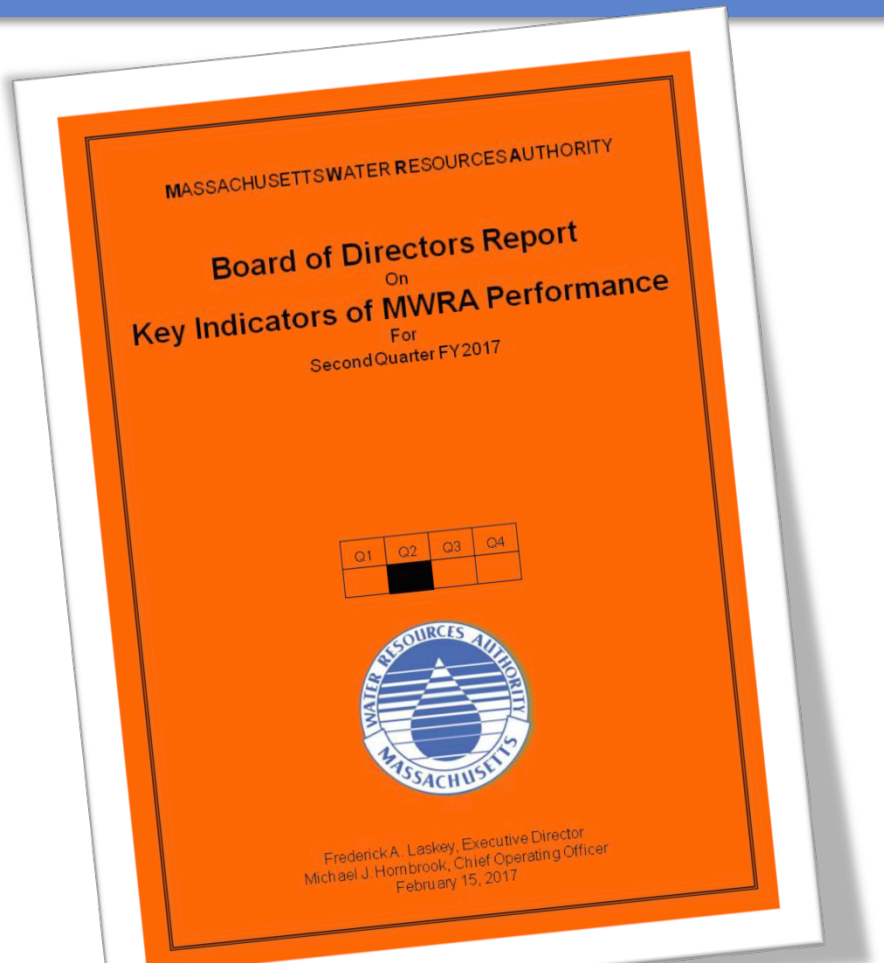
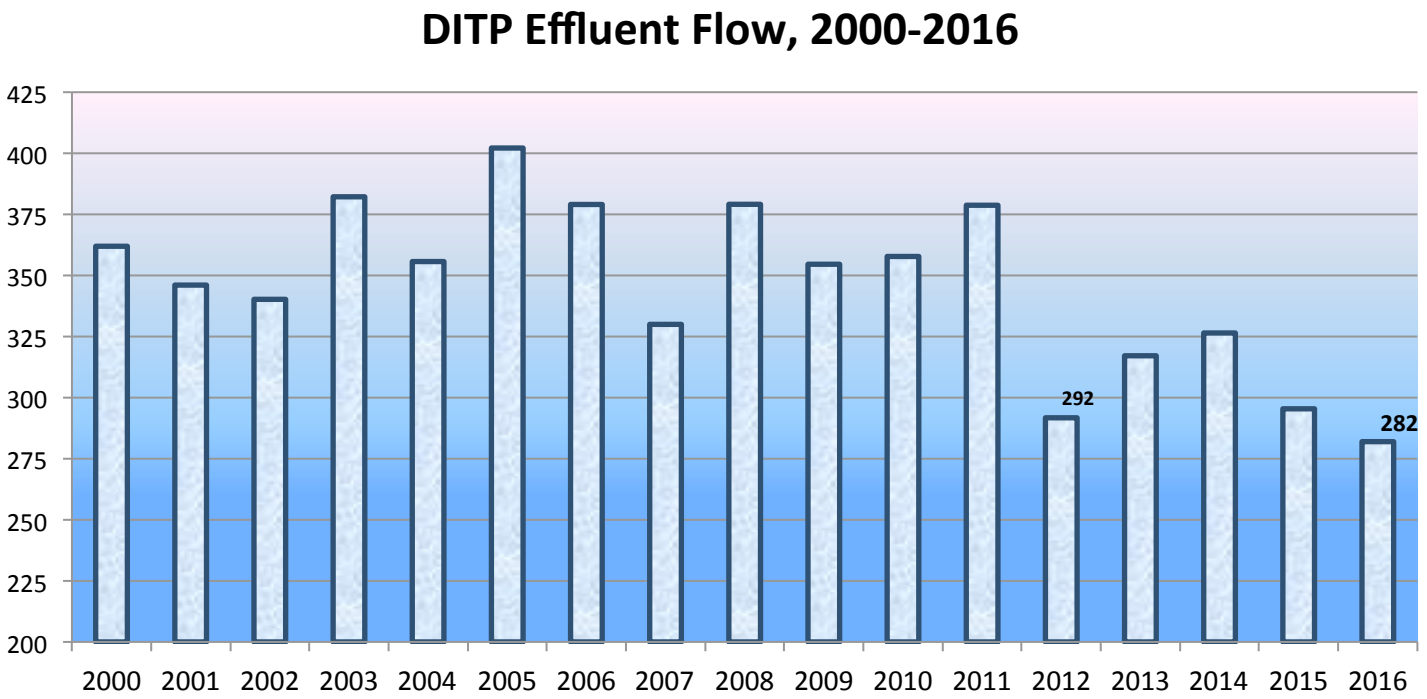

WATER RESOURCES AUTHORITY
MASSACHUSETTS

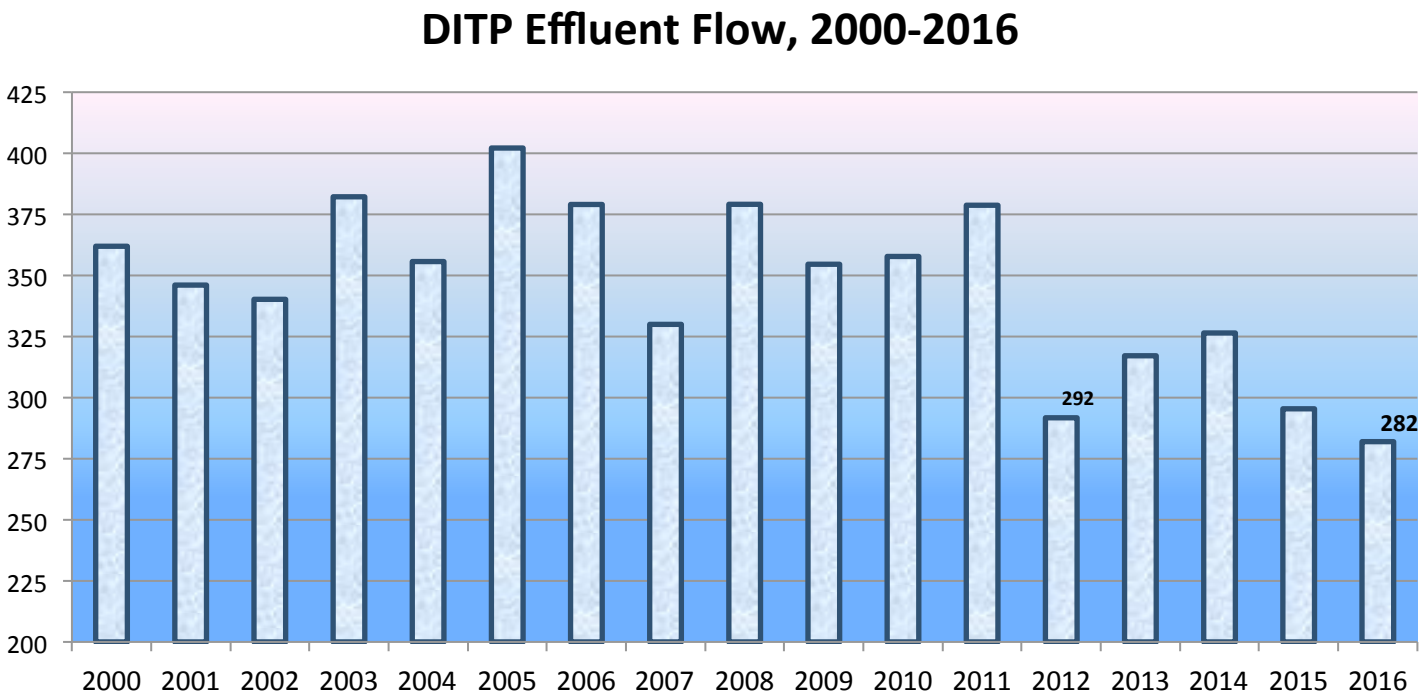
Massachusetts Water Resources Authority



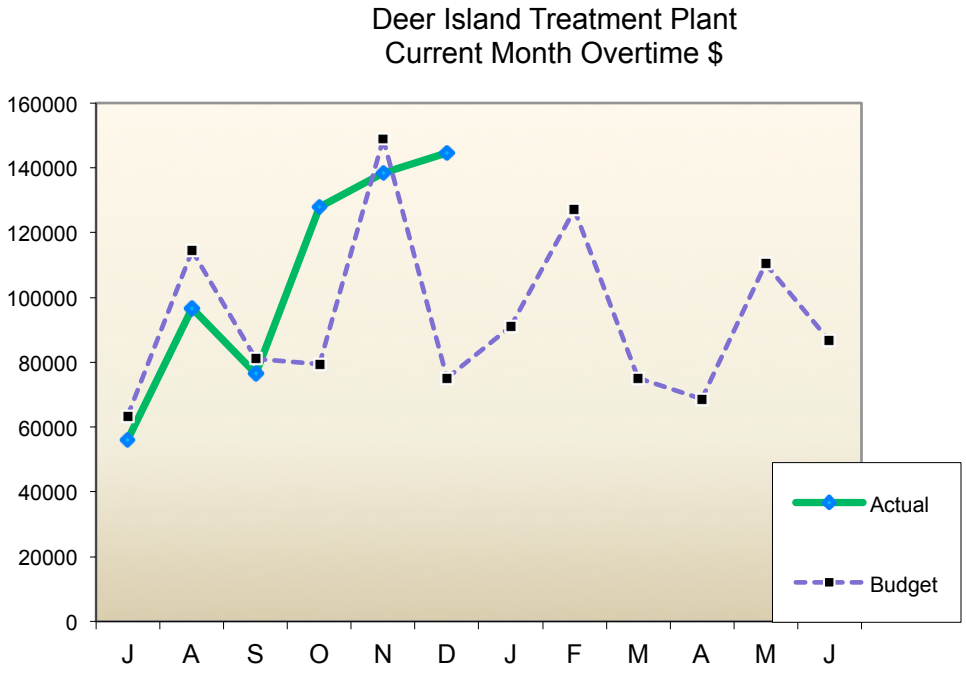
Lower Flows and Impacts at Deer Island WWTP



