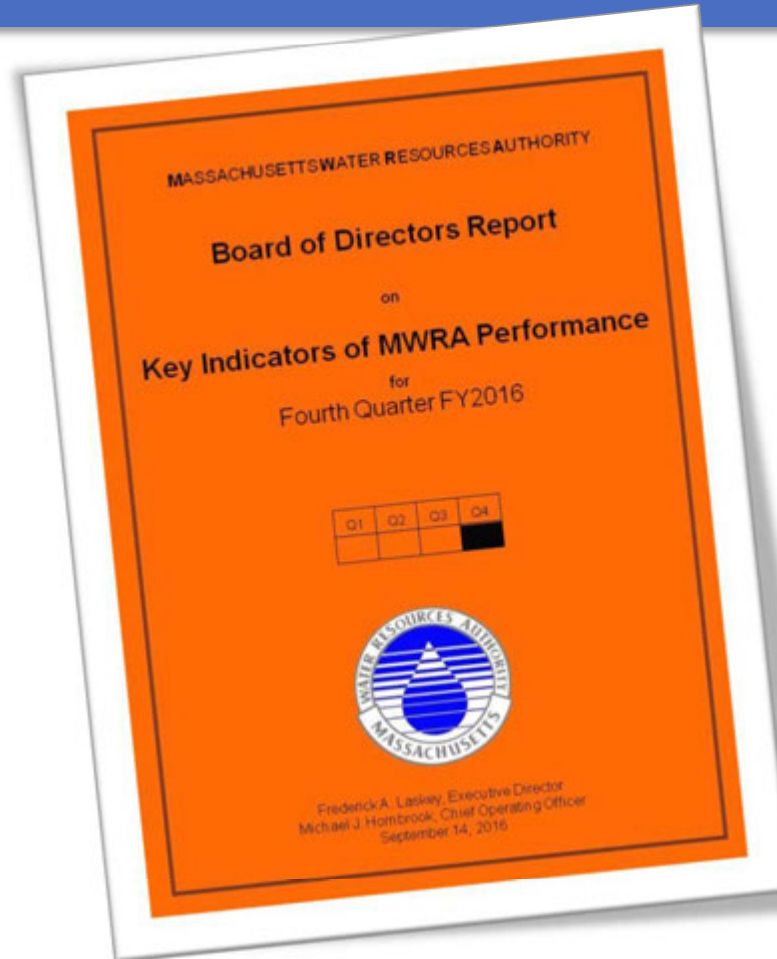




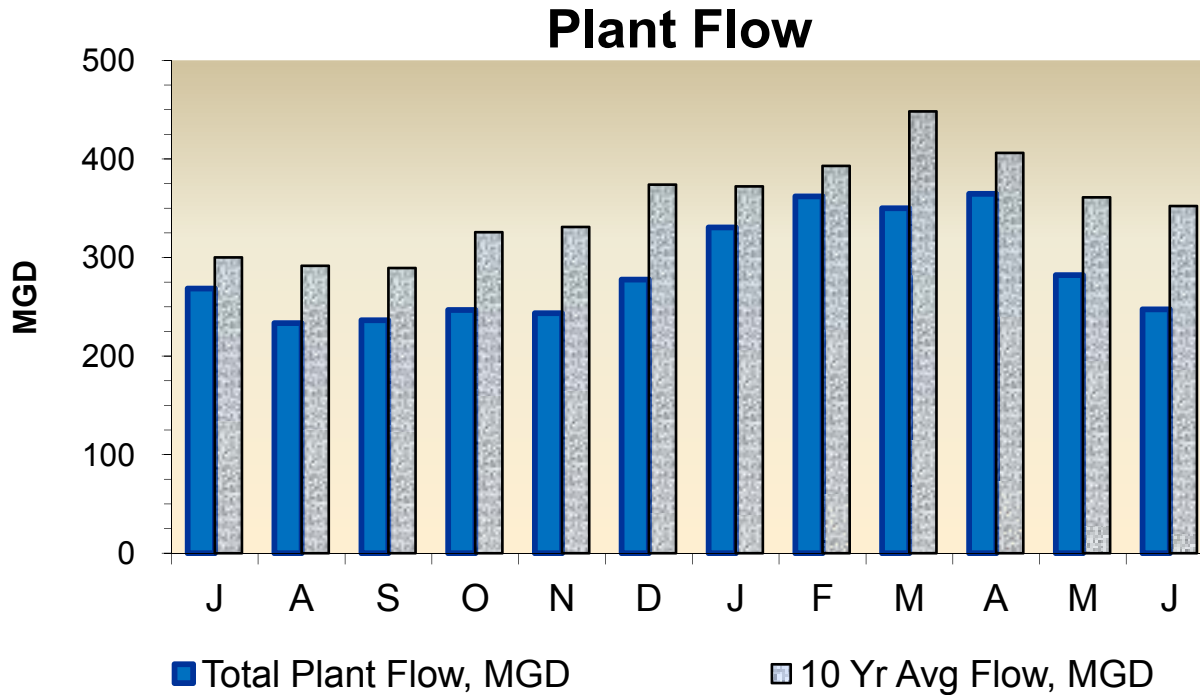


# Massachusetts Water Resources Authority





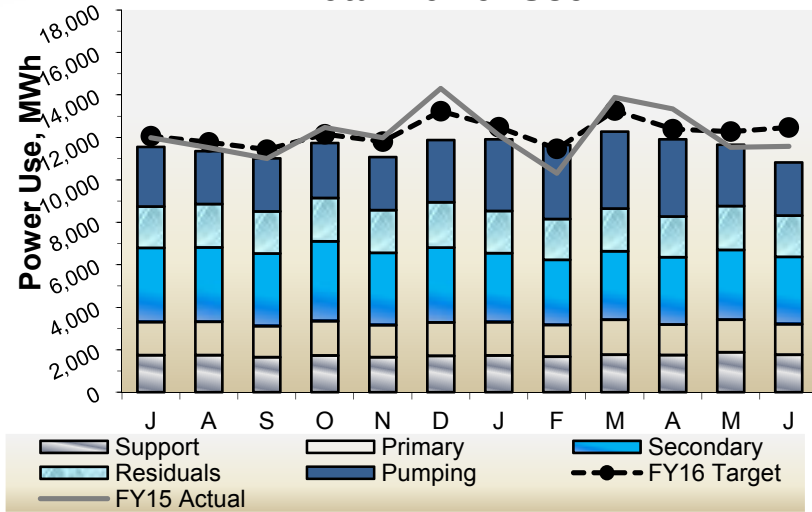
# Deer Island Operations: Wastewater Flow





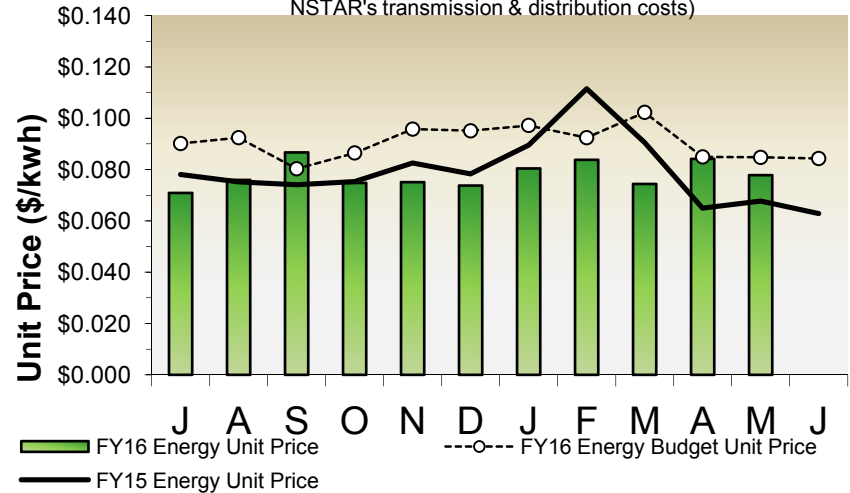
# Deer Island Operations: Power Use and Electricity Pricing

## Total Power Use



## Total Electricity Pricing

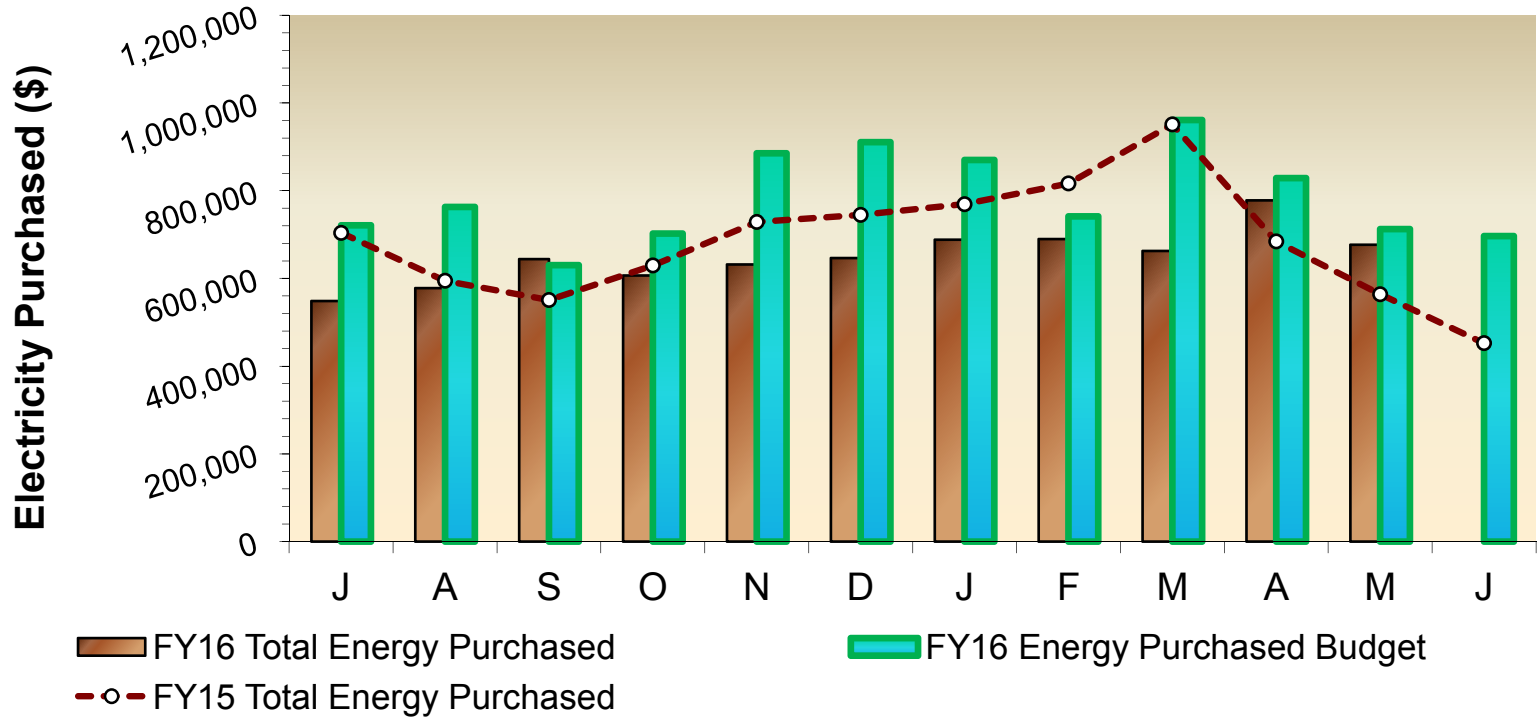
(includes spot energy price, ancillary costs, and NSTAR's transmission & distribution costs)





