
WATER RESOURCES AUTHORITY
MASSACHUSETTS

Presentation to

MWRA Board of Directors

MWRA's Outfall Monitoring Overview 2014 Results

October 14, 2015

MWRA Ambient Monitoring

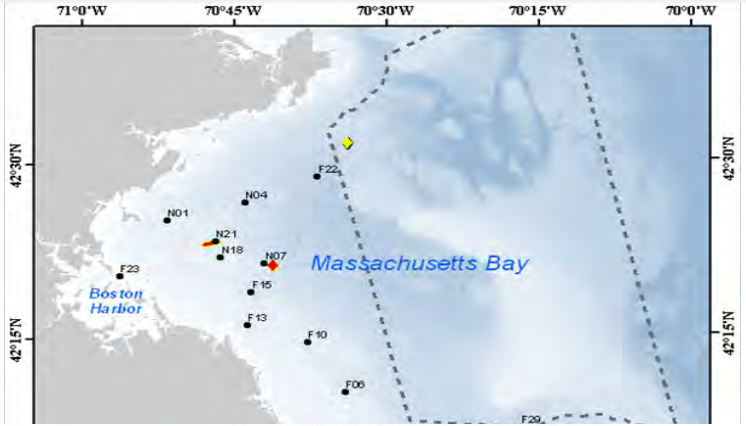
•Moving discharge from Boston Harbor initially caused environmental concerns.

• Comprehensive baseline monitoring required by regulators (1992-2000).

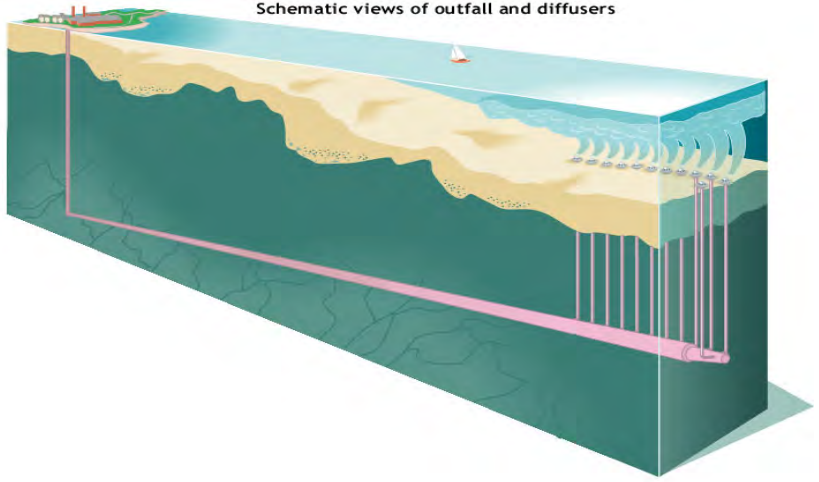
• Ambient monitoring required by DITP Permit (2000+).

•Major programmatic reviews in 2003 and 2009-10 led to reduced Ambient Monitoring requirements.

•Monitoring focuses on studies of receiving water, sediment quality, and fish and shellfish.



Schematic views of outfall and diffusers

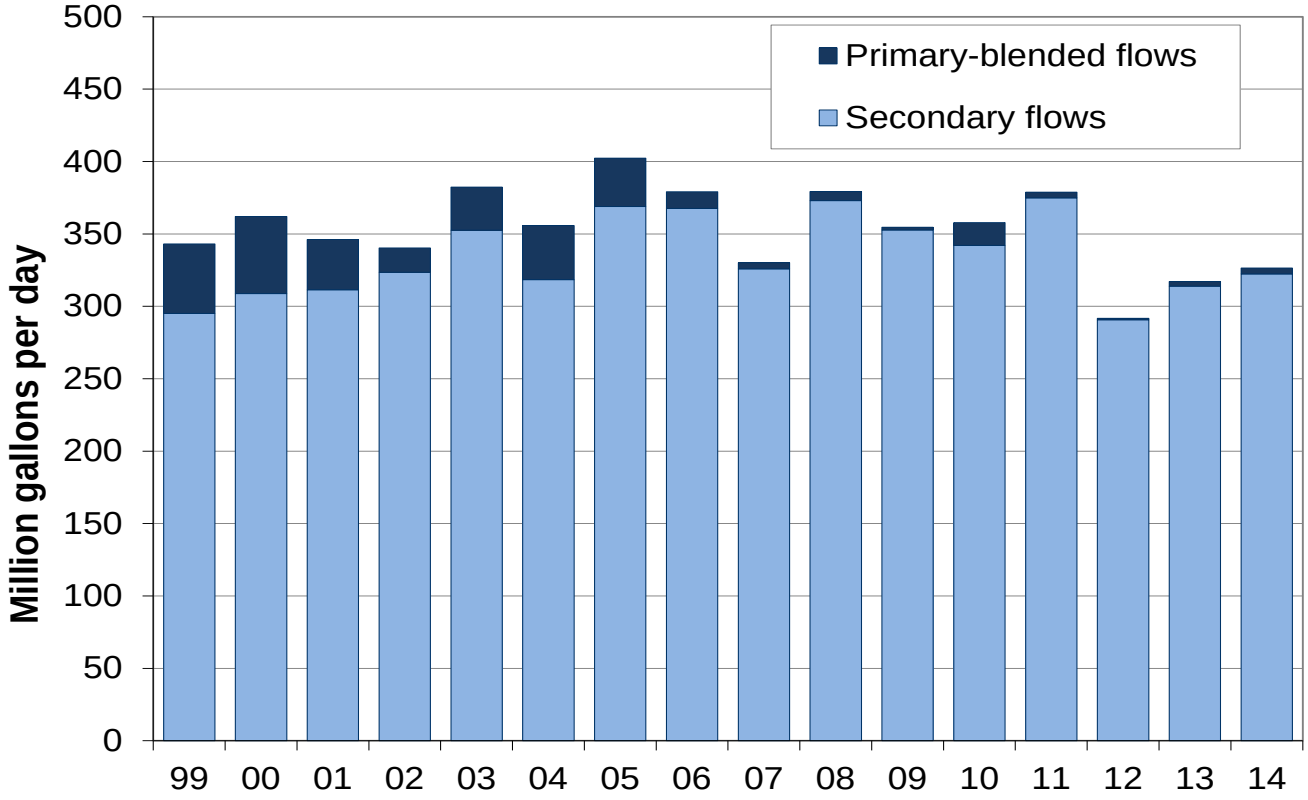


Outfall Monitoring overview 2014 highlights

- Effluent quality (Platinum 8 award!)
- Outfall Monitoring
  - Water quality good year-round
  - Nuisance algae exceedance of Contingency Plan
  - Sediment animal communities-diversity exceedance
  - Flounder liver disease low
- Harbor Monitoring
  - Water quality improvements
  - Sediment improvements
  - Flounder health improvements

