



Massachusetts Water Resources Authority

Presentation to the

New England Intergovernmental Audit Forum Meeting

on

Drinking Water Quality Assurance

Kennebunkport, Maine

November 4, 2016

Stephen Estes-Smargiassi

Director of Planning and Sustainability



Best Known for the "Boston Harbor Cleanup"





And Quabbin Reservoir





And a few years ago for a major pipe break



Surveillance Camera Captures Leak – May 1, 2010



Who Are We?

- MWRA provides wholesale water and wastewater services to over 2.5 million customers in 61 communities
- On average, MWRA delivers about 200 million gallons per day to its water customers
- MWRA collects and treats an average of 350 million gallons of wastewater per day, with a peak capacity of 1.2 billion gallons





Staff and Facilities Across the State

1170 Staff

Over 400 Vehicles

Wastewater

2 Treatment Plants

12 Pump Stations

4 Headworks

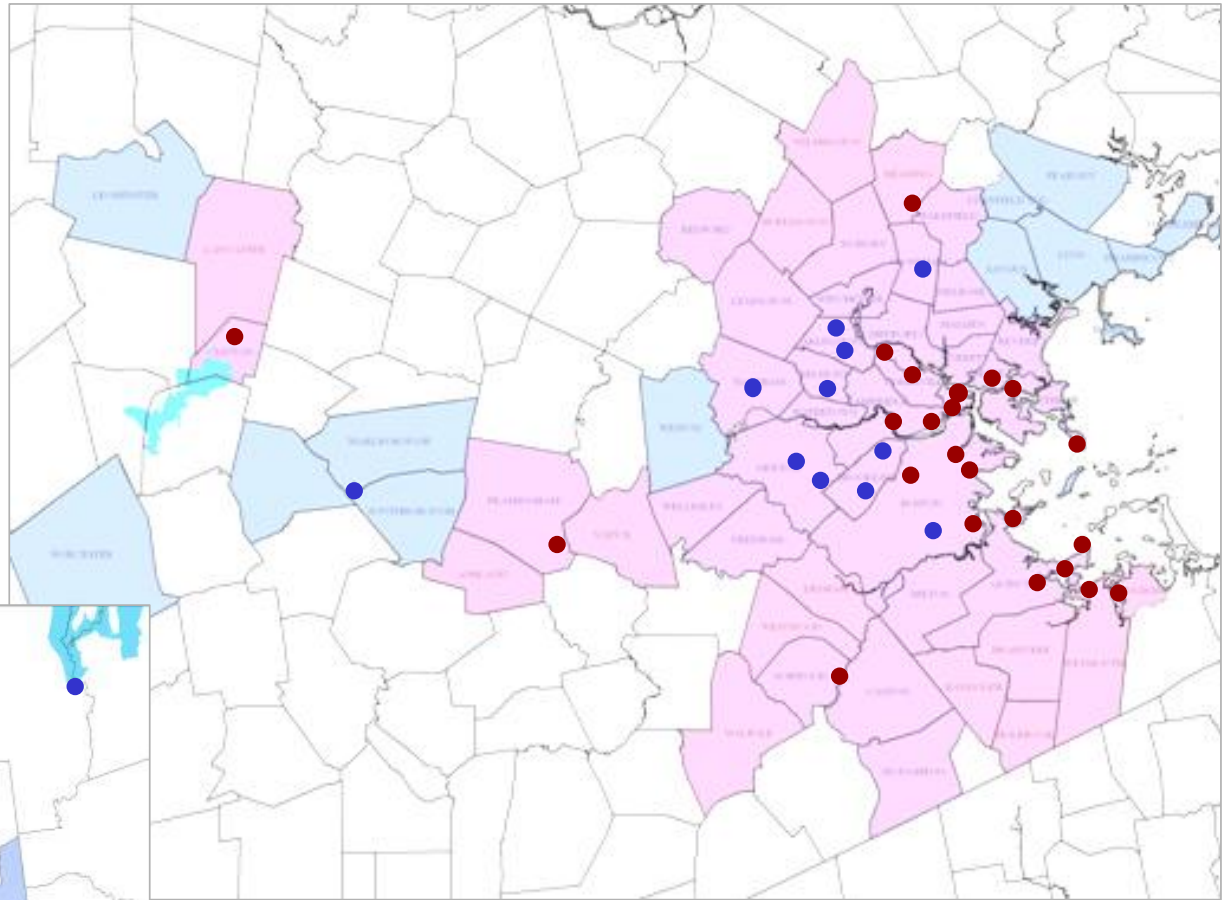
5 CSO Facilities

Water

2 Treatment Plants

10 Pump Stations

12 Tanks





Accountability and Transparency

Staff to Management

- Daily and event reporting

- Weekly reports on key indicators and initiatives

- Monthly “Yellow Notebook” posted to Intranet

Management to Board of Directors

- Financial Indicators – Monthly

- Quarterly “Orange Notebook” with highlights

Agency to Public

- Full transparency on web site – “open checkbook”

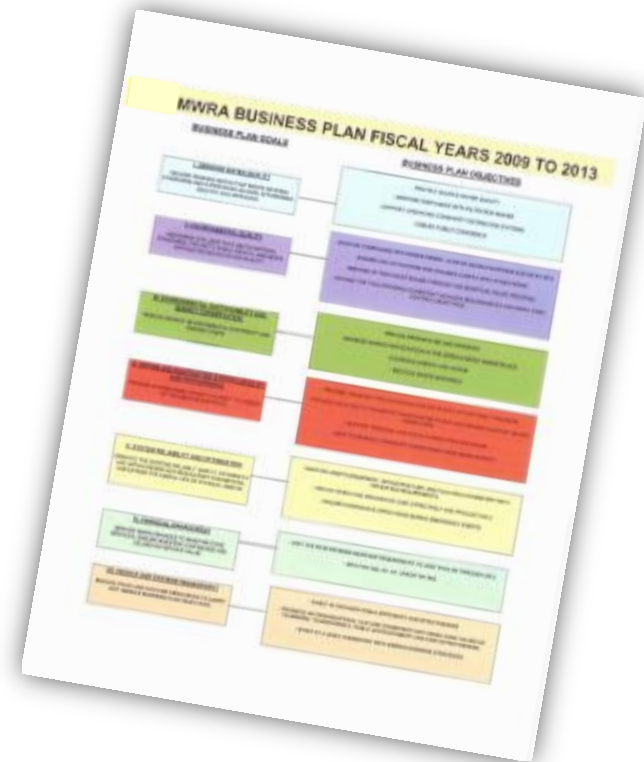
- Full access to Orange Notebook

- Full access to Board of Directors materials



Planning and Performance Measurement Framework

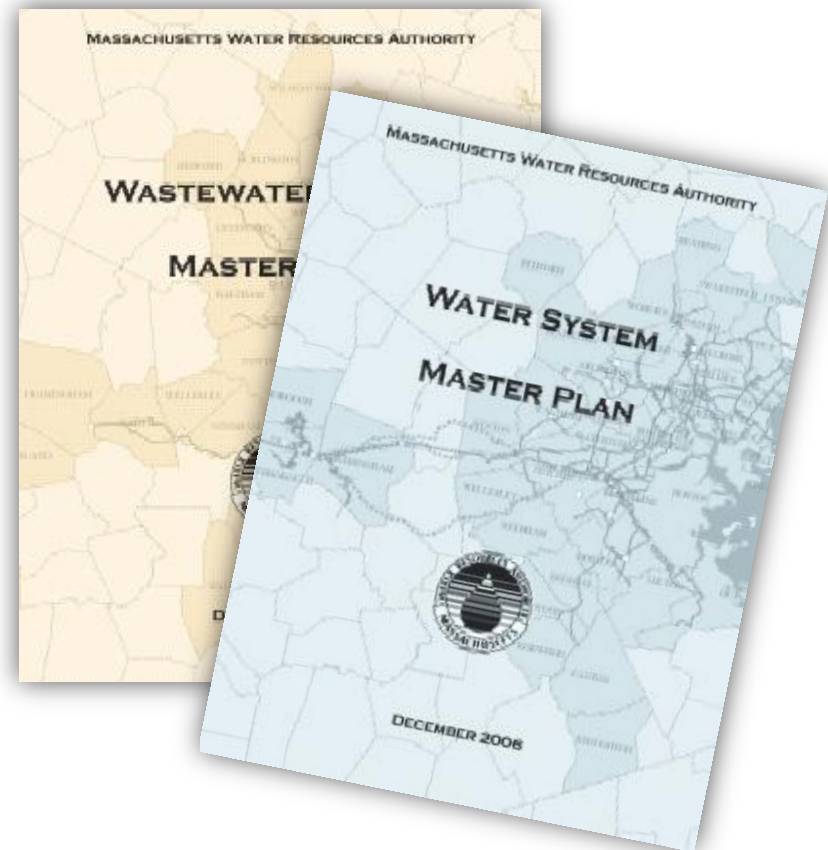
- **Business Plan** – 5-year horizon, quarterly milestones





Planning and Performance Measurement Framework

- **Business Plan** – 5-year horizon, quarterly milestones
- **Master Plans** – 20 year horizon





Planning and Performance Measurement Framework

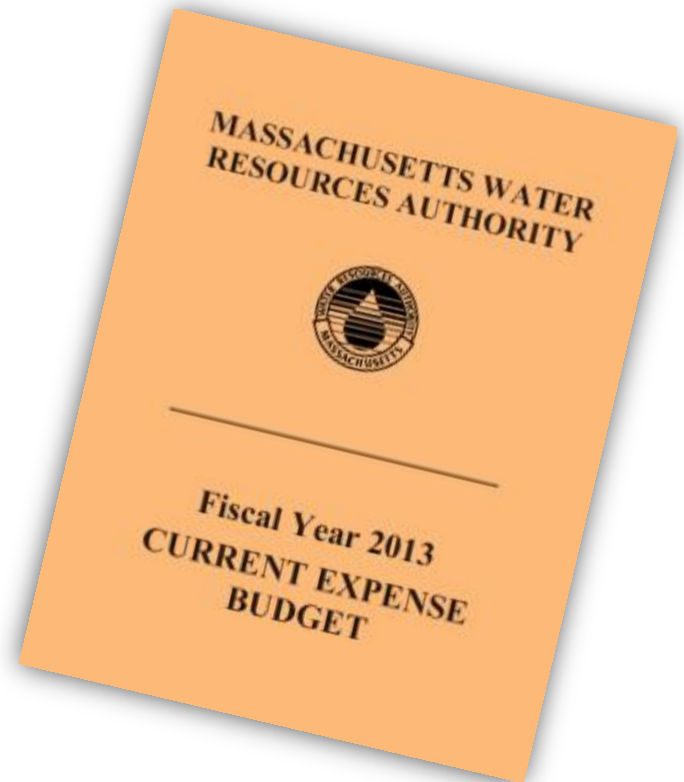
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- **Master Plans** – 20 year horizon
- **Capital Budget** – Approved Annually, 5-year cap periods





Planning and Performance Measurement Framework

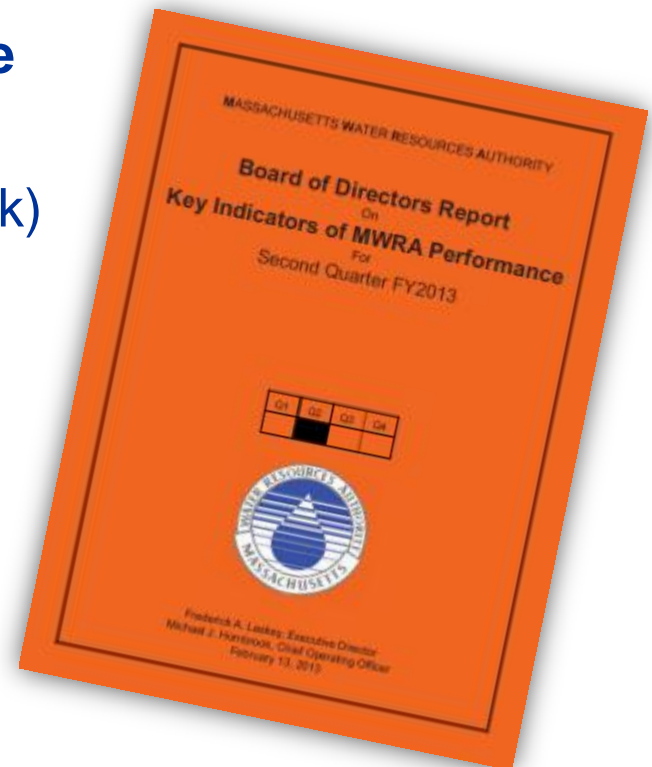
- **Business Plan** – 5-year horizon, quarterly milestones
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- **Capital Budget** – Approved Annually, 5-year cap periods
- **Current Expense Budget** – Annually