# Deer Island Operations

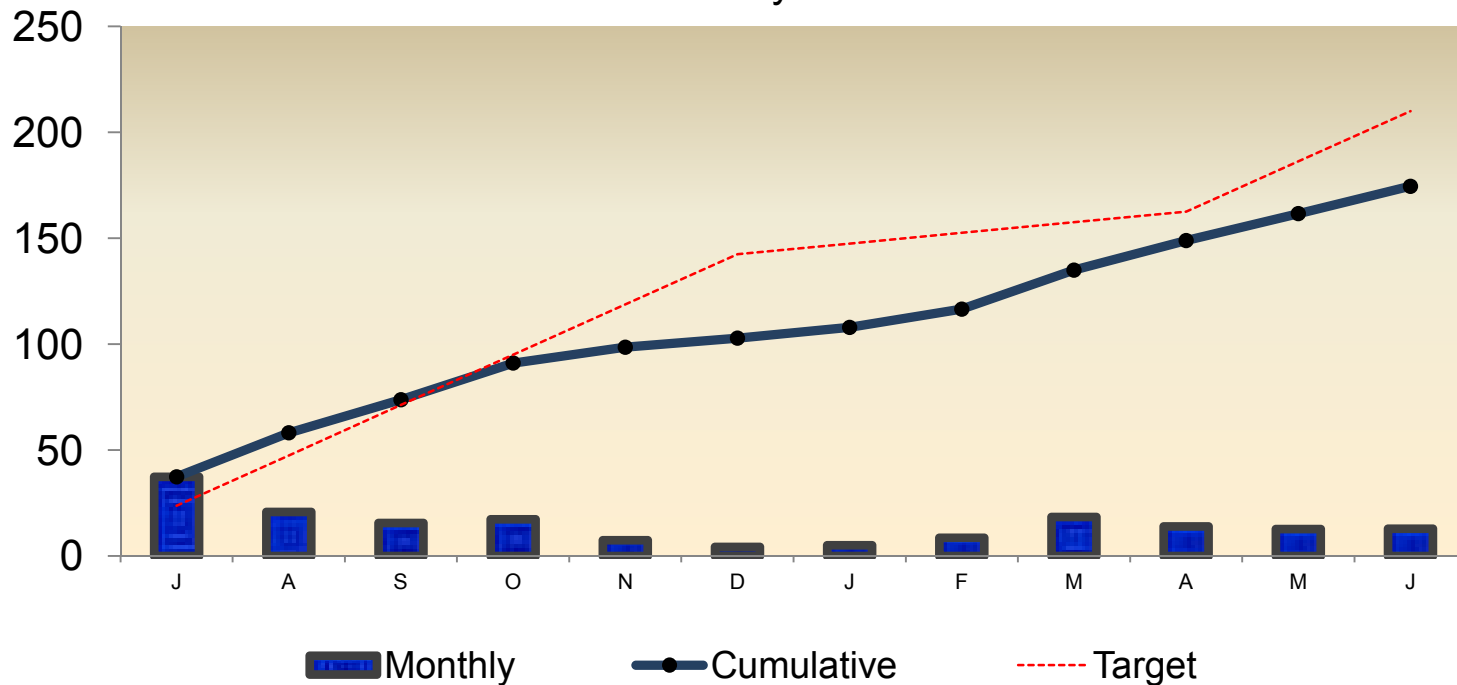
## Total Cost of Electricity





# Water Distribution: Pipeline Leak Detection and Repair

## Miles Surveyed for Leaks

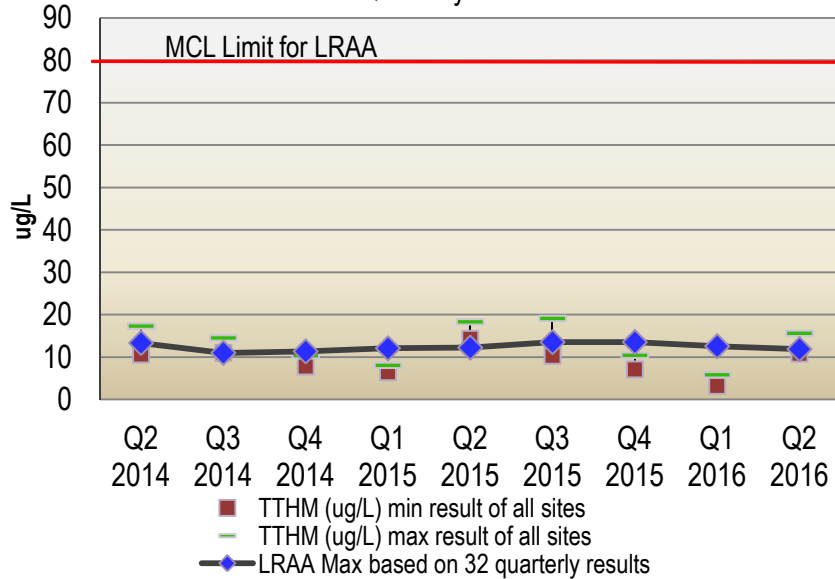




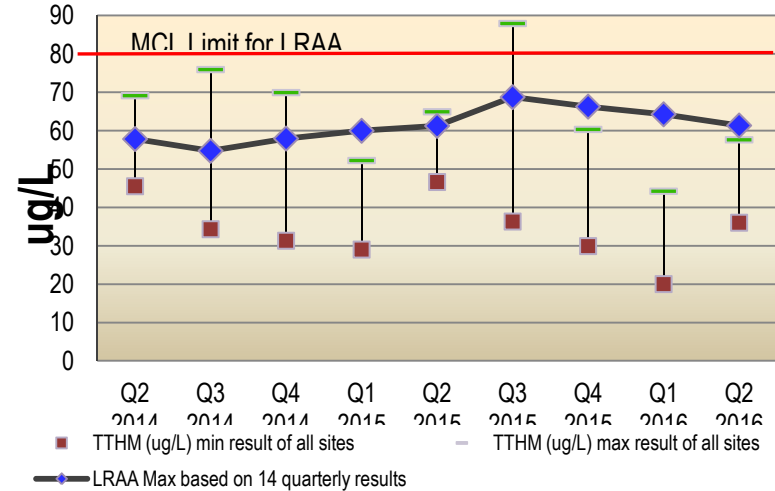
# Treated Water Quality: Disinfection By-Products