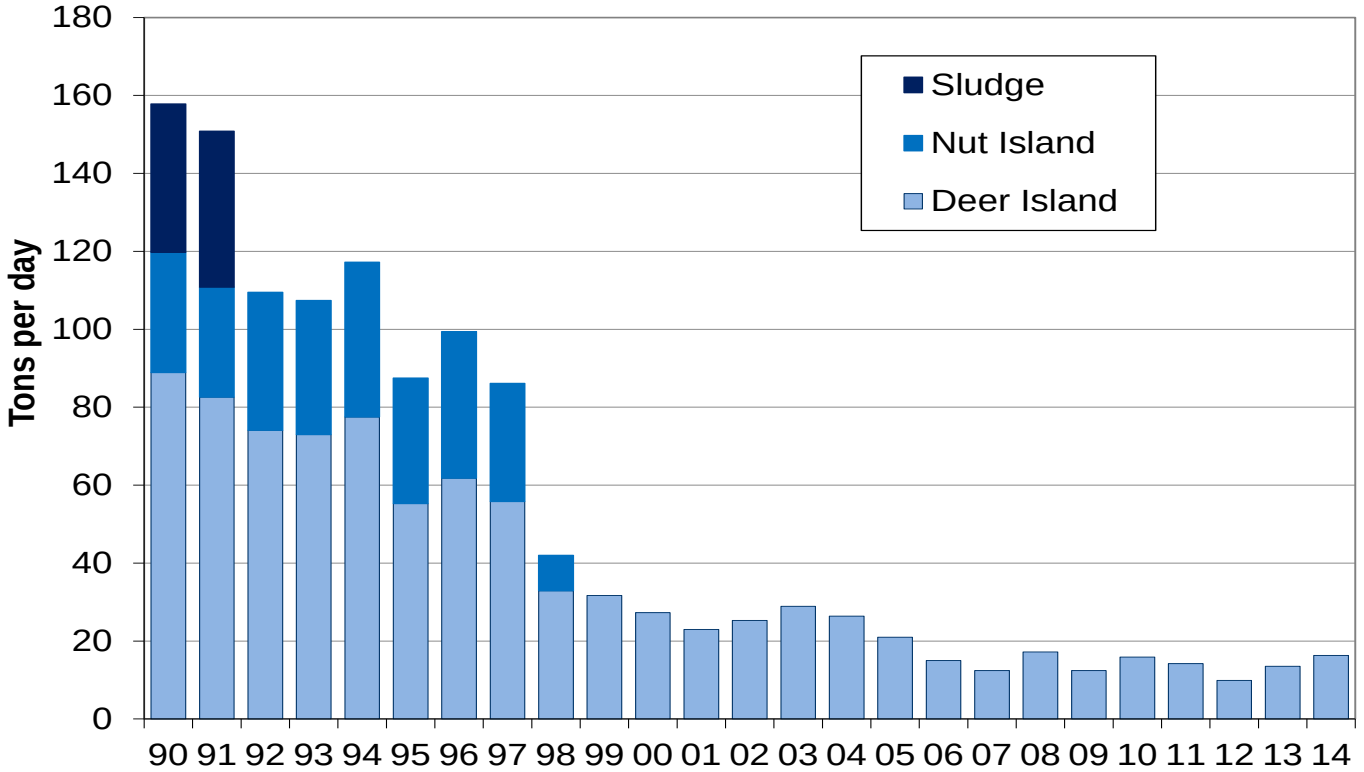
Sieving animals from the bottom sediments

2014 was an average rainfall year with almost no blending



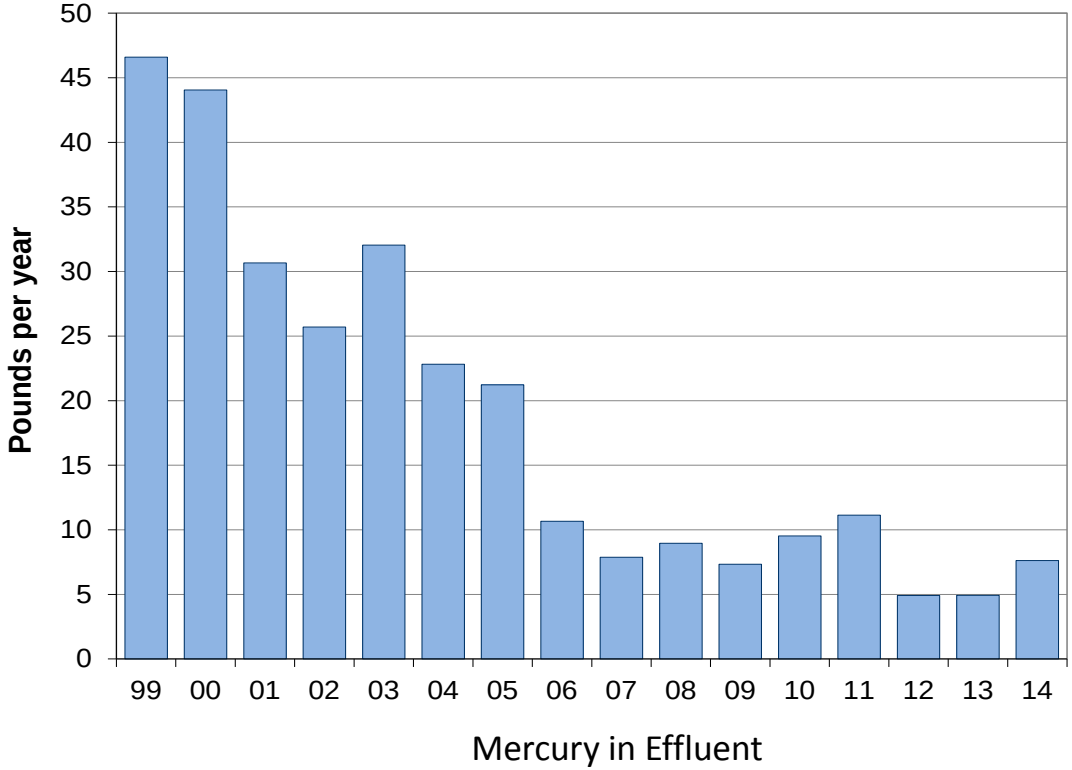
Average flow at DITP, 1999-2014

Total solids discharged (tons/day), 1990-2014



Contaminants in DITP effluent, 2014

- Metals remained low in 2014
  - <20% of discharge to Harbor in early 1990s.
  - Zinc has the highest load and is least toxic; has many sources.
  - Mercury has declined over last decade, < 8 pounds discharged in 2014.



Water quality monitoring 2014 results

- Surface and bottom waters were colder than average in winter and early spring, which delayed plankton growth.
- Dissolved oxygen in bottom waters stayed at healthy levels all year.
- No red tide bloom in 2014.
- Modest bloom of a nuisance algae in May resulted in Contingency Plan threshold exceedance
- No evidence of adverse outfall impact.

Collecting a plankton sample in Massachusetts Bay.

Boston Harbor bacterial water quality

- Monitoring throughout the Harbor since 1989.
- *Enterococcus* is a water quality indicator used for beach postings.
- Huge reduction in intensity and extent of exceedances, even during wet weather.
- There were no postings at South Boston beaches during 2014 (a dry summer).