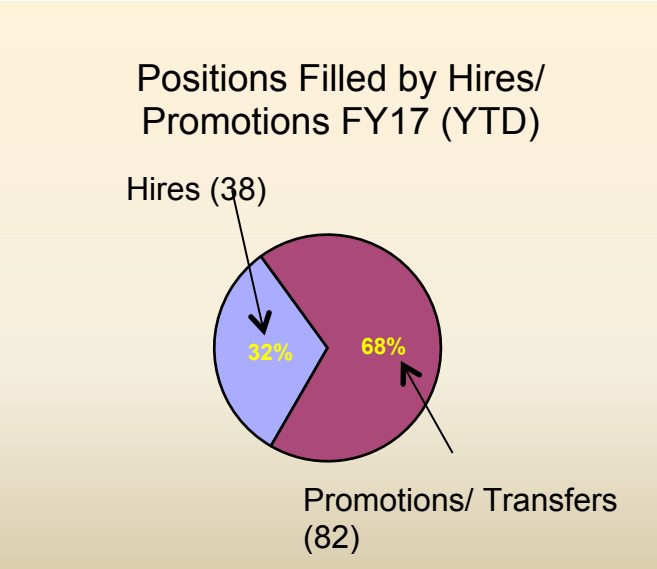
Lower Flows and Impacts at Deer Island WWTP

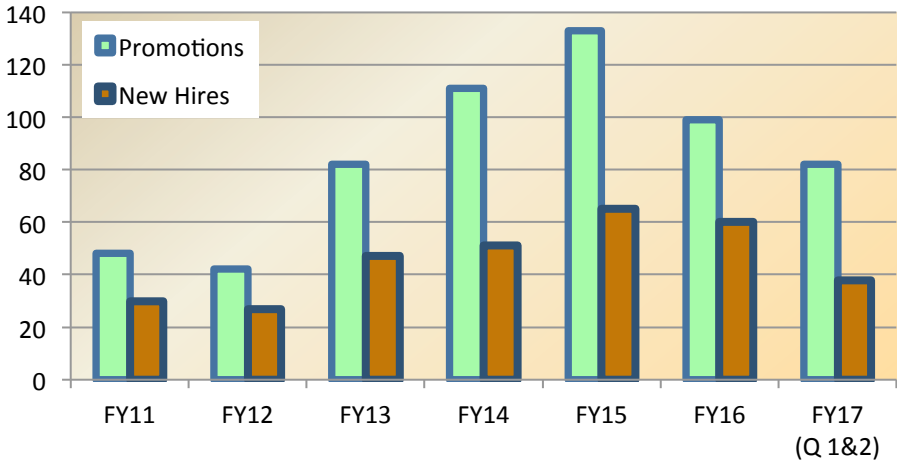


Deer Island Overtime Q2 FY17



Workforce Management





	Pr/Trns	Hires	Total
FY11	48 (62%)	30 (38%)	78
FY12	42 (61%)	27 (39%)	69
FY13	82 (64%)	47 (36%)	129
FY14	111 (69%)	51 (31%)	162
FY15	133 (67%)	65 (33%)	198
FY16	99 (62%)	60 (38%)	159
FY17	82 (68%)	38 (32%)	120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MASSACHUSETTS

MWRA Fiscal Year 2018
Proposed
Current Expense Budget

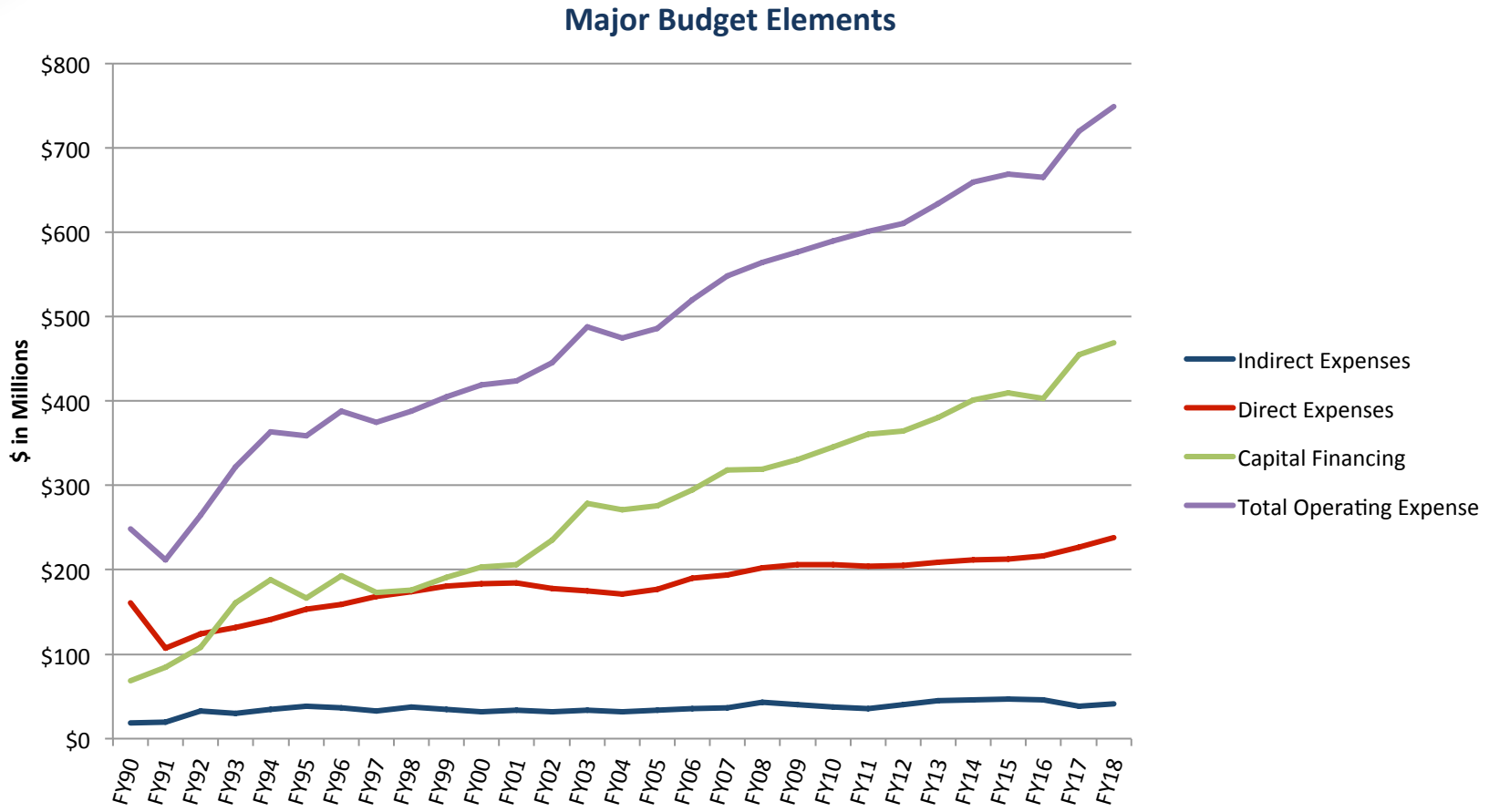
February 15, 2017

Managing Uncertainties to Achieve Sustainable and Predictable Rates

Goals

- Deliver sustainable and predictable rates
- Achieve progress toward long-term goals
- Manage uncertainty

