



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

Agency Preparedness

Increasingly Detailed & Focused Weather Reports

Activated Agency Emergency Operations Center (EOC)

- EOC Interacts with other Regional EOCs to Coordinate Incident Response

Business Continuity Plans for each Department



The Storm – Timeline

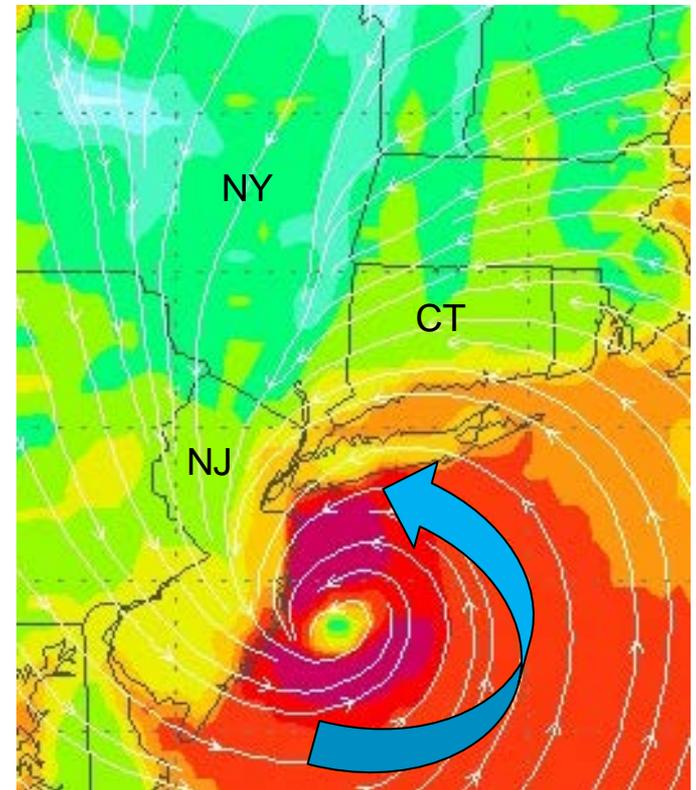
Sandy Landfall at 11:30PM Monday 10/29

Closures:

- All Facilities except Stewart Airport, PA Bus Terminal, and Lincoln Tunnel were closed prior to landfall.

Site Visits / Inspections:

- Begin morning of 10/30 after storm abated
- 39 separate requests for damage assessments which included multiple facilities and structures





The Storm

Most devastating effect of Sandy was the storm surge:

- Corresponded to High Tide 8:26 PM during a Full Moon
- Occurred during a Spring Tide
 - Approx. 20% Higher than Typical High Tide
- Direct Path into NY and NJ

Recorded storm surge heights:

- 14.06 ft - The Battery, Lower Manhattan (above Mean Lower Low Water (MLLW))
- 13.31 feet - Sandy Hook, NJ

Wind gusts up to 90 mph – No sustained winds above 74 mph
(Post -Tropical Cyclone)



Immediate Damages

Limited Wind Damage – Sustained Winds < 74 mph

Flood Damage across most coastal facilities

No Major Structural Deficiencies Found

Significant Electrical and Architectural Deficiencies



Aviation Facilities



Kennedy Airport
ILS pier deck impacted



Newark Airport
Bridge wing walls
partially washed away



LaGuardia Airport
Pier damaged
Flooding on Airfield

Port Commerce Facilities



- Runaway barge collided with Greenville Yd - transfer bridge
- Transfer bridge has been demolished
- Many buildings and electrical infrastructure was flooded.



