

**MTA Climate Adaptation  
Task Force**

**2019 Resiliency Report**  
Update on  
agency-wide climate  
resiliency projects



***"Climate change is an undeniable scientific fact. Period.  
To deny climate change is to deny reality."***

**Andrew M. Cuomo  
Governor, State of New York  
July 18, 2019**



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**“Superstorm Sandy threw the MTA the biggest curve ball in a generation and this report details how we rose to the challenge. From the smallest manhole cover to the flood barrier surrounding Coney Island Yard; we strengthened our system’s resiliency for extreme climate events. While there is always more to be done, we are very proud of what we have accomplished to date.”**

**Patrick J. Foye, MTA Chairman & CEO**  
 Metropolitan Transportation Authority  
 2019

## The Maturing of Climate Adaptation at the MTA

The Climate Adaptation Task Force (“the Task Force”) was formed by the MTA Chairman & CEO in 2013, one year after Superstorm Sandy caused unprecedented destruction to virtually every part of the MTA system. Boats washed up onto commuter railroad tracks, the Hugh L. Carey tunnel and all but one subway river tubes flooded, and power and communications suffered extensive damage. In the end, nothing was spared.

In the immediate aftermath of Sandy, both the MTA and the metropolitan region we serve found resilience in operational means. The MTA NYCT Department of Buses set up a bus bridge to transport passengers that the flooded subway river tubes could not. When the Rockaways connecting line was washed away, the NYCT Department of Subways transported subway cars on trucks to the coastal Queens community to ensure their service would resume. The MTA met the challenge in order to keep people moving.

The next phase was one of analysis and design. The Task Force played a key role in gathering information and bringing consultants, vendors, and employees of non-MTA agencies (New York City DOT, The Port Authority of New York & New Jersey, and New Jersey Transit) to share and learn from one another’s experiences. Members of the Task Force heard presentations, visited sites to see product demonstrations, and in some instances specified the use of these products for MTA projects. New standards evolved with structural designs to adapt to this new normal we were now facing. One design standard in particular stands out: the Design Flood Elevation – the height that flood waters are expected

to rise to in a future storm, and therefore the height against which we must defend our facilities. This new standard was arrived at through extensive analysis. Eventually, the commuter railroads, NYCT, and B&T all settled on different Design Flood Elevations:

Agency	Design Flood Elevation
NYCT	Category 2 + 3’
MNR	ABFE + 4’
LIRR	ABFE +4’
B&T	500 year flood

Now, more than five years after the Task Force was established, most projects reported on in the 2017 Resiliency Report are either significantly underway or completed. At street level, we built flood gates into flood-prone train station entrances, while hatches and manhole covers were redesigned to withstand large volumes of standing water. Underground, marine cabling replaced the regular wiring in the under-river tubes to increase flood resiliency. This current iteration of the Resiliency Report focuses on the work that has been completed thus far in addition to providing updates on the larger, more complex projects that remain in progress.

Climate science is ever-changing. The Task Force is committed towards keeping MTA climate adaptation in lock-step with what the latest science is telling us. This will ensure that the latest analyses, models, and projections are baked into MTA climate preparedness as we move forward.

**Project Updates** (All project updates as of 1/14/2019)

**MTA New York City Transit Subways and Staten Island Railway**  
**148th Street Portal**

*Project Description:* Located where tracks emerge from the subway to the above-ground terminal station, the 148th Street Portal is extremely vulnerable to flooding from the nearby Harlem River. The project will mitigate flooding of the portal and adjacent tunnels through a system of flood logs that can be deployed within hours of an oncoming storm. This replaces the labor-intensive and less reliable temporary wooden barrier demonstrated below.

Update	Resiliency
<i>Dollars Committed</i>	\$5.0m
<i>Progress</i>	4%
<i>Expected</i>	End of 2021



FIGURE 1: PROTECTION OF 148 STREET PORTAL BEFORE SUPERSTORM SANDY.



FIGURE 2: RESTORED MONTAGUE TUBE.



FIGURE 3: NEWLY INSTALLED WATERTIGHT DOORWAY.