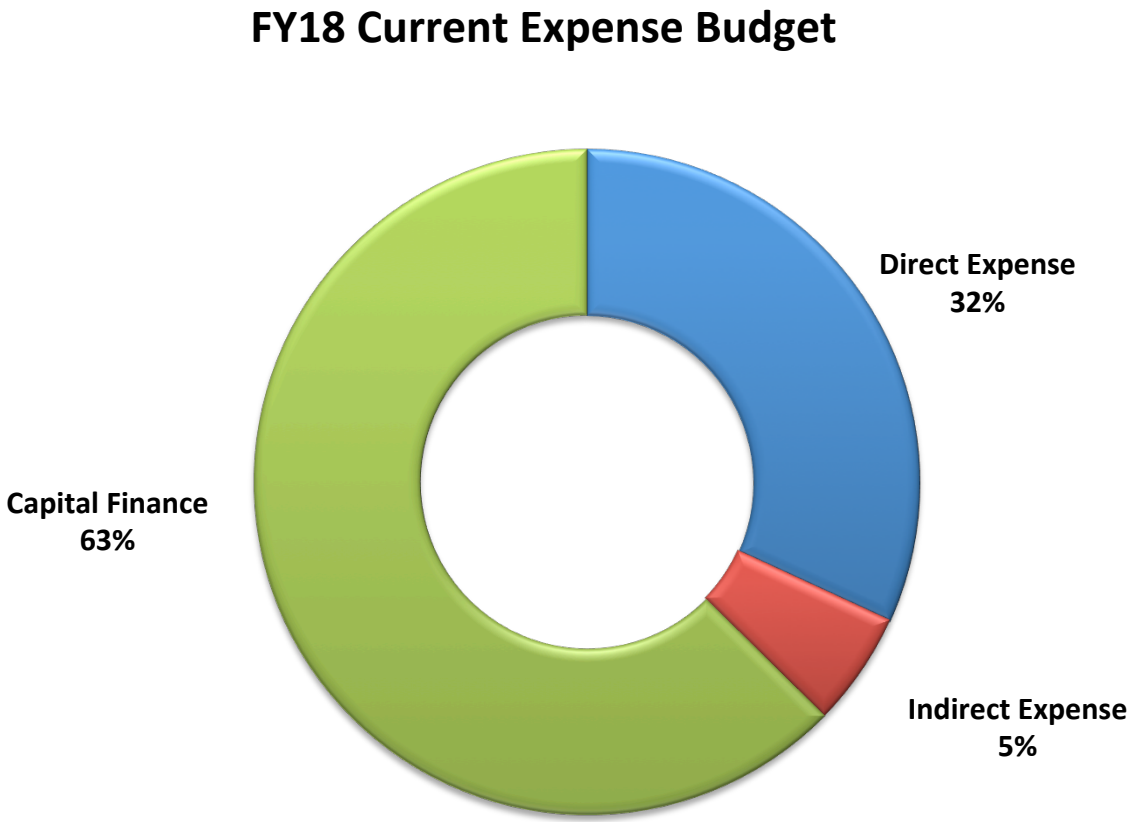
Historical Spending Chart



FY18 Proposed CEB – Areas of Uncertainty

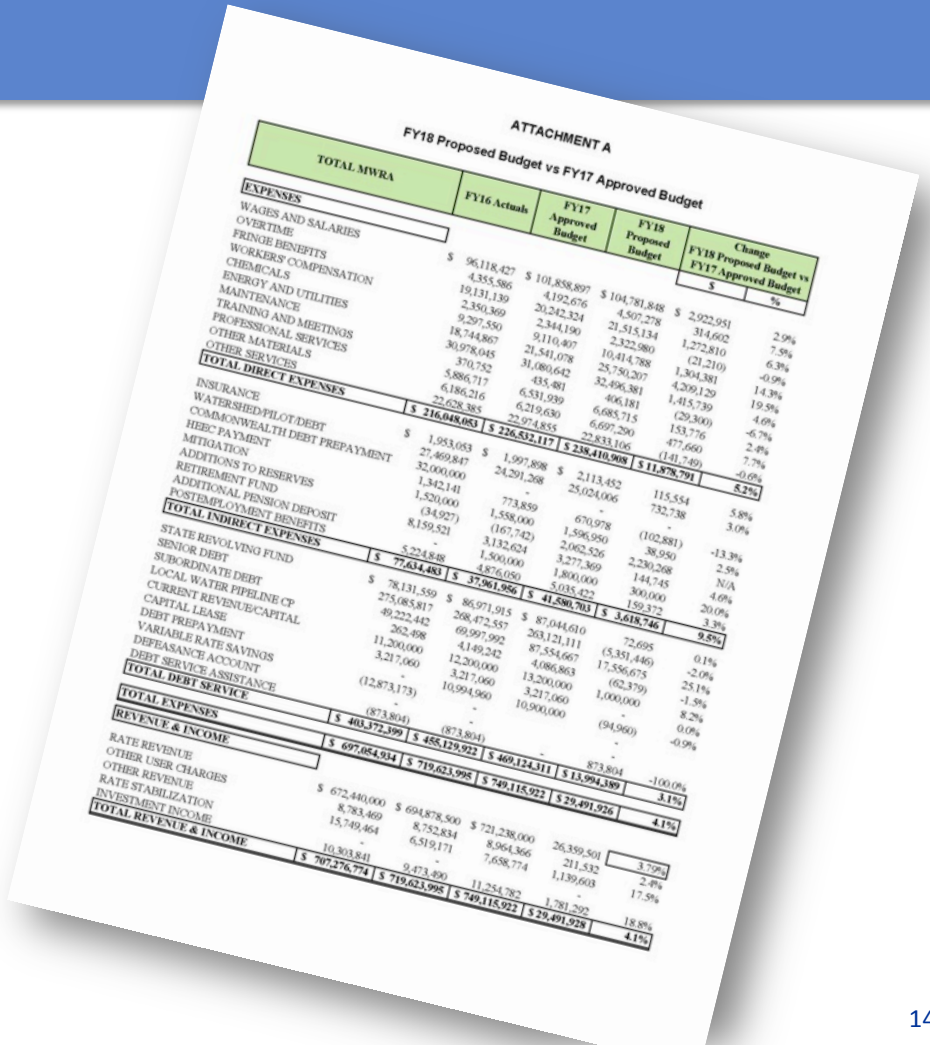
- Debt
- Investments
- Utility and Chemical Prices
- Construction Costs
  - Materials
  - Labor
- Consumer Price Index
- Tax Code Changes
- Environmental Regulations

FY18 Proposed Current Expense Budget (CEB)



CEB Budget Structure

- Direct Expenses
- Indirect Expenses
- Capital Finance Expenses
- Non-Rate Revenue
- Rate Revenue



ATTACHMENT A

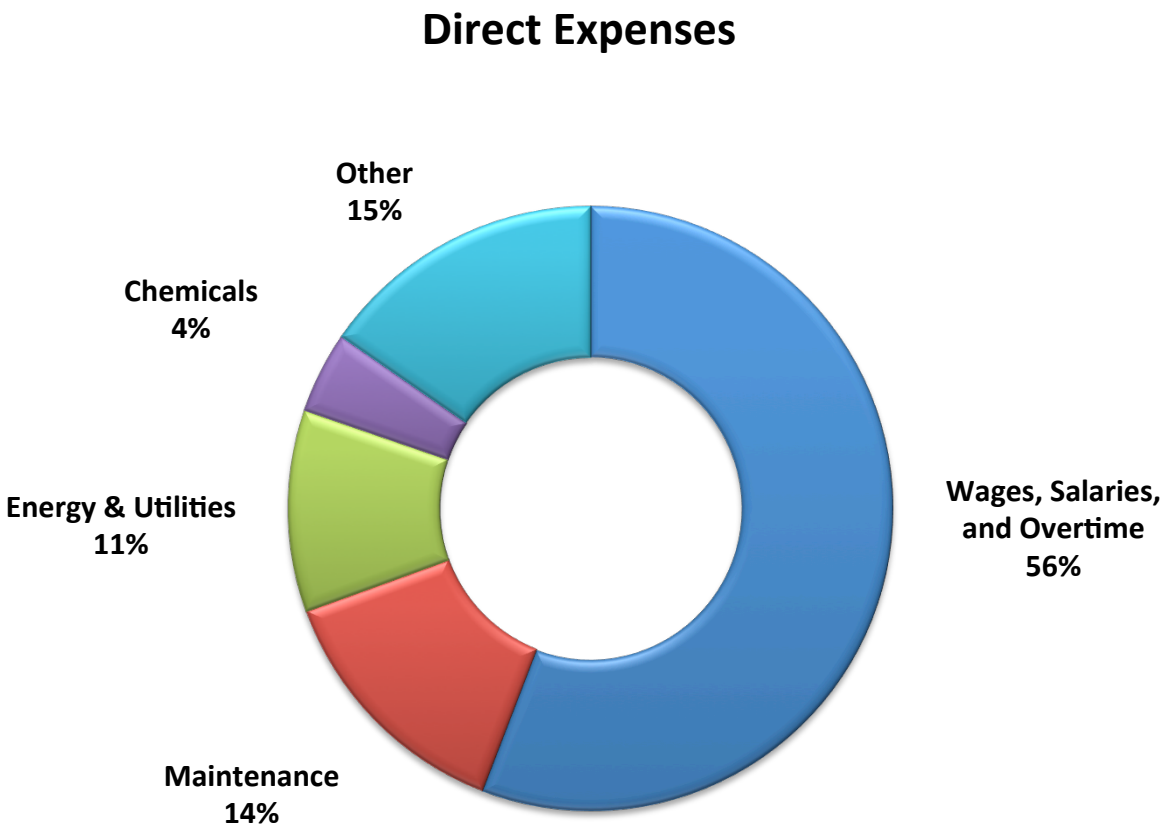
FY18 Proposed Budget vs FY17 Approved Budget

TOTAL MWRA	FY16 Actuals	FY17 Approved Budget	FY18 Proposed Budget	Change FY18 Proposed Budget vs FY17 Approved Budget $	Change FY18 Proposed Budget vs FY17 Approved Budget %
EXPENSES					
WAGES AND SALARIES	$ 96,118,427	$ 101,858,897	$ 104,781,848	$ 2,922,951	2.9%
OVERTIME	4,355,586	4,192,676	4,507,278	314,602	7.5%
FRINGE BENEFITS	19,131,139	20,242,324	21,515,134	1,272,810	6.3%
WORKERS' COMPENSATION	2,350,369	2,344,190	2,322,980	(21,210)	-0.9%
CHEMICALS	9,297,550	9,110,407	10,414,788	1,304,381	14.3%
ENERGY AND UTILITIES	18,744,867	21,541,078	25,750,207	4,209,129	19.5%
MAINTENANCE	30,978,045	31,080,642	32,496,381	1,415,739	4.6%
TRAINING AND MEETINGS	370,752	435,481	406,181	(29,300)	-6.7%
PROFESSIONAL SERVICES	5,886,717	6,531,939	6,685,715	153,776	2.4%
OTHER MATERIALS	6,186,216	6,219,630	6,697,290	477,660	7.7%
OTHER SERVICES	22,628,385	22,974,855	22,833,106	(141,749)	-0.6%
TOTAL DIRECT EXPENSES	$ 216,048,053	$ 226,532,117	$ 238,410,908	$ 11,878,791	5.2%
INSURANCE	$ 1,953,053	$ 1,997,898	$ 2,113,452	115,554	5.8%
WATERSHED/PILOT/DEBT	27,469,847	24,291,298	25,024,006	732,738	3.0%
COMMONWEALTH DEBT PREPAYMENT	32,000,000	-	-	-	
HEEC PAYMENT	1,342,141	773,859	-	(102,881)	-13.3%
MITIGATION	1,520,000	1,558,000	670,978	38,950	2.5%
ADDITIONS TO RESERVES	(34,927)	(167,742)	1,596,950	2,290,268	N/A
RETIREMENT FUND	8,159,521	3,132,624	2,062,526	144,745	4.6%
ADDITIONAL PENSION DEPOSIT	-	1,500,000	3,277,369	300,000	20.0%
POSTEMPLOYMENT BENEFITS	5,224,848	4,876,050	1,800,000	159,372	3.3%
TOTAL INDIRECT EXPENSES	$ 77,634,483	$ 37,961,956	$ 41,580,703	$ 3,618,746	9.5%
STATE REVOLVING FUND	$ 78,131,559	$ 86,971,915	$ 87,044,610	72,695	0.1%
SENIOR DEBT	275,085,817	268,472,557	263,121,111	(5,351,446)	-2.0%
SUBORDINATE DEBT	49,222,442	69,997,992	87,554,667	17,556,675	25.1%
LOCAL WATER PIPELINE CP	262,498	4,149,242	4,086,863	(62,379)	-1.5%
CURRENT REVENUE/CAPITAL	11,200,000	12,200,000	13,200,000	1,000,000	8.2%
CAPITAL LEASE	3,217,060	3,217,060	3,217,060	-	0.0%
DEBT PREPAYMENT	-	10,994,960	10,900,000	(94,960)	-0.9%
VARIABLE RATE SAVINGS	(12,873,173)	-	-	-	
DEFEASANCE ACCOUNT	-	-	-	-	
DEBT SERVICE ASSISTANCE	(873,804)	(873,804)	-	873,804	-100.0%
TOTAL DEBT SERVICE	$ 403,372,399	$ 455,129,922	$ 469,124,311	$ 13,994,389	3.1%
TOTAL EXPENSES	$ 697,054,934	$ 719,623,995	$ 749,115,922	$ 29,491,926	4.1%
REVENUE & INCOME					
RATE REVENUE	$ 672,440,000	$ 694,878,500	$ 721,238,000	26,359,501	3.79%
OTHER USER CHARGES	8,783,469	8,752,834	8,964,366	211,532	2.4%
OTHER REVENUE	15,749,464	6,519,171	7,658,774	1,139,603	17.5%
RATE STABILIZATION	-	-	-	-	
INVESTMENT INCOME	10,303,841	9,473,490	11,254,782	1,781,292	18.8%
TOTAL REVENUE & INCOME	$ 707,276,774	$ 719,623,995	$ 749,115,922	$ 29,491,928	4.1%