Planning and Performance Measurement Framework

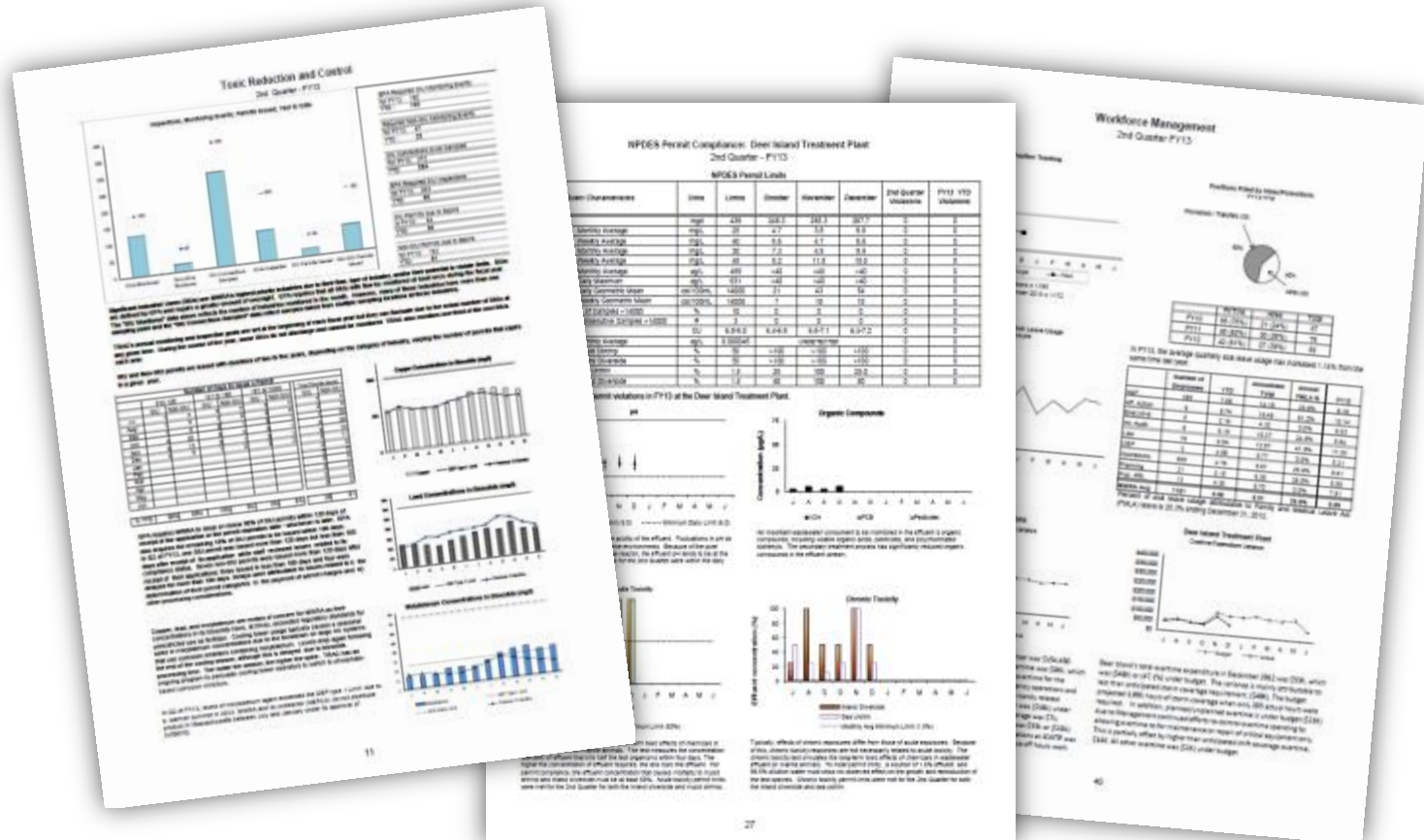
- **Business Plan** – 5-year horizon, quarterly milestones
- **Master Plans** – 20 year horizon
- **Capital Budget** – Approved Annually, 5-year cap periods
- **Current Expense Budget** – Annually
- **Key Indicators of MWRA Performance**
 - Monthly Internal (Yellow Notebook)
 - Quarterly External (Orange Notebook)





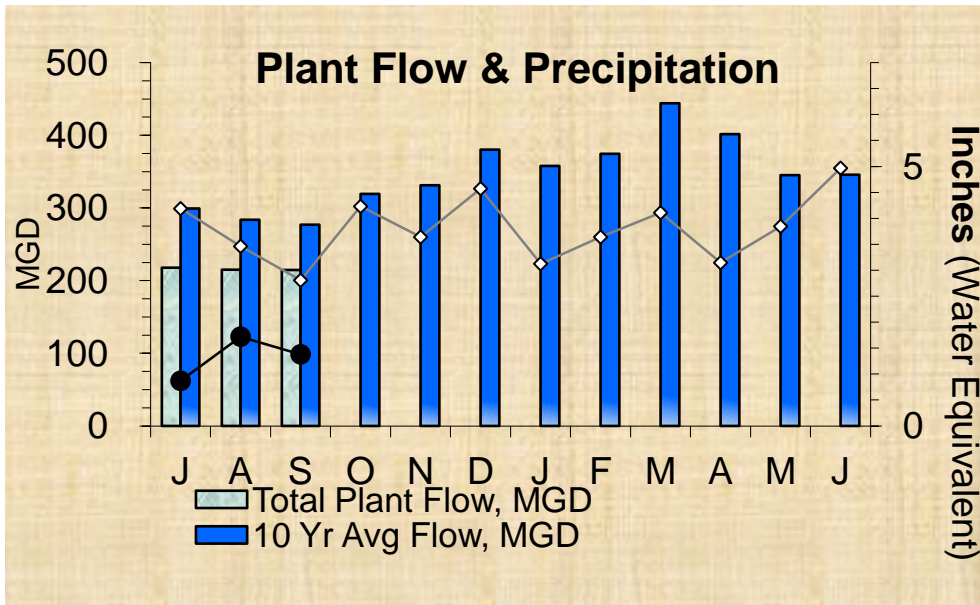
So, What Do We Track?

- Just about everything!





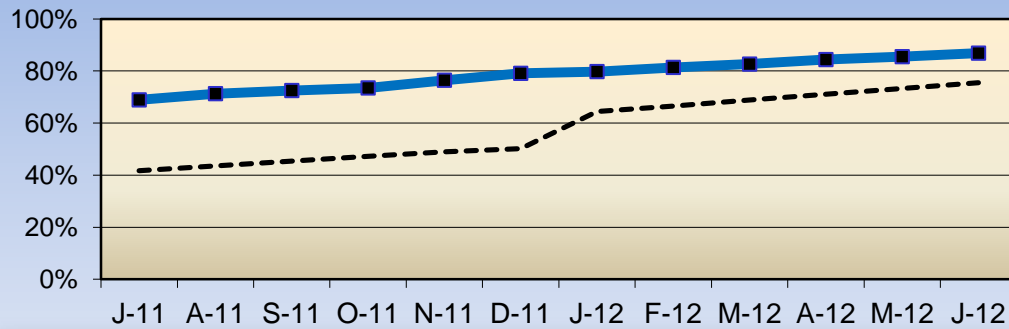
From Flows to Deer Island...





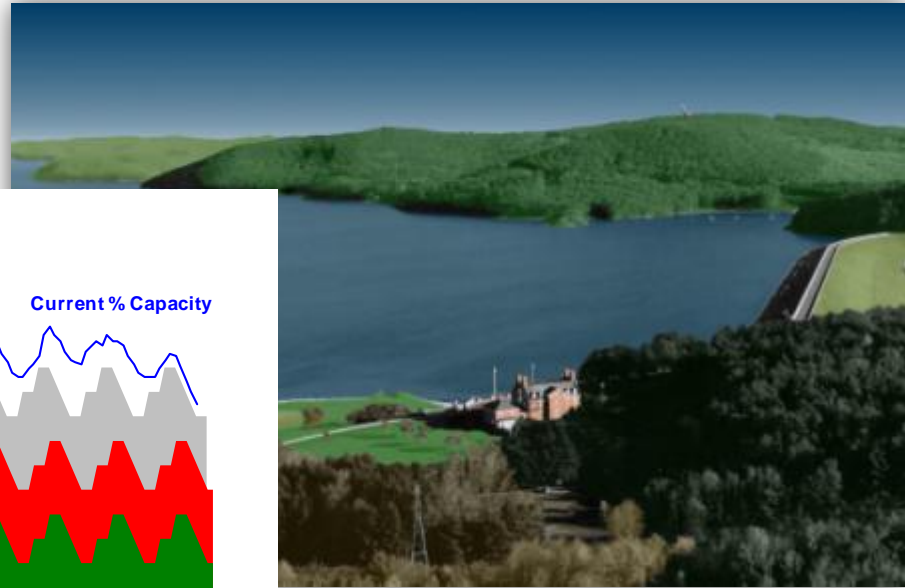
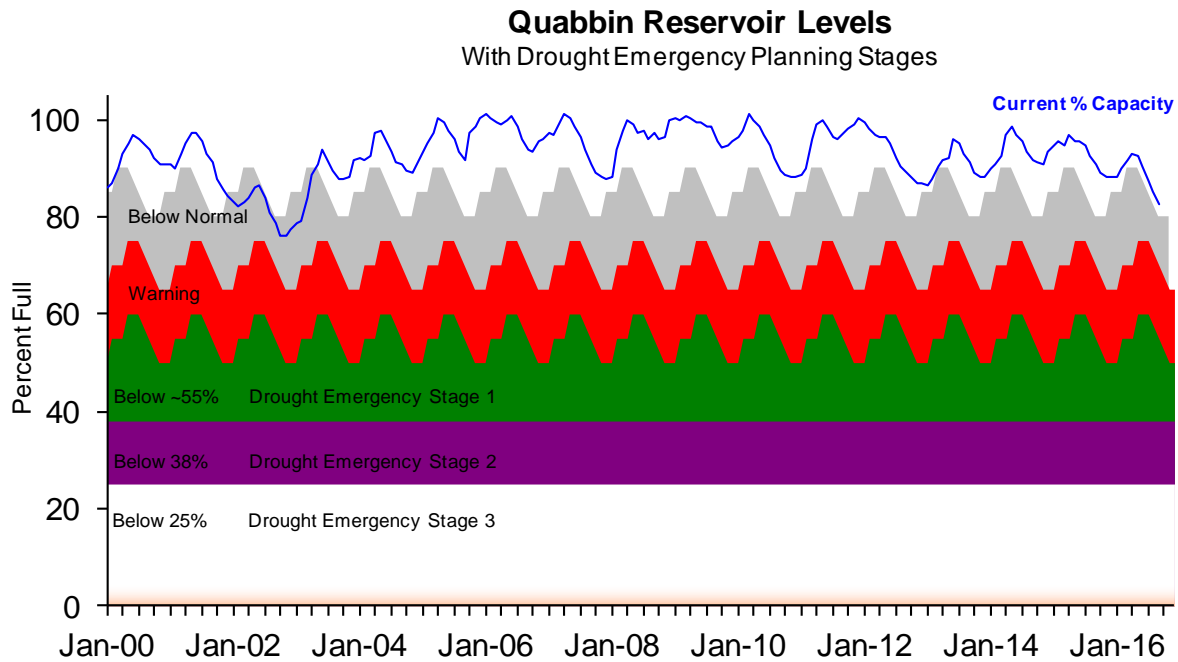
To Construction Progress...

Progress - June 2012





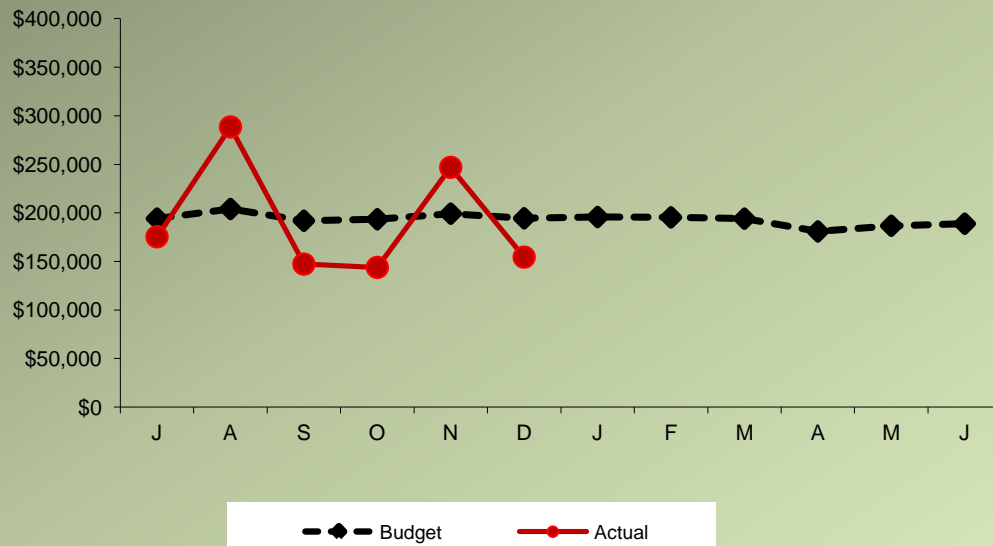
To Reservoir Levels...