## Project Updates

### MTA New York City Transit Subways and Staten Island Railway

#### Montague Street Tube

*Project Description:* During Superstorm Sandy, the Montague Tube, the under-river subway tube servicing the R subway line, flooded at a length of roughly 4,000 feet and a depth of 20 feet with 27 million gallons of debris-filled saltwater. The extensive damage suffered from the storm required complete shutdown of the tube from August 2013 - September 2014. In addition to restoration, resiliency measures completed in this project included the installation of marine cabling, hardening of pump systems, and protecting the electrical facilities with watertight doors

<b>Update</b>	<b>Restoration</b>	<b>Resiliency</b>
<i>Dollars Committed</i>	\$189.7m	\$56.4m
<i>Progress</i>	100%	100%
<i>Expected</i>	Completed, March 2015	Completed, March 2015

## Project Updates

### MTA New York City Transit Subways and Staten Island Railway

#### St. George Terminal

*Project Description:* St. George serves as the Staten Island Railway’s main terminal. Superstorm Sandy flooded all twelve tracks and overwhelmed the terminal’s drainage capacity. In addition to restoration, this project includes resiliency measures such as a permanent flood barrier, improved drainage systems, and more water resistant, recycled plastic track tie infrastructure.

Update	Restoration	Resiliency
<i>Dollars Committed</i>	\$115.3m	\$73.5m
<i>Progress</i>	100%	2%
<i>Expected</i>	Completed, March 2017	Mid-2021

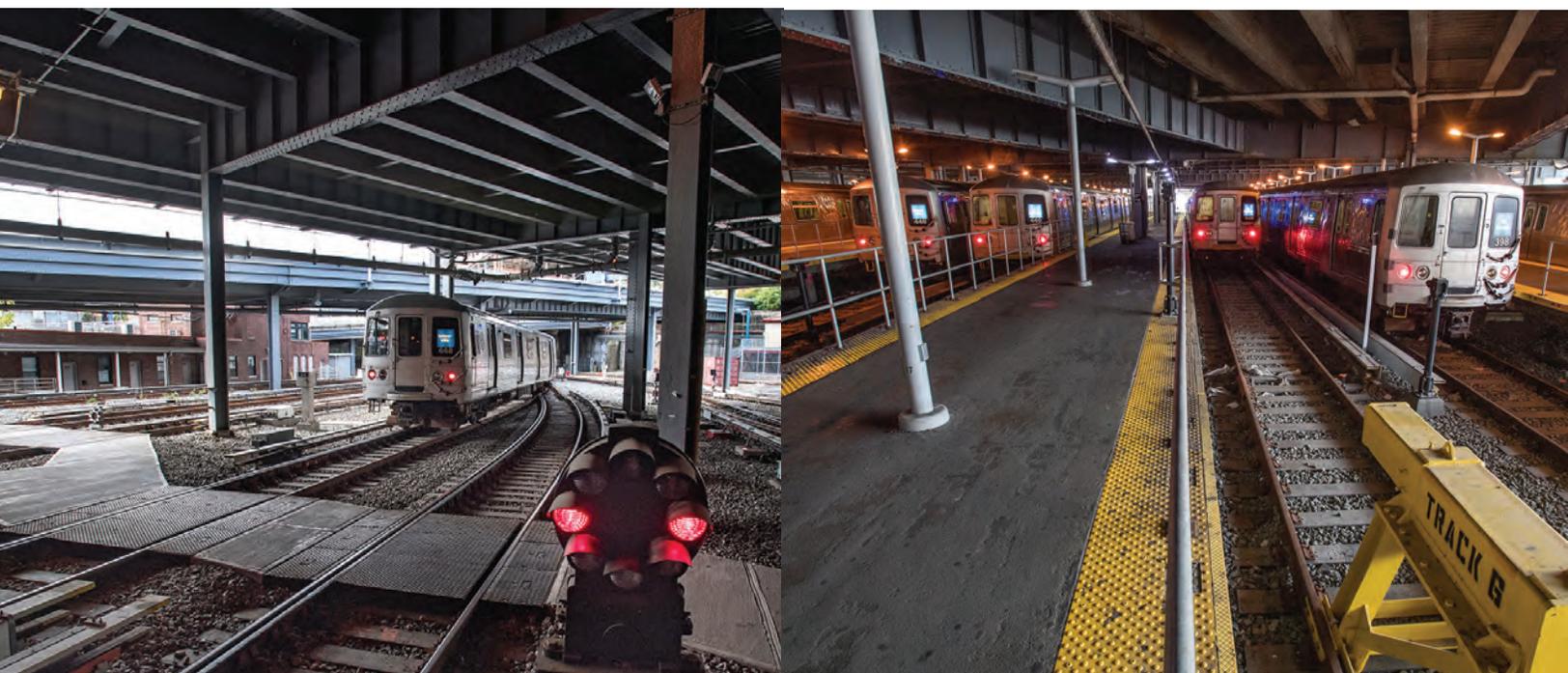


FIGURE 4: ST. GEORGE TERMINAL WITH NEW, FLOOD RESILIENT RECYCLED PLASTIC TIES.