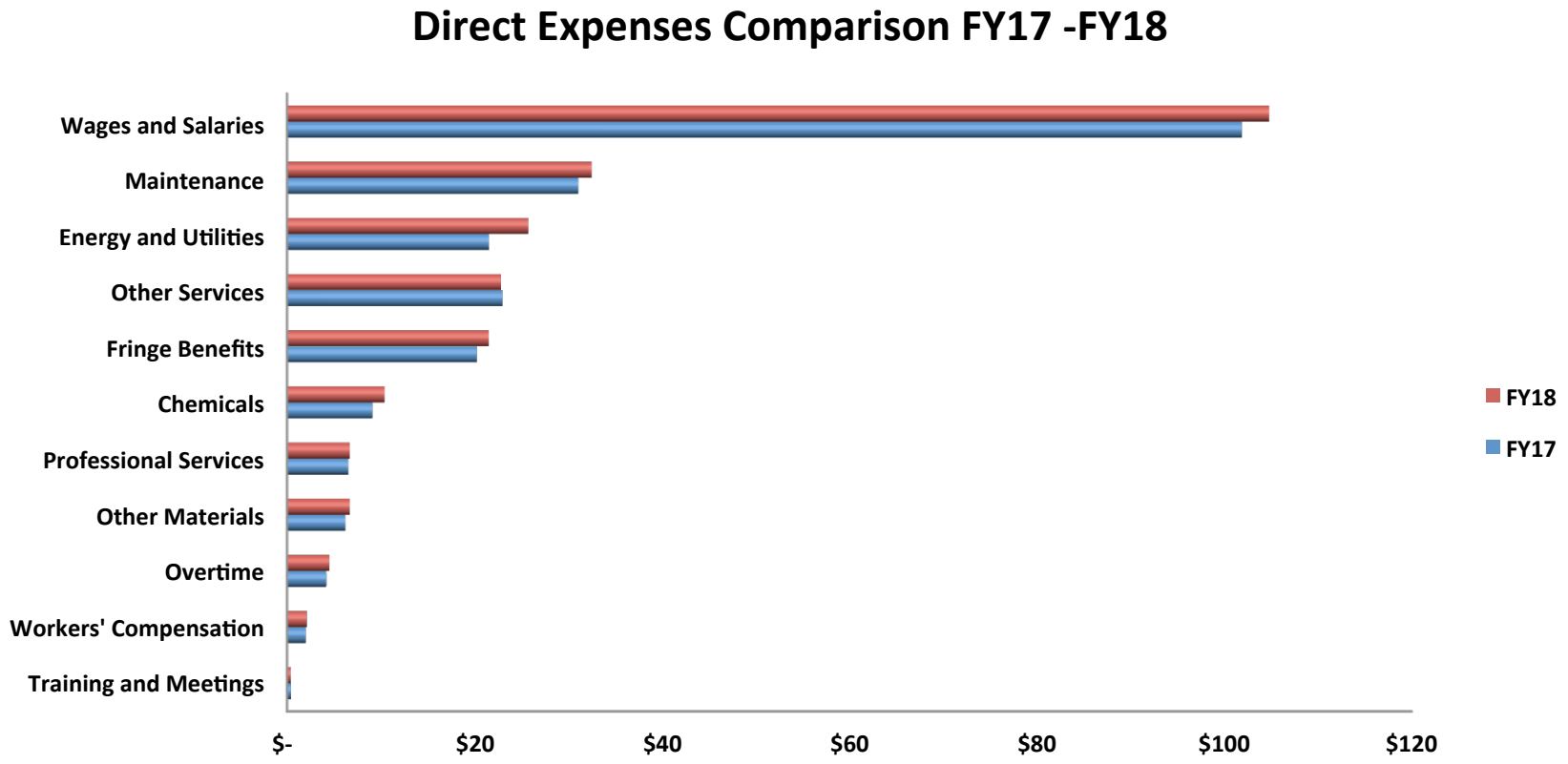
FY18 Proposed CEB vs FY 17

CATEGORY	FY17 Approved Budget	FY18 Proposed Budget	Change FY18 Proposed Budget vs FY17 Approved Budget	
			$	%
TOTAL DIRECT EXPENSES	$ 226,532	$ 238,411	$ 11,879	5.2%
TOTAL INDIRECT EXPENSES	$ 37,962	$ 41,581	$ 3,619	9.5%
TOTAL CAPITAL FINANCE	$ 455,130	$ 469,124	$ 13,994	3.1%
TOTAL EXPENSES	$ 719,624	$ 749,116	$ 29,492	4.1%

CEB Budget Structure – Direct Expenses



Direct Expenses Comparison



FY18 Proposed Current Expense Budget (CEB)

Highlights – Direct Expenses

- Wages and Salaries - $104.8M – Budgeted FTE's: 1,150 same as FY17
- Maintenance - $32.5M – $1.4 million above FY17
- Utilities - $25.8M – $4.2 million above FY17
- Other Services - $22.8M – basically level funded to FY17
- Fringe Benefits - $21.5M – $1.3 million higher than FY17

Managing Uncertainty

Direct Expenses

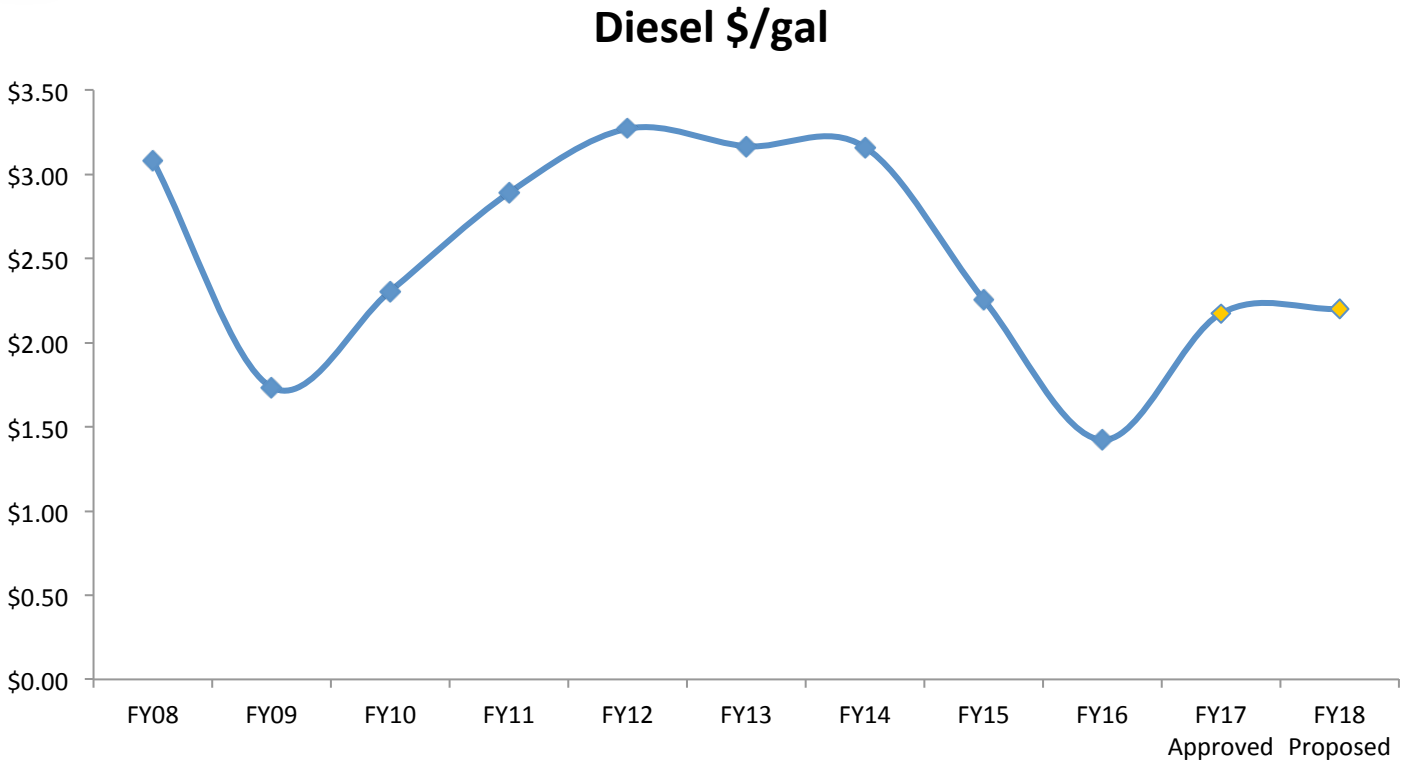
- HEEC Cable Protection - $4.4 million placeholder in various budget lines
- Health Insurance – assume 8% increase
- Utility Costs – anticipate volatility
- Chemicals
  - Regulatory Uncertainty - NPDES Enterococus - $600k placeholder
  - Contractual Increases

HEEC Cable Protection

Estimated one-time FY18 CEB Impact Placeholder $4.4 million

- Diesel Fuel - $6.2 million (2.9 million gallons)
- Avoided Electricity Charges – ($2.5 million) – 30.4 million kWh generated by CTG's)
- Labor - $0.4 million
- Other Charges - $0.3 million