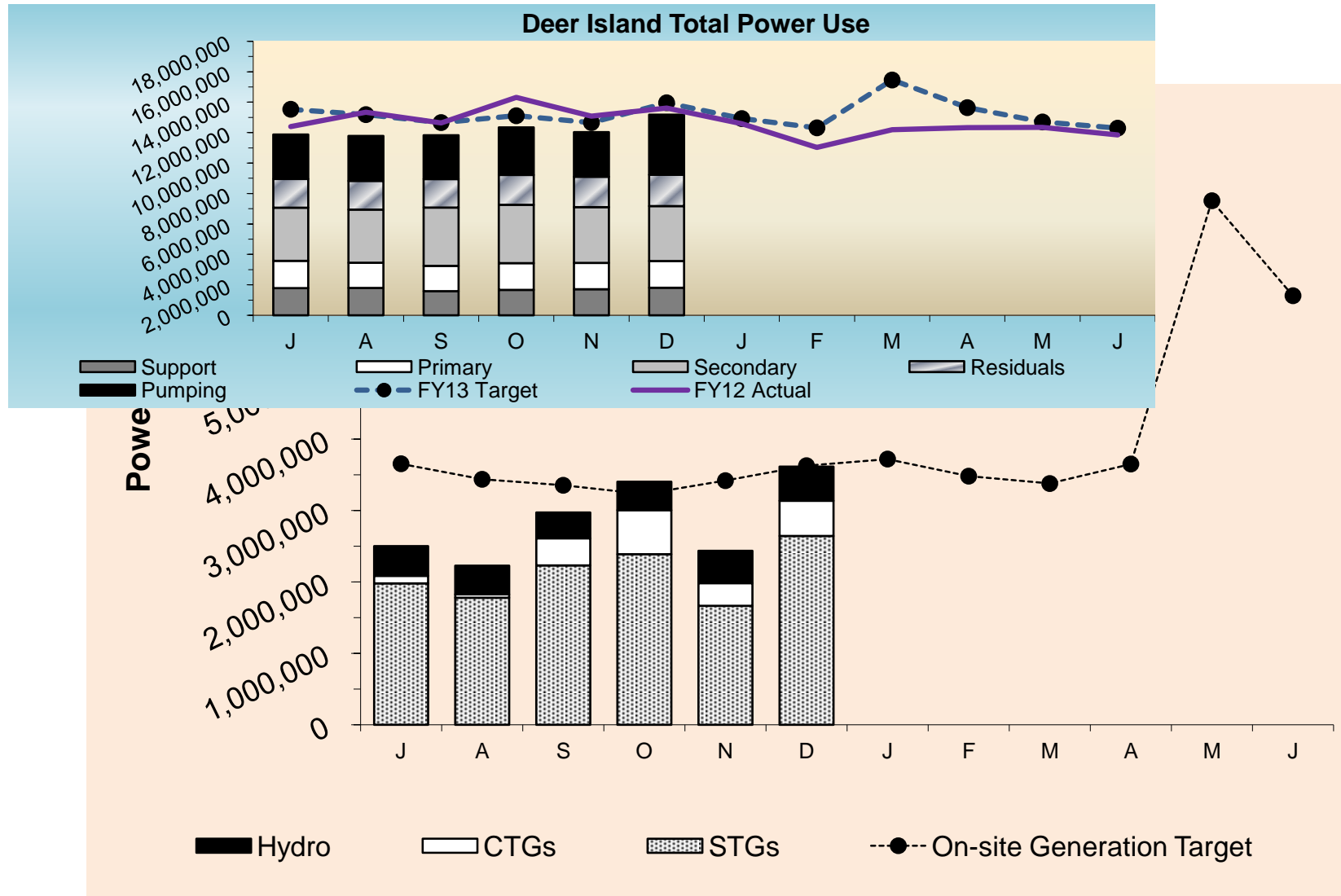
To Overtime...

Field Operations
Overtime Expenditure Variance



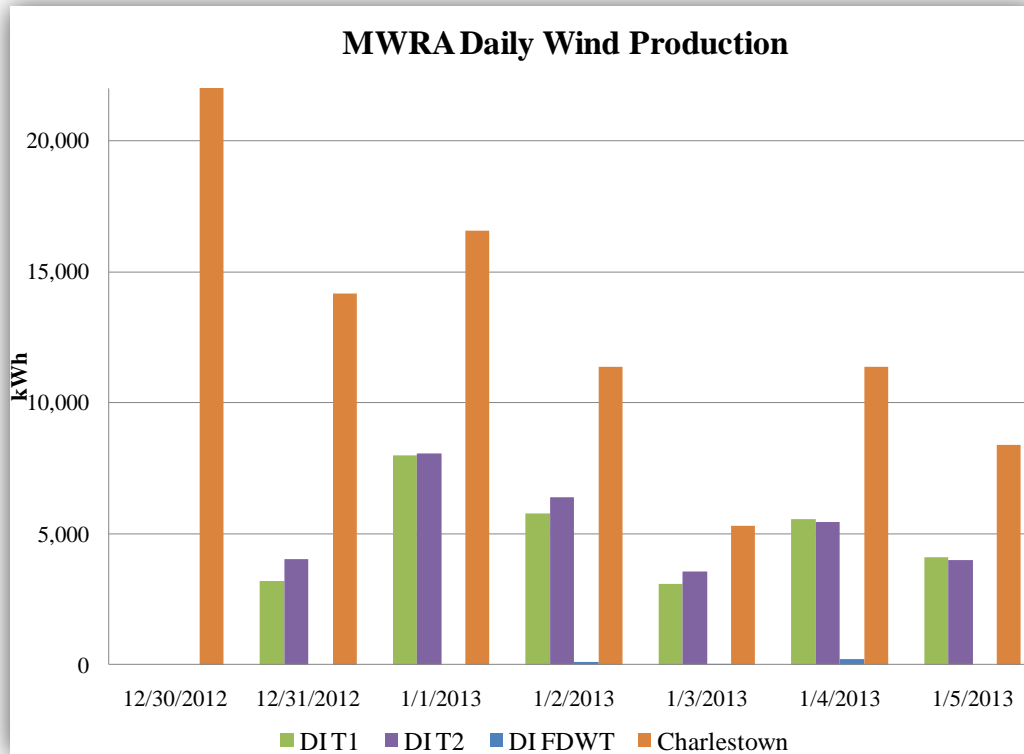


To Making Energy Use a Priority...



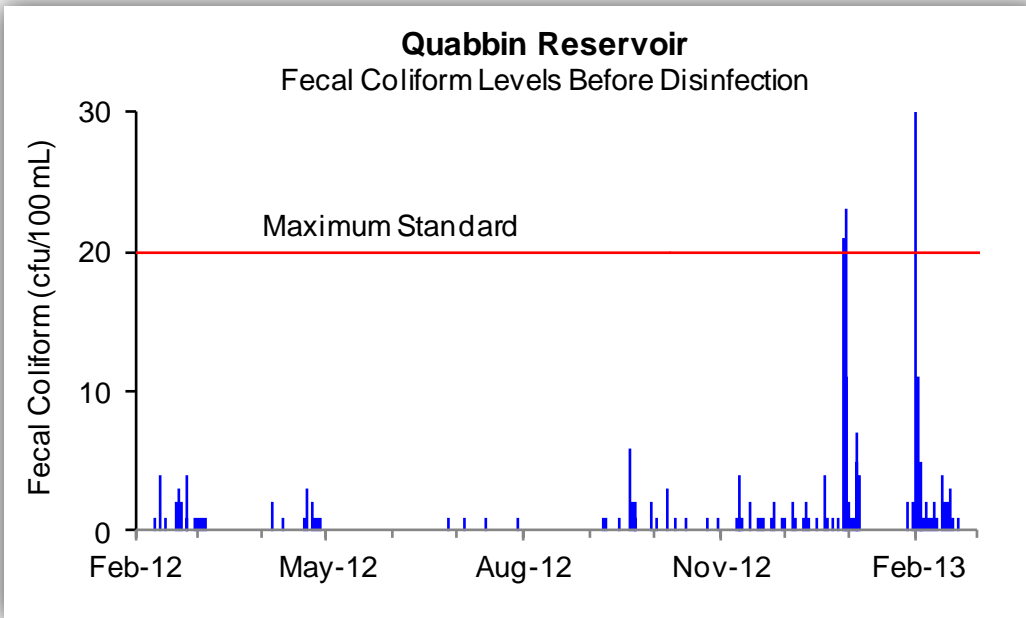


To Making Green Energy Production a Priority...





To Tracking Water Quality For Quick Response





What Happened in Flint?!!!





Some Background on the Lead in Water Issue

- Water is the “universal solvent”
- There is no lead in MWRA source water or local water mains
- Lead can leach from lead service lines, lead solder, brass pipes and fixtures
- Key issues:
 - Lead Service Lines
 - Stagnant Water
- Simple message to public:
 - We treat the water to reduce leaching.
 - You should flush your tap before using.
 - Get the lead out





Indications Of Problems In Flint Went Unheeded



- Public is more sensitive than ever to changes in water quality
- Need to take complaints seriously
 - Respond quickly
 - Provide good customer service
- Maintain customer's confidence in the safety of the water we provide



Children's Blood Lead Levels Rose Measurably

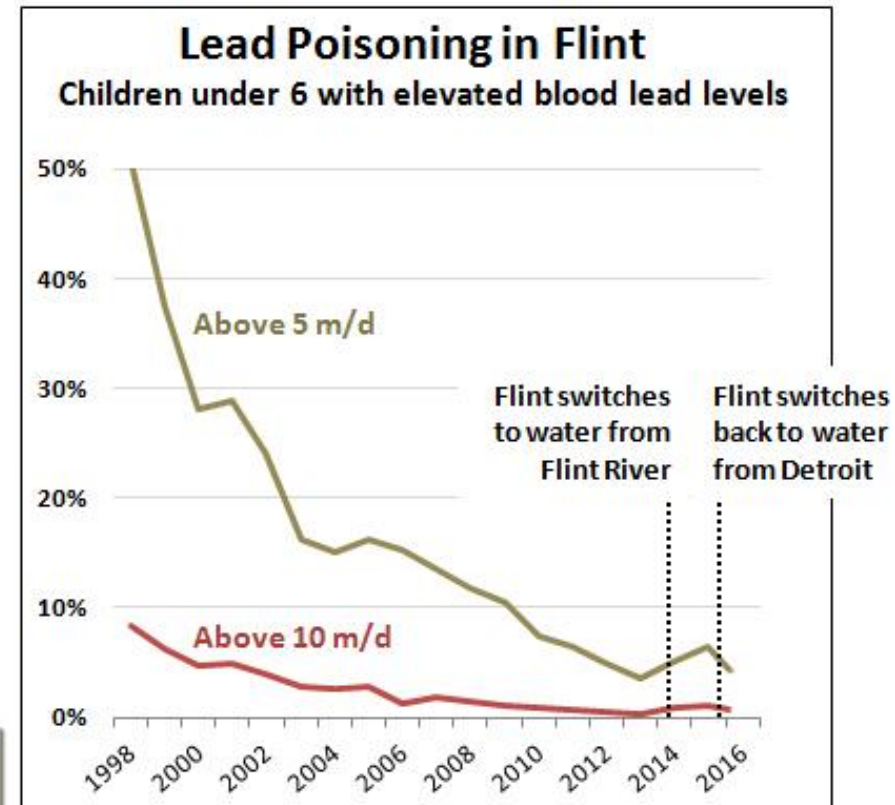


Blood Lead Level Analysis

- Large sample size
 - N= 1746 for Flint children (pre n=906, post n=840)
 - N= 1670 for non-Flint children (pre n=943, post n=727)

Flint results for children 5 years and under:

- PRE-SWITCH % EBL: **2.1%** (consistent with MDHHS data 2.2)
- POST-SWITCH % EBL: **4.0%**
- **$p < 0.05$; STATISTICALLY SIGNIFICANT CHANGE**





It looks bad, what should I do?