Prior to Boston Harbor projects (1989-1991)

Most Boston Harbor projects complete (post-2007)

Geometric mean (colonies/100 mL)
Sampled during rainfall
>=0.2 inches within 24 hours

- active treatment outfall
- closed treatment outfall
- active NITP sludge outfall
- closed NITP sludge outfall

Blue contours meet swimming standard, red-purple contours exceed swimming standard

- 0 - 5
- 5 - 10
- 10 - 35
- 35 - 104
- 104 - 158
- 158 - 275
- > 275

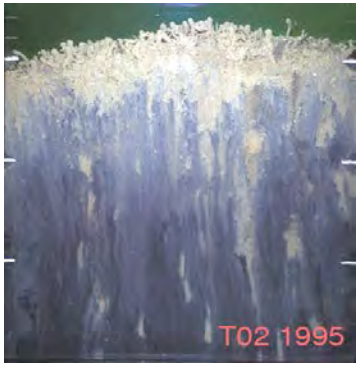
Sea Floor (Benthic) monitoring

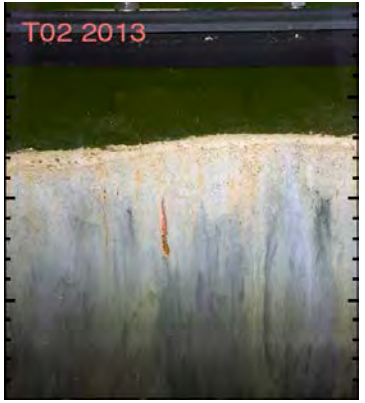
- Contaminants and organic matter bind to particles and deposit on the sea-floor.
- Animals in sediments are sensitive.
- Boston Harbor experienced extremely polluted sediments before Boston Harbor Project.
- MWRA has been monitoring sediments in Boston Harbor and Mass Bay since the early 1990s.

Collecting sea-floor sediments off of Deer Island

Harbor sediment communities recover from pollution

Collecting sediment profile images





Sediment profile images from the mouth of the Inner Harbor. Light-colored sediments are oxygenated.

Mass Bay: Sediments were of high quality in 2014

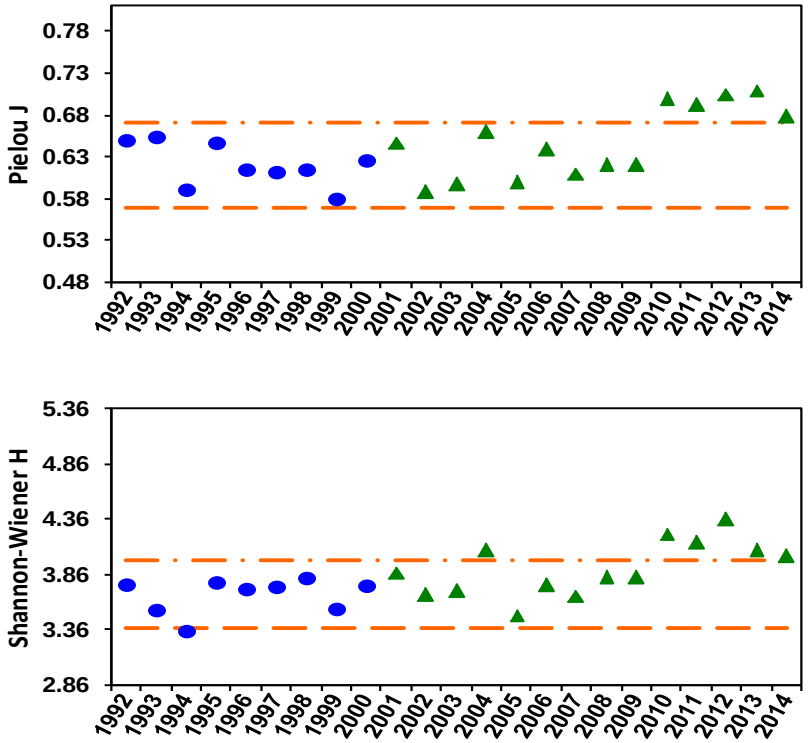
- Aerated sediments in the nearfield were the deepest yet measured.

- Animal communities near the discharge were more diverse than observed before outfall startup.

- This finding triggered a threshold exceedance (5th consecutive year).

- Evaluations indicate this is a normal fluctuation not observed during baseline.

- Contaminant sampling in 2014 shows no buildup of contaminants near outfall, most contaminants are decreasing or remaining the same.

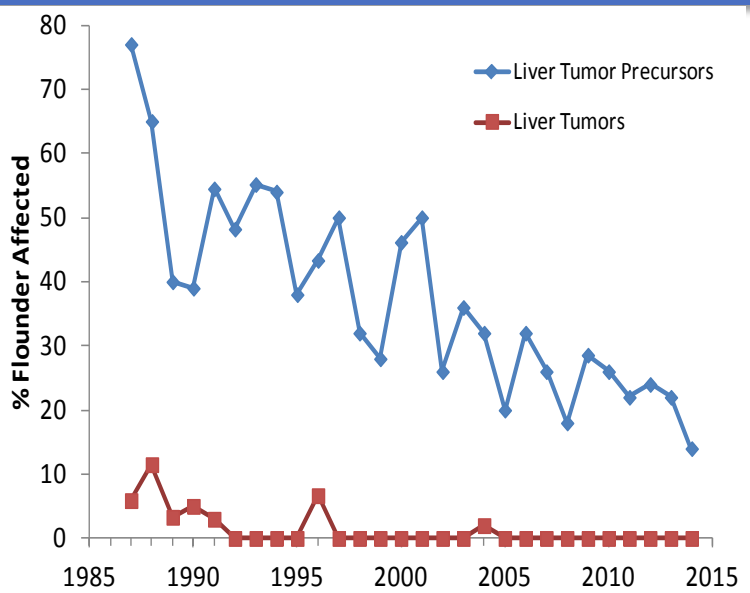


Two measures of sediment biodiversity

Flounder liver health

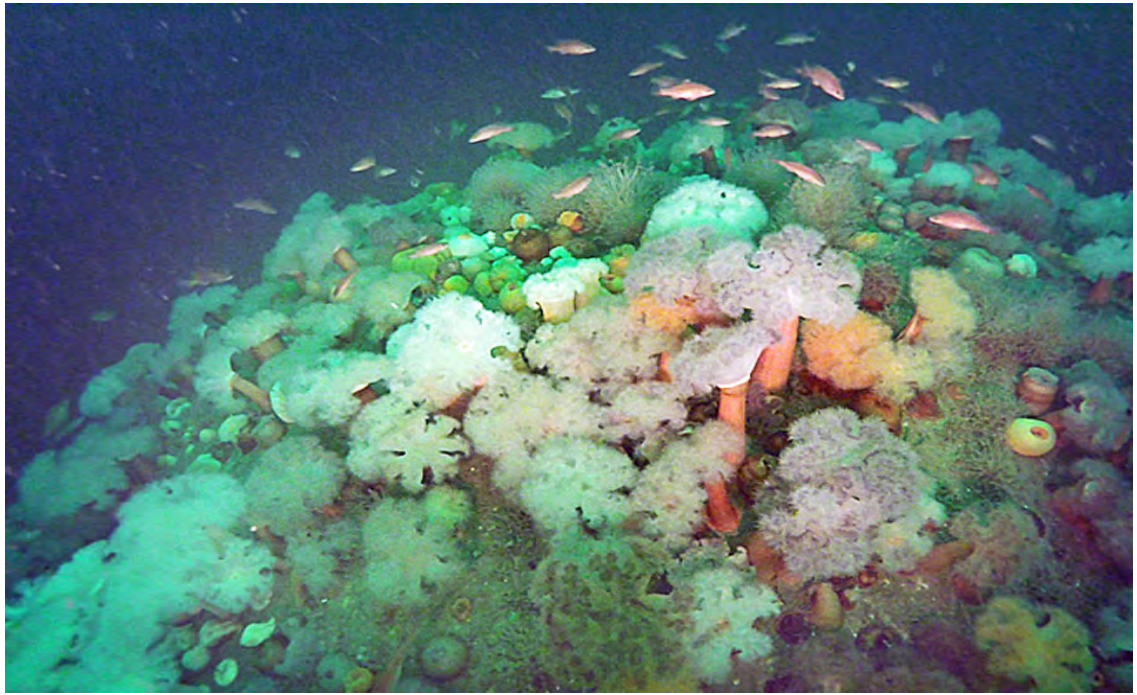
Winter flounder and cod on sea-floor near outfall

Flounder health in Boston Harbor



- Diseased flounder were one cause of Boston Harbor being termed “Dirtiest in the Nation”.
- Liver tumors were last observed in 2004.
- Prevalence of liver tumor precursors has decreased by more than 2/3.
- Tumor precursors are decreasing near outfall as well; 2014 levels were the lowest yet observed.