## MetroBoston Disinfection By-Products

Min Max Quarterly Results for TTHM



Min Max Quarterly Results for TTHM



## CVA Disinfection By-Products (Combined Results)







***Memorandum of Agreement Between  
MWRA and the City of Somerville***

September 14, 2016



# Somerville Marginal Interceptors





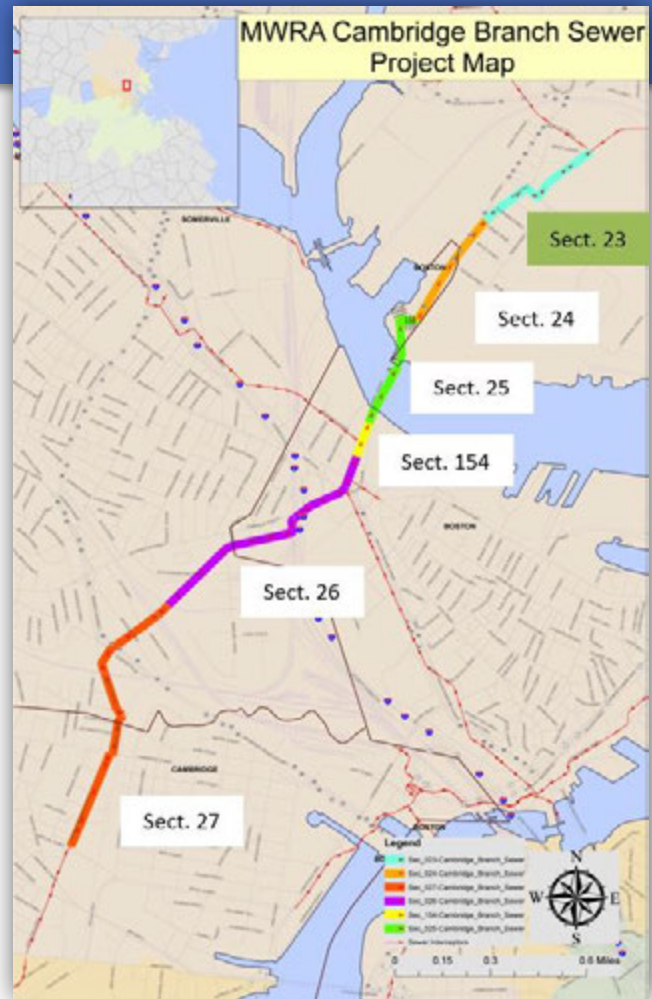


***Cambridge Branch Sewer Study  
Contract 7511***

September 14, 2016



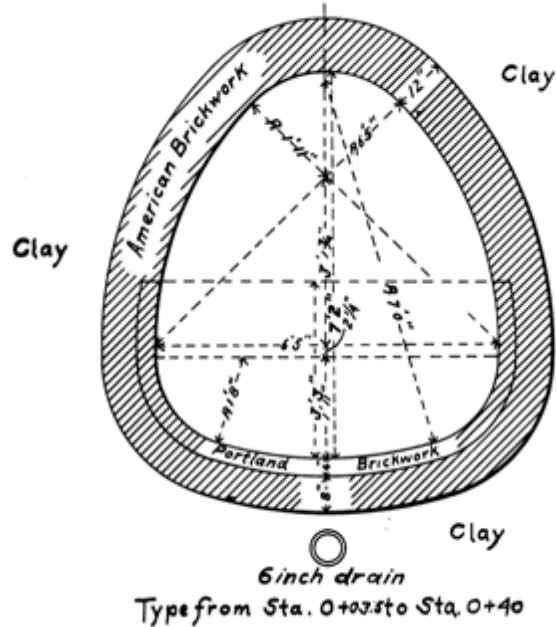
# Project Limits



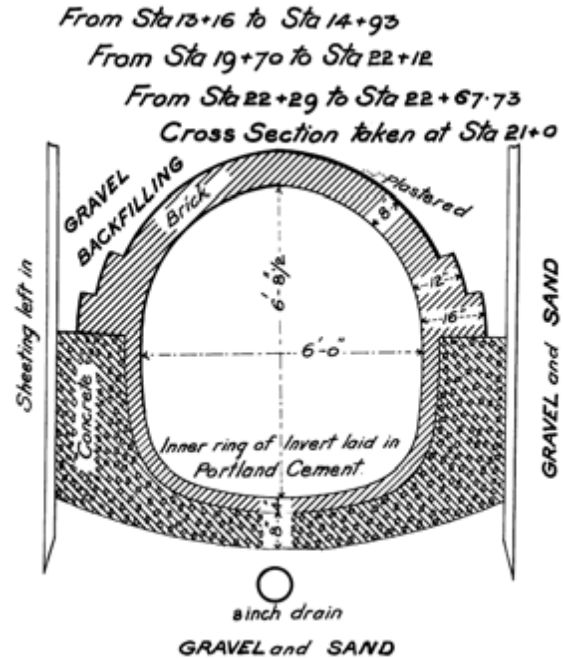


# Sewer Shapes

## Catenary



## Basket-Handle





# Current Conditions





## Services to be Provided

- Evaluation of Pipeline/Manhole Rehabilitation Methods
- Traffic and Environmental Assessments
- Hydraulic Capacity and Corrosivity Evaluations
- Recommended Rehabilitation Method(s) including limits of work, flow handling, access points, traffic mitigation and estimated costs





# Procurement Process

- 3 Proposals Received
- Selection Committee Recommends Hazen and Sawyer, P.C.
- Contract Amount:       \$686,953.85
- Contract Duration:       October 2016 – December 2017



# Contract 7359 – Prison Point CSO Facility Improvements







***Chelsea Creek Headworks Upgrade  
Construction Contract Award***

September 14, 2016



# Chelsea Creek Headworks Tributary Area





# Chelsea Creek Headworks Upgrade

- Major upgrade of entire facility including:
  - Automation of screenings collection and conveyance
  - New odor control and HVAC systems with added redundancy
  - Replacement of emergency generator/fuel oil tank/transformer
  - Remediation of hazardous building materials

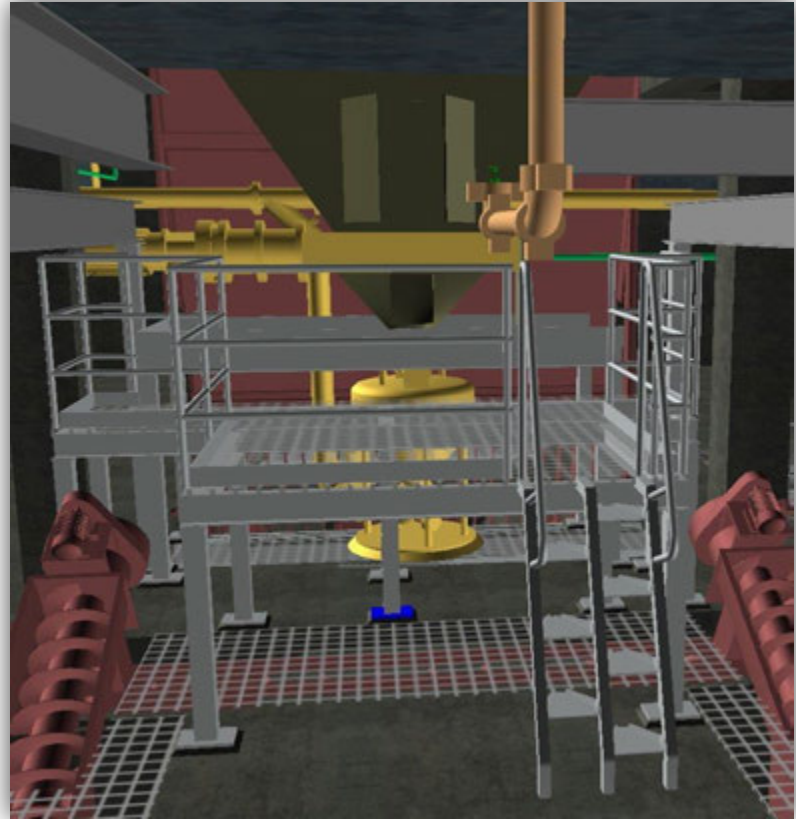


# Chelsea Creek Headworks Upgrade

- Major upgrade of entire facility including:
  - New communication tower with communications building
  - Flood protection to 100 year flood plus 2 ½ feet
  - Upgrades for code compliance for egress and fire suppression
  - Exterior façade enhancements



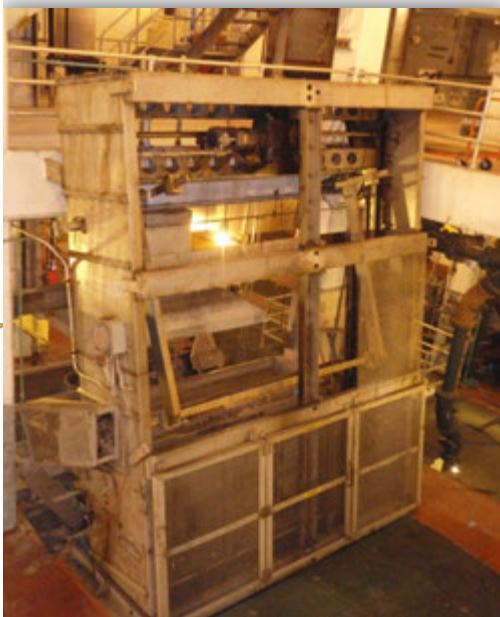
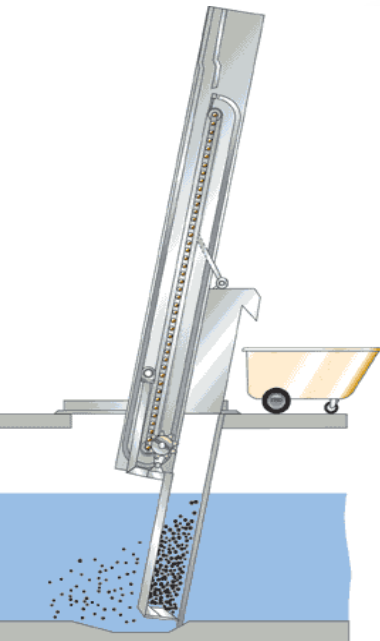
# Automated Screenings Collection





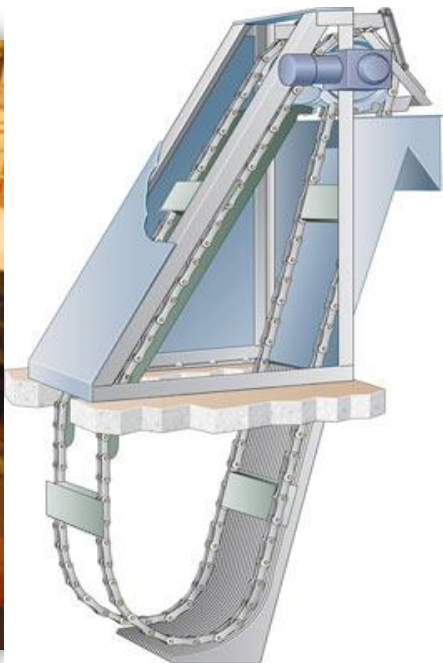


# Replacing Climber Screens with Catenary Screens



Chelsea Creek

Climber Screens



Nut Island

Catenary Screens



# Flood Elevations – Existing Facility





# Exterior Façade Enhancement





# Construction Challenges

- Project requires careful construction sequencing
- Facility must remain operational/staffed throughout construction
- Construction limited to one channel at a time - maintain full wet weather flow capacity
- Hazardous building materials must be remediated without impacting operations



# Construction Challenges

- Maintain HVAC, odor control, and electrical service throughout construction
- Concurrent operation of old, new and temporary systems
- Start up and testing will occur sequentially to maintain uninterrupted service



# General Bids for Contract 7161

General Bids were opened on August 25, 2016:

<i>Engineer's Estimate</i>	<i>\$69,000,000</i>
<b>BHD/BEC JV2015, A Joint Venture</b>	<b>\$72,859,000</b>
Daniel O'Connell's Sons	\$81,540,000
Walsh Construction Company	\$83,482,395



## Recommendation

- Staff determined that BHD/BEC JV2015, A Joint Venture is qualified and is the lowest responsible and eligible bidder
- Staff recommend the award of Contract 7161 to BHD/BEC JV2015, A Joint Venture in the amount of \$72,859,000 for a contract duration of 1,460 calendar days



# Construction Schedule

- Construction Notice to Proceed                      October 2016
- Construction Substantial Completion                      October 2020







***Remote Headworks Upgrade***  
*Amendment 4*

September 14, 2016



# Amendment 4 Summary

**Bidding Phase Services Level of Effort:            \$155,600**

Extended duration

- Bidder questions, site visits, addenda
- Assignment of remediation work/odor control equipment supplier conflicts

**Construction Administration Services:            \$614,000**

Added complexity of project and additional 6 months of construction

- Extended construction duration 6 months
- Conformed documents and record drawings
- Requests for information (RFIs), submittal review, change orders
- e-Construction





## Time Extension

- Extended design duration 26 months  
(Previous amendments provided funding but did not change contract end date)
- Extended bidding duration 6 months
- Additional construction duration 6 months





***Valve and Piping Replacements  
Various Facilities  
Deer Island Treatment Plant***

September 14, 2016



# Contract 7275 Overview



- Contractor: Carlin Contractors
- Notice to Proceed: June 23, 2014
- Award Amount \$ 16,960,425.00
- Replace the following equipment in pumping stations:
  - 41 valves ranging in size from 30" to 60" and 16 flowmeters in NMPS and WTF
  - 8 hydraulic dashpots in the SSPS
- Replace over 220 valves and 11,000 ft of scum/sludge piping in Primary/Secondary galleries





## Contract 7275 Change Order No. 5



- CO No. 5 : \$ 136,884.01
- Scope of Work: Replace corroded coupling hardware (and selected gaskets) on Secondary scum piping system in Battery A & B
- Hardware material: existing (carbon steel) to be replaced with SS316
- Difficult to access: dewatering, disinfection, confined space, etc
- Was identified after construction started
- Battery C originally utilized SS316
- Total COs to date (including CO No 5):  
\$379,266.92 or 2.24%  
Project 49% complete