- Discolored water was an indicator of the problem, but discolored water alone cannot be used to evaluate.



MWRA Takes Customer Concerns Seriously

- Water quality hotline: **617-242-LEAD**



- Tracks complaints received from community water departments
 - A minimum of weekly calls to each community
- Provides assistance to communities in resolution of complaints
 - Investigation support
 - Sample collection
 - Chemical/biological analysis
- Consults with regulators and public health officials





Flint Changed Source Water And Treatment



Quabbin Reservoir, above, and Wachusett Reservoir, below, have well protected watersheds and provide high quality water to MWRA treatment facilities



- MWRA has high quality source reservoirs
- Treatment has been stable for years
- Thorough review of any treatment changes
 - Bench and pilot testing
 - Expert panel review
- DEP and EPA involvement in review and approval
- Over 85% Naturally Protected
 - Forests and Wetlands



What about the Regulators?

- In Flint, Regulators -- Misinformed and Misleading
- Gave Very Poor Advice, Mislead Investigators
-
- Our Regulators are Active and Involved
- We work well together and trust each other





Flint Did Not Implement Corrosion Control Treatment

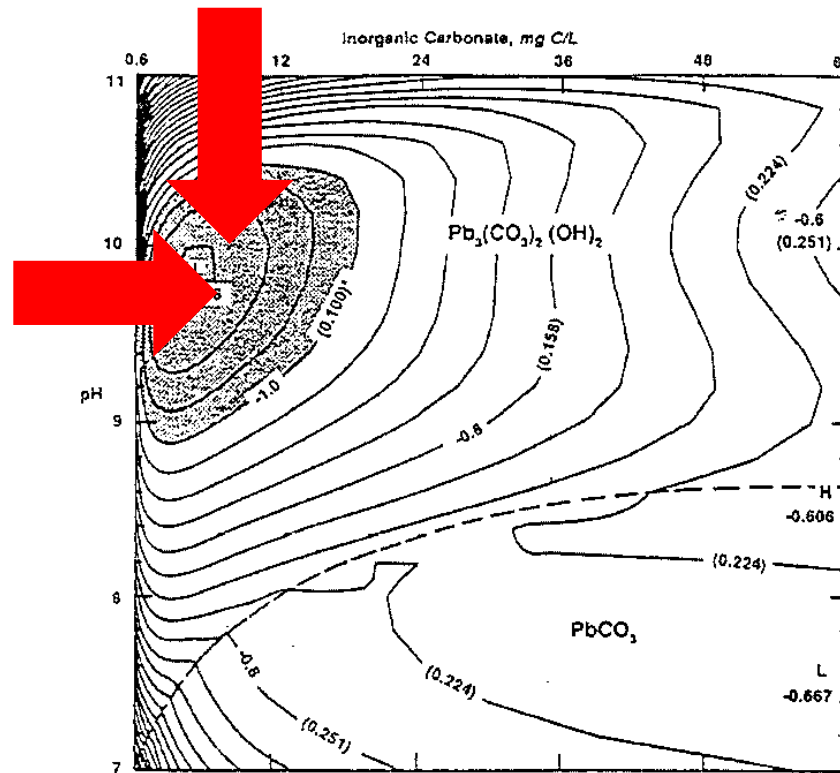
- MWRA corrosion control treatment in place since 1996
- Conducted by well-trained licensed treatment plant operators
- Sodium carbonate and carbon dioxide added to reduce corrosivity and improve stability
- State approved 'Optimum Water Quality Parameters' met consistently



The John J Carroll Water Treatment Plant (center) and Interim Corrosion Control Facility (foreground) provide continuous corrosion control treatment since 1996



MWRA treatment hits the “sweet spot” for solubility



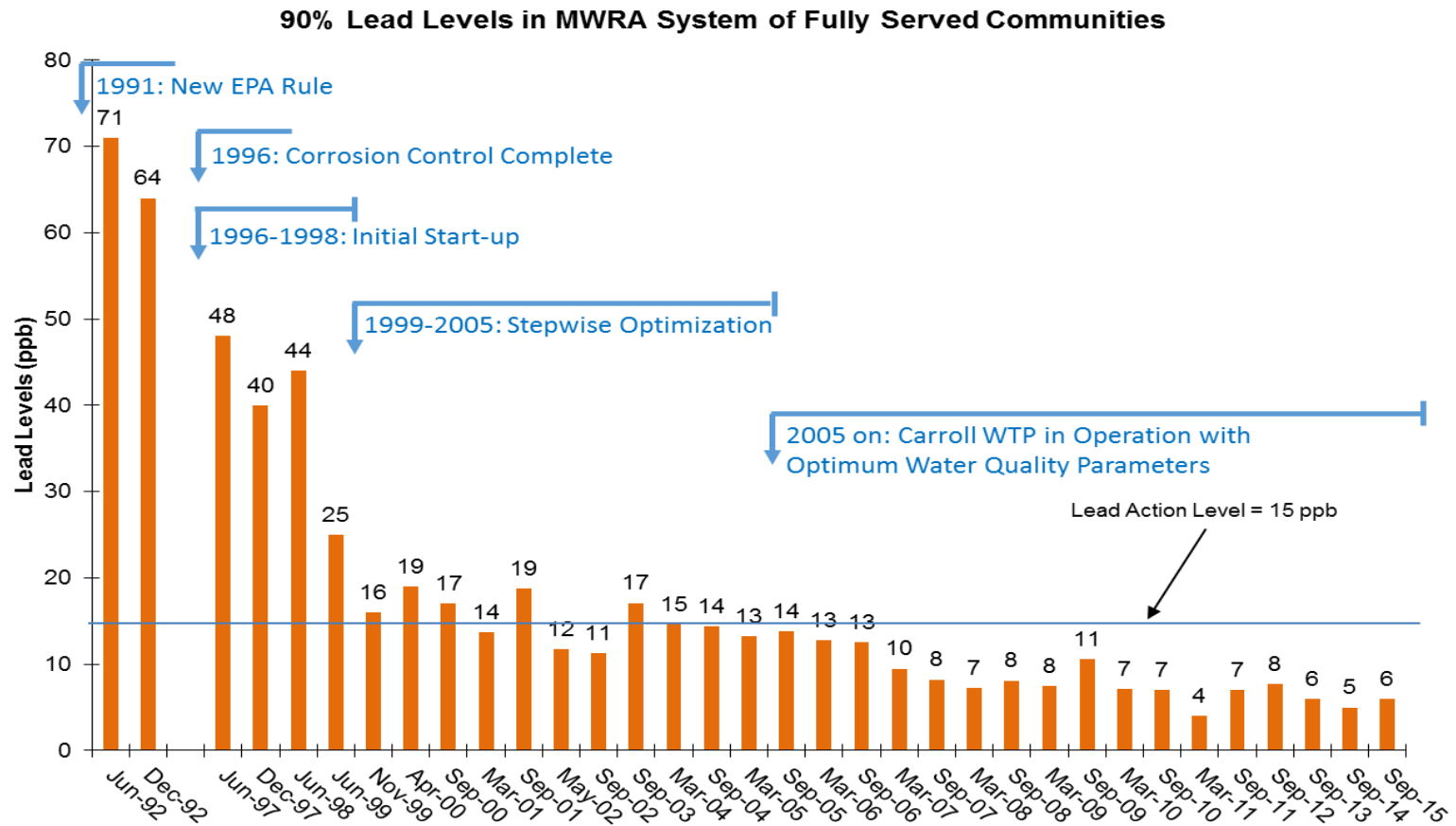
Source: EES 1990

Figure 1.5 Theoretical Pb(II) solubility diagram as a function of pH and DIC in absence of orthophosphate ($I=0.005$, $T=25^\circ\text{C}$)



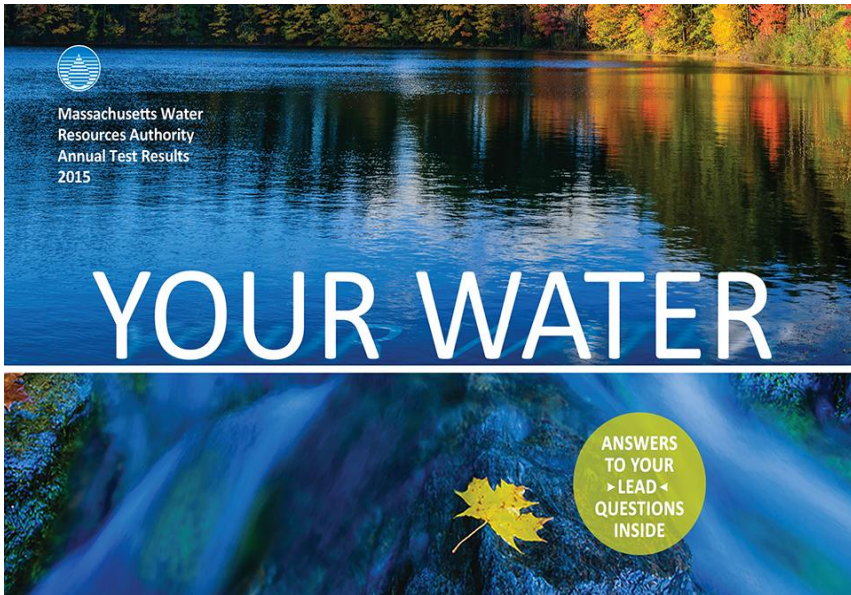
Over 90% Reduction In Lead Levels

- MWRA water system has now been below the lead Action Level of 15 parts per billion 20 straight rounds






Water Quality Data In Flint Was Not Made Public



- Lack of information undermined public confidence
 - Citizen groups gathered their own data
 - In contrast, MWRA publishes water quality data on mwra.com
-
- Data that can be found on MWRA website:
 - Raw water, treated water, and distribution system data
 - All lead compliance sample results since 1992
 - Easily understood summary charts




EPA Urging More Transparency With Lead Sample Results -- We're Setting an Example



Massachusetts Water Resources Authority

Charlestown Navy Yard, 100 First Avenue
Boston, Massachusetts 02129
(617) 242-6000


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[Harbor and Bay](#)
[School Program](#)
[Doing Business with MWRA](#)
[Contact MWRA](#)
[Job Postings](#)
[Links](#)



What's Happening in Flint's Water System and How is MWRA Different (PDF)

More:


- Facts about Lead in Drinking Water
- How to Get Your Water Tested



Notice for Residents of Winchester:


Town Will Temporarily Use of MWRA Water
March 2 - May 15, 2016

News




MWRA Pipe Repair May Cause Discolored Water in Areas of Medford and Somerville

March 17, 2016



Fix A Leak Week: March 14-20, 2016



Find and fix leaks!

In just **10 minutes** you could **save...**

10 percent on your water bill
10 thousand gallons of water

Sign Up For Notifications

Want to know how your water quality is? Looking for updates on the MWRA construction project in your neighborhood? What if there is a water emergency in your area? MWRA can keep you informed when you're at home, at work or on the road. Take a few minutes to **sign up** and get notifications on your phone, by email, or text message.

[Sign Up for MWRA Alerts](#)

Important Notice


There are no notices at this time.


MWRA 24-Hour Emergency Contacts

Water:	617-305-5950
Sewer:	617-305-5940
Security:	877-697-6972
TTY:	617-371-1903

Non-Emergency Contacts

Follow Us





MWRA online

- Home
- Water System
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- Harbor and Bay
- School Program
- About MWRA
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- Contact MWRA

Lead Test Results

To monitor lead levels, MWRA and your local water department test tap water in up to twenty-five homes in each community.

Lead results for the entire system and for each community are compiled by MWRA, with an average of 440 samples taken for the entire system. The regulations require that a system only size - serving over 2 million people - take only 100 samples. New York City, with around 5 times as many customers, takes only 100 samples.

We have agreed with our state regulators at the Department of Environmental Protection to uniformly sample more than 4 times as many homes across the service area to get a better idea of how our corrosion control treatment is working.

But not just any homes are sampled. Under Environmental Protection Agency regulations, homes that are likely to have high lead levels - usually older homes likely to have lead service lines or lead solder - must be tested. Also, only first flush samples, water most likely to have lead, are sampled. The EPA rule requires that 90% of these sampled homes must have lead levels below the Action Level of 15 parts per billion (ppb).

Lead levels in sampled worst case homes have dropped steadily since 1992. Average lead levels at sampled worst-case homes have dropped nearly 90%. Also, the proportion of samples has also changed over time.