FIGURE 5: INSTALLATION OF THE PERMANENT PERIMETER FLOOD BARRIER AT CONEY ISLAND YARD.

## Project Updates

### MTA New York City Transit Subways and Staten Island Railway

#### Coney Island Yard

*Project Description:* After Superstorm Sandy caused extensive flooding in this critical train yard, near-term and long-term flood mitigation measures were implemented to address critical climate vulnerabilities. Near-term projects include a temporary perimeter barrier and improved drainage to prevent pooling. Longer-term projects, funded entirely by an FTA resiliency grant, include a permanent flood barrier wall and drainage improvements.



Near-term projects include a temporary perimeter barrier and improved drainage to prevent pooling. Longer-term projects, funded entirely by an FTA resiliency grant, include a permanent flood barrier wall and drainage improvements.

Update	Restoration	Resiliency: Near Term	Resiliency: Long Term
<i>Dollars Committed</i>	\$200.7m	\$13.2m	\$516m
<i>Progress</i>	7%	100%	4%
<i>Expected</i>	End of 2023	Completed, February 2015	End of 2023



**Project Updates**

**MTA New York City Transit Subways and Staten Island Railway**

**Rockaway Line**

*Project Description:* The Rockaway A subway line is an above-ground and low-level track that suffered extensive damage during Superstorm Sandy. Track and key system restorations are complete and future resiliency measures include the protection of critical assets with a 13,000 foot dual-purpose flood and debris wall.

<b>Update</b>	<b>Restoration</b>	<b>Resiliency</b>
<i>Dollars Committed</i>	\$75.4m	\$221.5m
<i>Progress</i>	100%	26%
<i>Expected</i>	Completed, December 2013	TBD



FIGURE 6: DUAL PURPOSE FLOOD AND DEBRIS WALL INSTALLED AROUND HAMMELS WYE FACILITY AND FAR ROCKAWAY BRANCH.





## MTA Bus Company and New York City Transit Buses

### Michael J. Quill Bus Depot

*Project Description:* This project will enhance the roof protection at Michael J. Quill Bus Depot. A new mesh debris shield is near completion along the parapet edge and the exterior west-facing wall of the roof. This project is also part of the MTA's Small Business Federal Mentoring Program (SBFMP).

FIGURE 7: DEBRIS WALL ON THE PERIMETER OF THE MICHAEL J. QUILL BUS DEPOT.

Update	Resiliency
<i>Dollars Committed</i>	\$3.2m
<i>Progress</i>	92%
<i>Expected</i>	Mid-2019

### Far Rockaway Bus Depot

*Project Description:* This project repaired damages to the Far Rockaway Depot that occurred as a result of Superstorm Sandy. Work focused on the bus maintenance and service areas, interior office spaces, employee facilities, various fixed/non-fixed equipment, electrical distribution equipment, and flood proofing of the facility.

Update	Resiliency
<i>Dollars Committed</i>	\$11.4
<i>Progress</i>	100%
<i>Expected</i>	Completed, November 2018

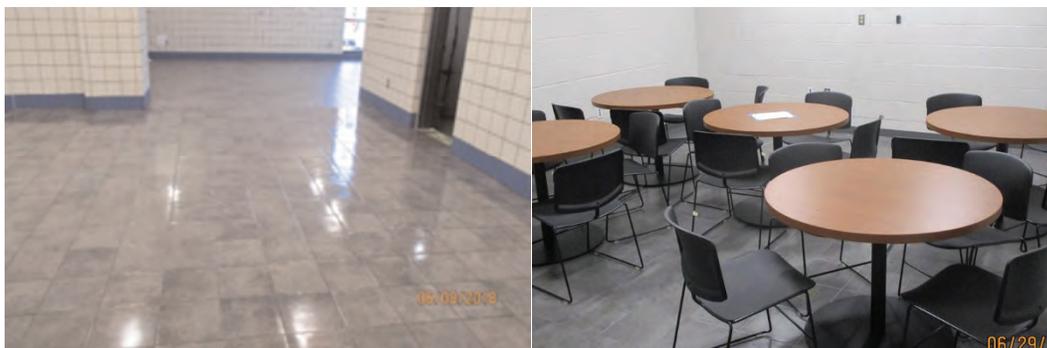


FIGURE 8: WATERPROOF FLOOR AND WALL TILING.

