



Adapting to the New Normal: MWRA's Approach to Climate Change Resiliency

Michael O'Keefe
Senior Program Manager, Planning
&
Stephen Estes-Smargiassi
Director of Planning and Sustainability

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Wastewater Advisory Committee



Early Adaptation for Sea Level Rise in the Design of Deer Island

- Deer Island plant protected from:
 - FEMA 100-year flood
 - Nearly 2 feet of sea level rise
 - Wave action of 14 feet on east side and 2 feet on west side



MWRA COASTAL FACILITIES





Feeling the Impacts of Flooding for Years





Approach to Adaptation

- Understand the potential impacts
 - Assess what facilities are vulnerable and prioritize
- Act quickly to mitigate impacts
 - No perfect models
 - Site-specific, multi-tool approach
- Develop institutional standards to create long-term resiliency

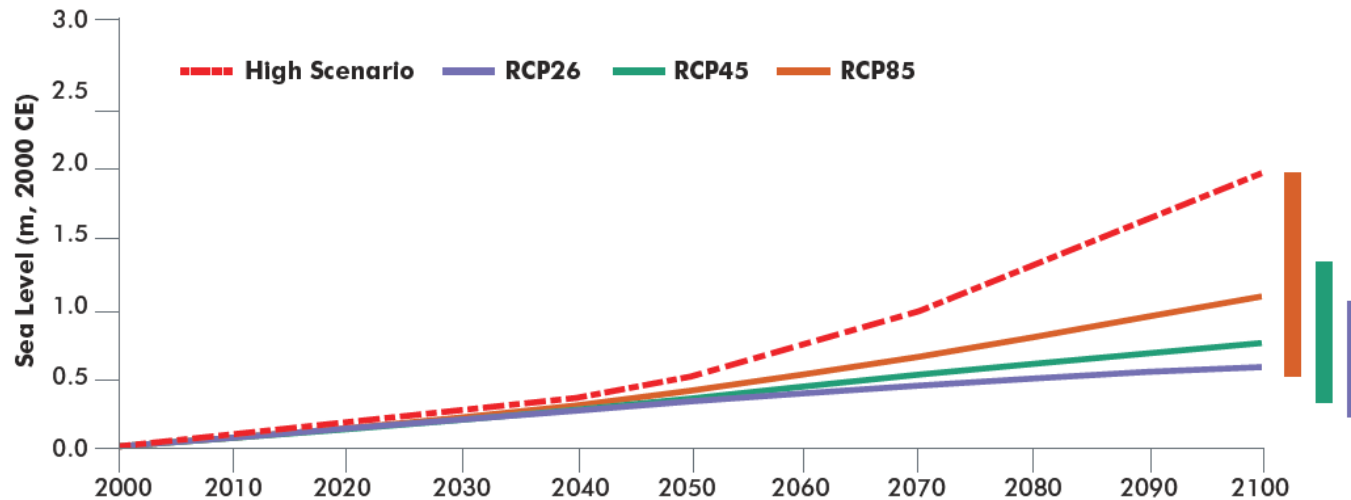


Image from Greater Boston Research Advisory Group, 2022



Initial Benchmarks For Evaluating Facilities

- 100 year FEMA flood
- **Add 2.5 ft of sea level rise – conservative estimate**
- *Wave action was reviewed for relevant facilities*