Back to "What You Need To Know About Lead in Tap Water" page

- Lead test results - graphs
- WATER TEST RESULTS
- Annual Test Results
- Monthly Test Results
- CONTACT US

MWRA Water Quality Hotline
617-242-5323
Email: [Joshua.Das](mailto:Joshua.Das@mwra.com)

Lead Levels in Sampled Worst Case Homes Have Dropped Steadily Since 1992



Land and Crops Results from 2020 through 2023												
All results in yds												
Community	Mar-20	Sep-20	Mar-21	Sep-21	Mar-22	Sep-22	Mar-23	Sep-23	Mar-24	Sep-24	Mar-25	Sep-25
Adelphi												
1	2.96	1.09	0.958	1.13		1.09		2.05		1.19		1.19
2	0.109	0.264	0.115	0.325		0.809		0.124		0.108		0.119
3	1.71	1.34	1.09	1.86		1.17		1.41		0.96		1.3
4						30.0		1.51		1.17		1.17
5	1.45	0.409	1.97	1.59				7.16		0.625		0.729
6	13.0	39.7	7.19	26.5		1.1		0.475		0.539		0.6
7	0.094	0.308	0.798	0.79		0.103		0		0.19		0.1
8	0.295	1.42	0.185	0.666		1.44						
9						5		2.71		1.09		
10								0.0604		0.0792		
11	1.15	2.05	3.55	3.51								
12	0.127	1.06	0.0807	0.241		0.194						
13								2.64		0.105		
14								1.091		0.137		
15	0.75	0.207	0.280	0.85		1.38		1.69		0.103		
16	0.175	0.177	0.189	0.391		1.17		0.0001		0.003		
17	0.189	1.29	1.12	1.89		0.0094				0.004		
18	0.049	0.429	0.079	1.05		0.525		0.965		0.004		
19		1.21	1.09	0.969								
20								1.14		0.006		
Belmont												
1	34.6	0.001	4.08	2.71		1.85		1.93				
2	1.06	1.67	0.95	1.95		1.16						
3	1.08	1.91	1.01	3.24		1.99		1.42		1.12		
4					2.1		0.477	0.629		0.004		
5	1.37	4.6	1.09	0.760		0.361		0.293		0.01		
6	0.136	0.131	0.209	38.1					0.013			
7	0.126	0.28	0.151	0.205		1.39			0.821		1.31	
8	1.92	0.091	0.099	1.09		1.99		4.29		1.25		
9	6.96	2.79	4.82	9.87		5.79		0.709		0.471		
10	4.29	2.24	5.94	3.34								
11	0.752	0.967	0.909	0.005								
12								2.19		1.08		0.912
13	3.49	3.49	1.58			0.971		1.17		1.49		
14						2.29		1.64		0.500		
15	1.46	1.3	1.94	0.91		1.11		1.16		0.066		
16	2.74	1.22	1.979									
17	1.15	0.623	1.75	0.569								
18								0.935		0.406		0.499
19	0.955	0.935	1.15	0.251								
Brookline								4.36		1.49		5.42
1	0.571	0.404		4.27								
2												
3	1.16	1.18	1.90	1.78								
4												
5	1.96	0.71						0.576		0.231		4.11
6	1.96	0.941	0.582	0.247				4.27		0.361		0.939
7	7.4	5.23	5.28	5.99				1.47				8.17
8	0.792	0.561	1.10	0.229								
9												
10	0.8	4.54	6	0.771				0.19		5.61		0.995
11	1.92	0.757	0.919	1.05				0.917		1.53		2.11
12	0.950	1.52	0.233	1.05				0.676		15.5		13.3
13	19.9	16.4	11.8	14.9				4.76		6.1		4.7
14	0.19	6.19	6.19	8.61				6.19		0.1		0.5
15	2.80	6.67	1.35					0.939		0.127		
16	2.36	0.997	0.939	0.999				0.266				
17	0.014	0.529	0.152	0.4				17.6		26.7		4.6
18	10.5	30.3	16.6	16.4				0.997		0.676		6.1
19	9.36	7.11	6.9	8.26								
20	1.16	1.16	1.16	1.091								
21												
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Over Half The Homes In Flint Have Lead Service Lines

- In comparison about 5 percent of services in MWRA communities are lead
- Important to maintain and update community inventories of lead service lines
- Risk of lead in water remains as long as lead service lines exist
- MWRA Adopted \$100 million zero-interest community loan program to fund replacements

Community	September 2015
MWRA System	6.22 Ppb
Arlington	2.59
Bedford	
Belmont	3.81
Boston	7.75
Brookline	3.06
Cambridge	
Canton	
Chelsea	11.6
Dedham/Westwood	
Deer Island TP	0.798
Everett	1
Framingham	2.84
Lexington	1.42
Lynnfield	1.57
Malden	18.5
Marblehead	6.75
Marlborough	
Medford	6.22
Melrose	15.7
Milton	13.7
Nahant	1.61
Needham	
Newton	3.04
Northborough	0.986
Norwood	7.6
Peabody	
Quincy	5.3
Reading	4.3
Revere	3.2
Saugus	2.6
Somerville	10.3
Southborough	2.52
Stoneham	11.1
Stoughton	
Swampscott	2.06
Wakefield	
Waltham	2.6
Watertown	2.42
Wellesley	
Westboro State Hospital	1.52
Weston	2.29
Wilmington	
Winchester	
Winthrop	14.6
Woburn	
Chicopee	3.8*
South Hadley F. D. #1	5.4*
Wilbraham	1.4*
TOTAL	

Number of Services	Estimated Lead Services
Community Estimate in Black MWRA Estimate in Red	
12,585	0
4,613	0
7,745	1
87,638	3,567
10,527	100
15,486	0
7,162	0
5,100	330
13,304	0
8,126	100
18,147	4
14,145	50
1,427	0
11,815	5,205
8,065	0
10,303	1,238
14,706	2,231
8,200	772
8,473	51
1,634	0
10,192	157
25,071	1,161
4,234	0
8,649	36
13,539	5,687
23,750	1,310
7,992	249
12,000	21
9,331	0
14,423	2,298
3,210	0
6,250	13
7,387	0
5,485	0
8,410	30
13,732	0
9,165	0
8,324	1
3,613	0
7,469	0
7,215	0
4,480	1,400
11,447	2
16,527	0
4,827	0
3,347	0
519,270	26,014

* Most recent data from 2012-2013



Lead Service Line Program Update

- MWRA Adopted a \$100 Million Zero–Interest Loan Program
- Newton is scheduled to receive \$4 million dollars in November 2016 for their program.
- Quincy is also scheduled to receive \$1.5 to cover full cost of replacement
- Three other communities have sent along applications: Peabody, Winchester, and Woburn. Expected to receive funds in FY2017.







EPA Urging Public Inventory Of Lead Service Lines

Boston Already is Doing It



 **Boston Water and Sewer Commission** **Lead Service** 

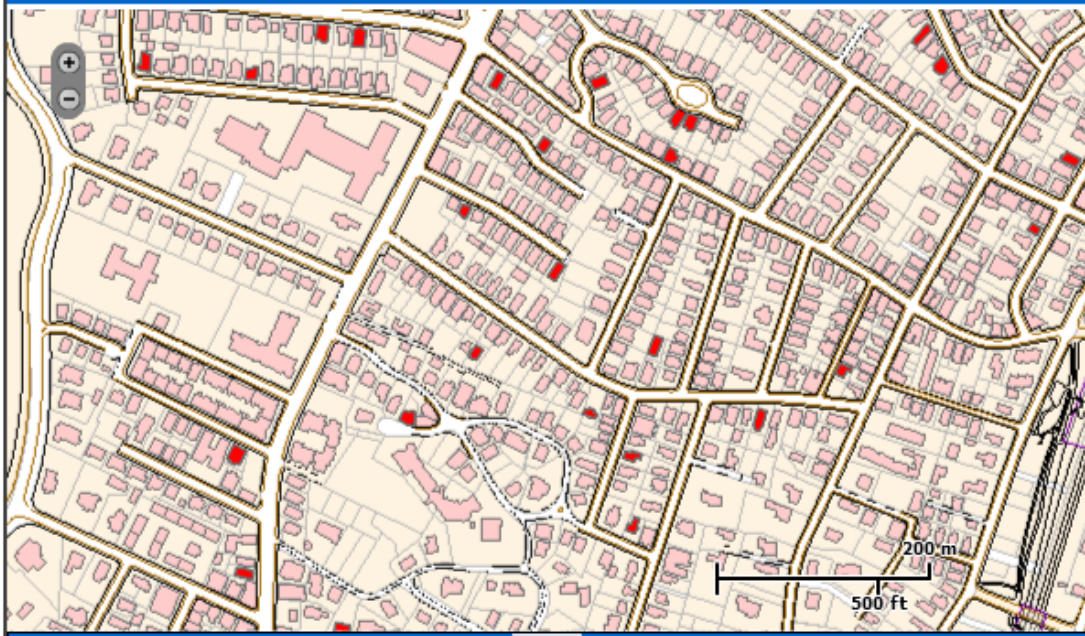


Table Options ▼

Address	Lead Service
41 OAKVIEW TER Jamaica Plain	YES
73 PERSHING RD Jamaica Plain	YES
99-105 SHERIDAN ST Jamaica Plain	YES
24 BOYLSTON ST Jamaica Plain	YES



What Is Changing In LCR Implementation?

- EPA Has Been Working on Rule Revisions for Several Years
- National Drinking Water Advisory Council Recommendations in November 2015
- National and International Attention on Lead Issues After Flint
- EPA Letter to every Governor and State Drinking Water Program in February, and to EPA Regions in October
- Stricter attention to existing Rule requirements



Key NDWAC Recommendations

- Improve the public education aspects of the rule
- Help customers identify and respond to the risks of lead in home plumbing – especially lead service lines
- Require the all lead service lines be completely replaced (over the long term)
- Focus sampling efforts on providing customers with information they can use to identify and reduce the risks in their homes
- Strengthen corrosion control, with better process monitoring



Renewed Focus on Schools

- Massachusetts DEP one of few states requiring any school sampling
 - DEP version of LCR required 2 schools each round
- LCCA is voluntary, and sampling has been variable
- Governor Baker announced \$2 million in funds to encourage more systematic sampling
- MWRA working with our communities.



MWRA School Lead Testing Program Results

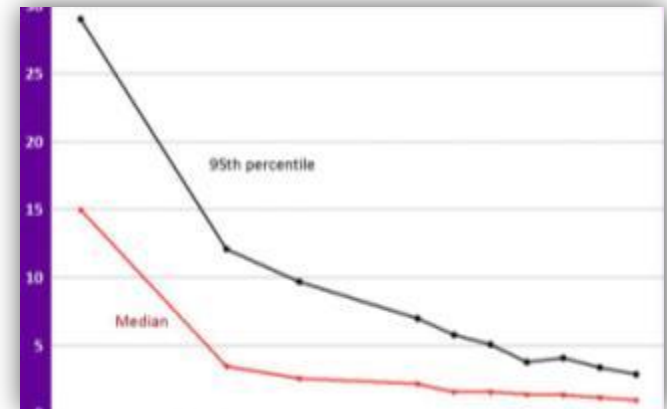
- Sampled 200 schools in 27 communities – 57 had one or more locations above the Action Level.
- Analyzed 11,314 samples -- 5.8% were above the lead Action Level.





So What's the Key Message on Lead?