Hardbottom communities are healthy



Hard bottom monitoring occurs every third year,
Survey occurred in June 2014. No discharge impacts were observed.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Presentation to

MWRA Board of Directors

DITP Fire Alarm System Update

October 14, 2015

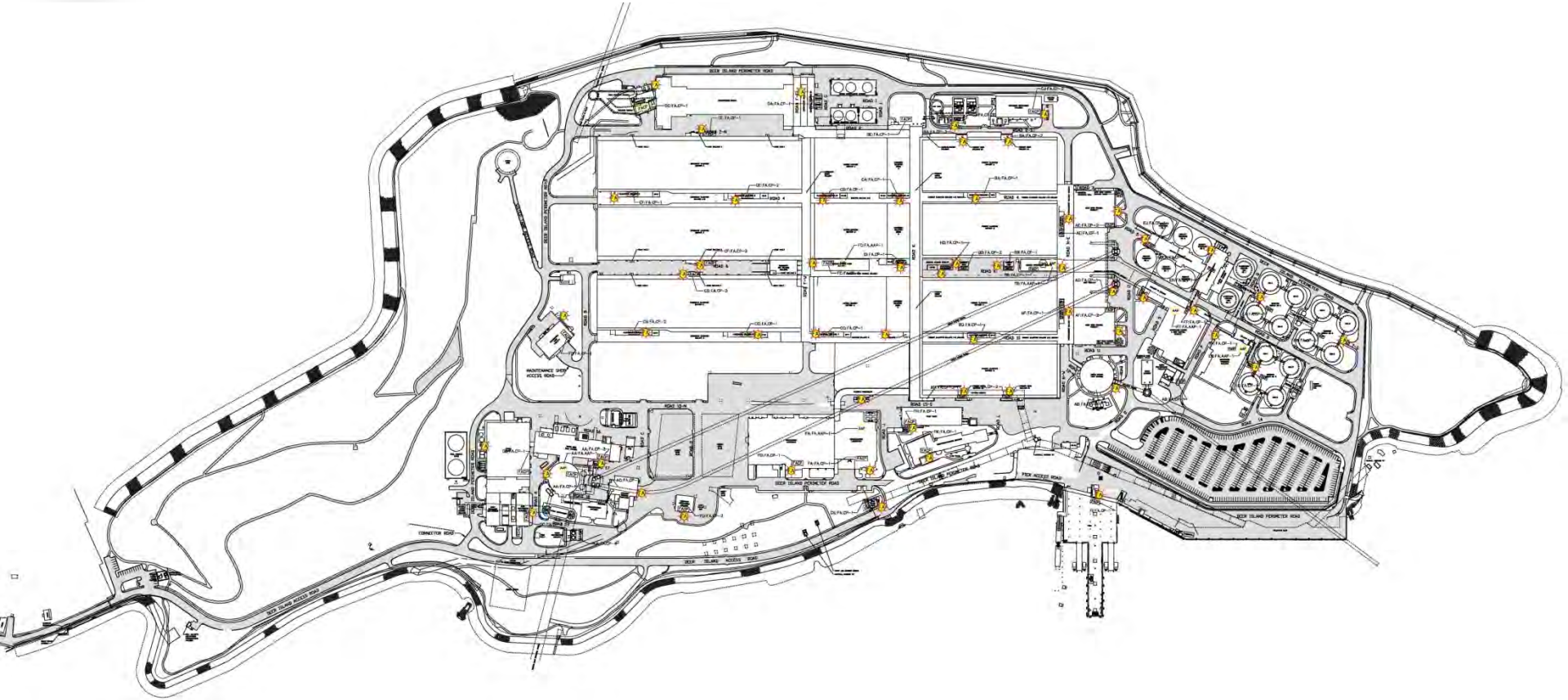
Fire Alarm System Overview

- **System is 18-23 years old**
- **One of the largest systems in New England**
- **System is comprised of:**
  - Graphic annunciation panels
  - 43 local Fire Alarm Control Panels
  - 0ver 3000 signaling devices (i.e. smoke and heat detectors, strobes horns, pull stations, etc.)
  - Over 6 miles of fiber optic cable