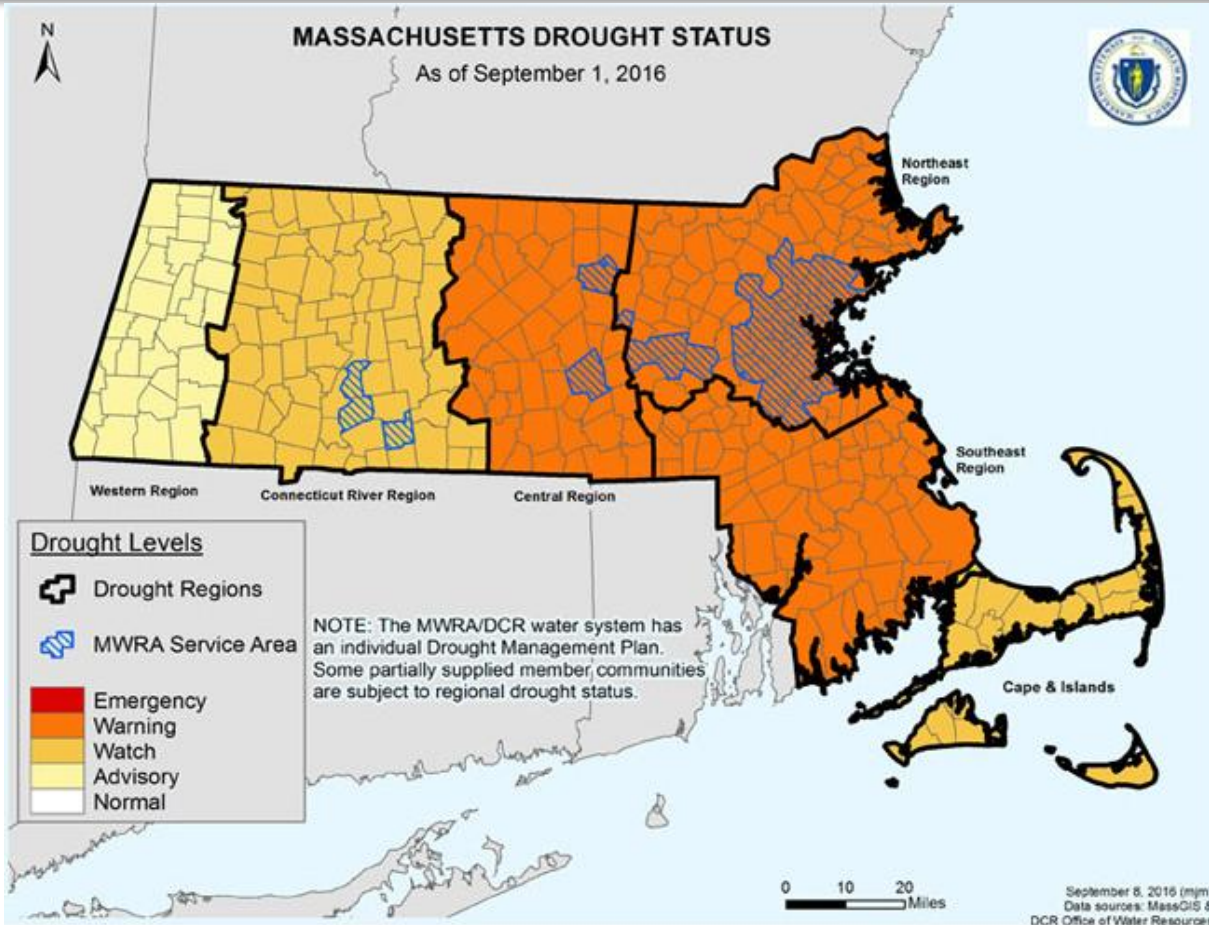


# ***Drought Status Update***

**September 14, 2016**

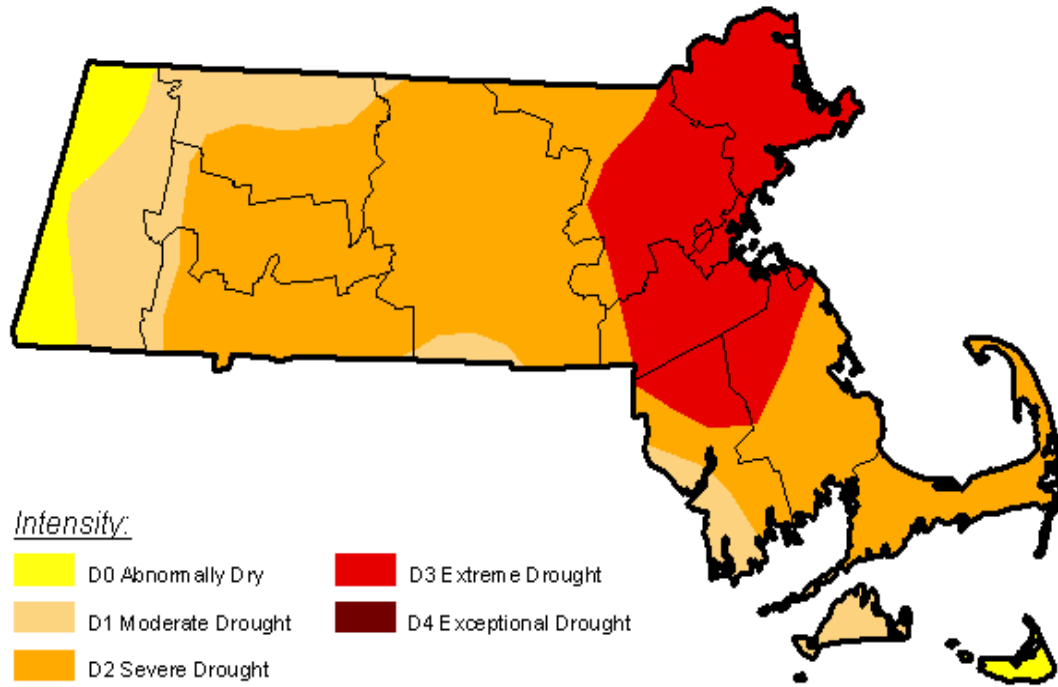


# Massachusetts Drought Status Designations



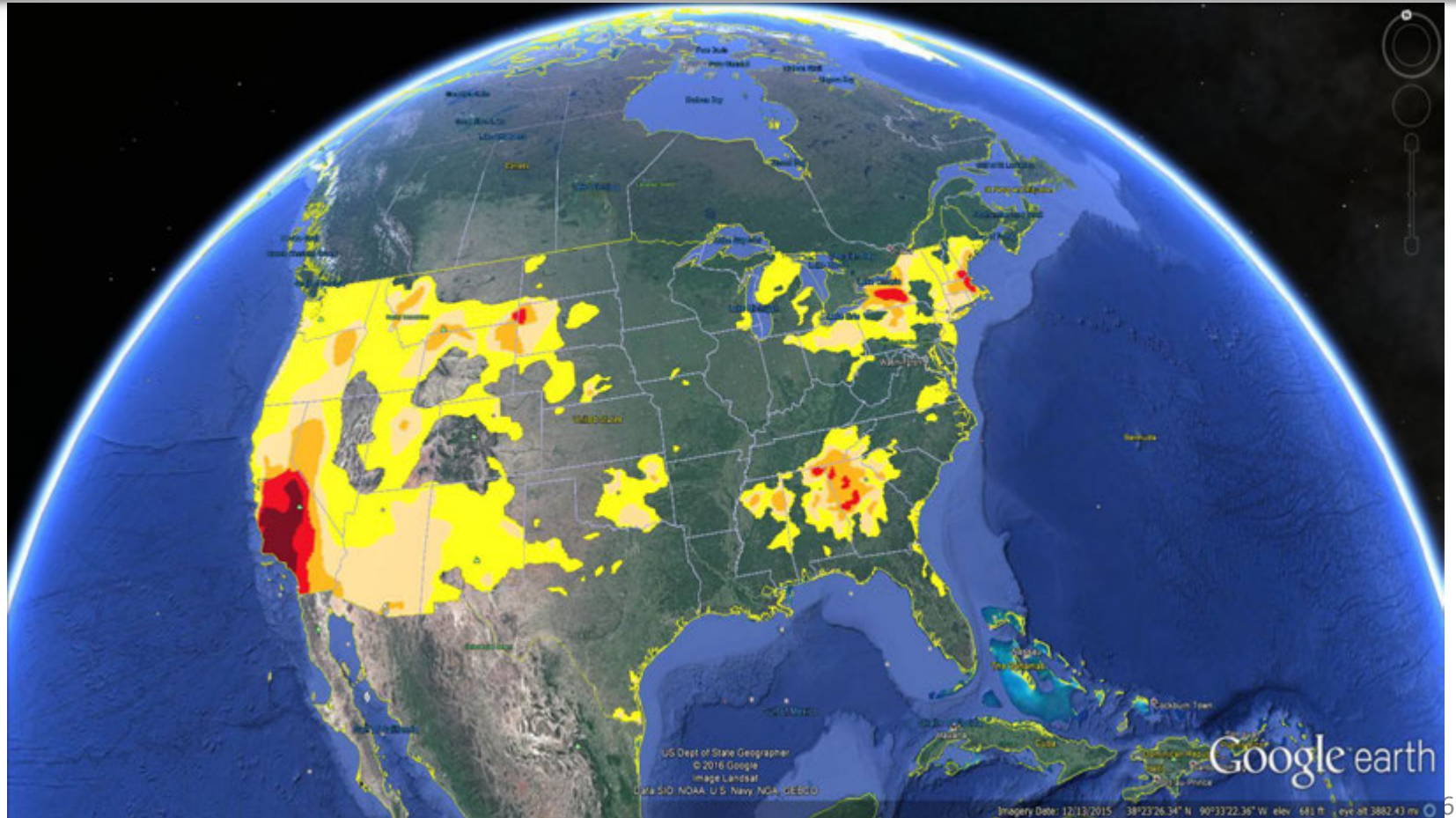


# National Drought Mitigation Center Intensity Map September 6, 2016



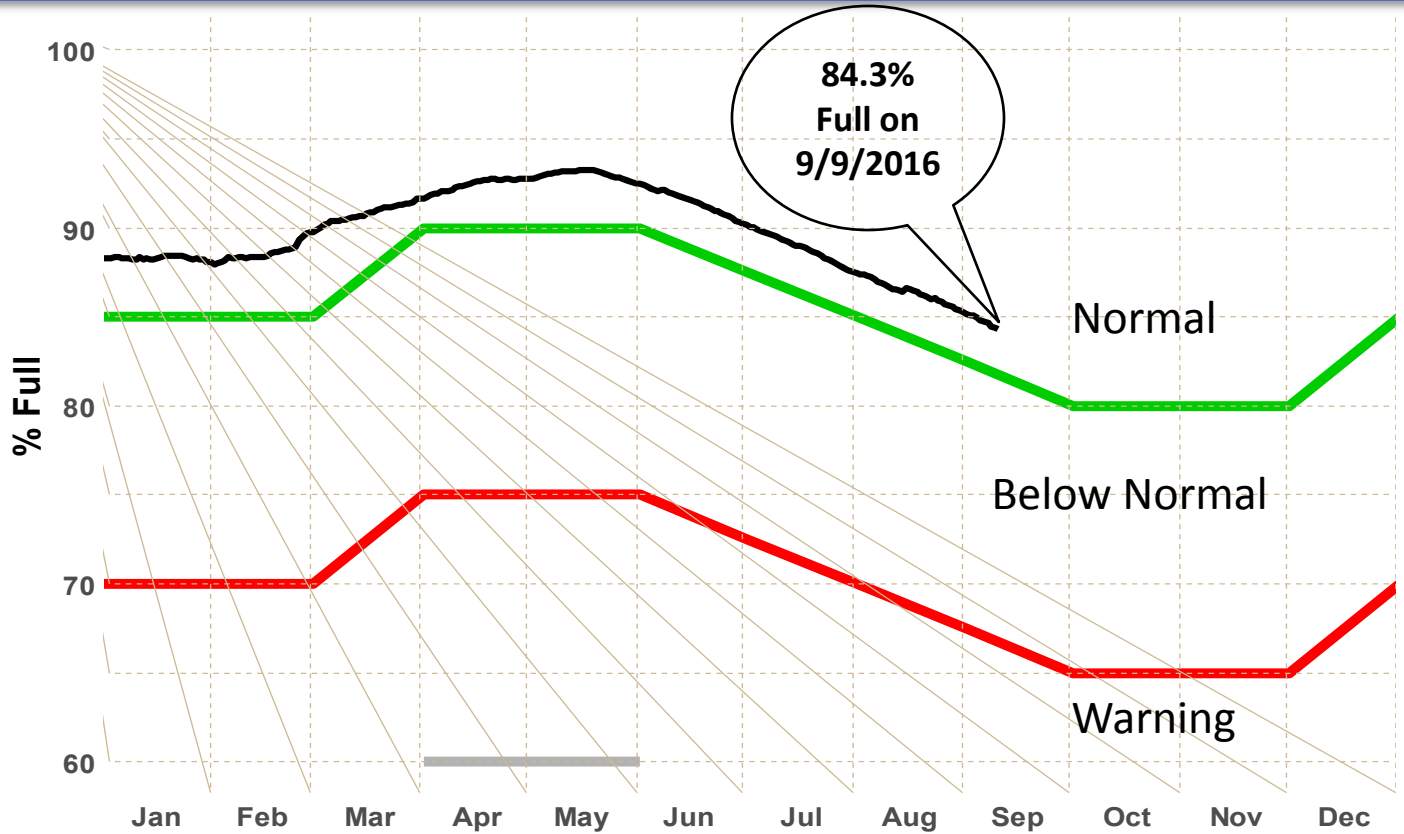