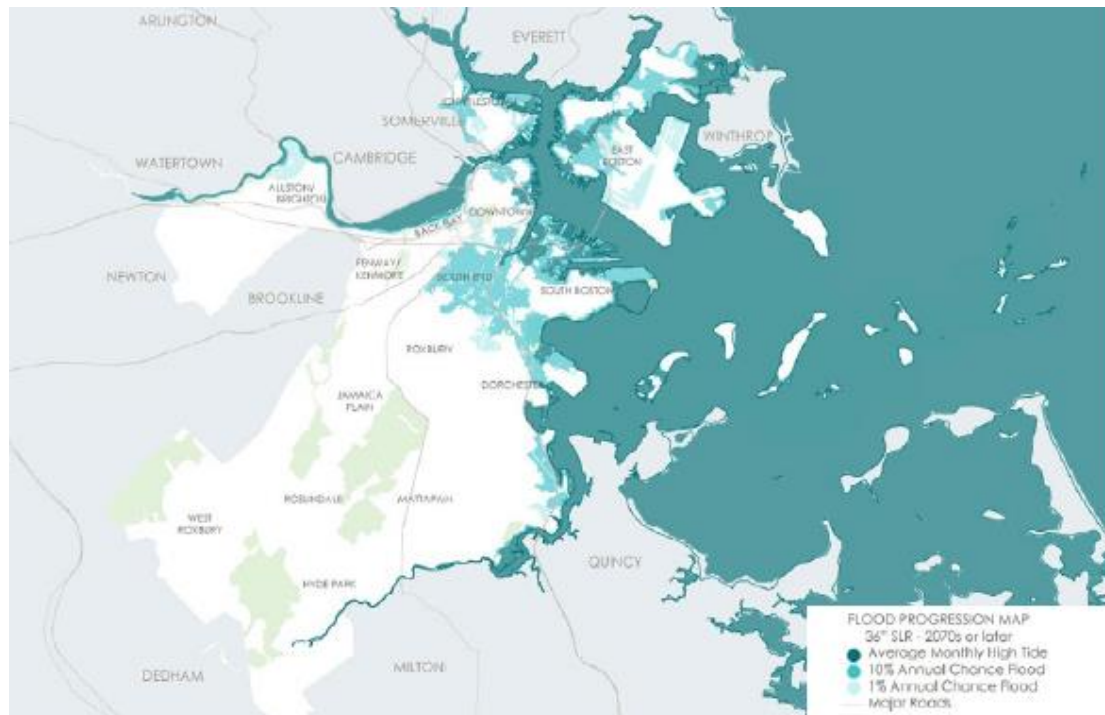
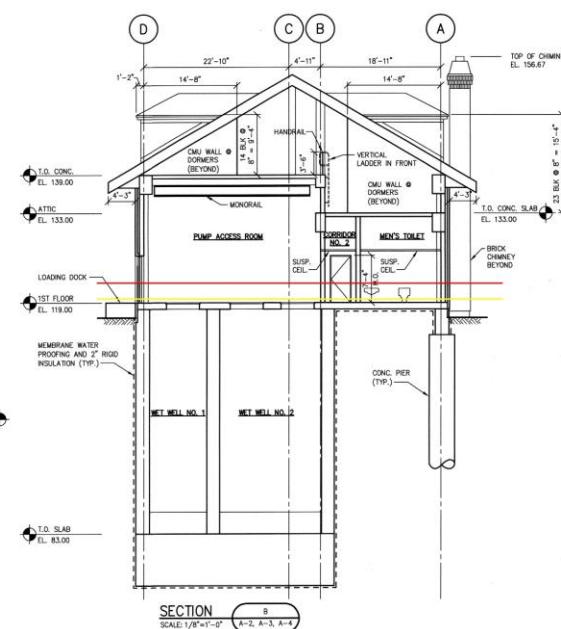
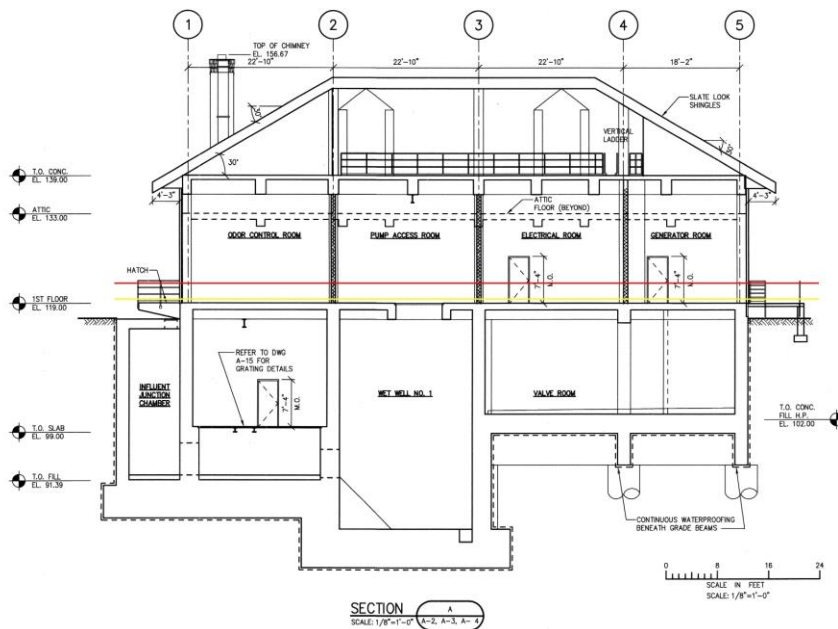


Image from Climate Ready Boston, 2016



Facility Assessment Strategy

- Reviewed record drawings for all 30 coastal facilities to identify lowest elevations
 - Usually first floor, but also underground hatches
- Performed site-specific inspections to note critical equipment elevation
- Performed inundation analysis using LiDAR data





Facility Vulnerability Ranking

Flood Level	Facility Ranking	Facility Name	Depth (ft)	
			100yr	100yr+2.5
Flooding During 100yr Storm	1	PELLETIZING PLANT	3.42	5.92
	2	HOUGHS NECK PUMP STATION	2.63	5.13
	3	SQUANTUM PUMP STATION	2.53	5.03
	4	ALFORD ST FACILITY	1.93	4.43
	5	QUINCY PUMP STATION	1.73	4.23
	6	CHELSEA CREEK SCREENHOUSE	1.43	3.93
	7	BRAINTREE-WEYMOUTH PUMP STATION	0.93	3.43
	8	SOUTH BOSTON CSO TUNNEL	0.43	2.93
Flooding Within 1ft of Elevation of 100yr Storm	9	S BOSTON CSO PUMP STATION	-0.07	2.43
	10	CHARLESTOWN NAVY YARD	-0.30	2.20
	11	ALEWIFE BROOK PUMP STATION	-0.67	1.83
	12	CHELSEA CREEK HEADWORKS	-0.69	1.81
	13	UNION PARK TREATMENT FACILITY	-0.82	1.68
Flooding During 100yr+2.5ft Storm	14	MYSTIC RIVER GATEHOUSE	-1.07	1.43
	15	CHELSEA ADMIN FACILITY	-1.32	1.18
	16	CHELSEA MAINTENANCE FACILITY	-1.40	1.10
Flooding Within 1ft of Elevation of 100yr+2.5ft	17	DEER ISLAND	-3.00	-0.50
	18	WIGGINS PUMP STATION	-3.19	-0.69
	19	COTTAGE FARM CSO FACILITY	-3.35	-0.85