FIGURE 9: RAISED CROTON HARMON (top) AND TARRYTOWN (bottom) SUBSTATIONS.



## MTA Metro-North Railroad

### Substations

*Project Description:* The scope requires the raising of three specific DC traction power substations on the Hudson Line that were damaged by Superstorm Sandy. The Hudson Line substations included in this scope are Riverdale, Tarrytown, and Harmon Yard.

<b>Update</b>	<b>Resiliency</b>
<i>Dollars Committed</i>	\$45.6m
<i>Progress</i>	89%
<i>Expected</i>	Mid-2019

### Harlem River Lift Bridge Facility House Restoration

*Project Description:* As a result of Superstorm Sandy, flooding occurred at the Manhattan and Bronx substation locations of the Harlem River Lift Bridge. This flooding caused extensive damage to equipment, which is critical for MNR's traction and bridge facility power. The project scope is to add alternative, resilient forms of power supply for the bridge control through a power tie cable transfer connection via a micro-tunnel between Manhattan and the Bronx.

<b>Update</b>	<b>Resiliency</b>
<i>Dollars Committed</i>	\$7.6m
<i>Progress</i>	67%
<i>Expected</i>	Early 2020

### Hudson Line Mitigation Project

*Project Description:* The Sandy Hudson Line Power/C&S Infrastructure Design-Build Project replaces existing damaged, degraded, or destroyed critical power and C&S (communications and signals) systems infrastructure along the flood prone MNR Hudson Line, making these systems more resilient in order to prevent or limit future damage that would degrade power and C&S electrical continuity.

<b>Update</b>	<b>Resiliency</b>
<i>Dollars Committed</i>	\$33.2m
<i>Progress</i>	37%
<i>Expected</i>	Early 2021

FIGURE 11: SWITCH MACHINE INSTALLED IN LEAD INTERLOCKING



FIGURE 10: SIGNAL CASE ON ELEVATED PLATFORM



## MTA Long Island Rail Road

### Long Beach Branch Signal and Communications Systems

*Project Description:* Replacement of damaged signal, power and communications system components and cabling along the right-of-way of this low-elevation, coastal commuter rail line. Specific systems include grade crossings and station platforms; central instrument locations at Long Beach Yard and Lead Tower; signal huts, impedance bonds and battery sets; grade crossings including manholes, conduit, cabling, gates, cases and control huts; signal cabling, aerial messenger cable and cases; communications network cabling, aerial messenger cable and cases which support the communication network; communications equipment rooms at station buildings; third rail cabling and conduits, and switch boxes; and station platform lighting at Oceanside and Island Park, including cabling, conduits, poles, fixtures and lamps.

Update	Resiliency
<i>Dollars Committed</i>	\$68.6m
<i>Progress</i>	63%
<i>Expected</i>	End of 2021

### Long Beach Branch Substations

*Project Description:* Replace three Long Beach Branch substations at Oceanside, Oil City and Long Beach Yard damaged by Superstorm Sandy storm surge flooding.

Update	Resiliency
<i>Dollars Committed</i>	\$50.1m
<i>Progress</i>	100%
<i>Expected</i>	Completed, January 2018



FIGURE 12: FROM LEFT TO RIGHT, RAISED SUBSTATIONS AT OCEANSIDE, OIL CITY, AND LONG BEACH.