# National Drought Mitigation Center Intensity Map September 6, 2016



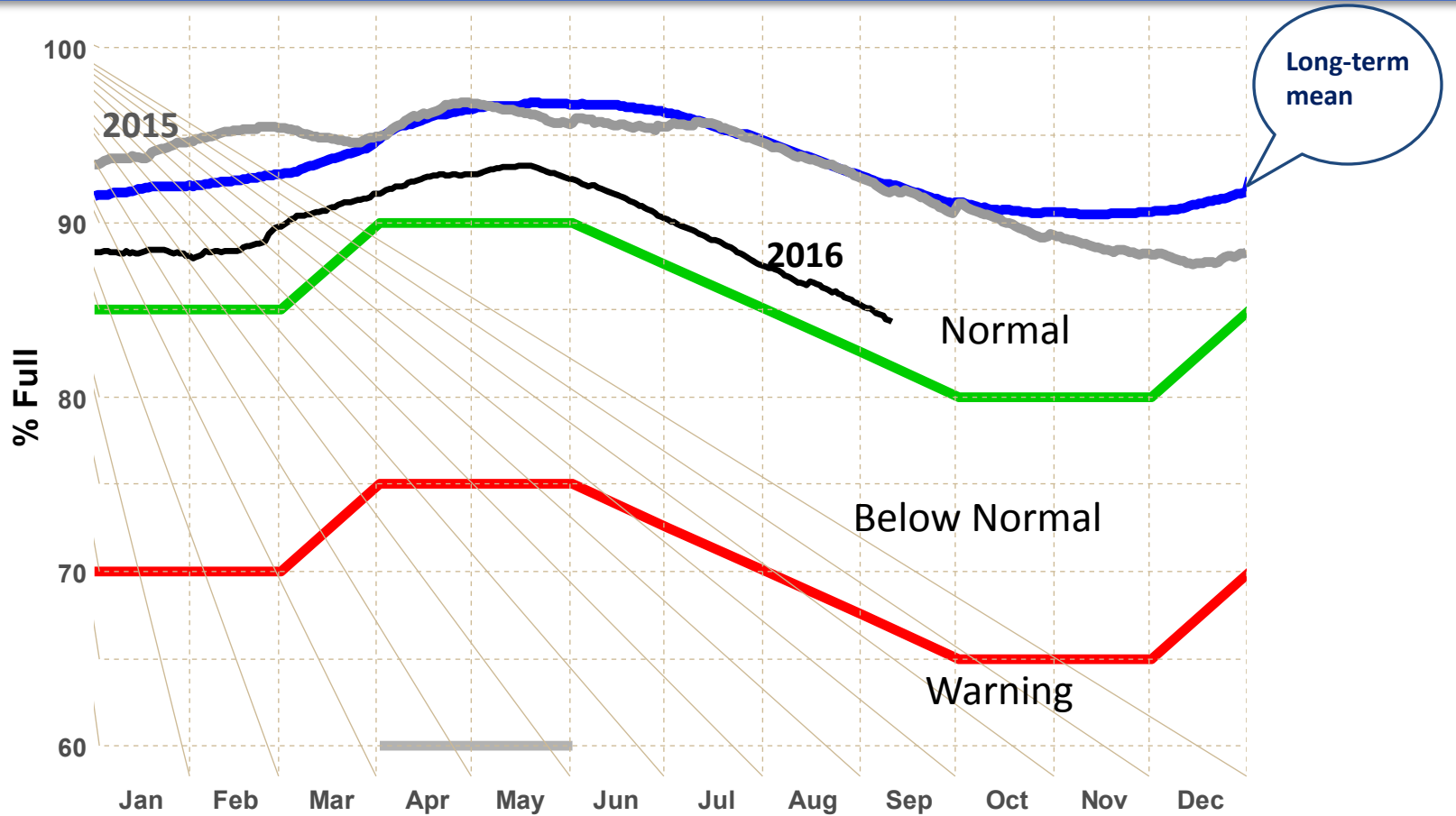


# Quabbin Reservoir Volume





# Quabbin Reservoir Volume







# Worcester's Quinapoxet Reservoir, September 8th 2016




Capacity at 12%







# Communities Activating or Close to Activating Emergency Connections



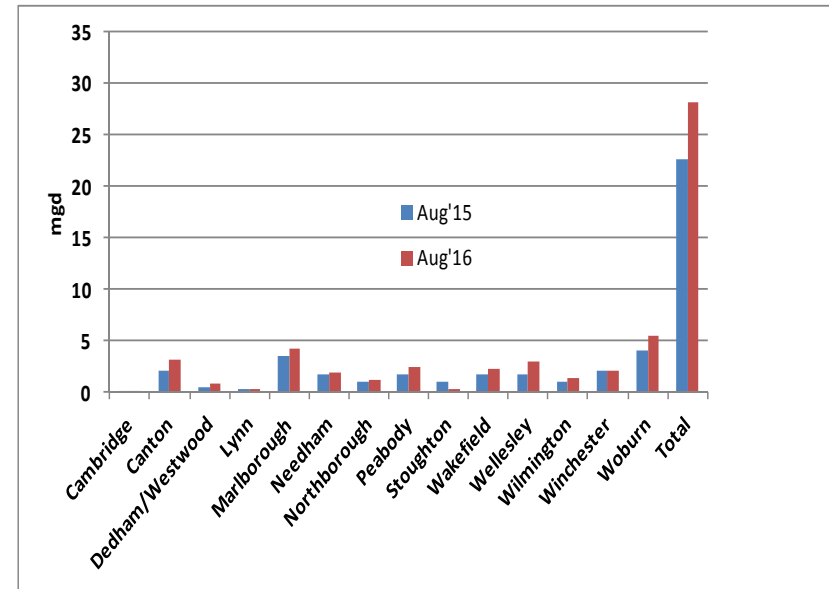
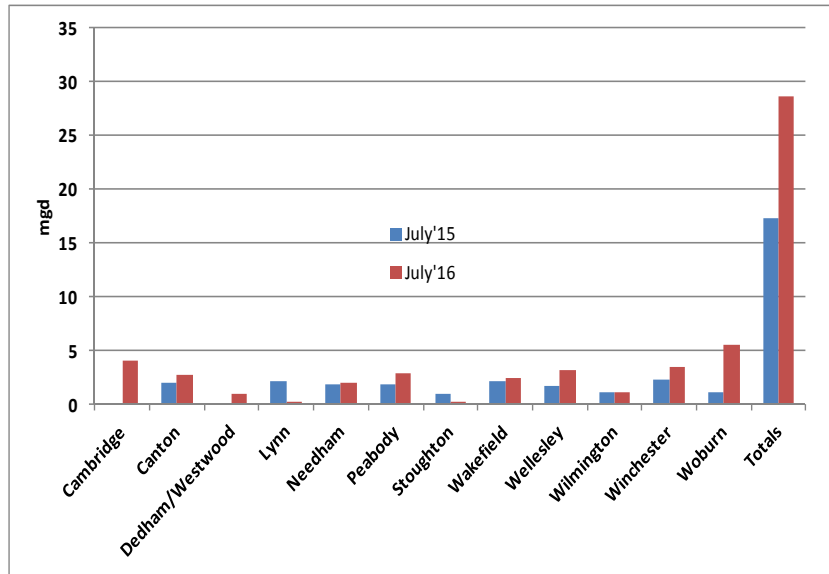
 MWRA Fully Supplied Communities