Diesel Pricing History

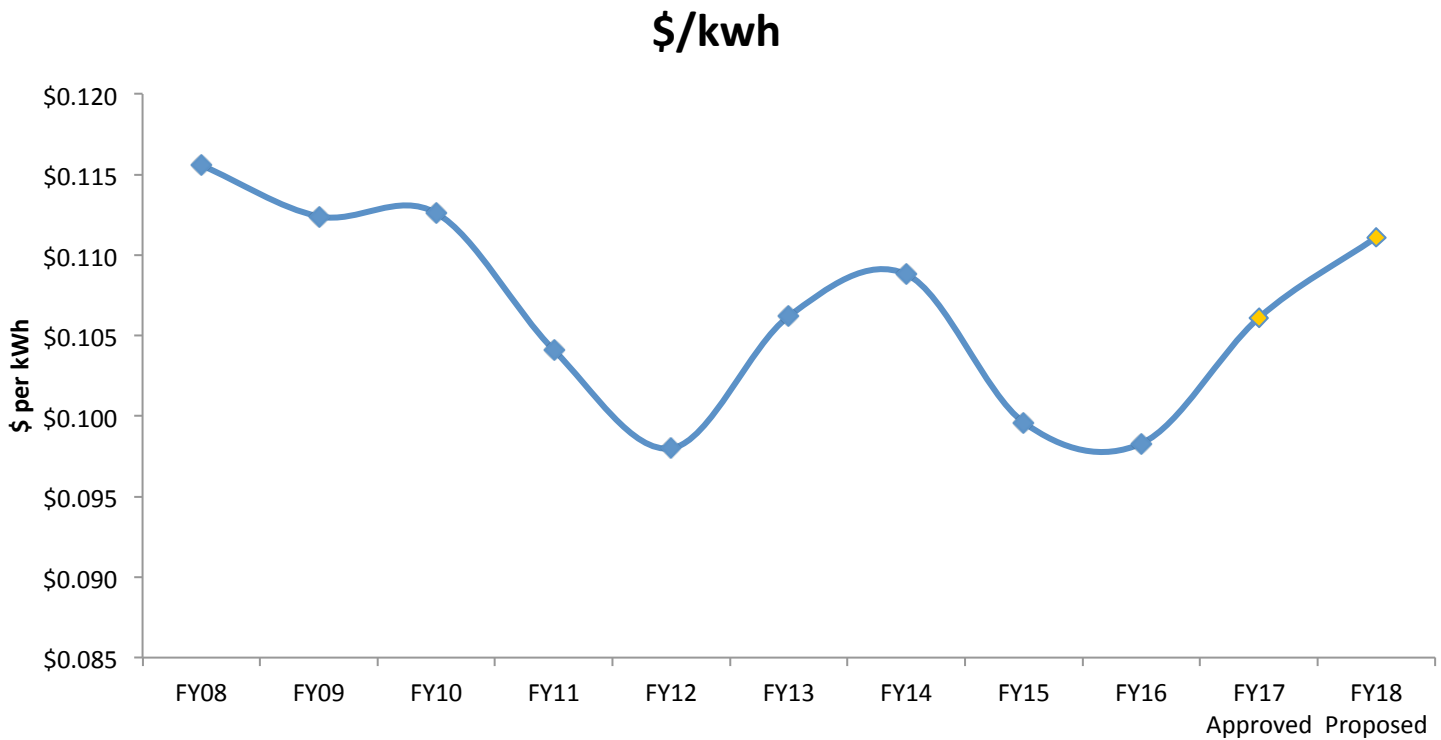


Most recent purchases:

$1.58/gal Nov 2016
$1.83/gal Jan 2017
$0.25 increase

5 -YR Ave. $2.66/gal
10 -YR Ave. $2.59/gal

Electricity Pricing History

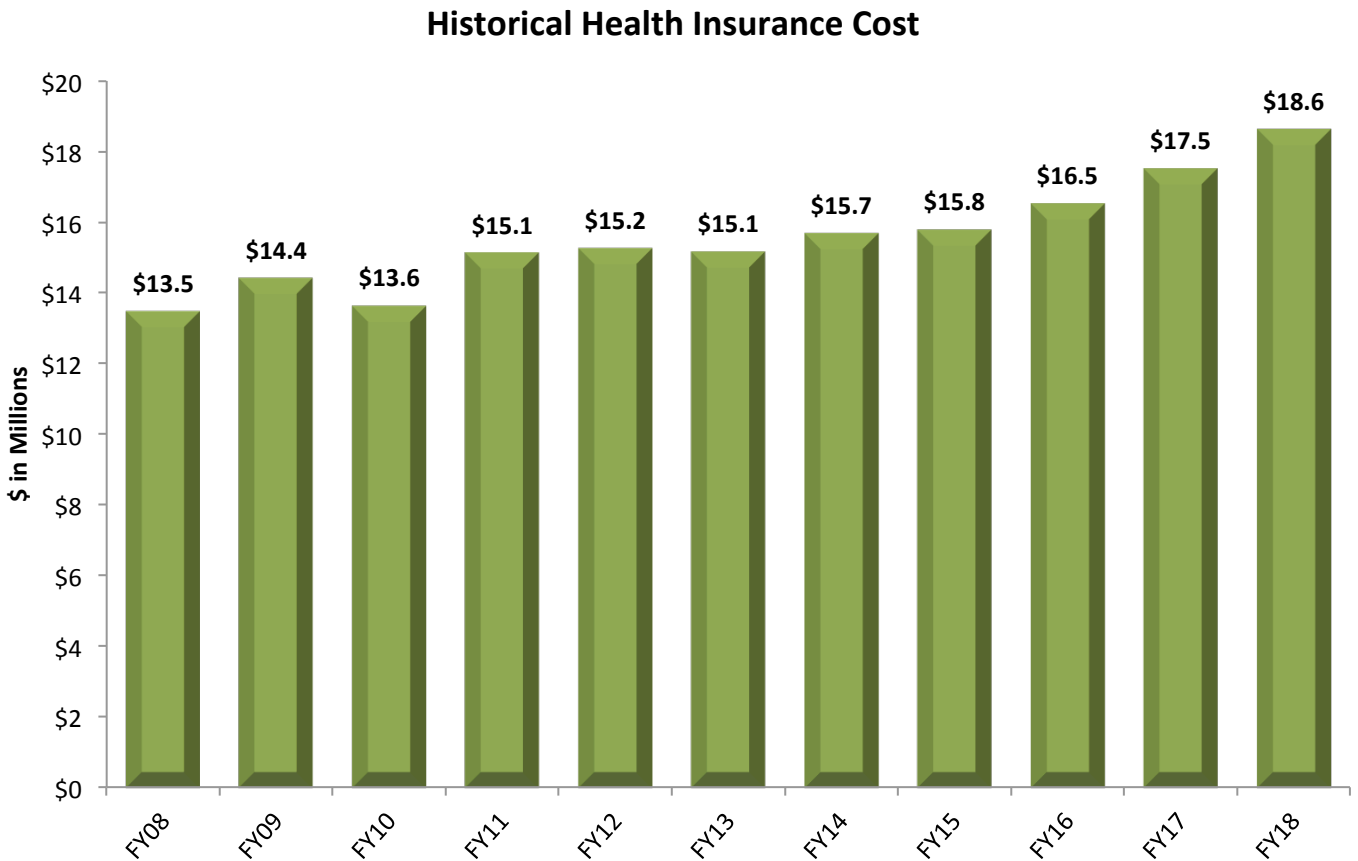


Mix of fixed and variable rate power blocks

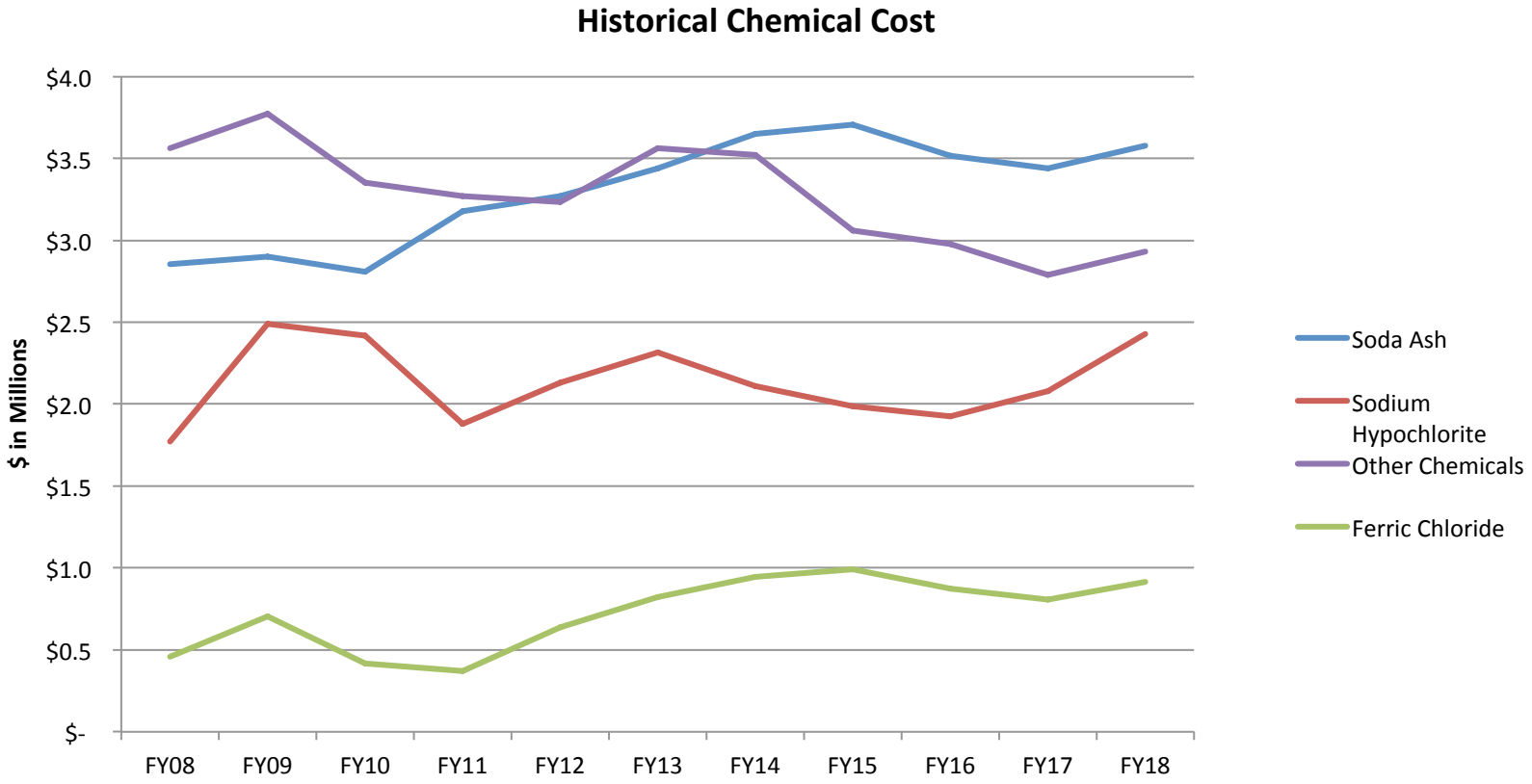
Procurements: Deer Island, Interval Accounts, and Profile Accounts