Flood Level	Facility Ranking	Facility Name	Depth (ft)	
			100yr	100yr+2.5
No flooding During 100yr+2.5ft storm	20	DELAURI PUMP STATION	-3.57	-1.07
	21	CARUSO PUMP STATION	-3.57	-1.07
	22	PRISON POINT CSO FACILITY	-3.57	-1.07
	23	SOMERVILLE CSO FACILITY	-5.57	-3.07
	24	COLUMBUS PARK HEADWORKS	-6.69	-4.19
	25	SOMERVILLE SAMPLING BUILDING	-6.82	-4.32
	26	WARD STREET HEADWORKS	-7.57	-5.07
	27	INTERMEDIATE PUMP STATION	-7.82	-5.32
	28	LITTLE MYSTIC CHANNEL CSO	-8.57	-6.07
	29	HINGHAM PUMP STATION	-10.37	-7.87
	30	NUT ISLAND HEADWORKS	-14.07	-11.57

- 8 Sewer Facilities Likely Affected by a 100 Year Event
- 4 Sewer and 1 Administration Facilities Within One foot of a 100 Year Event
- 3 Sewer Facilities Affected by 100 plus 2.5 ft SLR



Flood Elevations At Chelsea Creek Headworks





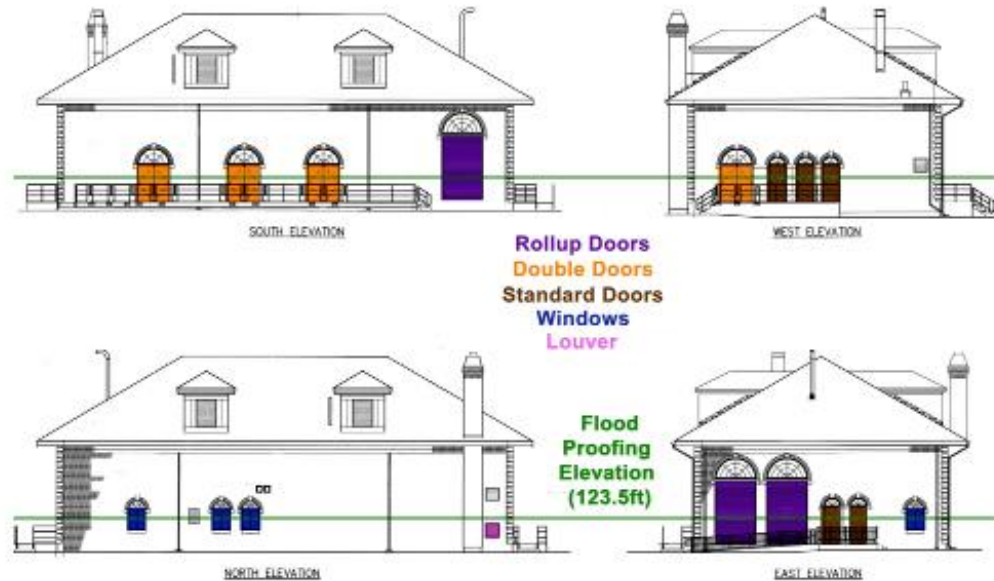