 MWRA Partially Supplied Communities

 Potential for Assistance



# Supply to Partial Communities Has Increased



July and August Flows for Metropolitan Partially Supplied Communities



# Driest Summer on Record

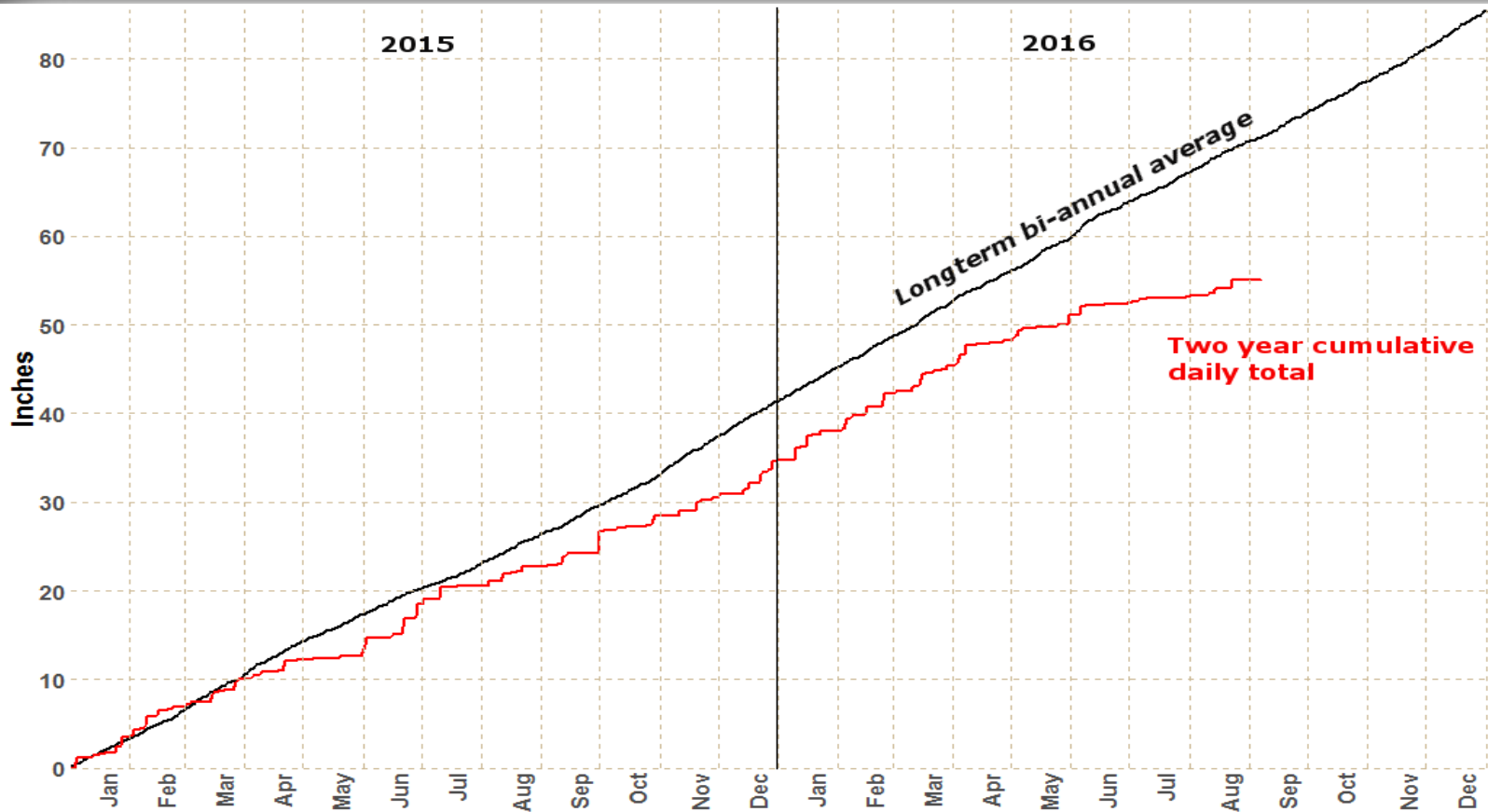
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Long-term Average	3.64	3.36	4.01	3.57	3.37	3.46	3.04	3.40	3.29	3.44	4.01	4.09	42.7
2016 Total	3.27	4.18	3.17	2.91	2.83	1.33	0.87	1.72					

**Driest summer ever recorded. Total only 3.92 inches**

Inches of Precipitation at Logan Airport



# It's Been Dry for Over A Year





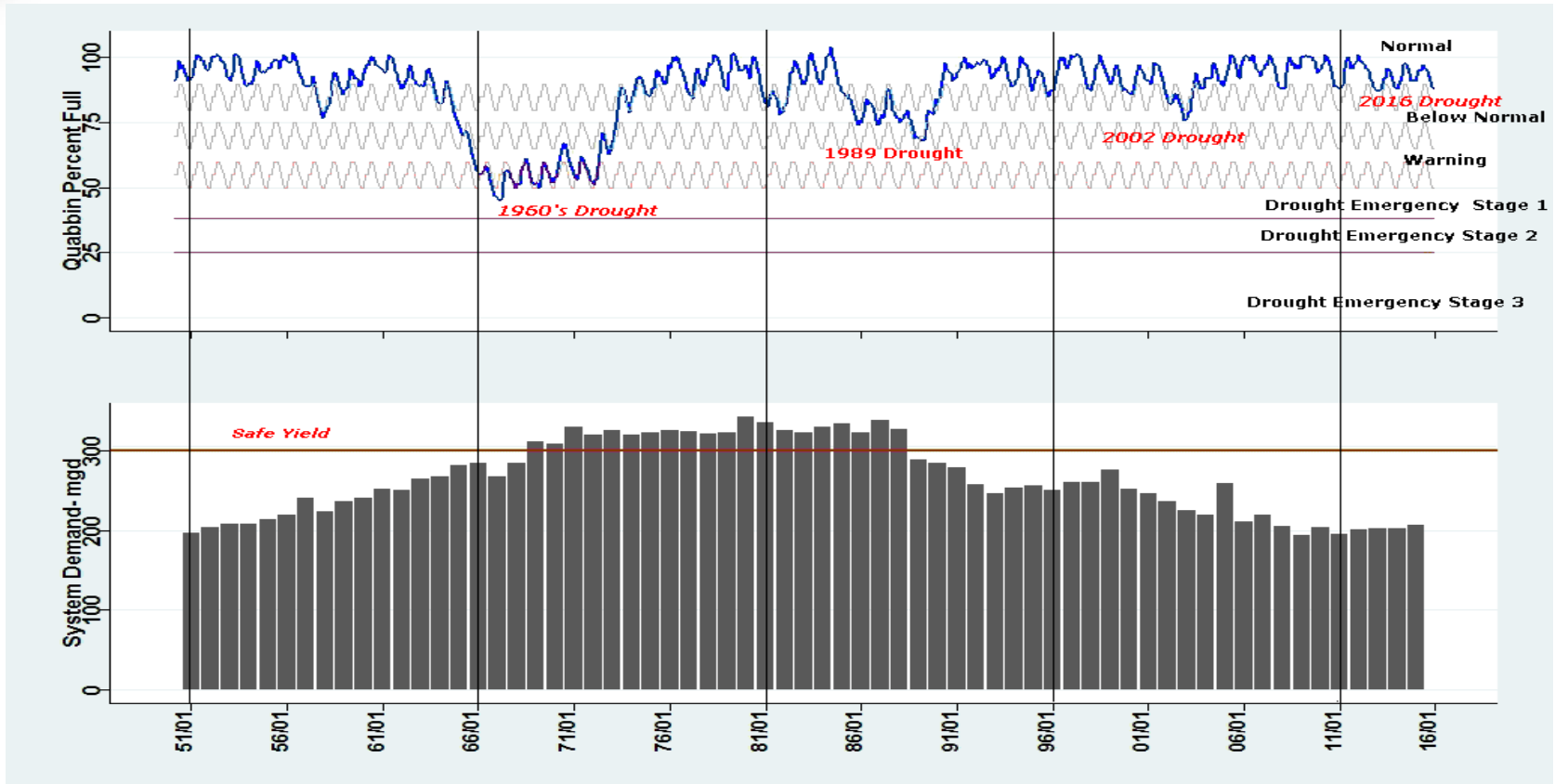
# How Dry Has It Been At Quabbin?

	1 Month	3 Months			6 Months	
JAN	13th driest				27th driest.	6th Driest
FEB	57th driest			15th driest.		6th driest
MAR	18th driest		7th driest.		3rd Driest	
APR	9th driest		3rd driest.			
MAY	11th driest	3rd driest				
JUN	2nd driest	5th driest				
JUL	3rd driest.					
AUG	26th driest					

Based on 68 years of Quabbin yield data from 1948 to 2016



# Quabbin Historical Droughts







**October 13, 1966 --187 Billion Gallons, 45.3% Full**  
**September 10, 2016 – 347 Billion Gallons, 84.3% Full**





- Quabbin in Normal Operating Range
- Even if drought extends several years:
  - Can supply all fully and partially supplied communities
  - Able to provide assistance to neighboring communities
- Asking our customers to use water wisely and efficiently