FIGURE 13: PORTAL FLOOD GATE AT HLCT MANHATTAN WEST IN CLOSED POSITION

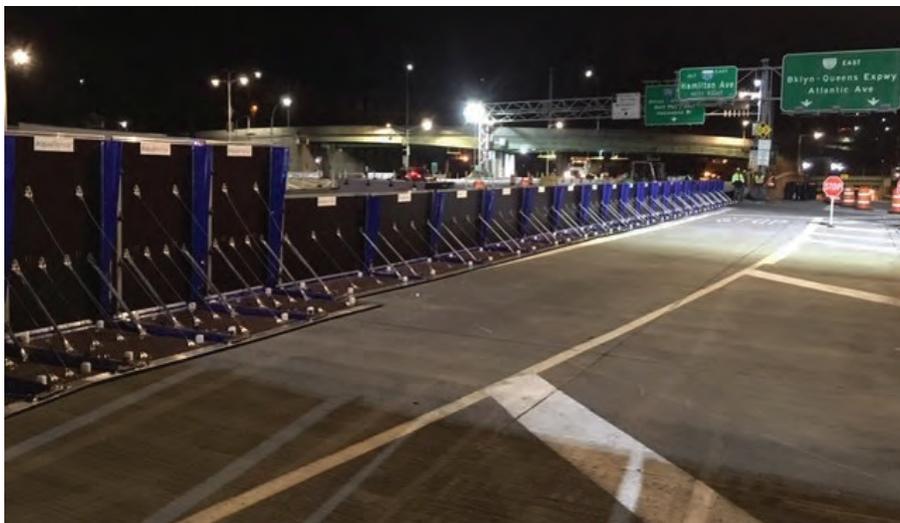


FIGURE 14: RAISED SEAWALL AT GOVERNORS ISLAND VENTILATION BUILDING



FIGURE 15: DEPLOYABLE AQUAFENCE BARRIERS

## MTA Bridges & Tunnels

### Hugh L. Carey Tunnel

*Project Description:* The Hugh L. Carey Tunnel flooded with approximately 60 million gallons of saltwater during Superstorm Sandy. Short-term adaptations for this high-trafficked, Manhattan-Brooklyn connection included flood-proofing and relocating the data center above FEMA 500-year flood level. Long-term adaptations included the installation of deployable and permanent barriers at each tunnel plaza to form a protected perimeter, installation of hinged steel flood gates at tunnel portals, installation of emergency generator, installation of seawall at Governors Island Ventilation Building, replacement of drainage pumps, and other flood mitigation measures.

Update	Restoration	Resiliency
<i>Dollars Committed</i>	\$312.8m	\$54.5m
<i>Progress</i>	100%	100%
<i>Expected</i>	Completed, March 2018	Completed, December 2018

### Rockaway Bridges (Marine Parkway Bridge & Cross Bay Bridge)

*Project Description:* Two toll bridges, the Marine Parkway Bridge and the Cross Bay Bridge, on the Rockaway Peninsula suffered flood damage during Superstorm Sandy. Resiliency efforts included repairing the seawall and shoreline and raising the elevation of electrical equipment and substations.

Update	Restoration	Resiliency
<i>Dollars Committed</i>	\$22.7m	
<i>Progress</i>	100%	100%
<i>Expected</i>	Completed, 2013	Completed, 2018



FIGURE 16: RESTORED SEAWALL AND PEDESTRIAN WALKWAY AT MARINE PARKWAY BRIDGE



FIGURE 17: RESTORED ABUTMENT AT CROSS BAY BRIDGE

FIGURE 18: DIGITAL RENDERING OF A SOLAR PANEL INSTALLATION AT THE CONEY ISLAND MAINTENANCE FACILITY



## Looking Ahead...

**Roofs are an important asset** in both climate adaptation and mitigation. As part of our climate adaptation portfolio, the MTA has planted green roofs to absorb precipitation, reduce storm water discharge, and alleviate the urban heat island effect. These initiatives, however, do come with a capital cost. Looking forward, as we expand our focus to include climate mitigation, we are continuing to leverage roofs as an asset, but with an alternative financing structure.

On Earth Day 2019, the MTA launched the MTA Solar initiative to generate clean, emission-free electricity that will open a new frontier of untapped revenue: leasing industrial roof space and commuter parking lots to companies for solar power development.

The MTA has identified more than 100 bus depots, train yards, repair shops, and commuter lots across all MTA agencies – totaling more than 10 million square feet – that are suitable for solar development. Fully realized, these properties present an opportunity to develop more than 100 megawatts of emission-free electricity for New Yorkers – enough to power 18,000 households. The MTA hopes to achieve a significant new revenue stream from this activity, with little to no capital investment of its own. MTA Solar creates a new path for the MTA to lead in Climate Change mitigation.

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