- Port Newark – barge lifted 8 ft. onto Berth 2
- Inspection revealed no damage to berth

PATH Tunnels and Stations



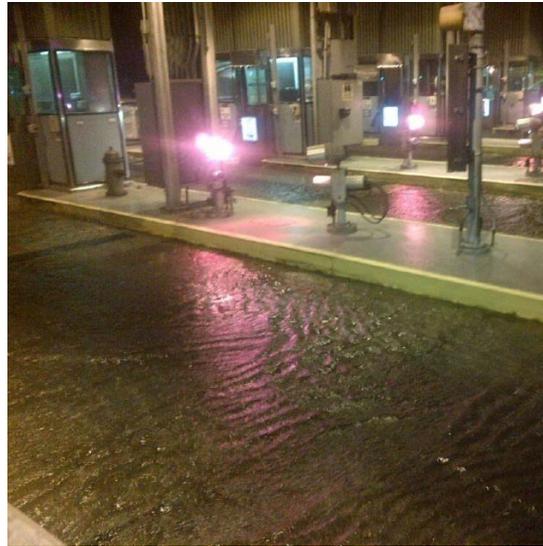
- Extensive Flooding of PATH Tunnels, Stations and Substations

- Significant damage to power traction systems, signals, elevators, escalators, and other electrical devices

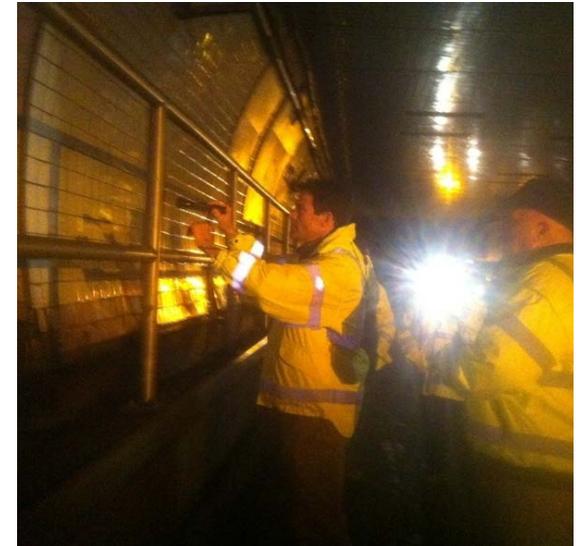
Bridge and Tunnels Facilities – Holland Tunnel



- HT Flooding through vent buildings



- HT Flooding through North Portal



- Post-storm inspections

Lincoln Tunnel, PA Bus Terminal:

- No Flooding, Remained Open



Immediate Resiliency Efforts

High-level list of mitigation strategy projects assembled

- Includes very preliminary cost ranges and durations
- Emergency Generators, Flood Control, Drainage, Electrical System

Internal Mitigation Team Established:

- Storm Mitigation and Resilience Office
- Office of Emergency Management
- Business Departments
- Finance
- Engineering Department

Short Term Protective Measures including Water Intrusion Protection – Implementation Ongoing

Water Intrusion Protection Measures



Concrete Bin Blocks

- Open areas
- Water heights < 4'

2,600 Linear Feet
99% Complete
Construction Estimate: \$1.25m



**Concrete Barriers
(Cast in Place)**

- Constrained Areas
- Smooth finish surface

3,000 Linear Feet
90% Complete
Construction Estimate: \$6.6m



HESCO Barriers

- Industrial areas
- Water heights > 4'

8,800 Linear Feet
82% Complete
Construction Estimate: \$.6m

Water Intrusion Protection Measures



Stop Logs

- Install before event
- Doors, station entrances, and vents

6,300 Linear Feet
70% Complete
Construction Estimate: \$8.4m



Water Filled Barriers

- Install before event
- Low-water level situations
- Roadways

300 Linear Feet
100% Complete
Construction Estimate: \$.7m



Aqua Fence

- Water heights up to 7'
- Narrow profile

70 Linear Feet
100% Complete
Construction Estimate: \$.1m



Further Design Criteria Enhancements

Level of flood protection considers:

- Asset life expectancy
- Asset criticality
- Risk of flood occurrence

Utilize final FEMA flood elevation maps

Establish Flood Elevation

- Design base: 100 yr flood elevation
- Increase elevation from 18" to 55"



Resiliency Efforts – Long Term

Participation in the New York City Building Resiliency Task Force reviewing building codes for inclusion of resiliency strategies.

Development of Resiliency Design Guidelines for:

- Increased Sea Level Rise and Frequency of Storms
- Increased Precipitation
- Increased Frequency of Heat Waves

Thank You – Questions?