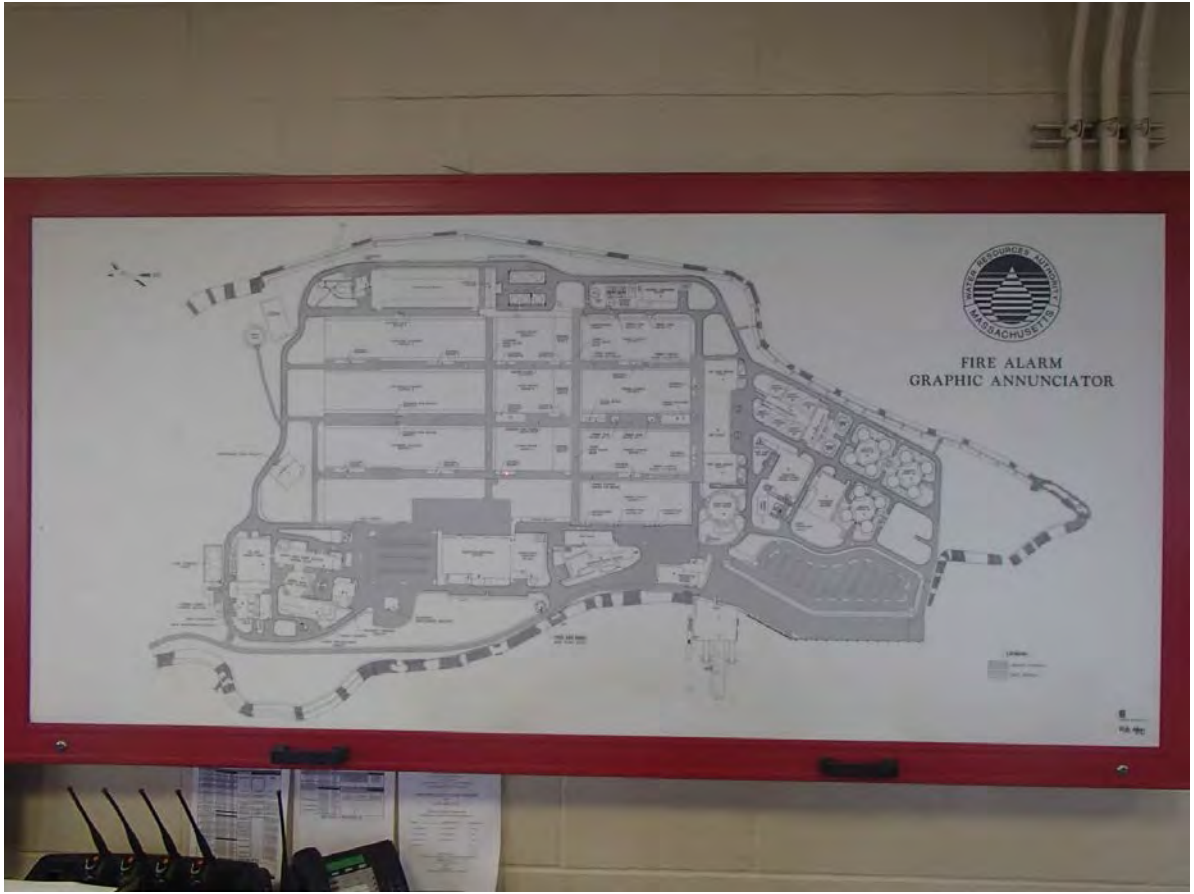
Project Specific Issues

- Parts are no longer available.
- Fiber optic highway is over 20 years old-may need to be replaced.
- Evaluate fire pumps
- Upgraded to existing applicable codes
  - Regularly scheduled meetings with Winthrop and Boston Fire Departments

DITP Active Fire Alarm Systems

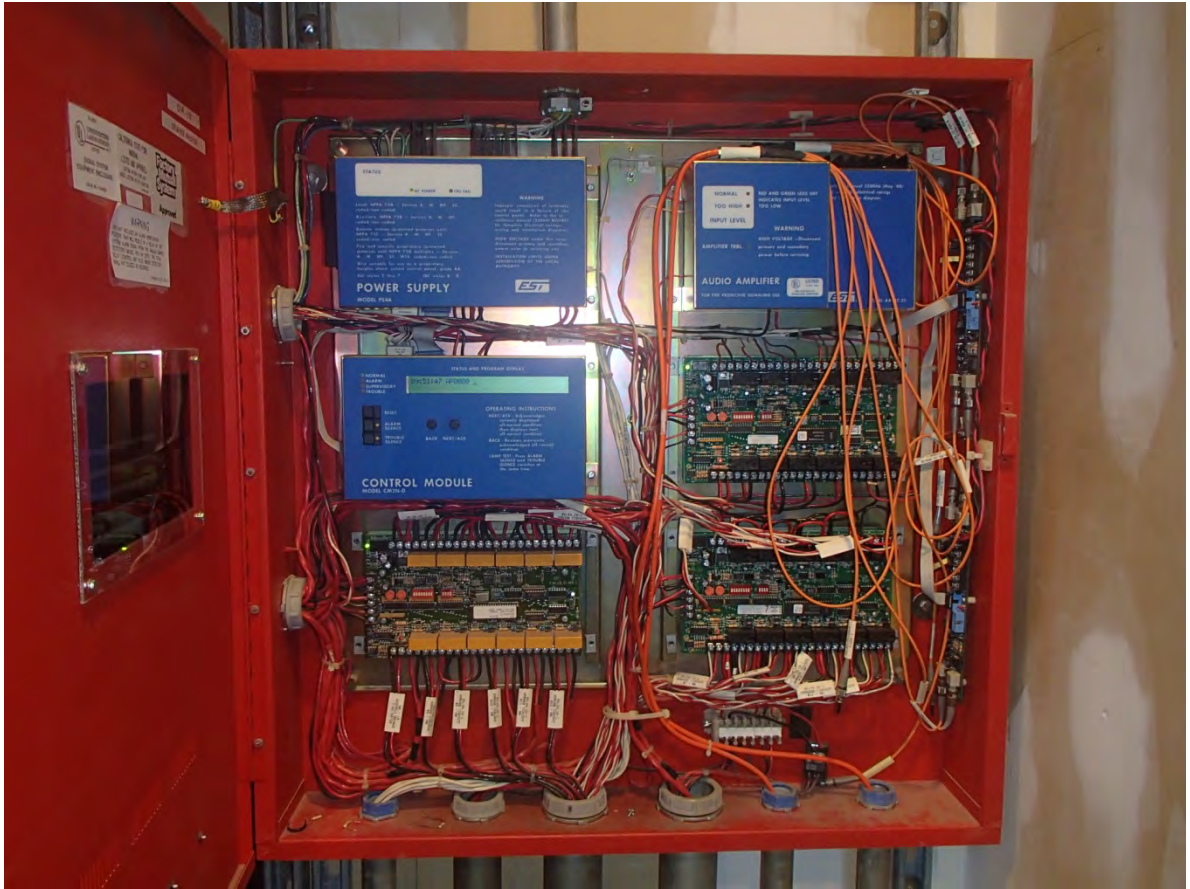


Graphic Annunciation Panel



Fire Alarm Control Panel

Fire Alarm Control Panel (inside of panel)



Fire Alarm Pumping system

Design / Construction Phases

- DESIGN PHASE
  - Preliminary Design Report (180 days)
  - Final Design Phase (12 months)
- Construction to commence Spring 2017 (42 months)
- Original system construction cost (1992 dollars): $13M
- New system construction cost: $16M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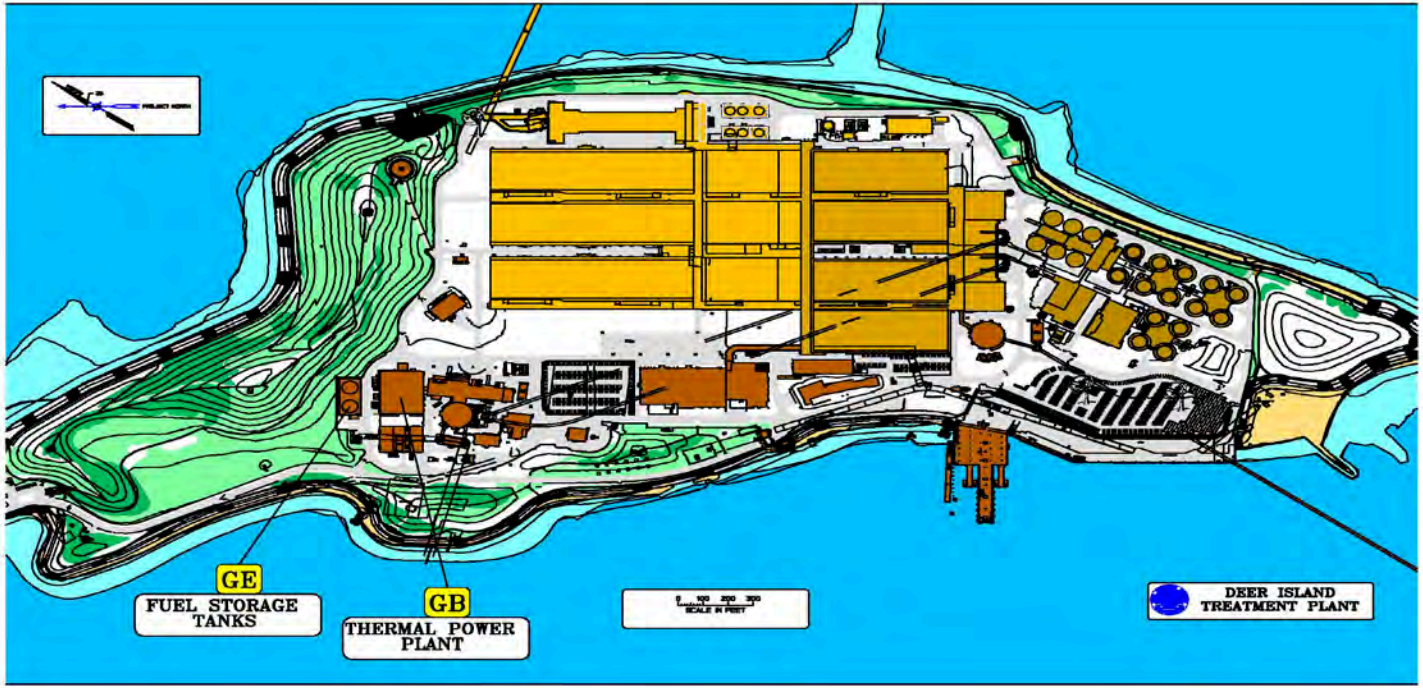
TPP Fuel Oil System Upgrade