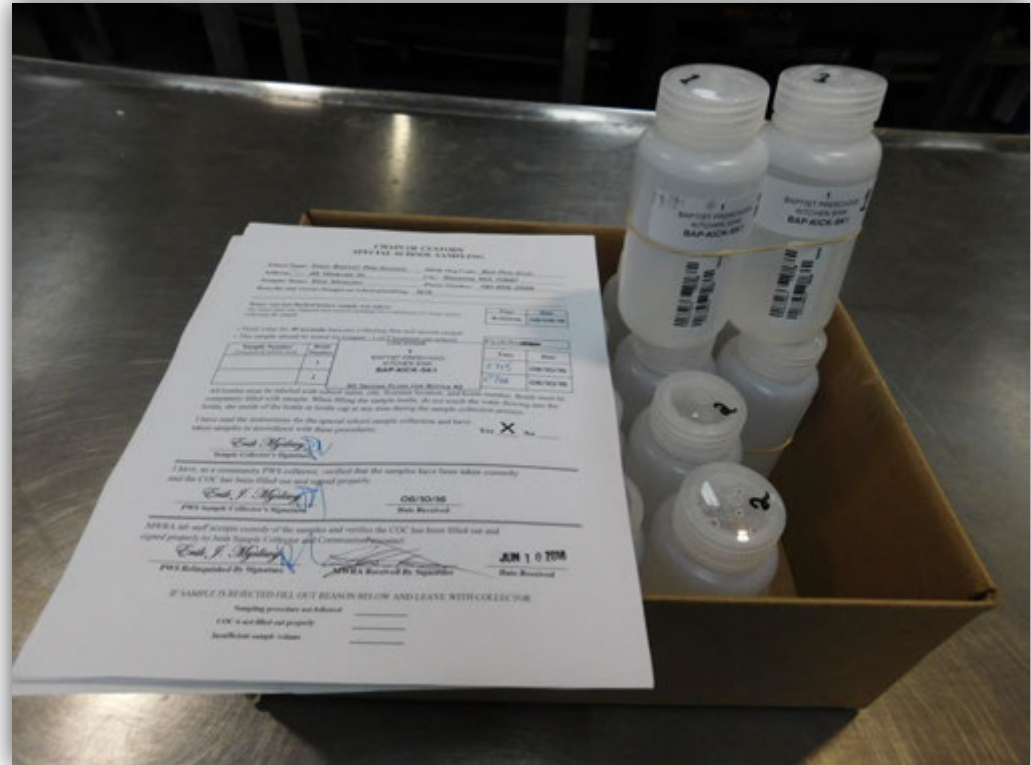
# *Update on Lead Programs*

September 14, 2016



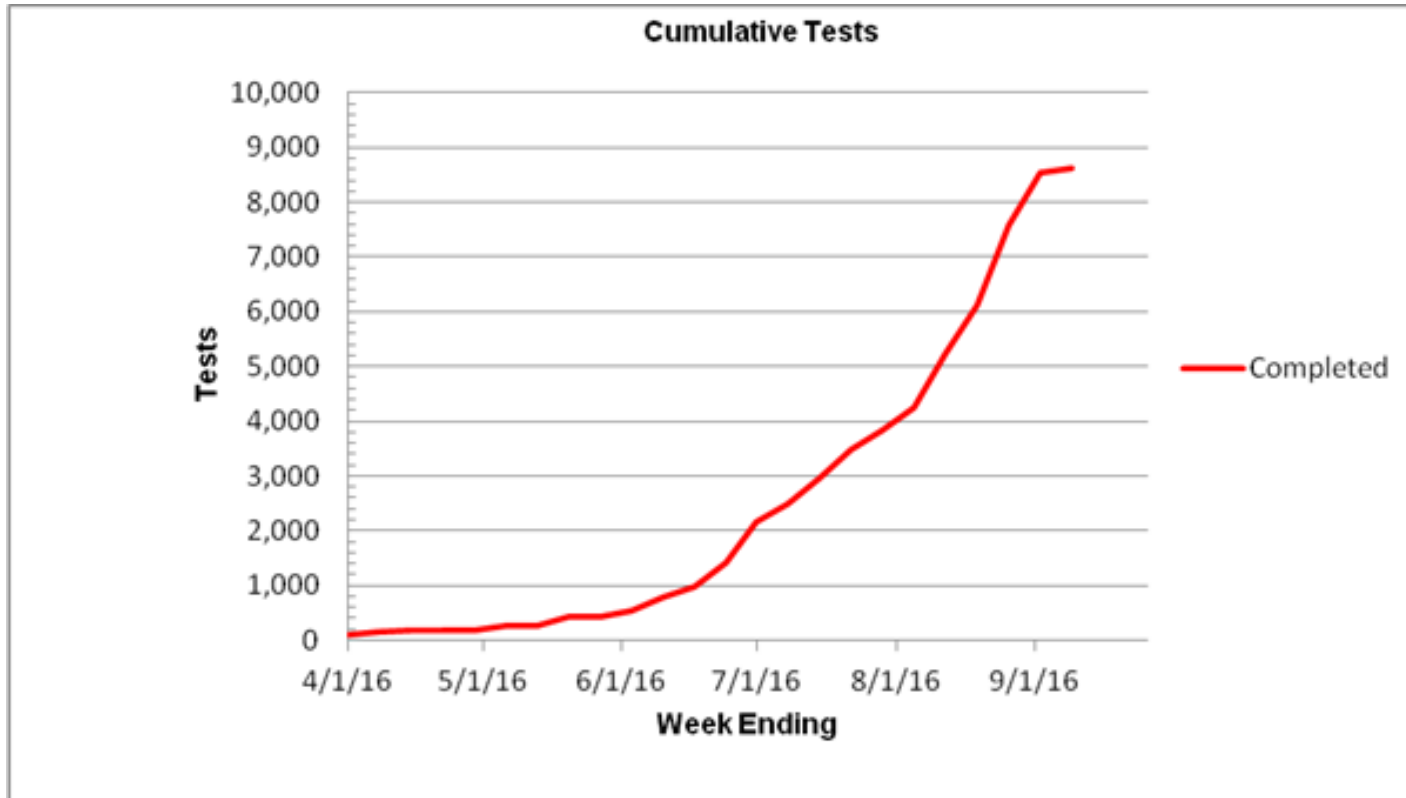
# Communities that have Participated in the School Lead Testing Program

Community	# of Schools
Arlington	8
Boston	1
Brookline	19
Chelsea	10
Hanscom AFB	1
Lexington	10
Malden	2
Marblehead	9
Medford	3
Melrose	10
Milton	6
Needham	11
Newton	22
Northborough	6
Peabody	1
Reading	4
Revere	9
Stoneham	1
Wakefield	2
Waltham	12
Wilmington	9
Winchester	8
<b>22 Communities</b>	<b>164 Schools</b>





# Number of Tests Completed





# Lead Samples Being Processed at Deer Island Lab





# School Lead Testing Program Results

- 44 of 164 schools with one or more locations above the Action Level
- 5.8% of the 5,119 lead samples were above the Action Level







# Lead Service Line Program Update

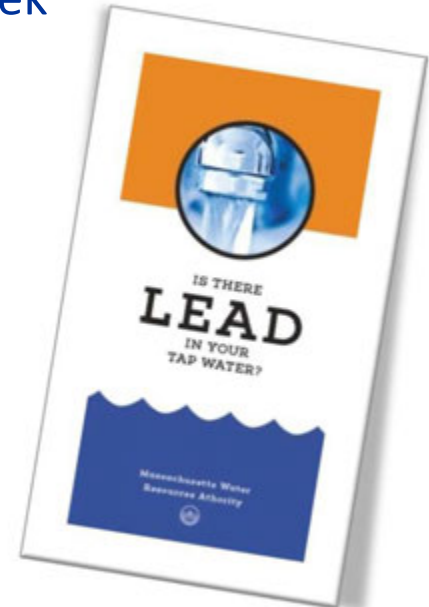
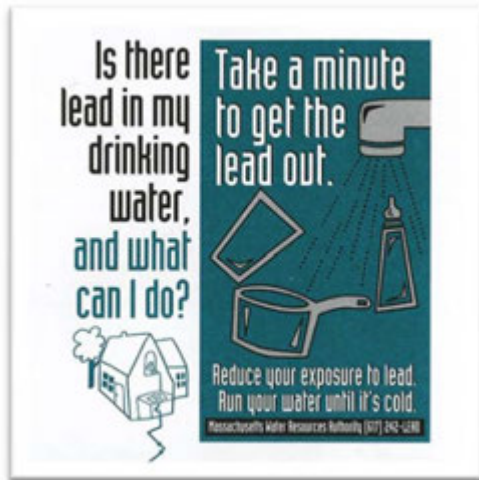
- Newton is scheduled to receive \$4 million dollars in November 2016 for their program
- Four other communities have sent along applications: Peabody, Quincy, Winchester, and Woburn. Expected to receive funds in FY2017





# MWRA/MDPH Joint Outreach and Testing Program

- Sampling protocol has been confirmed, and education materials have been developed
- MWRA and DPH will be training field staff next week
- First samples collected at homes expected this fall







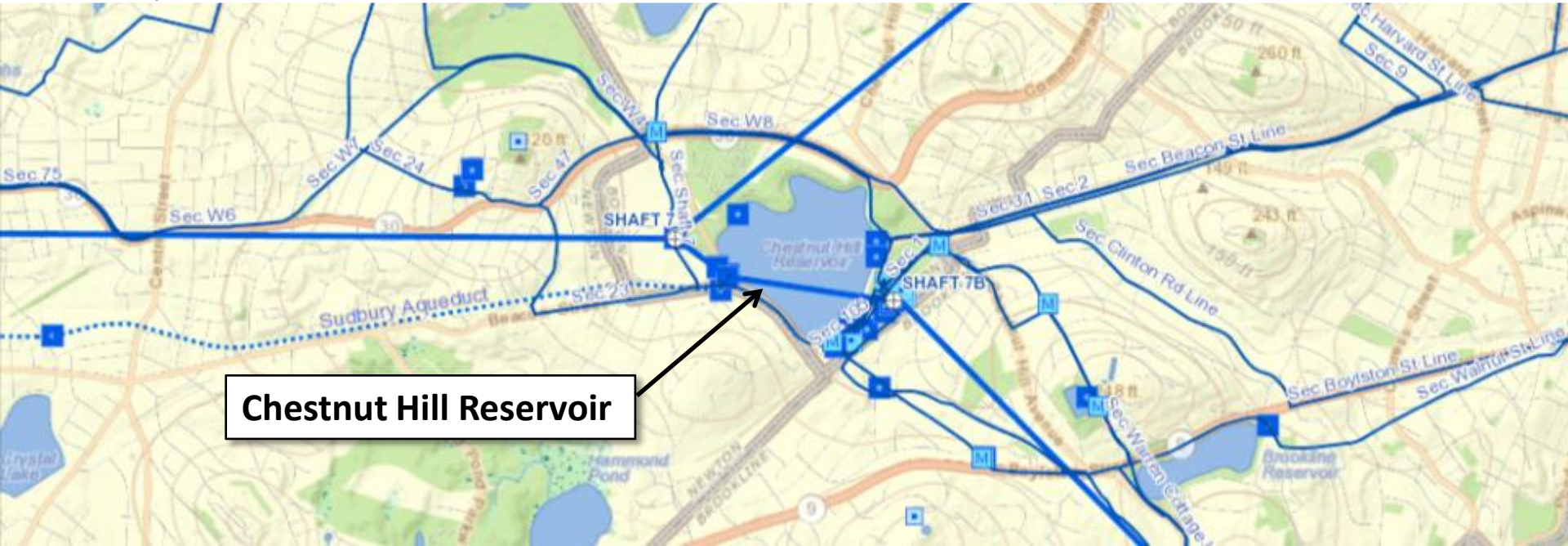
# *Chestnut Hill Emergency Pump Station*

September 14, 2016



# Chestnut Hill Reservoir

- Located at the intersection of Boston, Newton and Brookline
- A focal point of the water system since the 1870's
- Initially supplied by the Cochituate Aqueduct and later by the Sudbury Aqueduct