Braintree Weymouth Pump Station



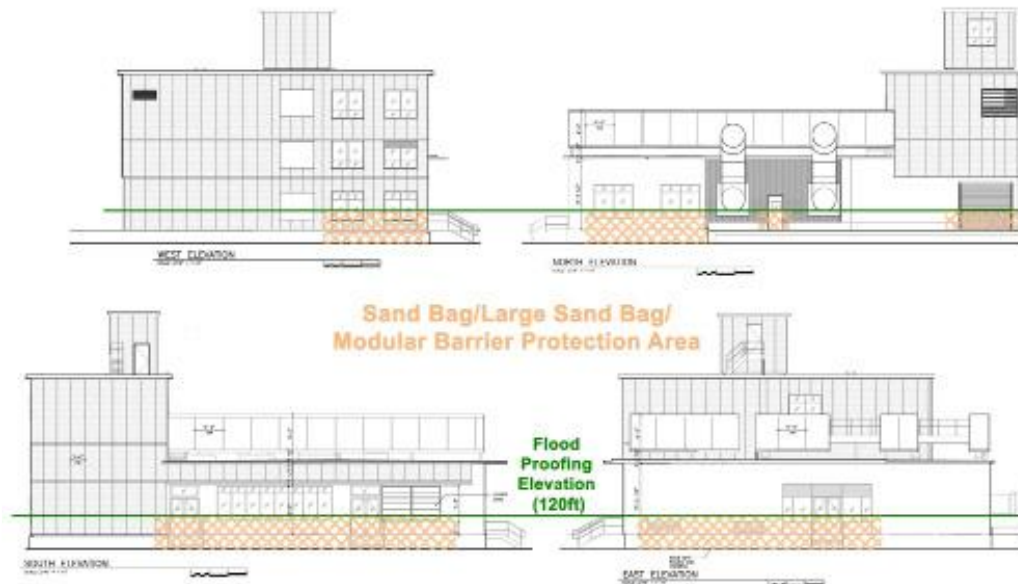


Developed Adaptation Plans

Braintree-Weymouth Pump Station



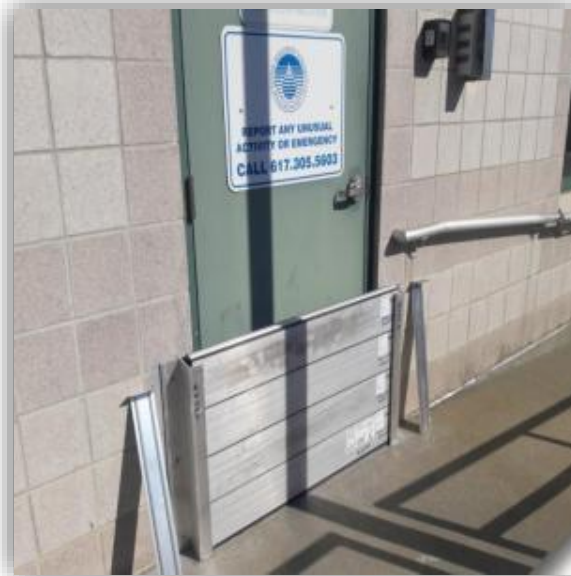
Chelsea Headworks





Protect Most Vulnerable Facilities from Flooding

- At-risk buildings fitted with deployable flood barriers
- Sandbags for areas that cannot be outfitted
- Build protective walls around critical equipment, such as generators
- Move or raise electrical equipment





Braintree Weymouth Side Entrance



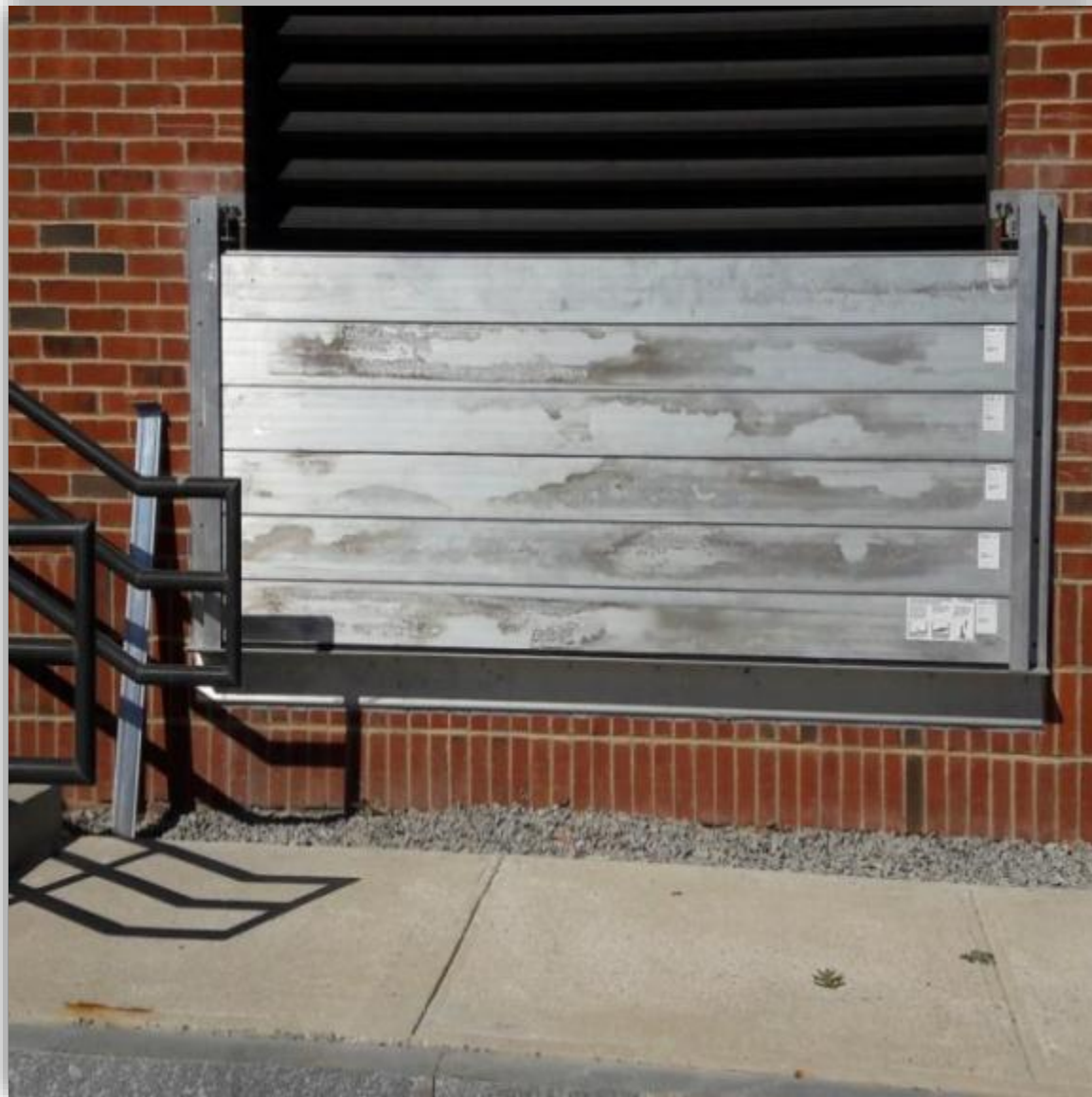


Braintree Weymouth Hatch to Screen Room





Braintree Weymouth Generator Louvers





Flood Barrier Stop Plank Storage Cabinet





Accomplishments Since Assessments

- Nearly all facilities vulnerable to a 100 yr storm are protected
- Instituted regular training on deployment of temporary flood barriers