October 14, 2015

Fuel Oil Tank Farm Location



Fuel Oil Tank Farm

- Two 750,000 gal. storage tanks
- Ultra low sulfur diesel fuel
- One Existing Fuel Oil Skid; 3 pumps, 1 standby
- one buried pipeline from tanks to TPP

Fuel Oil Skid

Project Overview

- **Fuel Oil Pumping skid system consists of three pumps (1-standby):**
  - Provides fuel to both CTG units and boilers
  - Single point of failures
  - New Fuel Oil skid on elevated platform
  - New pipeline
  - Totally independent control systems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John J. Carroll Water Treatment Plant
10 Year Operation Status Report

October 14, 2015

Carroll Treatment Plant placed into service July 27, 2005

- Continuously met all regulatory requirements
- Improvements to water quality
- Maintenance program to protect plant assets
- Optimized plant processes
- System improvement projects

Treatment Processes

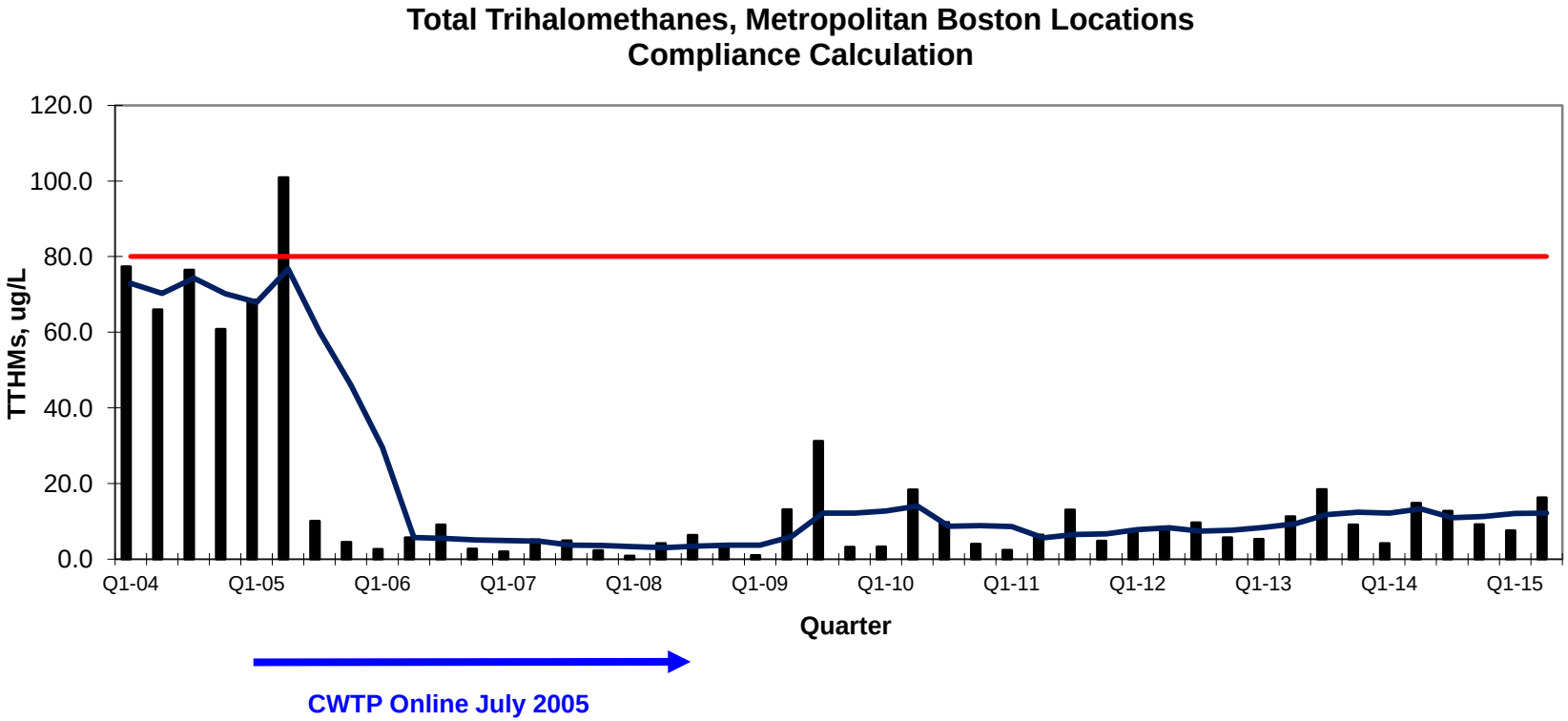
- Ozone for primary disinfection
- Second primary disinfection (UV) added in 2014

- Soda Ash and Carbon Dioxide for corrosion control
- Chlorine and ammonia for residual disinfection
- Fluoride for dental health