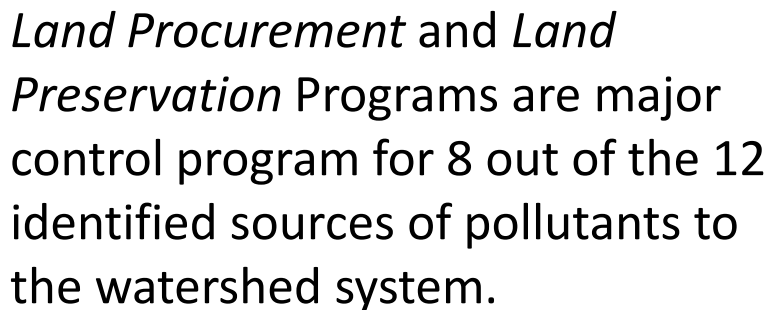
- Lead is found from a variety of sources: Gasoline – Paint – Dust -- Soil
- Levels have declined significantly over time



- MWRA water quality is stable, as is treatment
- Being responsive and transparent builds confidence in the water
- MWRA staff take a science-based approach to assessing water quality, treatment, and compliance.
- Shared Responsibility Between Water System and Public
- So long as there is lead in contact with water, risk remains so just “get it out”



What Systems Do we Have In Place to Ensure Delivery of High Quality Water



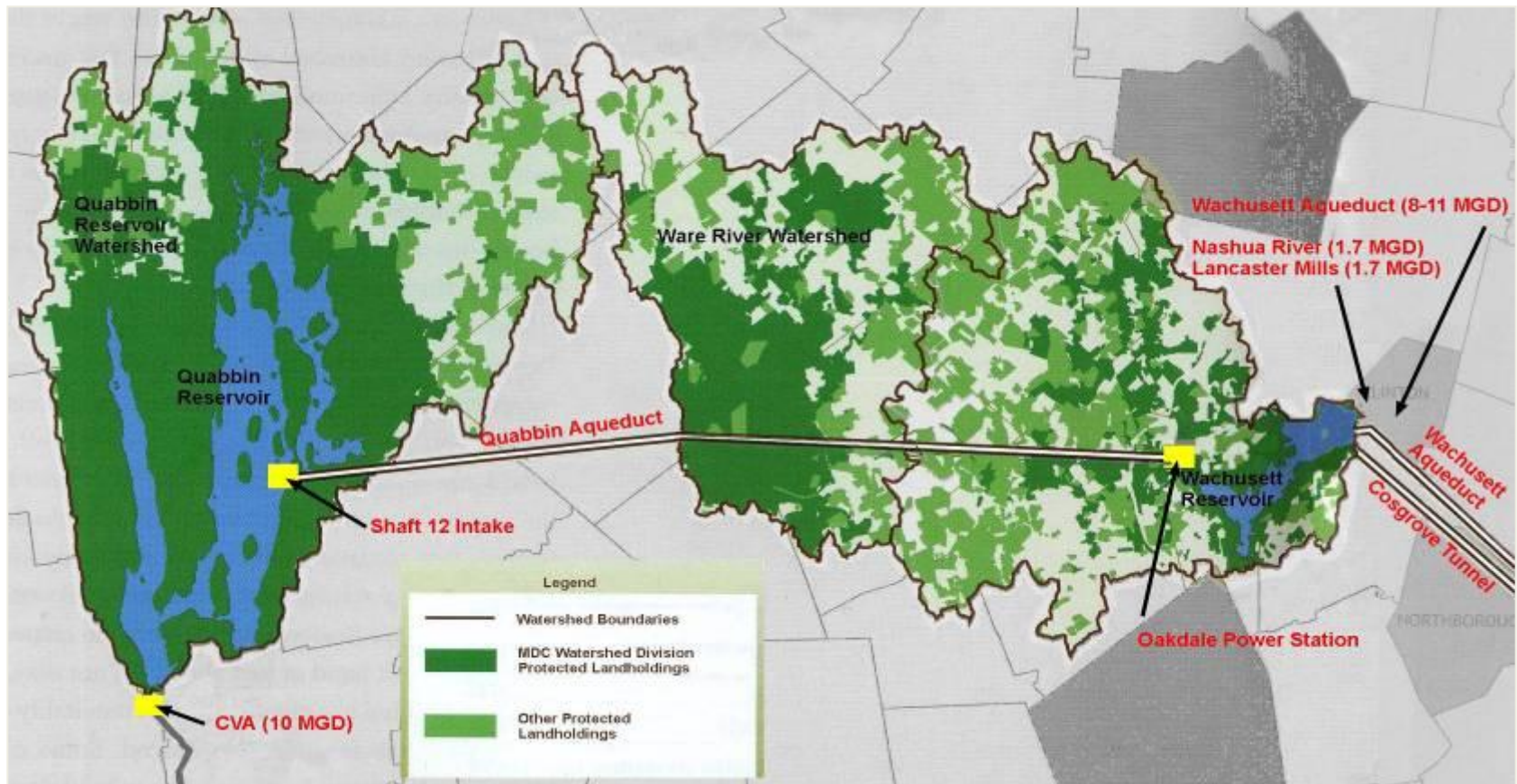
- 1. Protect the most sensitive areas of the watershed through ownership or agreements with land owners.***
2. Manage DWSP-owned properties to protect water quality and provide stewardship of natural resources.
3. Work with watershed communities to protect water resources while accommodating community needs.
4. Monitor to identify potential or existing water quality problems.

[illegible]



The Watersheds – 400 square miles of protected lands

- \$131 Million invested in land preservation
- So well protected, the Safe Drinking Water Act requires only disinfection





Protected Watersheds = High Quality Water





High Quality Source Water Means...

- Less Intensive Treatment Required
- Fewer Chemicals Added to the Water
- Less Risk from Treatment Failure
- Lower Costs for Better Water
- Better to Keep Out, Than Take Out



John J. Carroll Water Treatment Plant

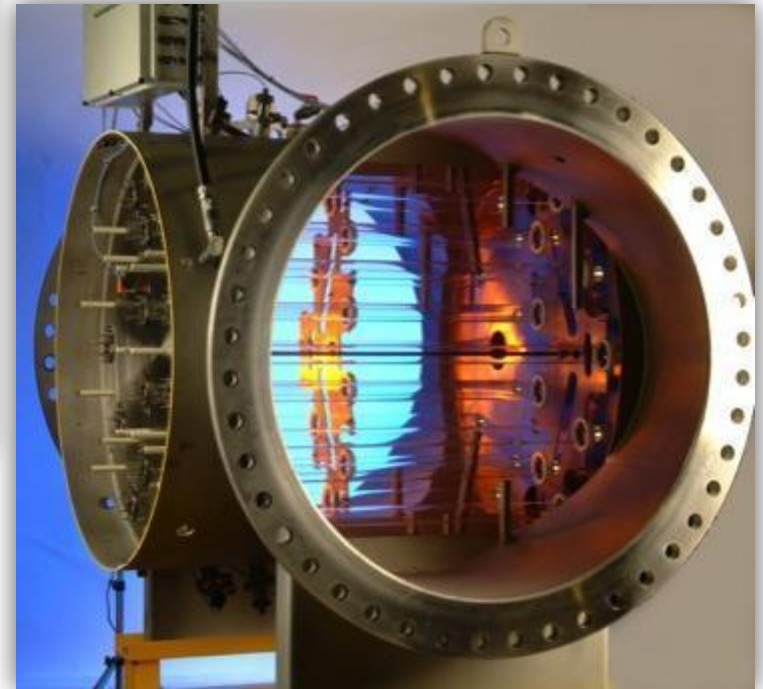
- Completed in July 2005
- Treatment Processes:
 - Ozonation for primary disinfection
 - Corrosion control
 - Chloramination for secondary disinfection
 - Fluoridation





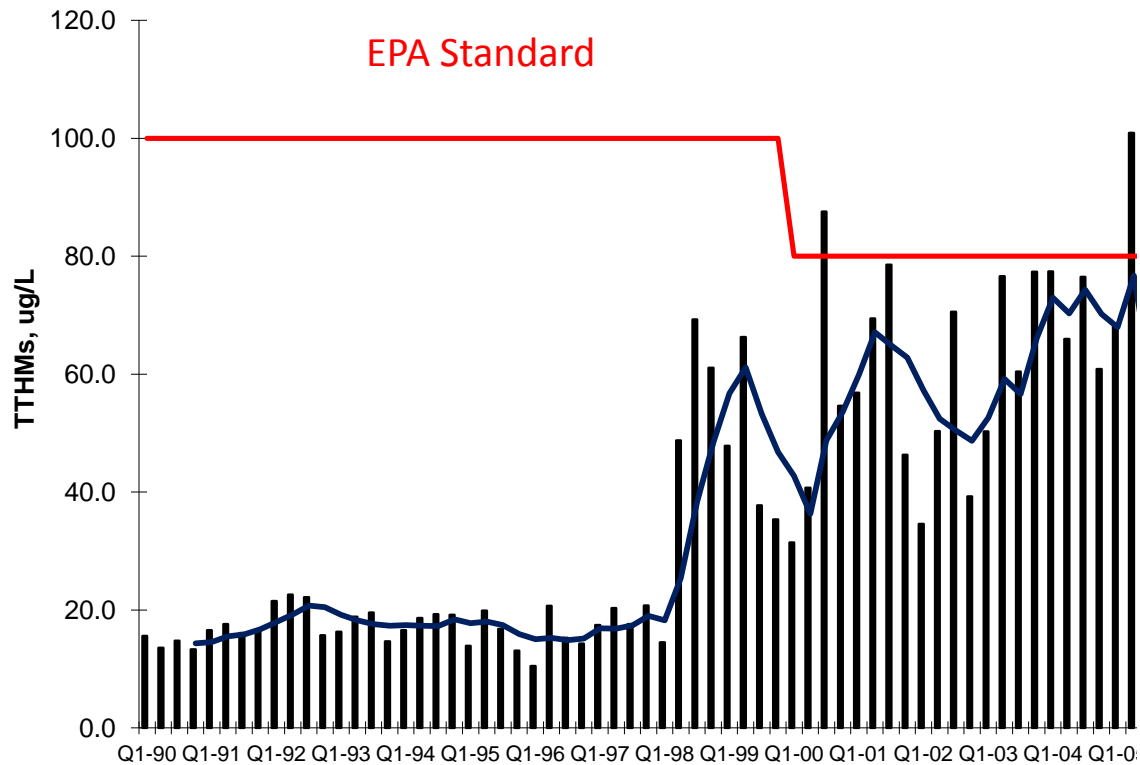
Addition Of Ultraviolet Light Disinfection – April 2014

- New regulations required that unfiltered systems must have two primary disinfectants, one of which must achieve *Cryptosporidium* inactivation



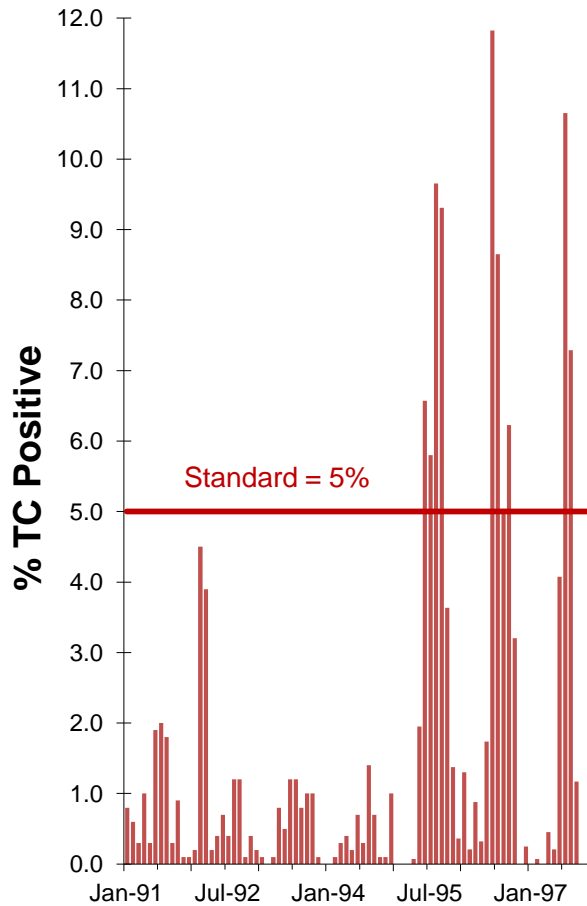


Disinfection By-Products





Community Total Coliform Rule Compliance





Chemical Delivery Security and Quality Assurance





Pipeline Rehabilitation

No more wooden pipe, but...