MWRA Long-Term Approach Going Forward

- During facility assessments, three significant rehabilitation projects were in design
 - Amended each design to account for 2.5 feet of sea level rise
 - Full retrofit rather than spot repairs
 - Every future rehabilitation contract takes sea level rise into account
 - On average, we rehabilitate our facilities every 15 or 20 years



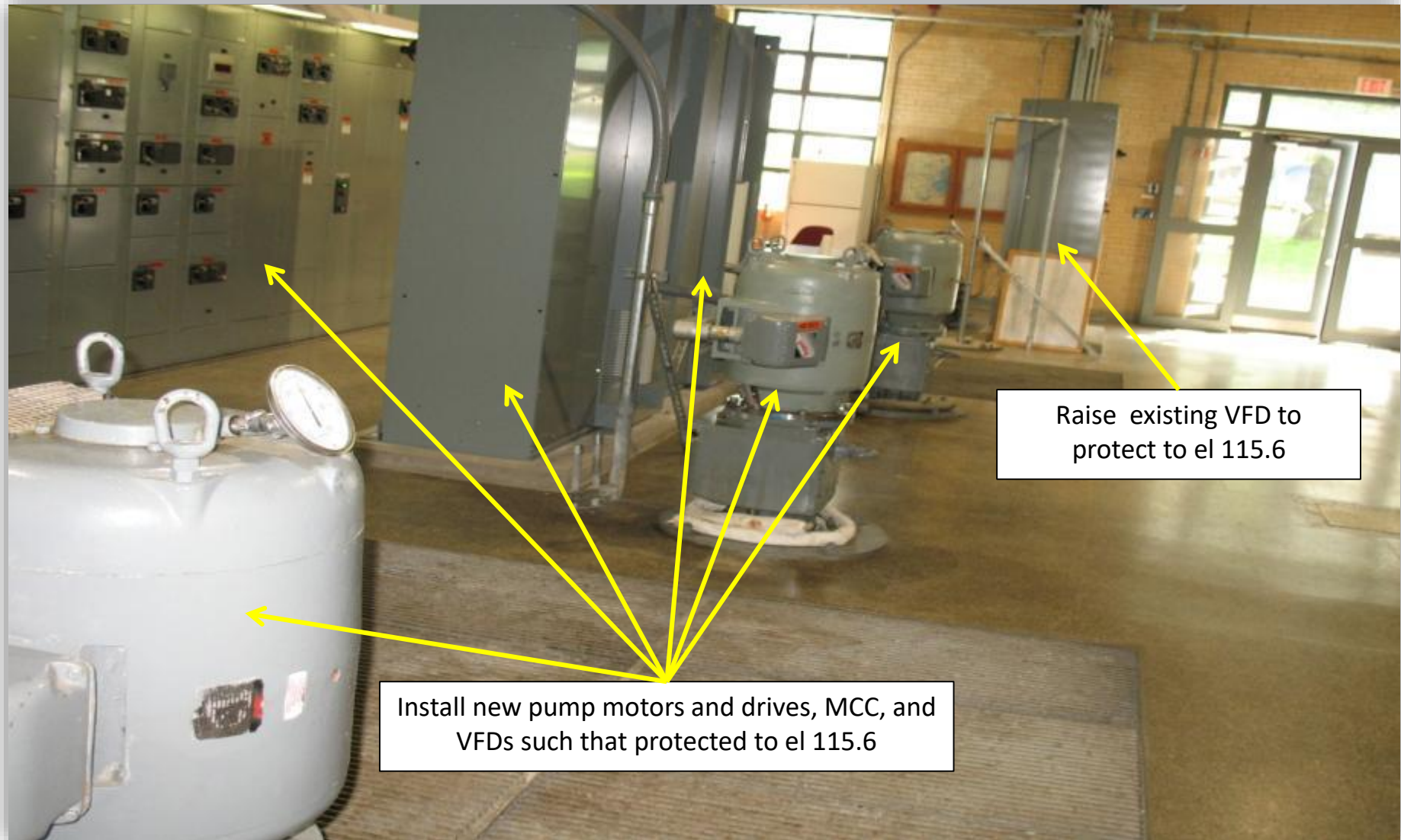


Chelsea Screenhouse Generator





Operating Room – Flood Protection Measures





Alewife Brook Pump Station





Alewife Brook Pump Station





Updating Facility Vulnerability

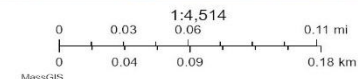
- Original assessments based on FEMA 100 year storm and conservative 2.5 SLR
- Models have improved and become more local
 - Massachusetts Coastal Flood Risk Model
 - Projects 2.4 ft. by 2050 and 4.2 ft. by 2070
- Closely matches initial rankings

Chelsea Screenhouse - 2050 Flood Depths for 1% ACFEP (MC-FRM)