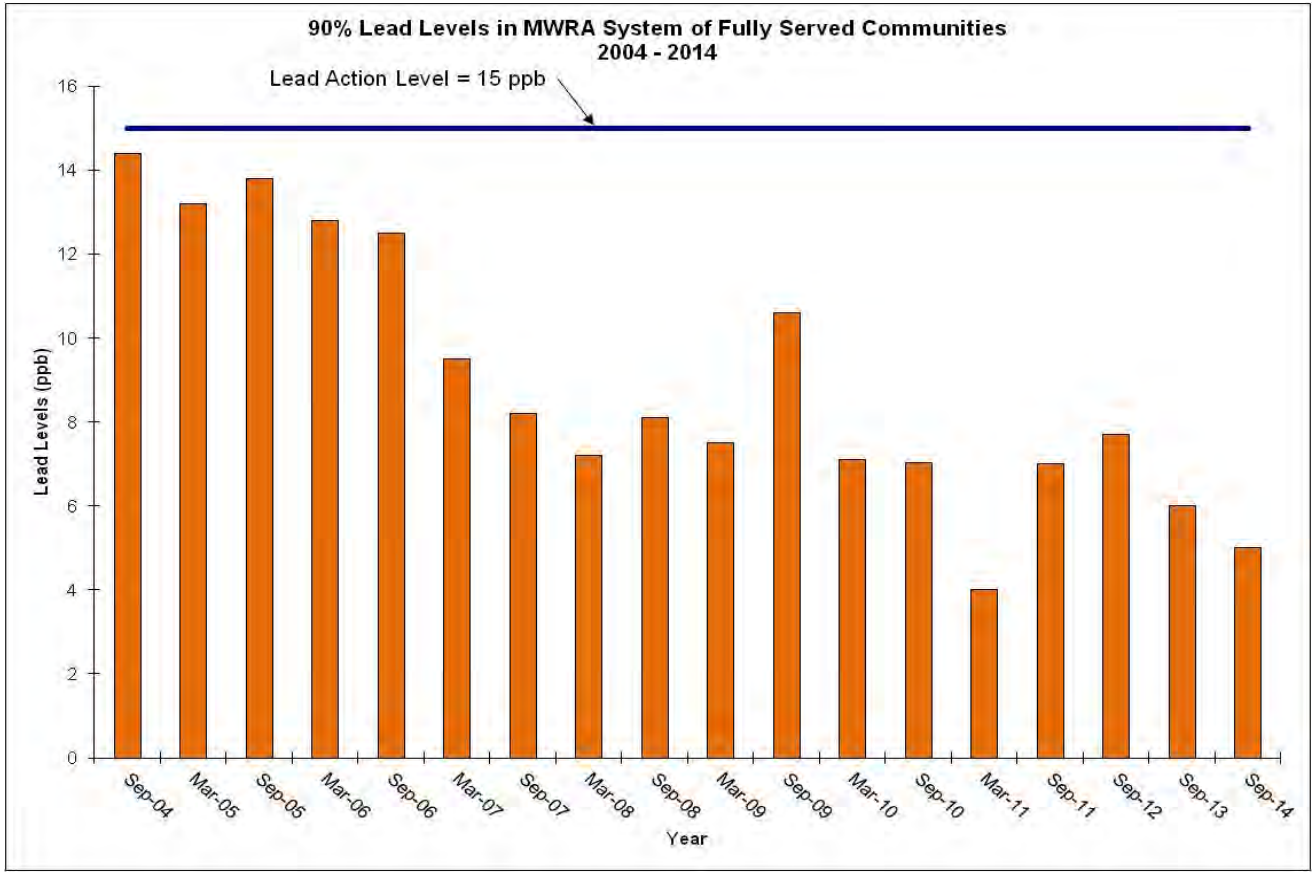
Safer Water = Better Water

- Inactivation of 99.9% of *Giardia*, 99% *Cryptosporidium*, 99.99% viruses.
- Reduction in chlorinated disinfection by-products
- Optimum Water Quality Parameters for reduced lead and copper levels
- Low bacterial counts, strong chloramine residuals…without taste and odor complaints.
- Water is clearer and tastes better!

Safer Water


Total Trihalomethanes, Metropolitan Boston Locations
Compliance Calculation
TTHMs, ug/L
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Q1-04
Q1-05
Q1-06
Q1-07
Q1-08
Q1-09
Q1-10
Q1-11
Q1-12
Q1-13
Q1-14
Q1-15
Quarter
CWTP Online July 2005

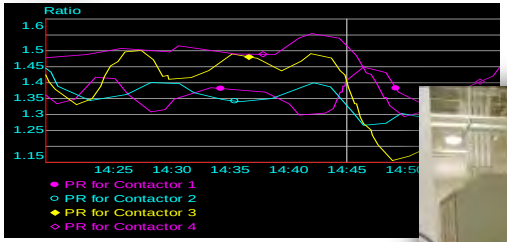
Safer Water


90% Lead Levels in MWRA System of Fully Served Communities
2004 - 2014
Lead Action Level = 15 ppb
Lead Levels (ppb)
16
14
12
10
8
6
4
2
0
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Mar-11
Sep-11
Sep-12
Sep-13
Sep-14
Year

Robust Maintenance Program

- More than 4,000 pieces of equipment in Computerized Maintenance Management System (Maximo)
- > 7,000 Preventative Maintenance Work Orders
- 99% completion Rate
- Excellent equipment reliability
- Half Plant operation each winter

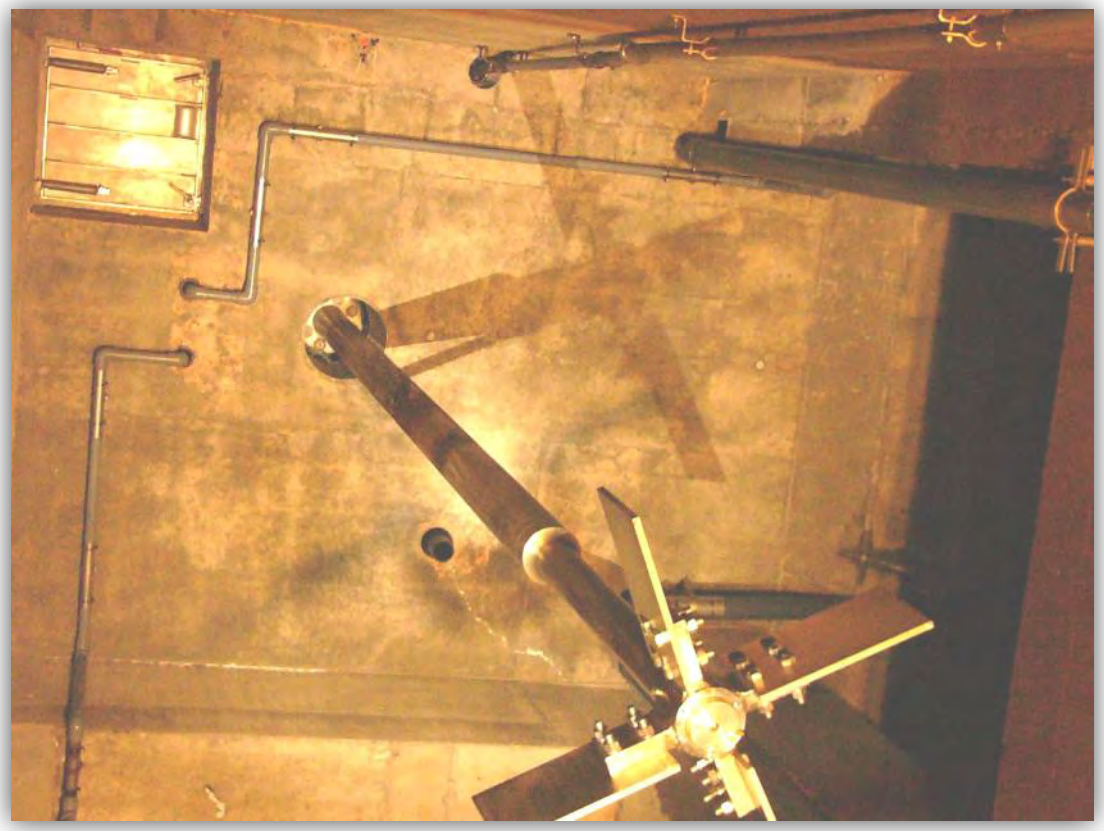
Process Optimization



- Thousands of process variables monitored
- Fine-tuned operation and re-designed systems and procedures
- Reduced unplanned shut-downs to average one per year
  - Plant restart from > 4 hours to 1-1/2 hours
  - Alternate chemical flow pacing controls

