



# Climate Resiliency at MWRA

Frederick A. Laskey Executive Director

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- Currently, we average 104 rain events per year with an average of 44 inches of rainfall
- Models suggest we'll see longer dry spells with shorter, heavier rain
- An overall modest increase in total rainfall
- Flooding during the January and March Nor'easters in 2018 impeded access to several MWRA facilities



### No Longer A Theory: State Street, Boston – March 2018





# Charlestown Navy Yard – March 2018





## Eastern Avenue, Chelsea – March 2018



## Shirley Street, Winthrop – March 2018







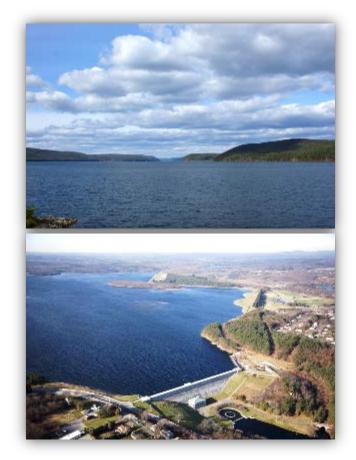
# Nut Island, Quincy – March 2018





#### Preparing for Climate Change: Drinking Water System Is In Good Shape

- Quabbin Reservoir, Belchertown
  - 65 miles west of Boston
  - Elevation 528 feet
- Wachusett Reservoir, Clinton
  - 35 miles west of Boston
  - Elevation 395 feet
- Water treatment plant is in Marlborough
- 85% of water delivered by gravity
- Lowest elevation of a water tank is 192 feet above sea level





• All MWRA dams, dikes, spillways and appurtenances are inspected routinely by licensed dam safety engineers and are in good condition

• MWRA has spent over \$22 million on dam safety projects

• Quabbin and Wachusett spillways have been improved to be able to discharge the probable maximum flood



## Quabbin Spillway Rehab











## Wachusett Crest Gate





- Deer Island plant fully protected
  - 100-year flood
  - 1.9-foot (0.6 meter) sea level rise
  - Wave run-up of 14 feet (4.3 meters) on east side and 2 feet (0.6 meter) on west side
  - Nut Island headworks in Quincy similarly designed for sea level rise



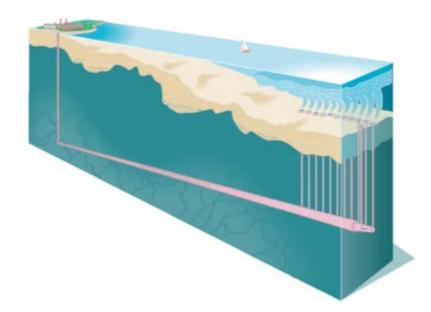


• On-site power plant ensures uninterrupted power supply to keep the plant operating for up to 90 days

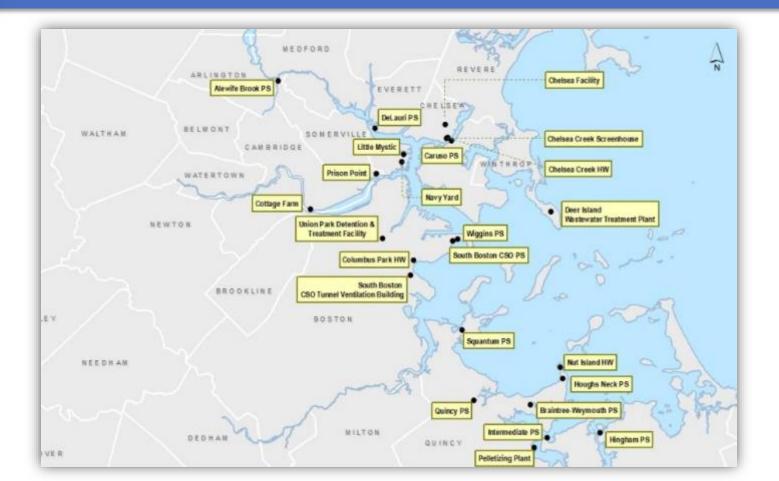




- The effluent from the sewage treatment plant is discharged by gravity to the 9.5-mile outfall tunnel
- To maintain hydraulic capacity, plant process tank elevation raised 1.9 feet and tunnel diameter was up-sized from 24 feet to 24.25 feet



#### **MWRA Coastal Facilities**





• Most of our staff and equipment is at our Chelsea Facility off of Eastern Avenue, across from the Chelsea Creek