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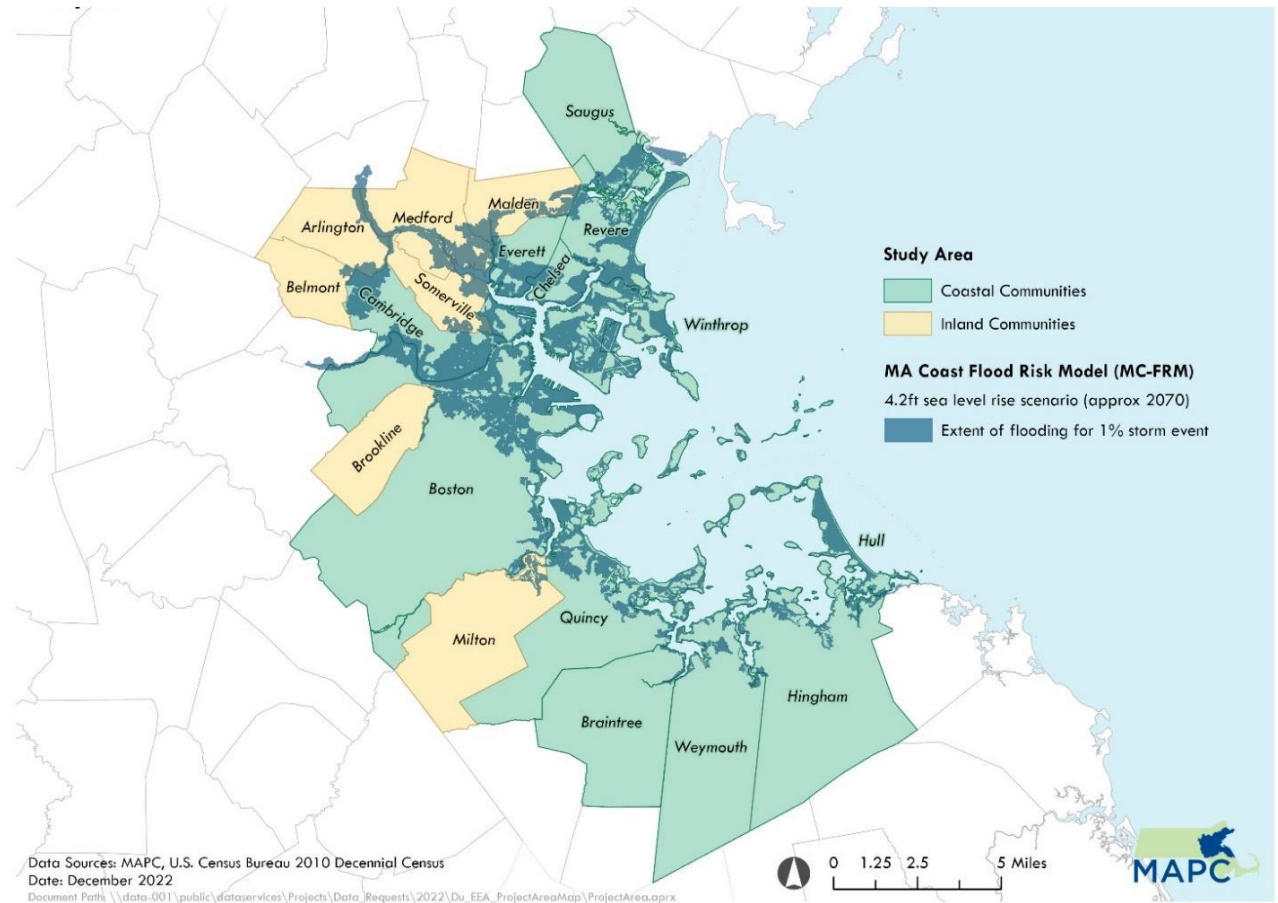
MassGIS_Basemap_Detailed_Features: 2050 Flood Depths for 1% ACFEP (MC-FRM)