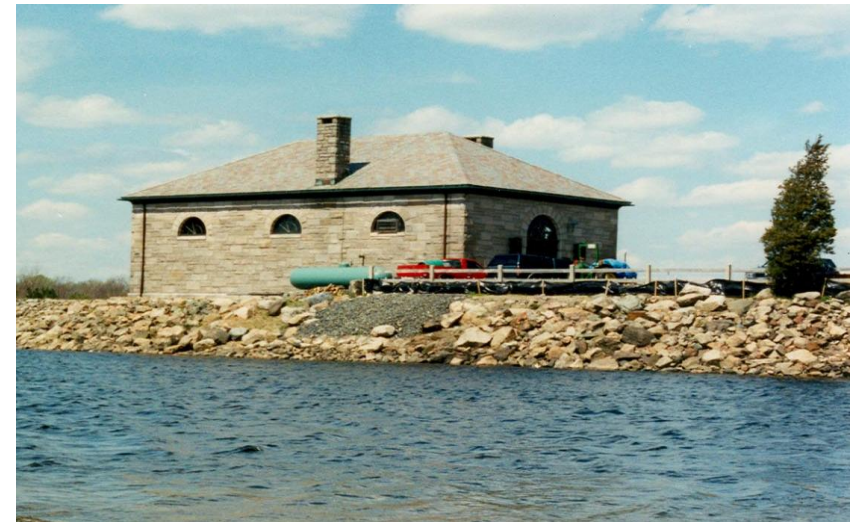


- More than half of community pipes were unlined
- \$250 Million Zero-Interest loan program for community pipes



Open Reservoirs Offer Opportunities for Degradation

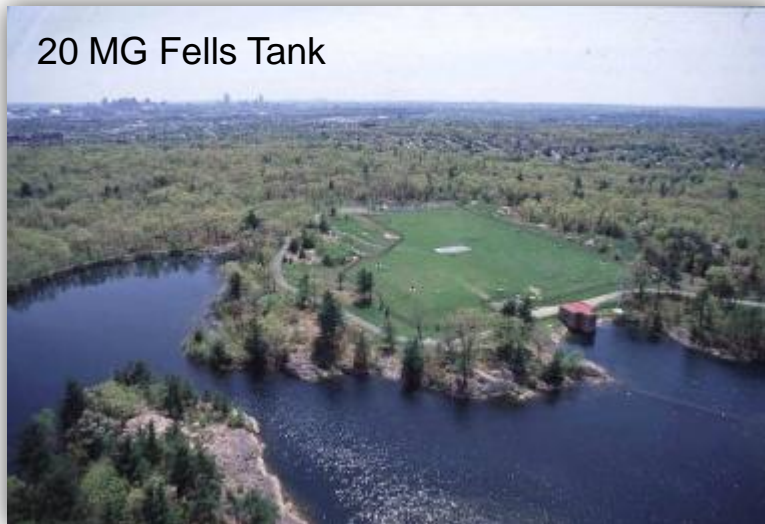
- Classic Unfiltered System Design
- Modern Water Quality and Security Concerns
- People, Animals, Pathogens and Chemicals
- Just Plain Changed Chemistry





Covered Storage Replaces Open Reservoirs

- From 10 days of open storage to 1 day of covered storage
- Water is Not Exposed to Light From Reservoir to the Tap



20 MG Fells Tank



115 MG Norumbega Covered Storage Facility



Buried Tanks Become Meadows



- More Stable Water Quality
- Reduced Use of Chlorine
- Better Total Coliform Results





MWRA and Our Communities Have Robust Sampling and Analysis Program





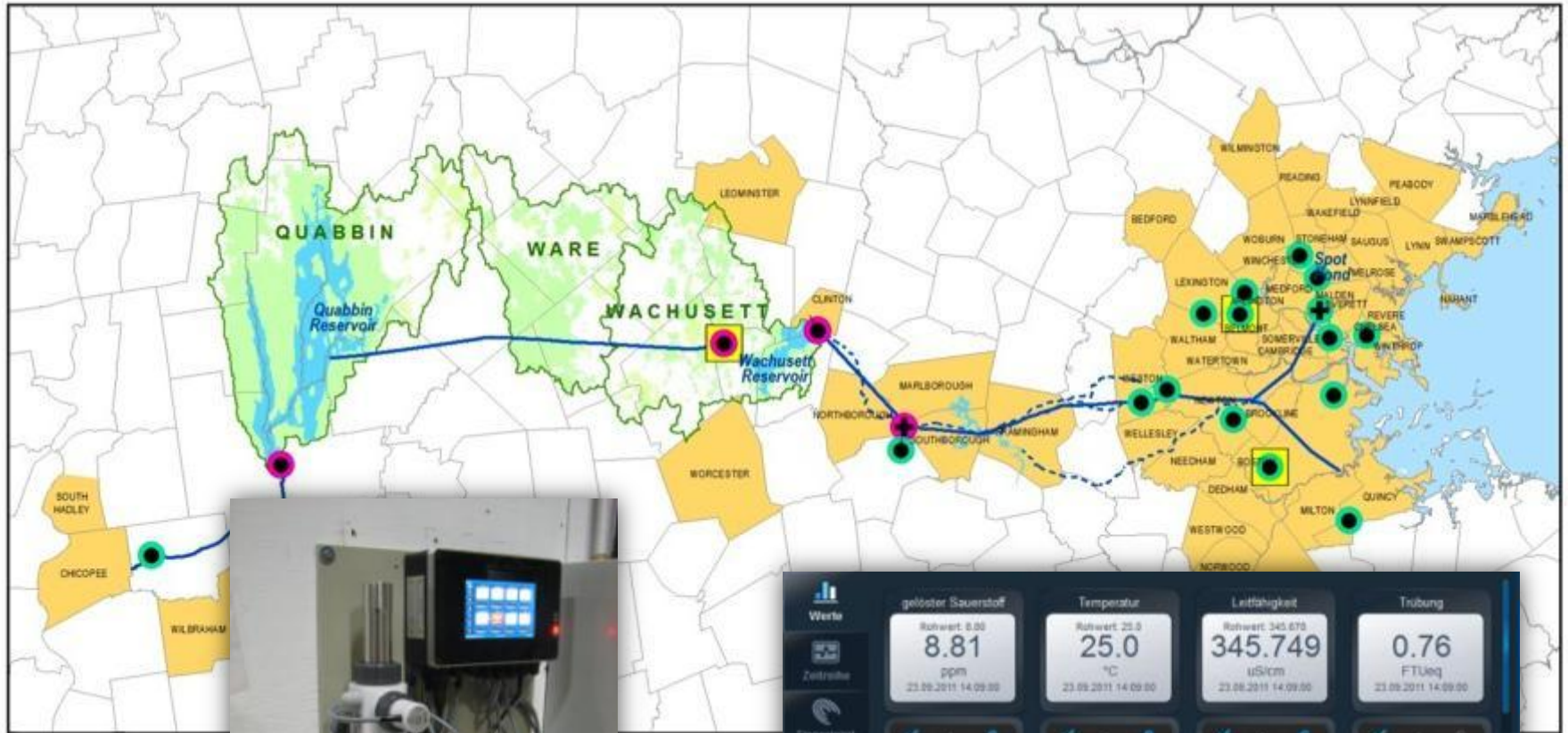
State-Of-The-Art Real Time Monitoring System

- Post 9/11 – security of water system a priority
- Implemented second generation of “contaminant monitoring system”
- Sophisticated UV light probes at key locations monitor multiple parameters





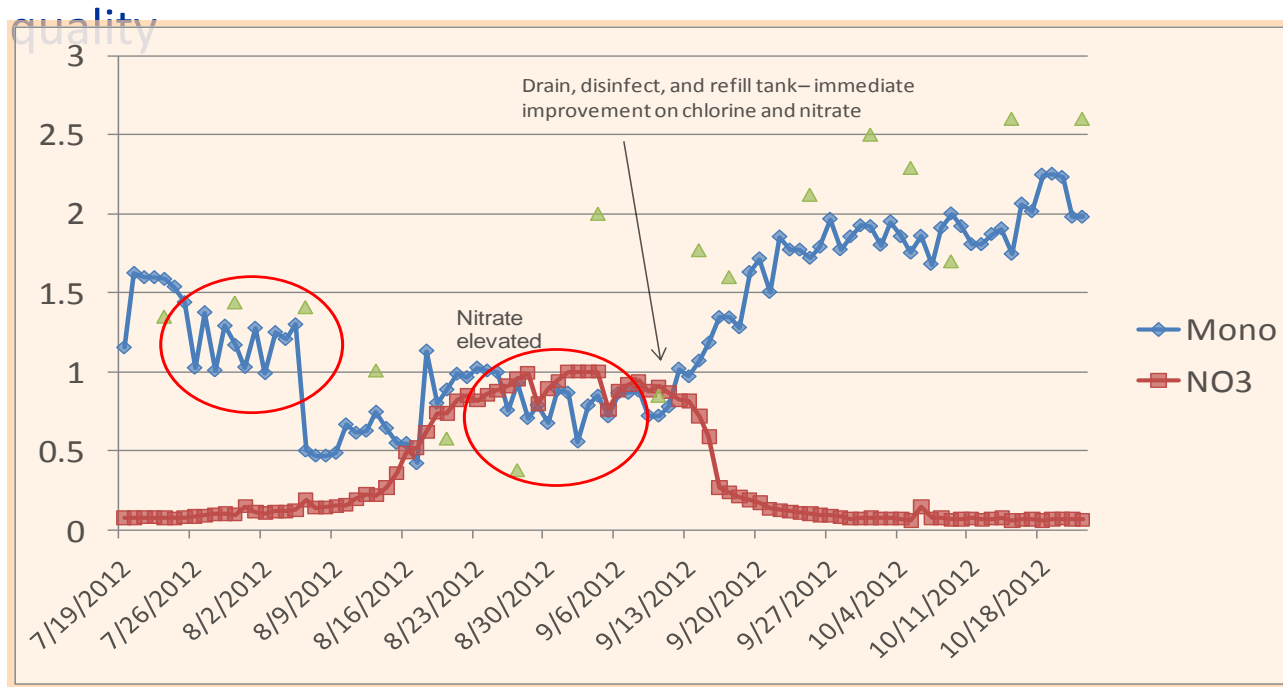
Security Monitoring Does Double Duty





On-line Monitoring Detects Change, Before Problems

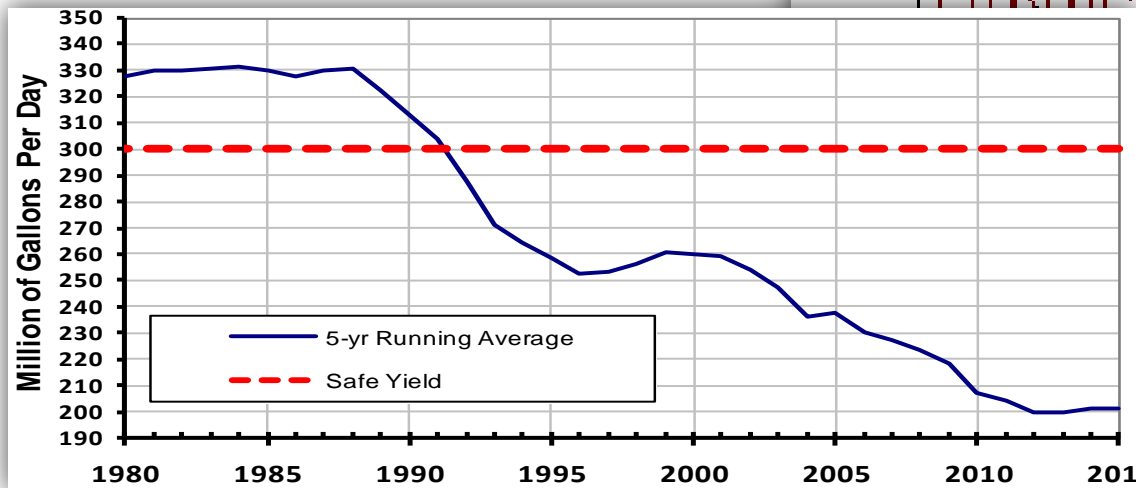
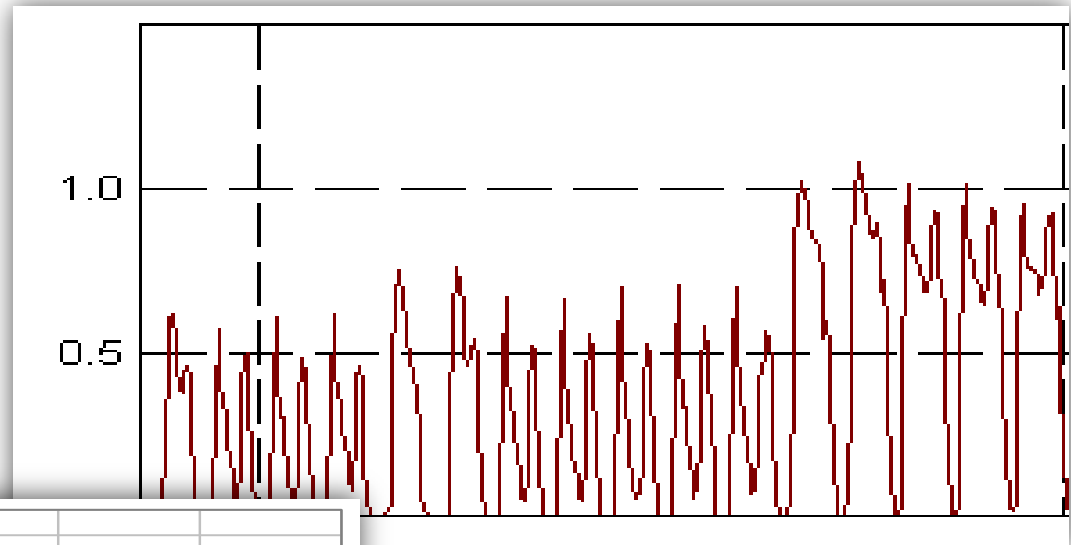
- Allows preemptory action to preserve water quality
- Avoids problems for our customers
- Without monitoring, first notice would be unacceptable water





Continuous Monitoring – Not Just for Water Quality

- Regular review of community metering data can detect leaks even before they surface





But Our Customers Worry More and More
about Smaller and Smaller Risks



Pharmaceuticals found in US drinking water Trace quantities could endanger wildlife, humans

By Jeff Donn, Associated Press | March 10, 2008

NEW YORK - An array of pharmaceuticals - including antibiotics, anticonvulsants, mood stabilizers, and sex hormones - have been found in the drinking water supplies of at least 41 million Americans, an Associated Press investigation found.