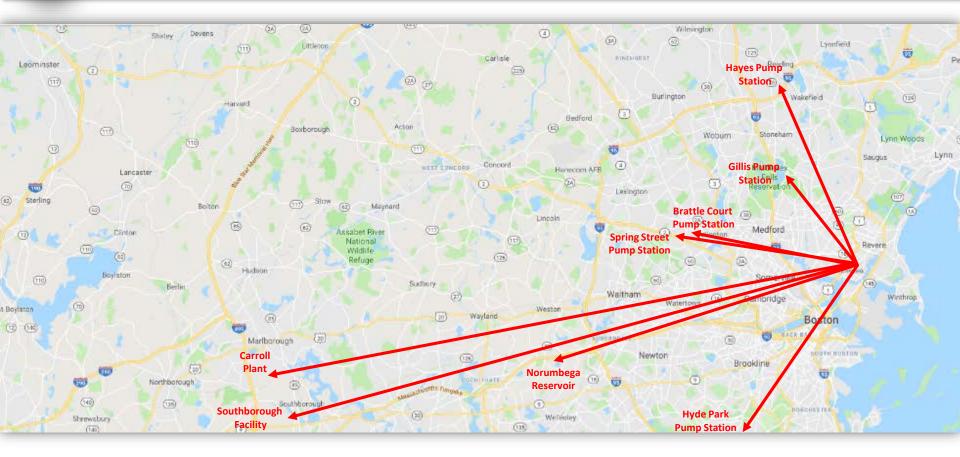


• Back-up water and wastewater operations control center created at Carroll Treatment Plant in Marlborough





### Plans to Pre-deploy Staff and Equipment to Higher Ground





- 100 year flood as determined by FEMA
- 100 year flood + 2.5 feet (NYC DEP, BHA)
- Hurricane flooding levels as determined by FEMA's SLOSH model (current evacuation planning recommendation) were reviewed
- Wave action (for facilities adjacent to FEMA Hazard Zone VE) was reviewed



- Short-term
  - At-risk buildings are being fitted with temporary flood barriers
  - Expanding fuel storage at wastewater stations
- Long-term
  - Facility rehabilitation on a 20-year cycle
  - Future rehabilitation contracts will include protection measures
- May have to speed things up



#### **Flood Elevations At Chelsea Creek**



#### Southwest Facility View

#### **Backup Generator**



#### Flood Elevations At Chelsea Creek Headworks





## New Flood Control Measures Are Being Added







## Chelsea Headworks



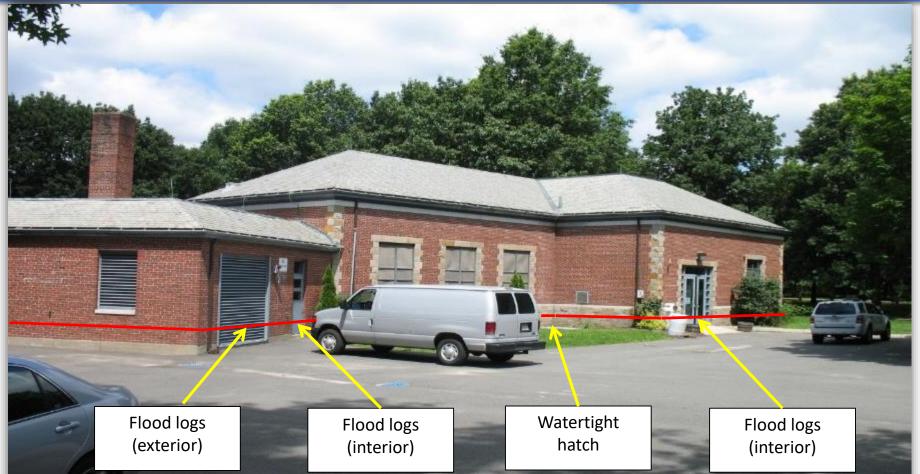


# Chelsea Headworks





### **Alewife Brook Pump Station**





## Alewife Brook Pump Station





## Alewife Brook Pump Station





- 191 miles of sewer Cured-In-Place Pipe liner installed
- 160 miles of sewer replaced
- 6,804 manholes rehabilitated/sealed









- Metro Mayors Coalition
- EEA Municipal Vulnerability Preparedness Program
- City of Boston
- Mystic River Watershed Association
- Boston Harbor Now



 MWRA works closely with its customer communities, providing training on Emergency Action Plans and guidance assistance with vulnerability assessments

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