5 - YR Ave. $0.102/kWh
10 – YR Ave $.106/kWh

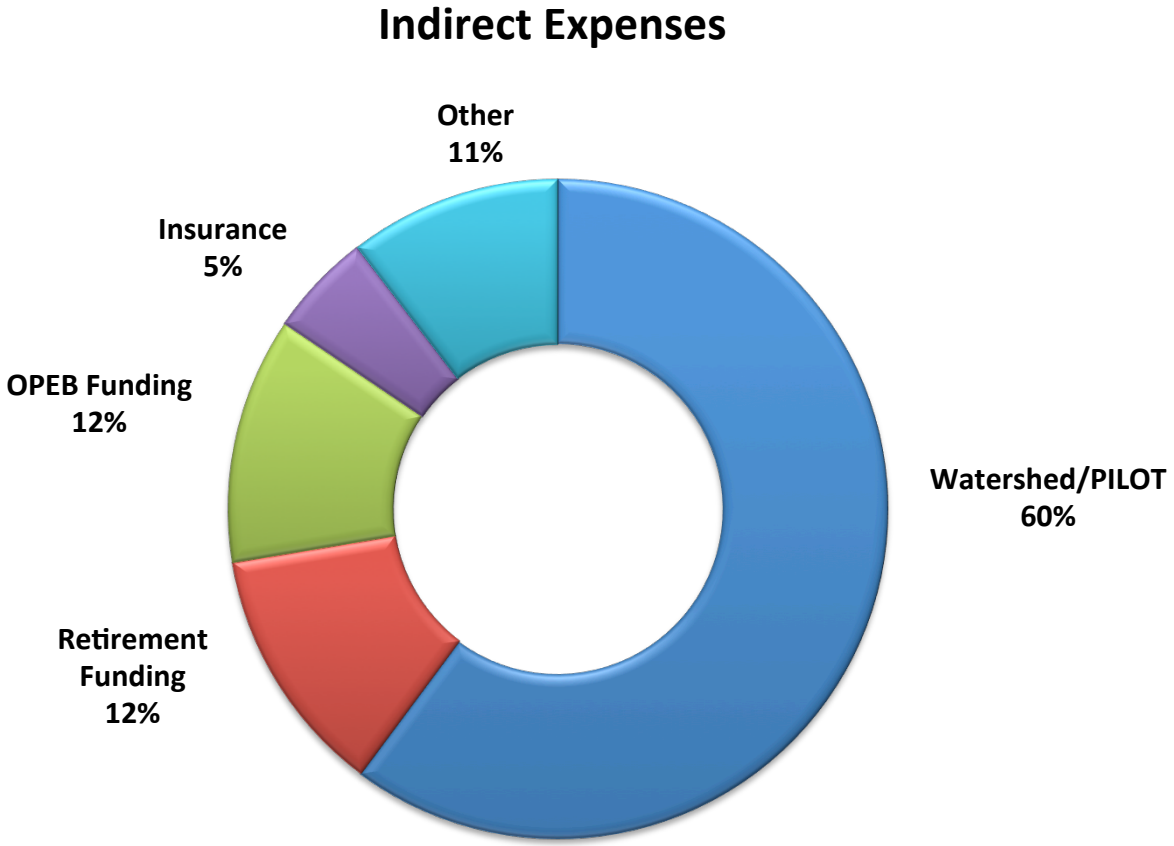
Health Insurance



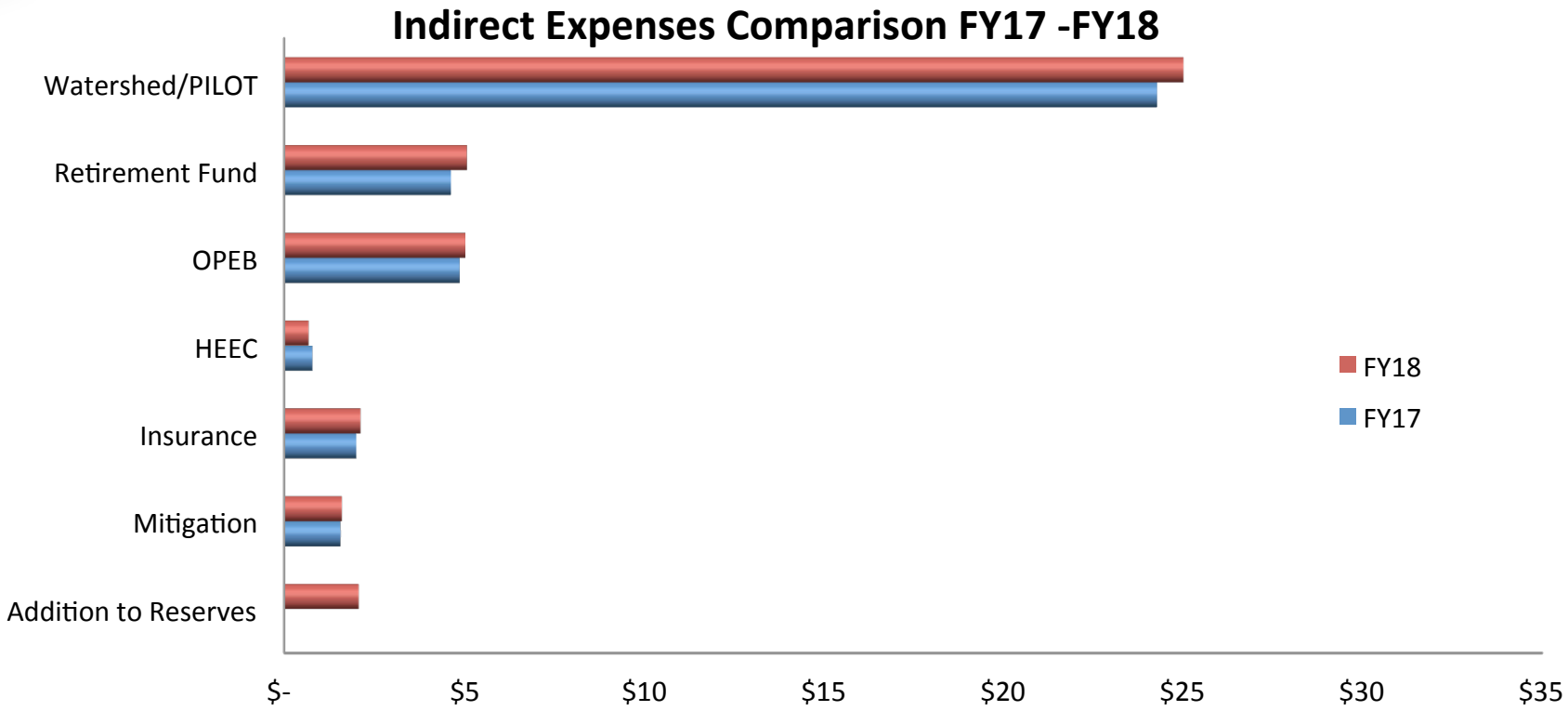
Chemical Expense History



CEB Budget Structure – Indirect Expenses



Indirect Expenses Comparison



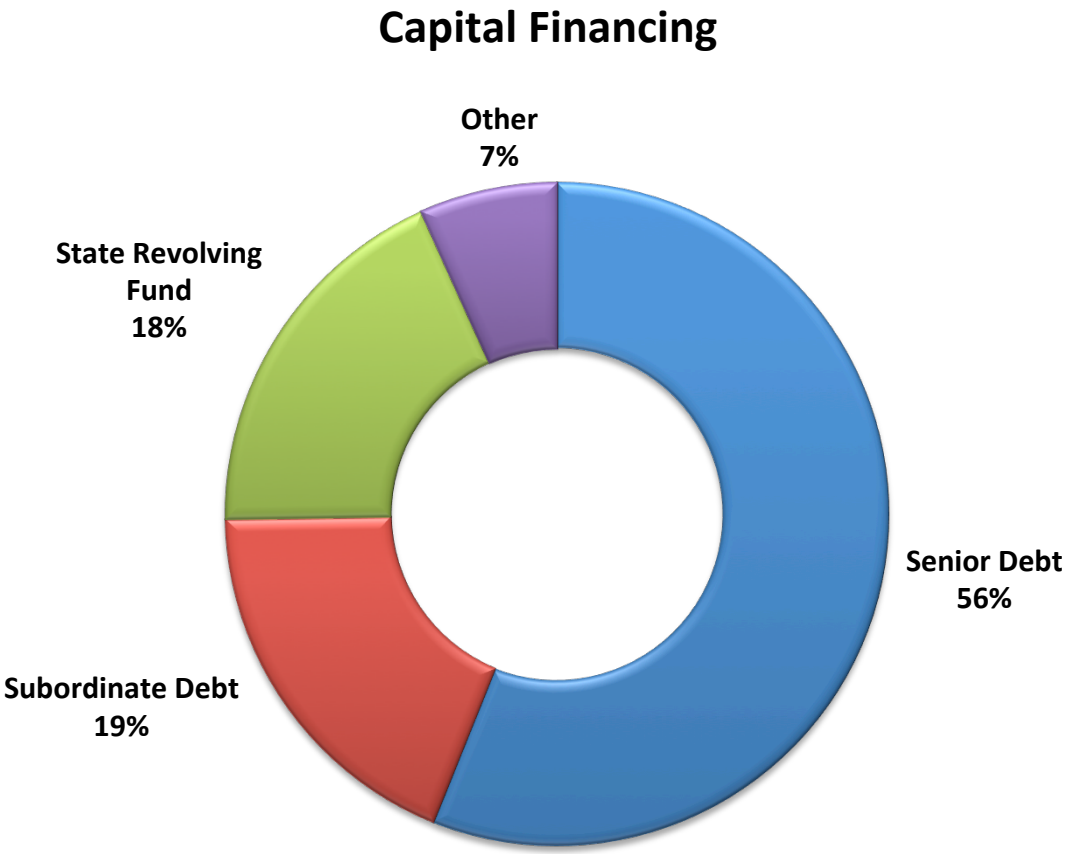
Highlights – Indirect Expenses

- Watershed Program for operating and PILOT: $25.0M
- Pension Fund required contribution: $3.3M plus an additional $1.8M contribution
- OPEB half of actuarial funding schedule: $5.0M
- Insurance: $2.1M
- Mitigation: $1.6M
- HEEC contract: $0.7M