Regional Approach is Necessary for Future Protection

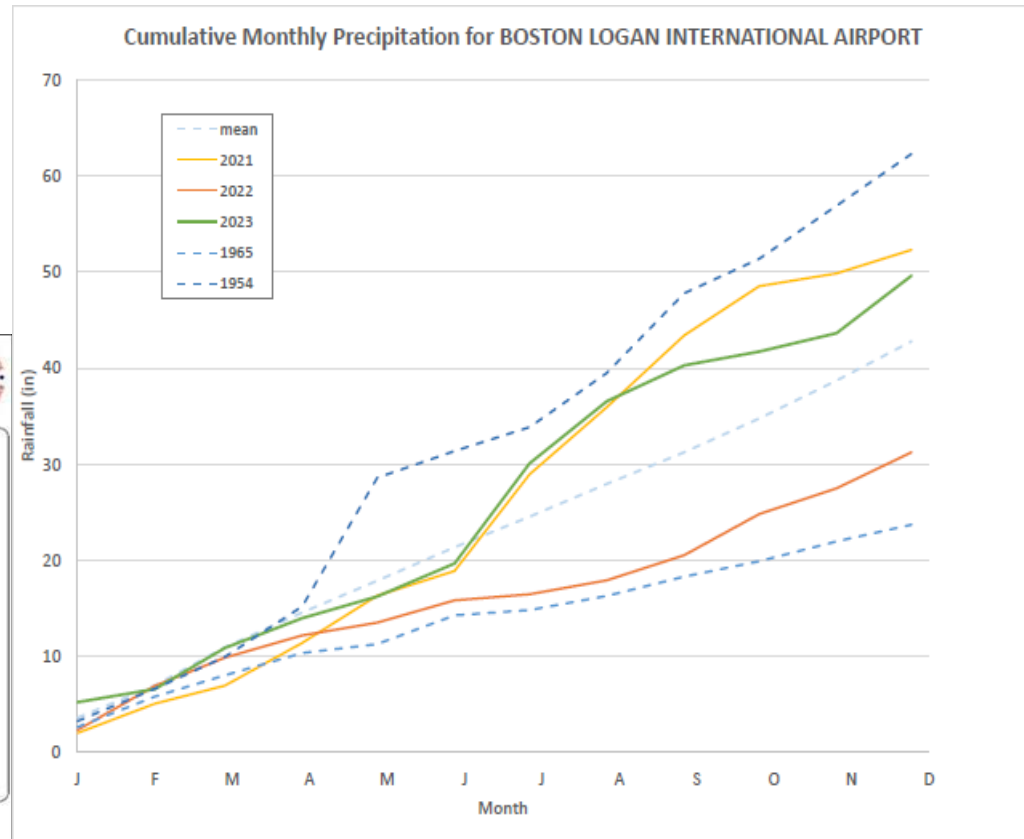
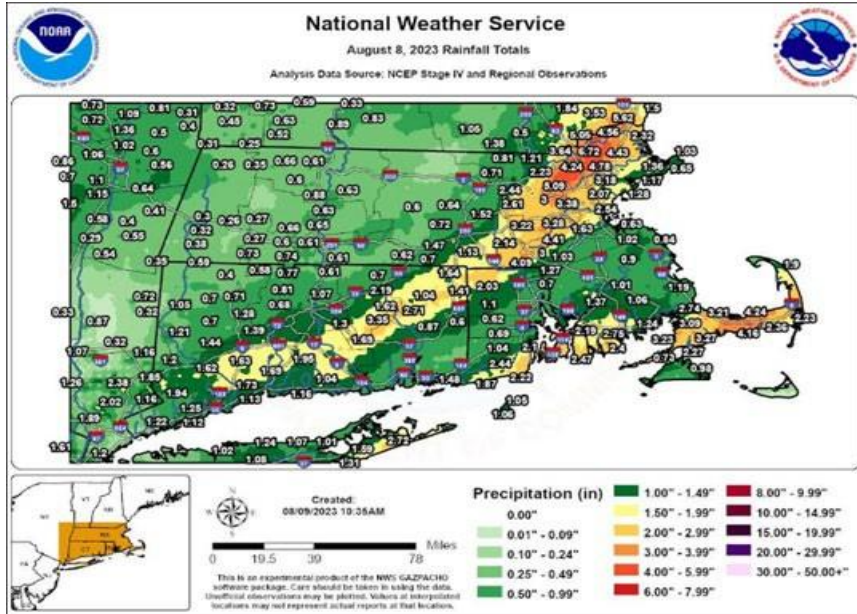
- Protecting facilities much beyond 2050 requires a regional approach
- At this level of flooding and sea level rise, facilities could be protected, but might not be accessible
- Understand how our facilities would be protected by regional adaptation





Climate Change is Altering Historical Precipitation Trends

- Historic levels of precipitation
- High intensity events – 1.5-2 in/hr
- Highly localized
- Difficult to predict storm paths





Integrating Precipitation Changes into the Updated CSO Control Plan

Updated CSO Control Plan

- Develop new Typical Year for 2050
- Evaluate alternatives to further reduce CSOs under these conditions

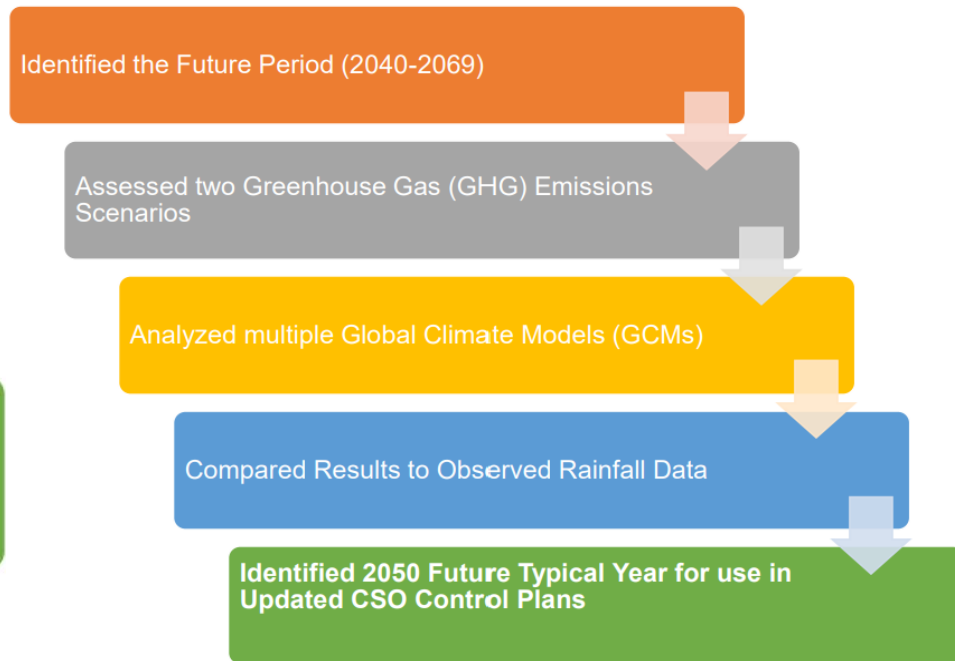
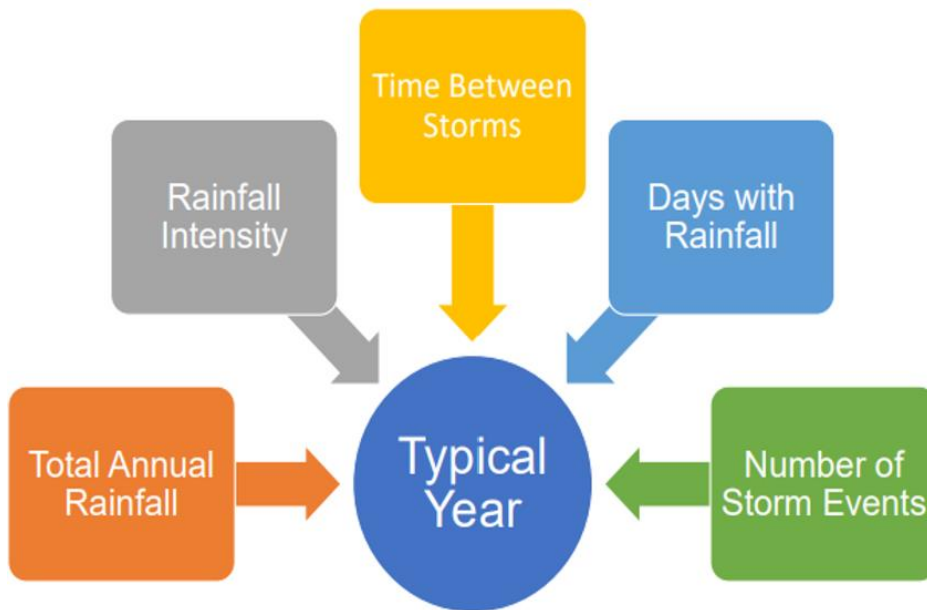