**Chestnut Hill Reservoir**



# Old Chestnut Hill Pump Stations

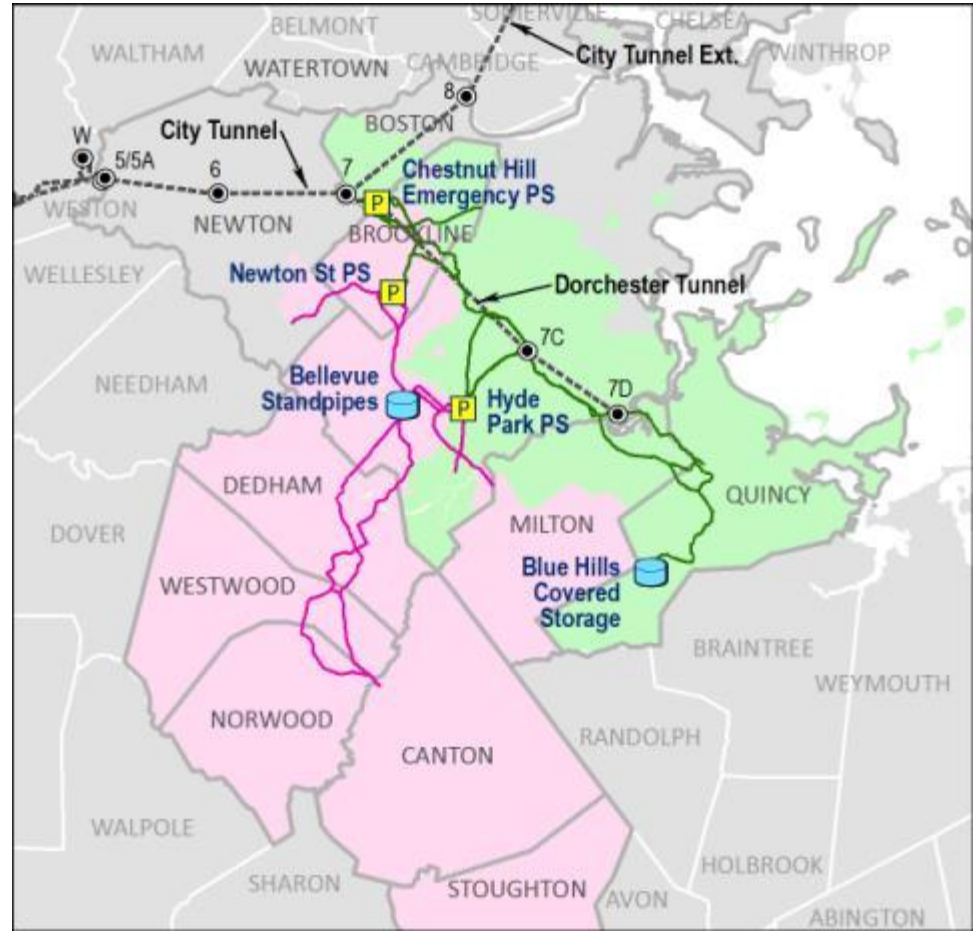


- High Service Station built 1887. Supplied south to Fisher Hill Reservoir in Brookline, Forbes Hill Reservoir in Quincy and later to Blue Hills Reservoir.
- Low Service Station built 1898. Supplied north to Spot Pond in Stoneham.
- Declared surplus in 2002.
- Currently the site of the Metropolitan Waterworks Museum and condominium residences



# Metropolitan Tunnels Changed Southern Service

- City Tunnel in 1950 reduced pumping by direct connection at Shaft 7B
- Blue Hills open reservoir on line in 1954; however, system could not maintain adequate water elevation
- Dorchester Tunnel completed in 1974:
  - Eliminated pumping all together
  - Blue Hills level recovered





## Succession of Pump Strategies at Chestnut Hill

- Steam pump demolition began after Dorchester Tunnel was completed
- Subsequent leaks in the Dorchester Tunnel required shut down for repairs
- Gas turbine pumps were installed at Chestnut Hill. Operated until repairs complete in 1980
- Pumps retained for emergency back-up
- Construction of replacement Emergency Pump Station authorized in 1998





# Chestnut Hill Emergency Pump Station (2001)

- Underground station adjacent to Shaft 7B
- 4 x 1,000 HP Constant Speed Pumps
- Ability to pump from Chestnut Hill Reservoir (~90 MGD) or Boston Low (~35 MGD)
- Pump to Dorchester Tunnel or surface mains





## Station Used Successfully in 2010

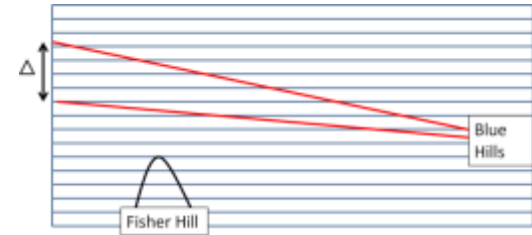
- Activated during Shaft 5A Water Main Break
- Operated during peak demand hours
- Required booster chlorination and boil order
- City Tunnel and Dorchester Tunnel remained in service, despite constrictions upstream



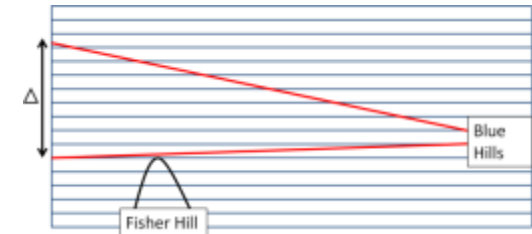


# Operational Challenges Affect Reliability and Service

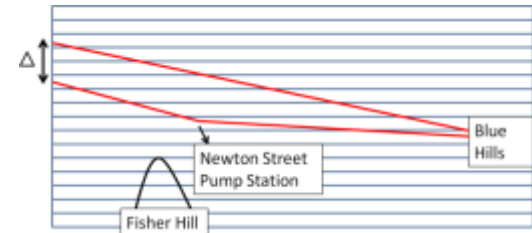
- Some failure scenarios result in Dorchester Tunnel off line
- Need higher-than-normal pressure to overcome surface pipeline deficiencies
  - Could result in surface main breaks
- Reduced pressure concerns when pumps shut down
- Other factors intensify pressure swings:
  - Downstream pump station operations;
  - Power failure
  - Starting/stopping pumps



Additional pressure without tunnel



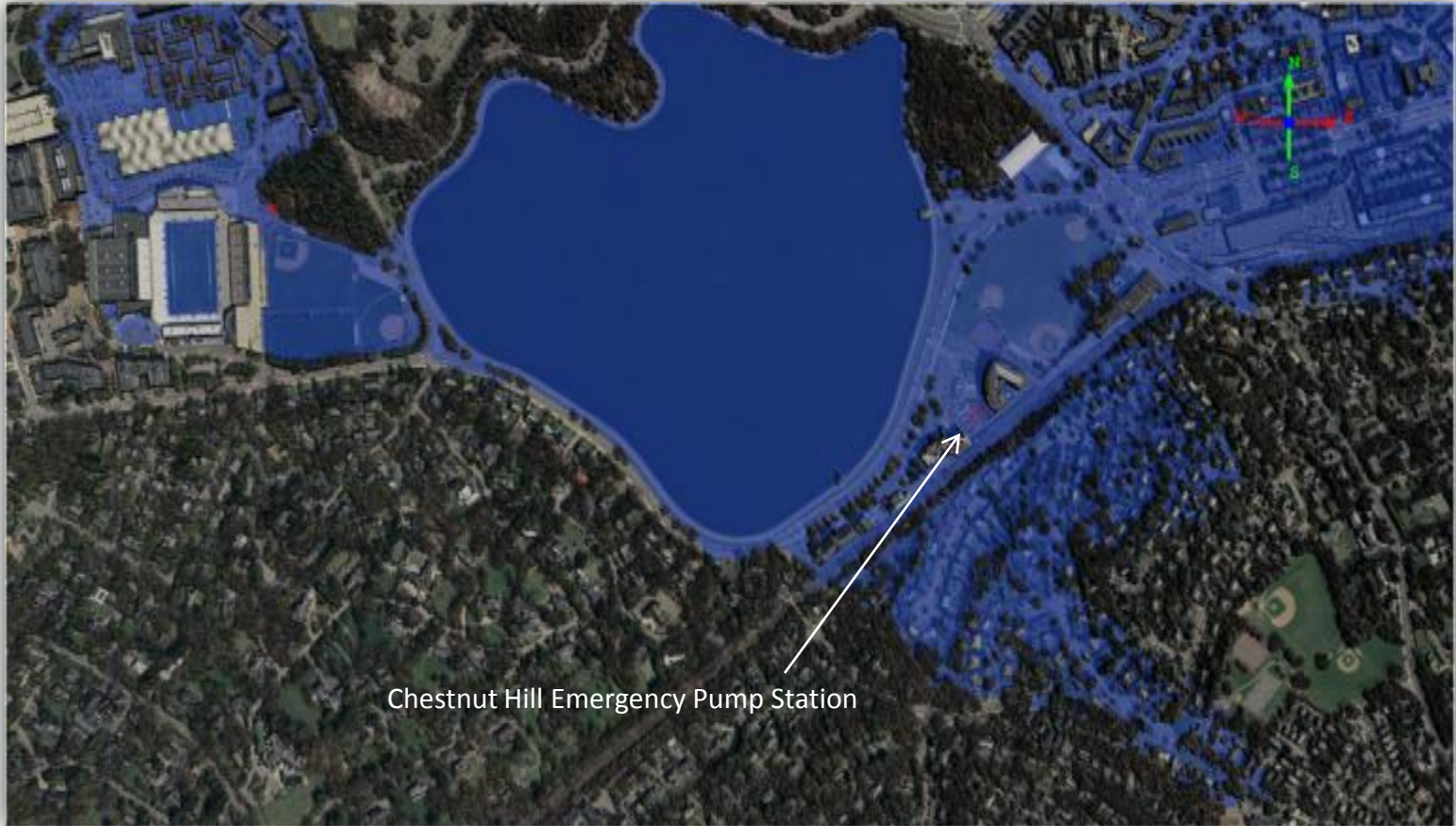
Pump shut down affects high areas



Downstream pump station impacts



# Potentially Inaccessible





## Summary

- Use of the Chestnut Hill Emergency Pump Station without the Dorchester Tunnel creates operational challenges and affects reliability
- Some challenges can be mitigated with station modification and other improvements (if space allows)
- However, southern surface mains still have limited capacity and high head loss
- These concerns could influence strategic decisions about redundancy for Southern High and Southern Extra High service areas