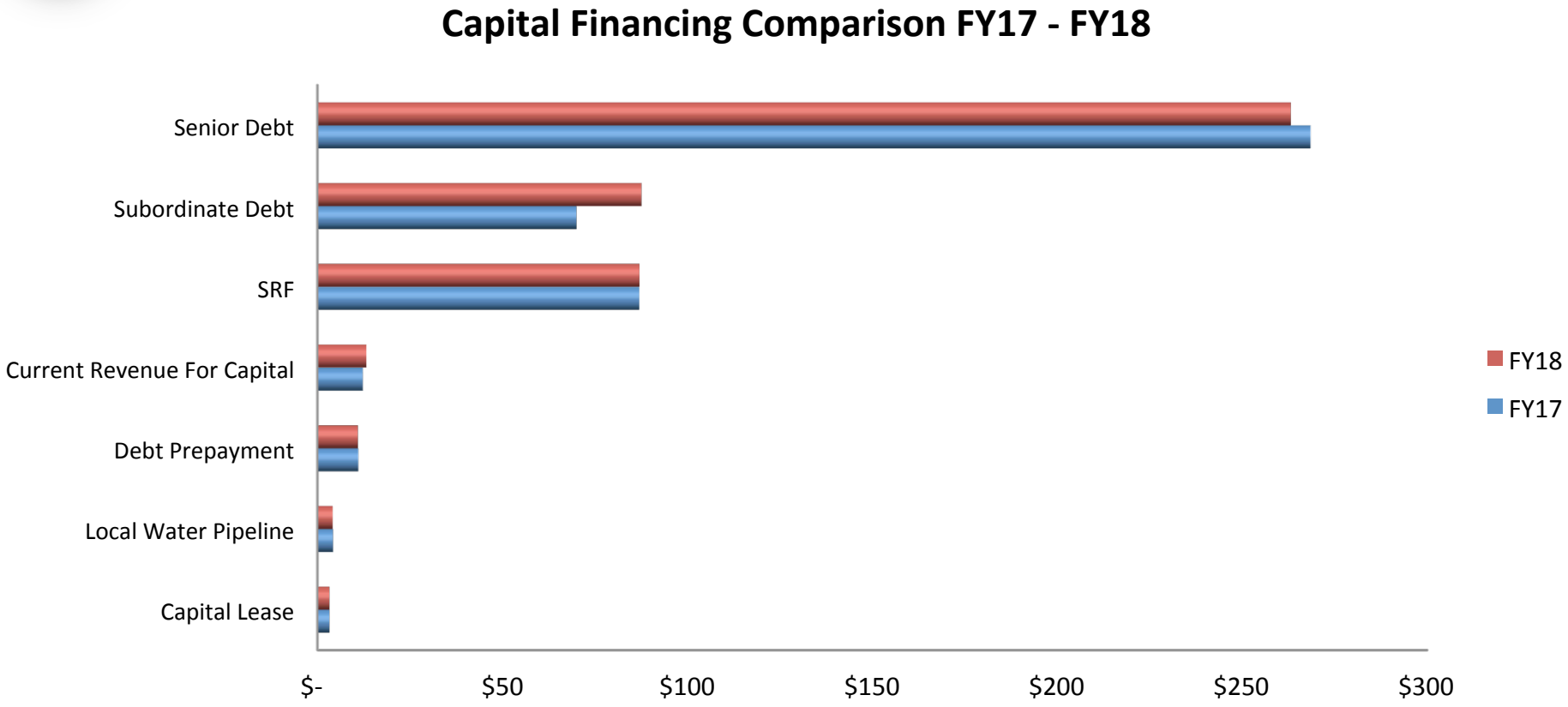
Indirect Expenses

- Pension and OPEB Contributions
  - Actuarial Revaluation
  - Lower Investment Returns

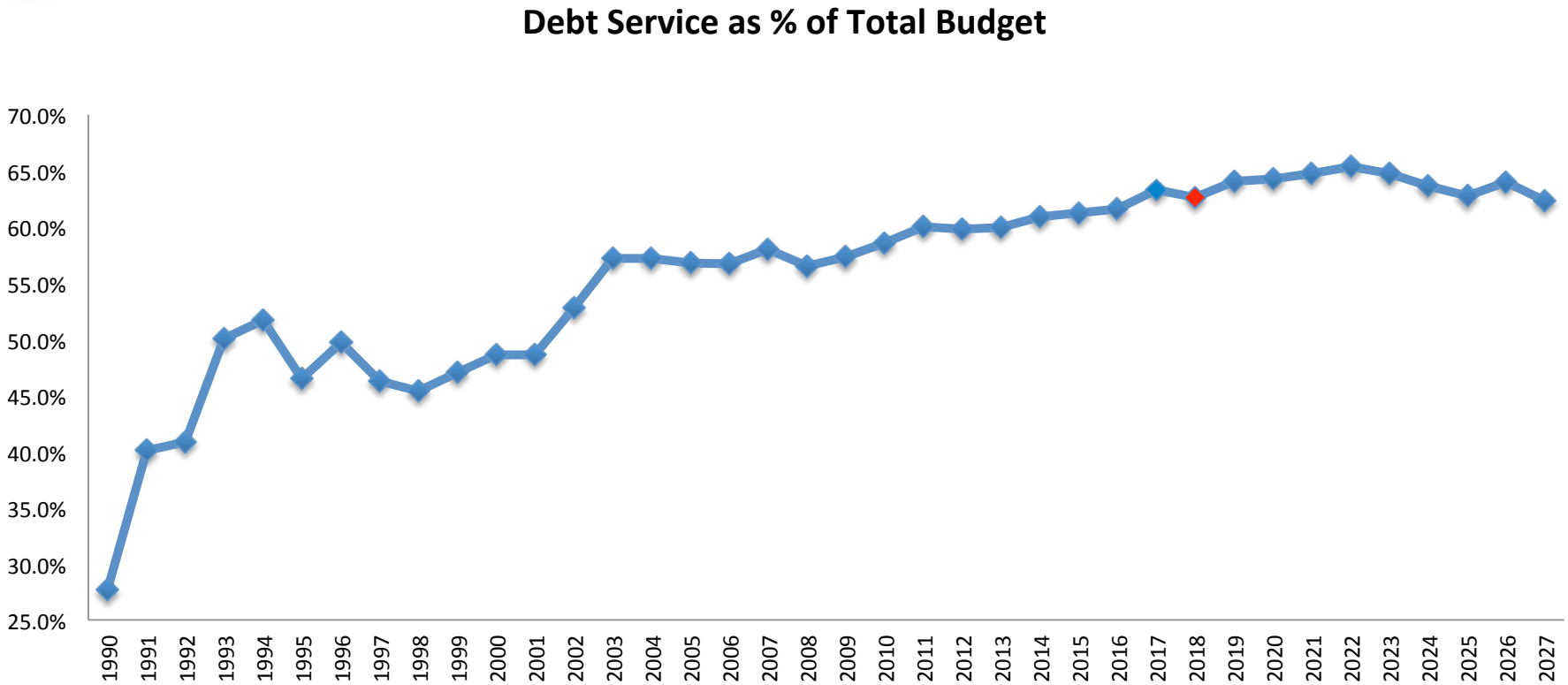
CEB Budget Structure – Capital Finance Expenses