Developing a 2050 Typical Year

**Data driven process
examining past years**

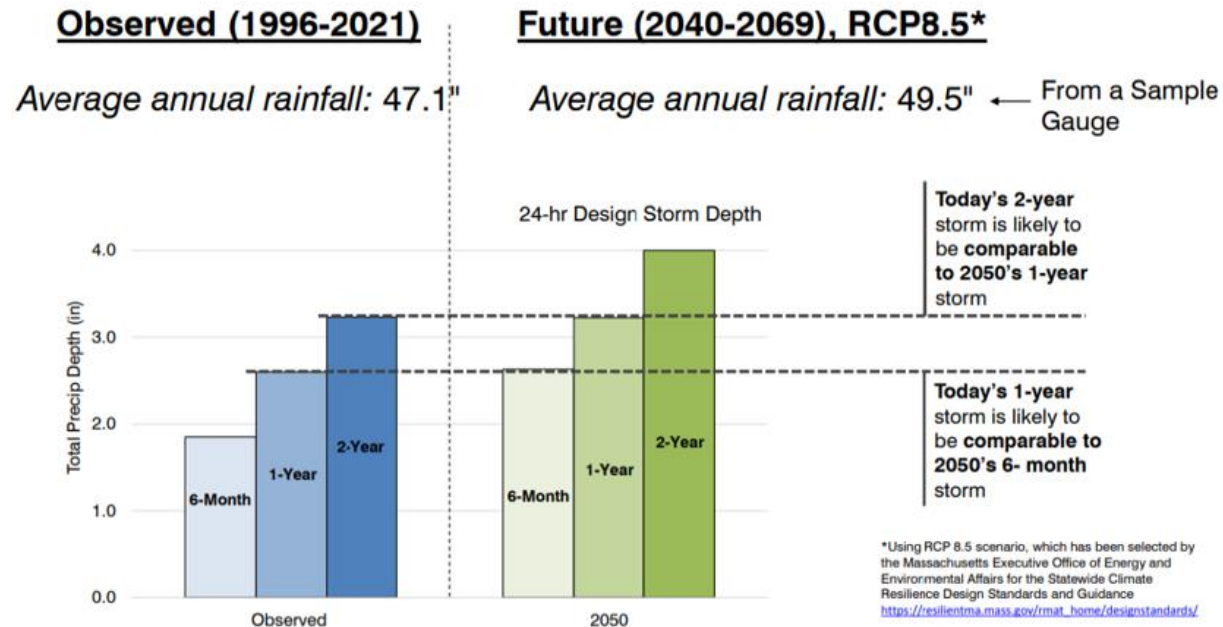
**Used models to analyze
future years**





What will the future look like?

- More frequent intense storms and heavier rainfall will make CSOs and flooding worse in the region.
- Developed a 2050 Typical Year to use in the Updated Control Plan to ensure we are prepared for this new normal.





Infiltration and Inflow Funding for Communities

- \$560 million in grants and loans disbursed for 685 projects with over \$1 billion funded
- 363 miles of Cured-In-Place Pipe liner installed
- 84 miles of sewer replaced
- 24,994 manholes rehabilitated/sealed
- 551 sump pumps redirected





Water System Assets Well Prepared for Climate Change

- All MWRA dams, dikes, spillways are in good condition
- Quabbin and Wachusett spillways have been improved to be able to discharge the probable maximum flood (1 in 1000 years)
- Evaluating water facilities' – pump stations, storage tanks, etc. – vulnerability to intense precipitation

New Wachusett Crest Gate



Quabbin Spillway





Large Reservoir to Yield Ratio + More Precipitation = Higher Safe Yield and Plenty of High Quality Water

- Existing Partial Users May Use More in Dry Years, Less in Wet
- Adjacent Communities May Need Emergency Supply More Often
- Some Communities May Choose to Permanently Connect





Thank You

Michael O'Keefe

Michael.Okeefe@mwra.com

Stephen Estes-Smargiassi

Stephen.Estes-Smargiassi@mwra.com



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