The concentrations of these pharmaceuticals are tiny, measured in quantities of parts per billion or trillion, far below the levels of a medical dose. And utilities insist that their water is safe.

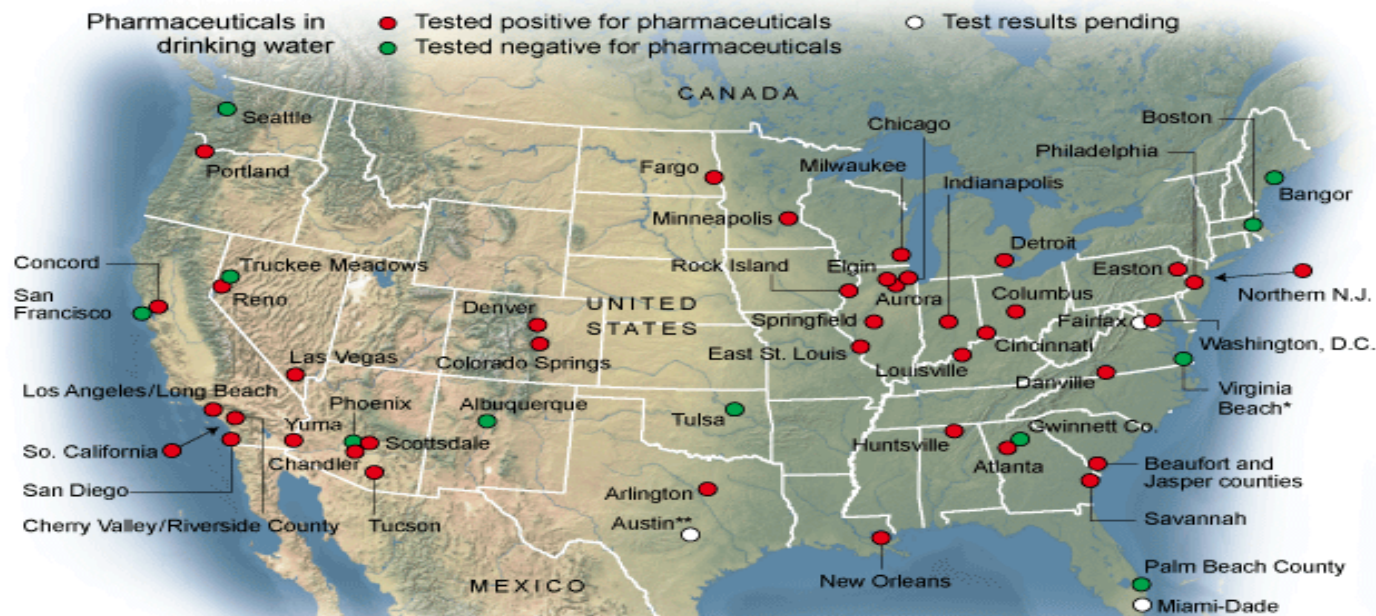
But the presence of so many prescription drugs - and over-the-counter medicines like acetaminophen and ibuprofen - in so much of our drinking water is heightening worries among scientists of long-term consequences to human health.



Associated Press: Pharmaceuticals in Tap Water

New tests detect pharmaceuticals in more water

At least 46 million Americans are supplied water that has tested positive for trace concentrations of pharmaceuticals, up from 41 million in March. The original Associated Press reports prompted many more communities to test their water.



* In Virginia Beach, pharmaceuticals were found in source water but not in treated drinking water.

** Drinking water in Austin, Texas, was tested for only one prescription drug, a synthetic birth control chemical.

NOTE: All places include some surrounding areas except: Albuquerque, N.M.; Arlington, Texas; Long Beach, Calif.; Los Angeles; New Orleans.

SOURCES: Drinking water providers' responses to Associated Press questions; AP review of scientific literature.

AP



No Pharmaceuticals In MWRA Water Supply

- After AP story broke last March, MWRA tested for 31 pharmaceutical compounds
- No traces were found!





Hexavalent Chromium (Chromium VI)

'Erin Brockovich chemical' or hexavalent chromium, a likely carcinogen, is found in tap water

A chemical called chromium-6 or hexavalent chromium has been found in the tap water in 31 out of the 35 American cities tested, reports the Environmental Working Group. Norman, Okla., Honolulu and Riverside, Calif., had the highest levels of the substance, dubbed the "Erin Brockovich" chemical."

New York, while far down on the list of cities, still had more chromium-6 in the tap water than what California is proposing as a "public health goal" for safe levels: 0.06 parts per billion. "The New York finding is .18, so it is on the high side," said Leeann Brown, spokesperson for the EWG.

Copyright 2011 NY Daily News.com

EWG reports MWRA lowest in country
MWRA conducting quarterly testing

Results just over detection limit
20 to 27 parts per trillion





The New York Times

Radiation Is Everywhere, but How to Rate Harm?

Since the first reports last month of damage to nuclear reactors at the Fukushima Daiichi power plant, the lingering question has been whether drifting plumes of radioactive elements from the plant will harm people in Japan or other parts of the world. **For many people, the biggest fear is cancer.**

Certain levels of radiation exposure are known to increase the risk of cancer, but **scientists disagree** about the effects of very low doses of the sort that may have occurred so far in Japan.

Some researchers say it is reasonable to use data from high doses to calculate the risk of smaller and smaller doses. They argue that any exposure to radiation raises the risk of cancer, though **probably by only a small amount in the case of small doses.**

But others say that **estimating risk for doses near zero is nonsensical**, and some believe there is a threshold dose, or limit below which there is no risk from exposure.

- Published: April 4, 2011



Paying Attention to the Future:

Can't Let the Day-to-Day Drive All Planning



Impact of Global Warming: 100 Year Storm and Sea Level Rise In Year 2100.

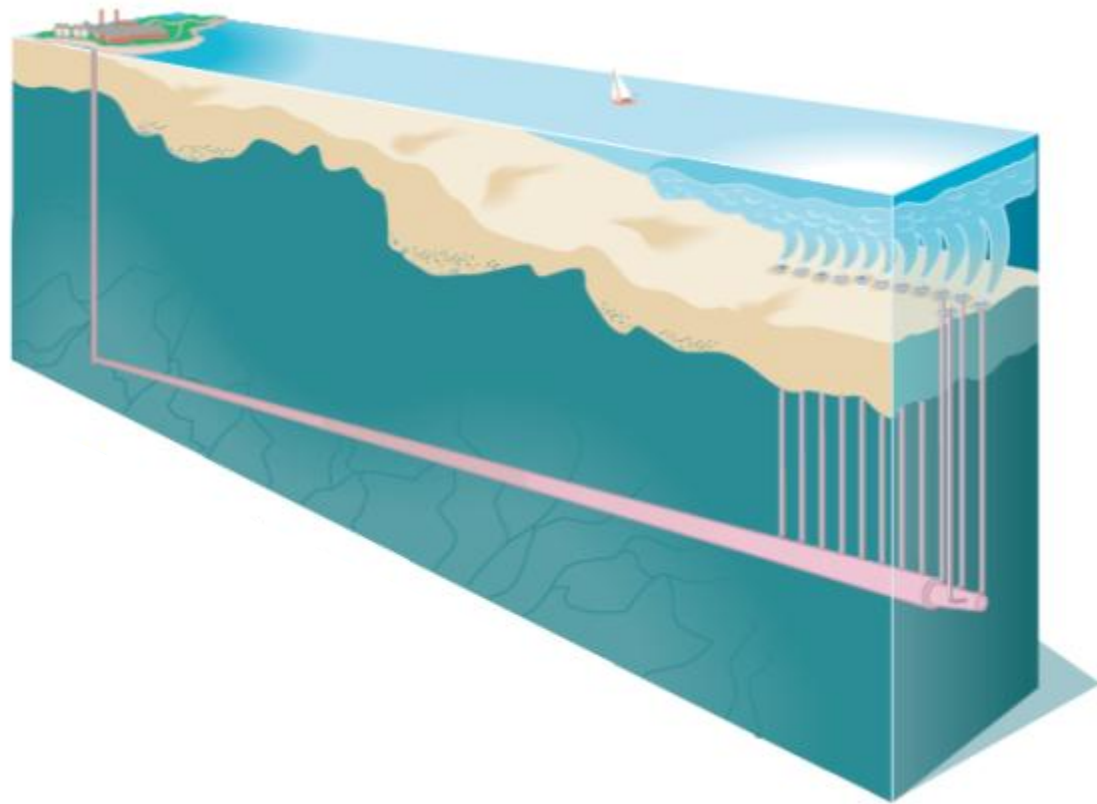


Data sources: Flooded area IPCC , ground elevations determined by LIDAR.



A Rising Sea Impacts The Hydraulics Of The Outfall Tunnel

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





Sea Level Rise Vulnerability of Every Facility Examined

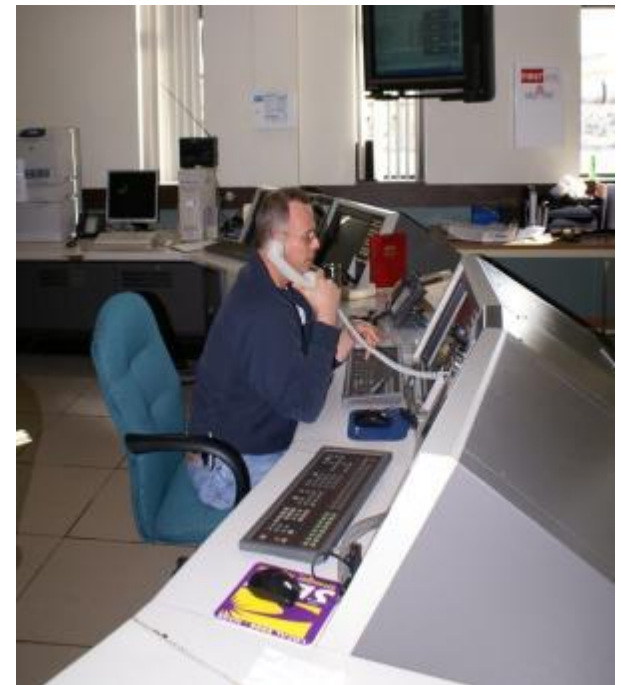
- Be Pragmatic – Don't Miss Any Opportunities to Adapt
- Long Term – Use Periodic Facility Rehab Process for Major Upgrades
- Meanwhile – Use Maintenance Crews to Improve Flood Proofing





Created SOPs To Redeploy Staff And Equipment

- Staff and equipment redeployed to pre-determined locations in advance of storms.
- Back-up water and wastewater operations control center created at Carroll Treatment Plant in Marlborough.





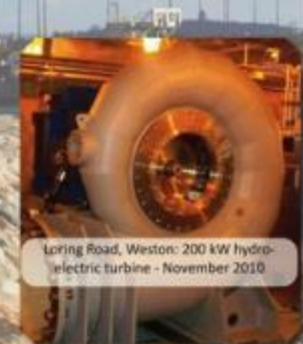
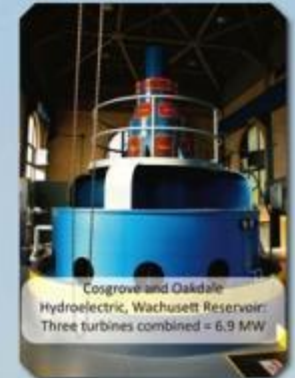
And We Love Being Green!

- Of our \$40 million annual energy budget, \$22 million comes from renewable sources





Renewable Energy and Energy Efficiency at MWRA





Our Mission in Short

- Adequate, Reliable Supply of High Quality Drinking Water
- Environmentally Responsible Collection, Treatment and Disposal of Wastewater
- **Drink with Confidence**
- **Flush with Pride**
- **All Accomplished Affordably**
- **Under All Circumstances**

Questions or Comments?

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