Energy Conservation

- Replacement of lighting fixtures
- Variable speed drives for pumps on heating system
- Carbon dioxide sensors for control of HVAC air supply
- Elimination of dry mixers
- Ozone system optimization



Alternative Energy

- American Recovery and Reinvestment Act funds
- 496 KW solar photovoltaic system
- 2,420 individual solar panels
- Off-set about 5% of energy consumed at plant

Addition of Ultraviolet disinfection

- Demolition of extended ozone contactors
- Continued operation of facility with NO regulatory violations

Addition of Ultraviolet disinfection

- Conversion to new UV treatment rooms
- Equipment installation
- Construction of new electrical building
- Total cost of $32M

Continued Improvements – Closed Loop Cooling System

- Closed loop cooling system added to stop internal corrosion of ozone generators
- Ozone generators disassembled and rebuilt

Continued Improvements – Redundant GOX Supply Line

- GOX line identified as single point of failure
- Temporary oxygen system installed to keep ozone system running
- New redundant GOX line installed

Future Challenges

- Integrate Wachusett Aqueduct pump station into plant operation
- Declining demand impacts on process optimization
- Asset protection and replacement

Summary

- Produces great tasting, safe water
- Has met all regulatory requirements
- Maintained to protect plant assets
- Improvements made to increase reliability and efficiency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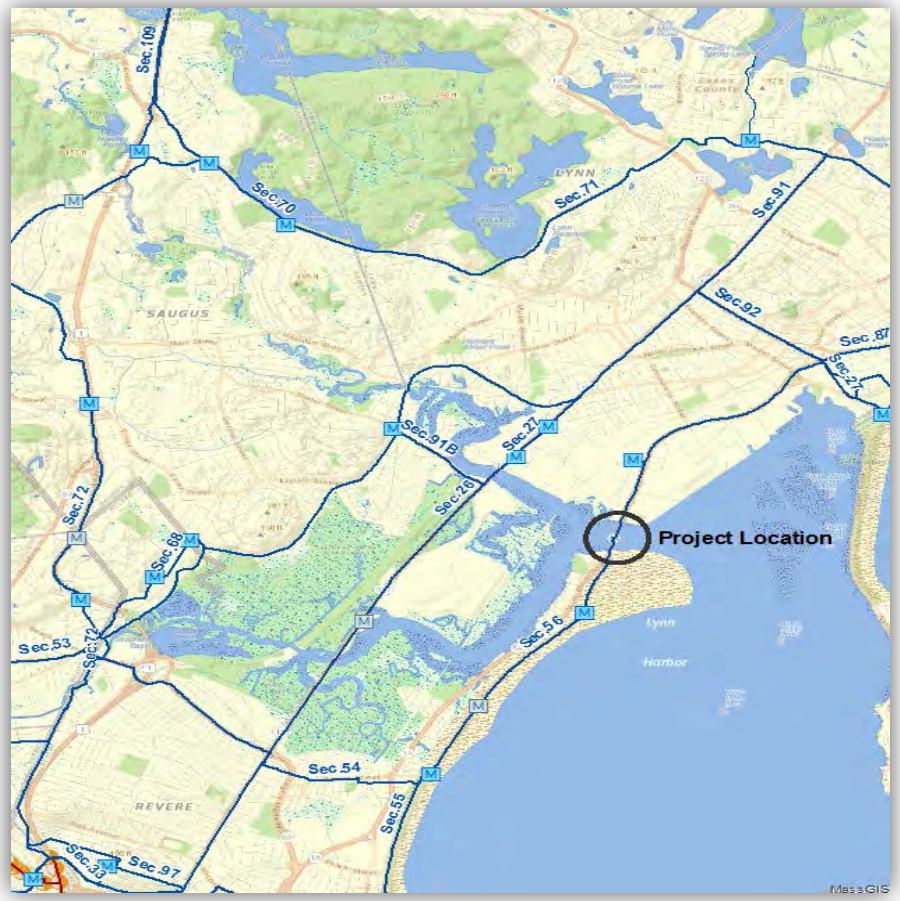
Engineering Services to Conduct Feasibility Study
Section 56 General Edwards Bridge
Crossing of the Saugus River

Contract 7500

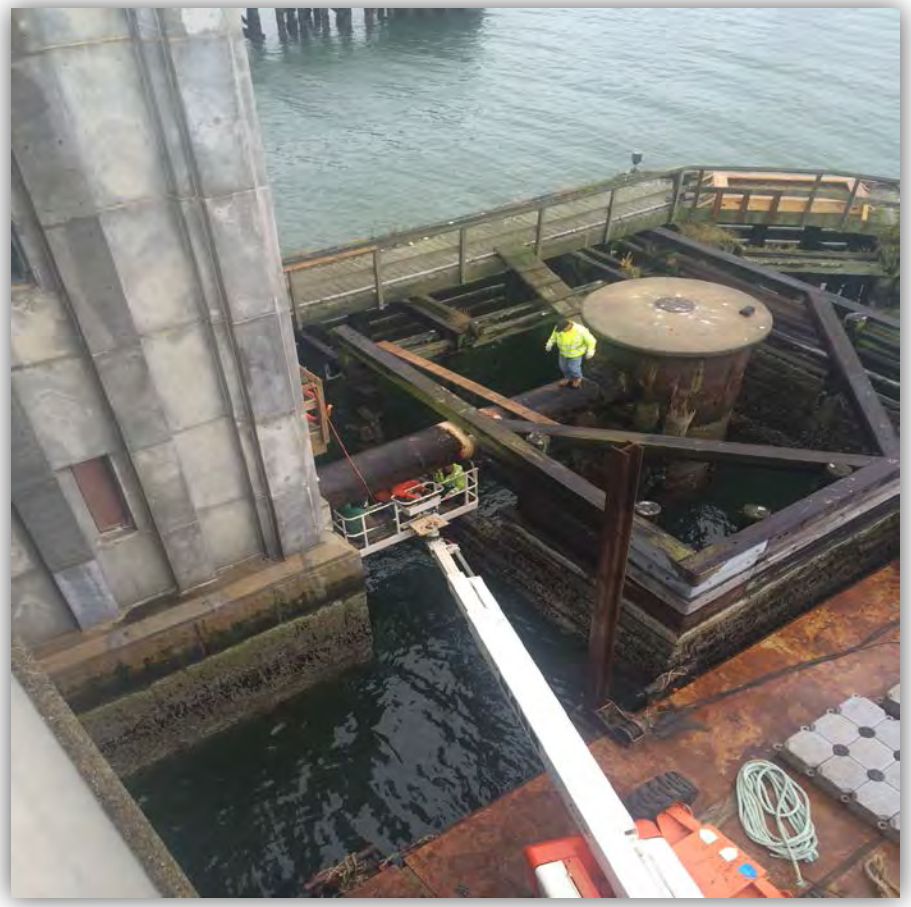
October 14, 2015

Section 56 Saugus River Crossing / Project Limits



General Edwards Bridge

Previous Leak Repairs – Near North Tunnel Shaft, 2014



Previous Leak Repairs - Welded Plug & Mechanical Clamp, 2014

Corrosion Protection at South Tunnel Shaft, 2014

Current Condition of the Pipe Under the Bridge, 2015

Exterior Rust and Corrosion of the Pipe Under the Bridge, 2015

Splitting of the Pipe under the Bridge, 2015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