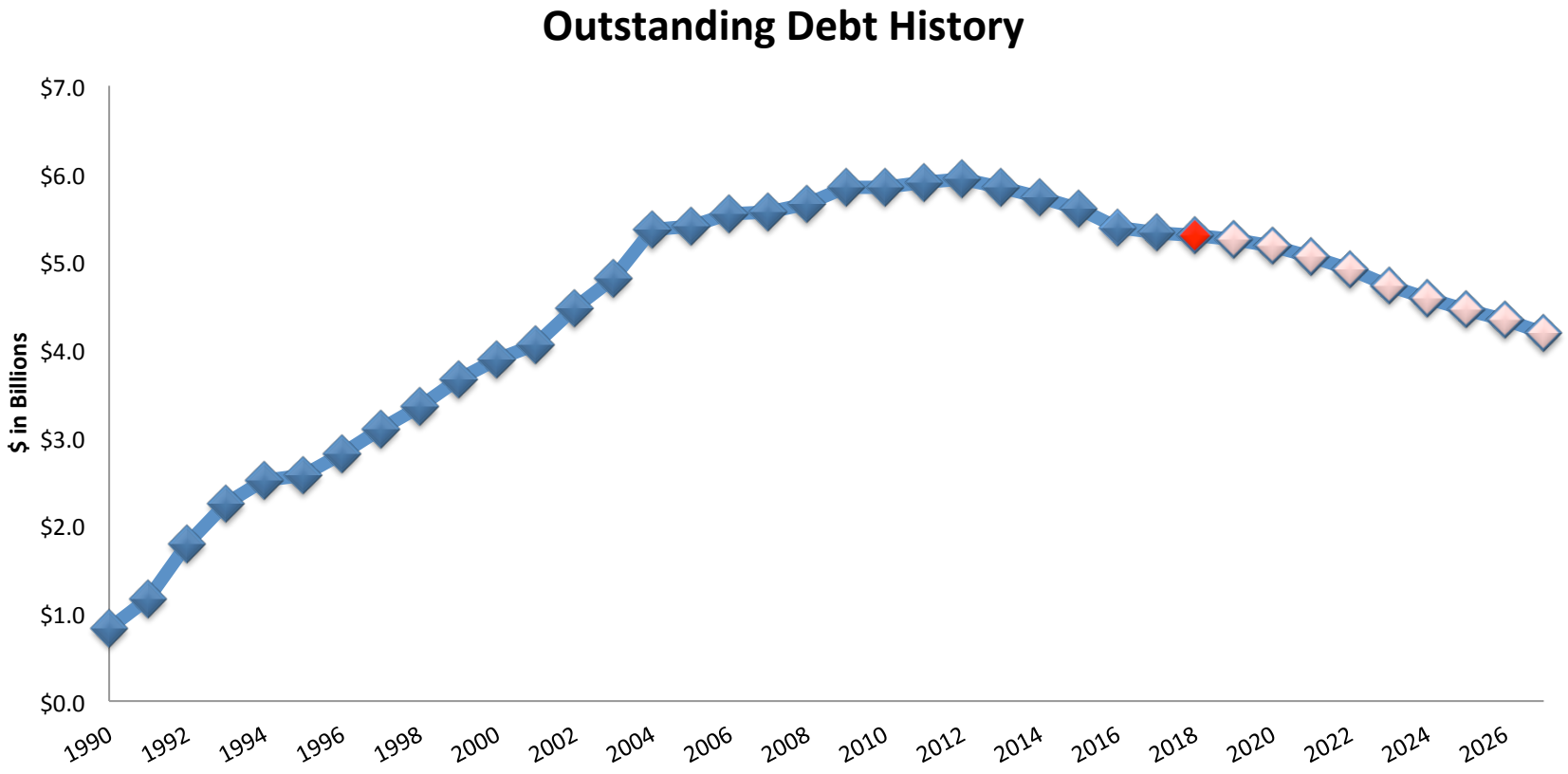
Capital Finance Expenses Comparison



Capital Finance Expenses – Peak in 2022



Outstanding Debt



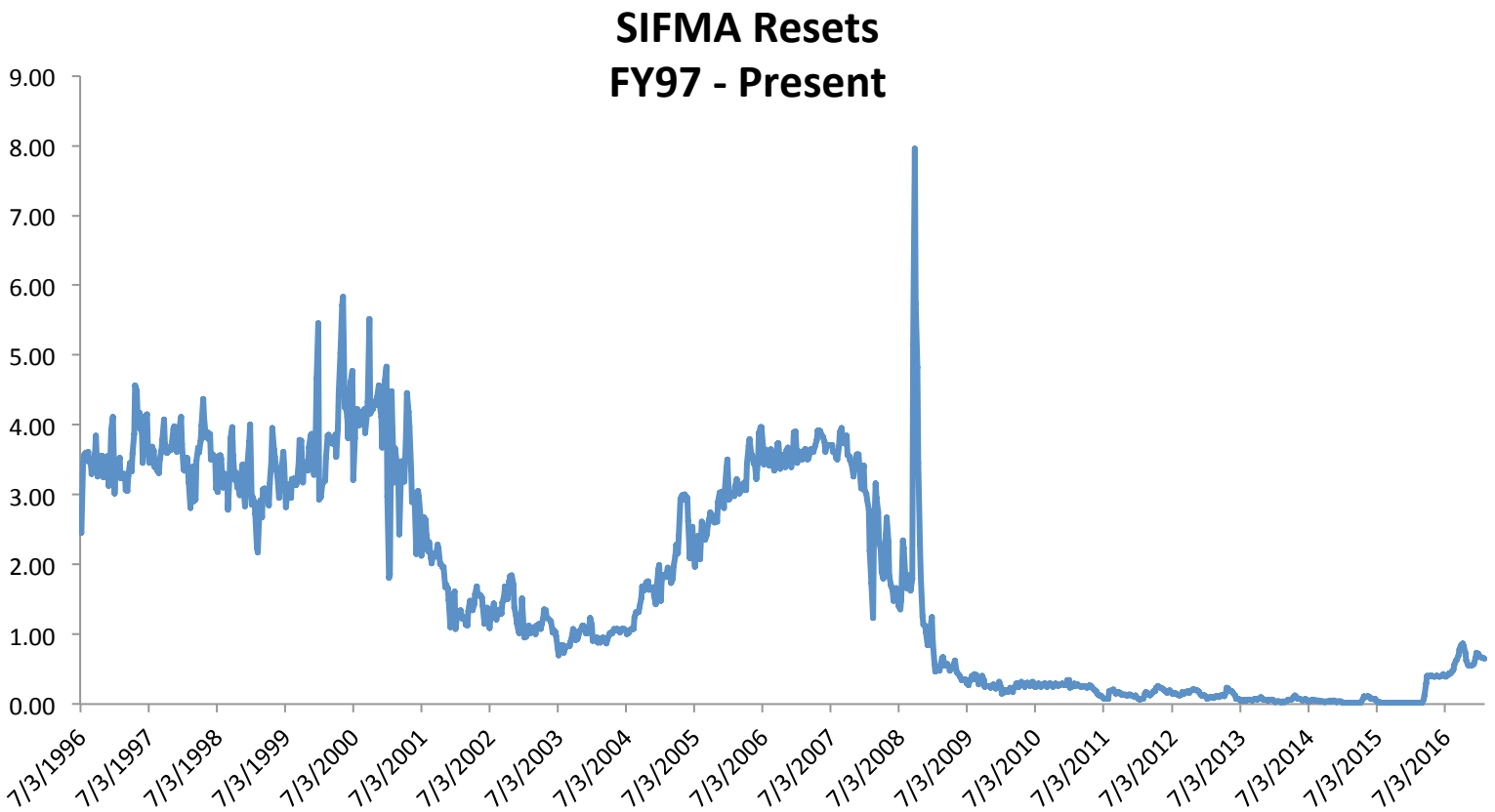
Ways to address the Debt Service challenge

- Defeasance
- Use of Reserves
  - Rate Stabilization Fund
  - Bond Redemption Fund
- Tactical Issuance – Repayment Structure
- Control Capital Spending
- Strategic Use of Current Revenue/Capital Funding

Managing Uncertainty

- Interest Rates
- Amount and Timing of New Money
- Amount and Timing of SRF
- Potential Tax Code Changes

Interest Rate Risk



FY18 Proposed Current Expense Budget (CEB)

Highlights – Capital Finance Expenses

- Variable Rate Debt Assumption 3.50%, 25 bp increase
- $20 million defeasance built into the FY18 Budget
- $10.9 million prepayment of debt built into FY18 Budget
- $1.0 million continued commitment to increase Current Revenue for Capital
- No Debt Service Assistance

FY18 Proposed Current Expense Budget (CEB)

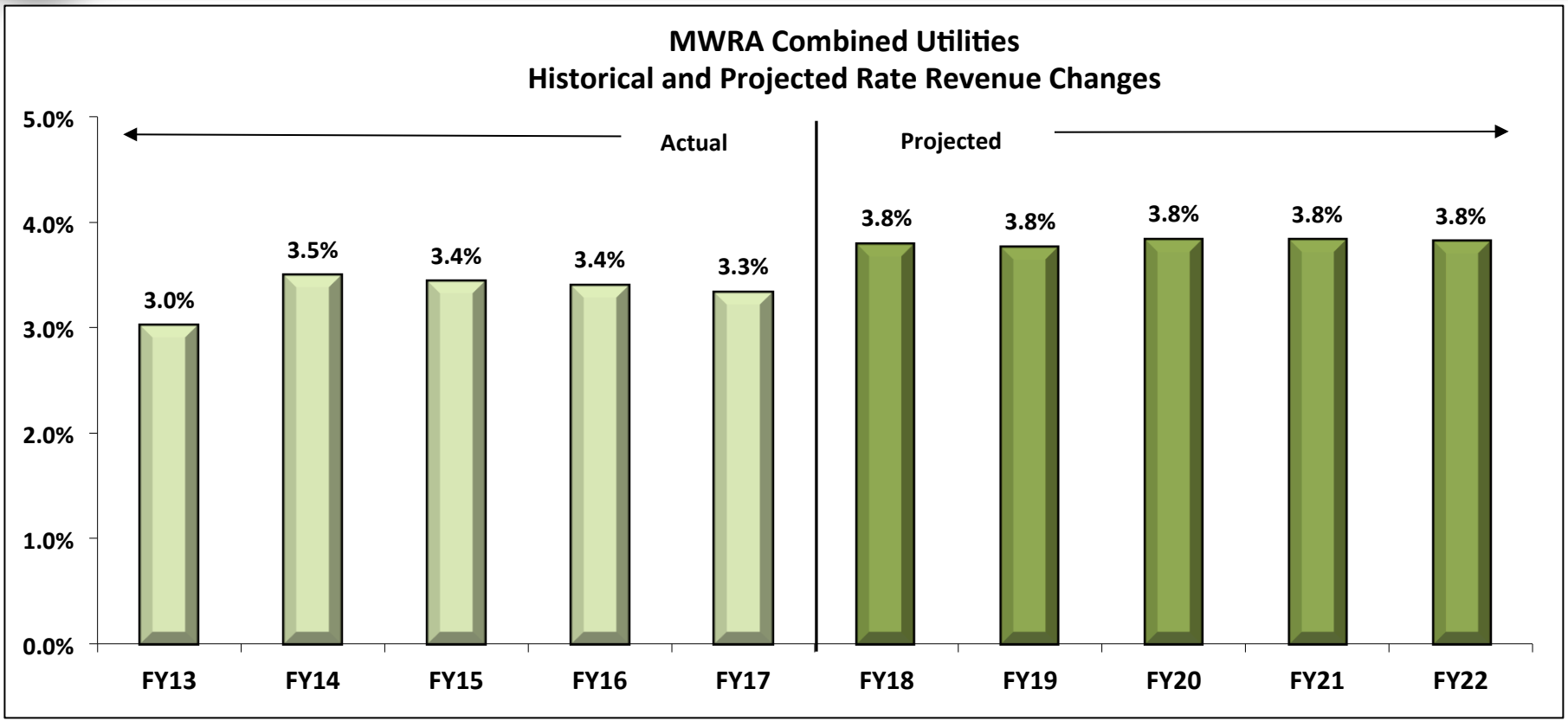
Non- Rate Revenue

- Other User Charges - $9.0 million, increase of $0.2 million
- Other Revenue - $7.7 million, increase of $1.1 million
- Investment Income - $11.3 million, increase of $1.8 million

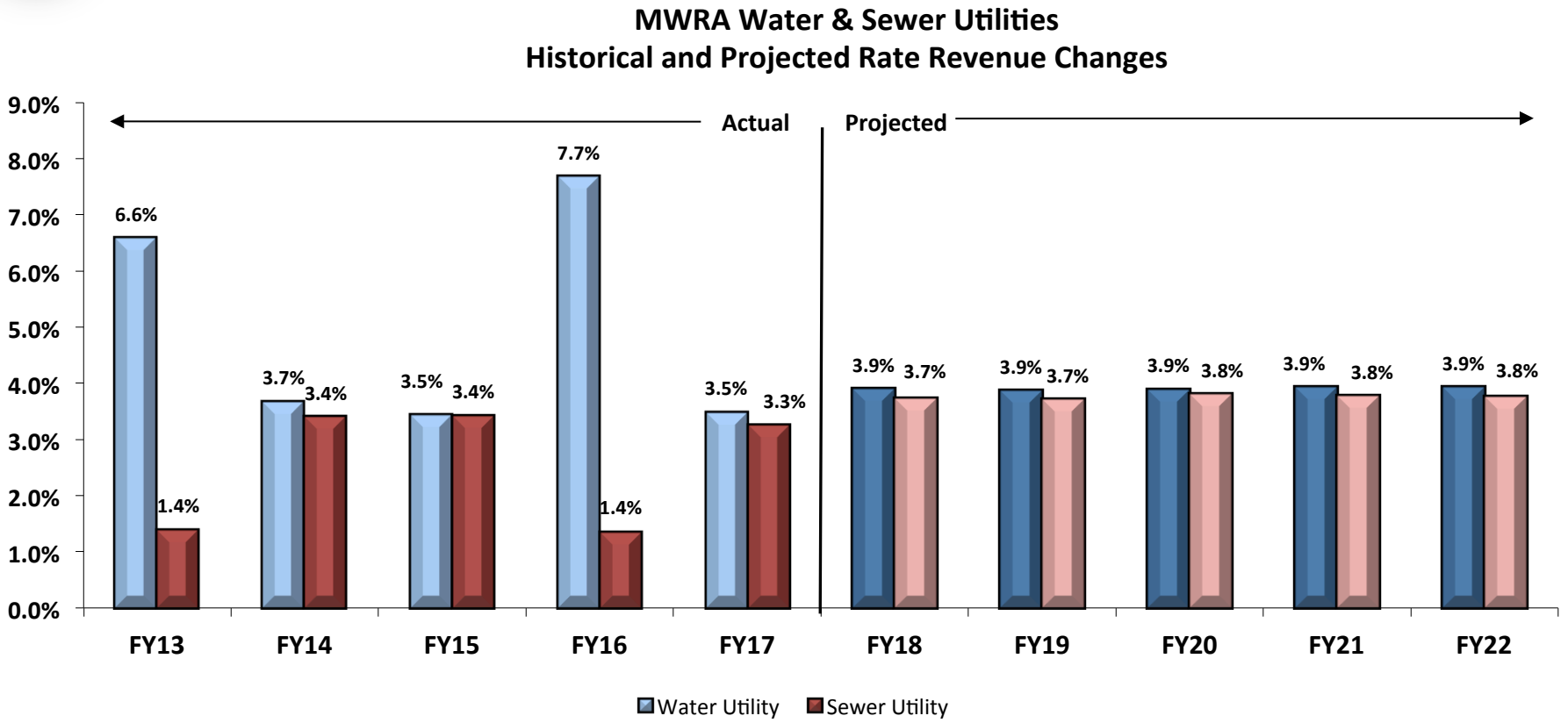
Rate Revenue Requirement

Direct Expense	$238.4 M
Indirect Expense	$41.6 M
Debt Service	$469.1 M
Non-Rate Revenue	($27.9) M
Rate Revenue Requirement	$721.2 M

Actual and Forecasted Assessment Changes



Actual and Forecasted Assessment Changes by Utility



FY18 Current Expense Budget Next Steps

- Transmit Proposed Budget to Advisory Board for 60 day review
- Public Hearing
- MWRA Board Hearing
- Staff will present Draft Final Budget in June

Thank You


WATER RESOURCES AUTHORITY
MASSACHUSETTS

Deer Island Long-Term Energy Supply Alternatives Analysis

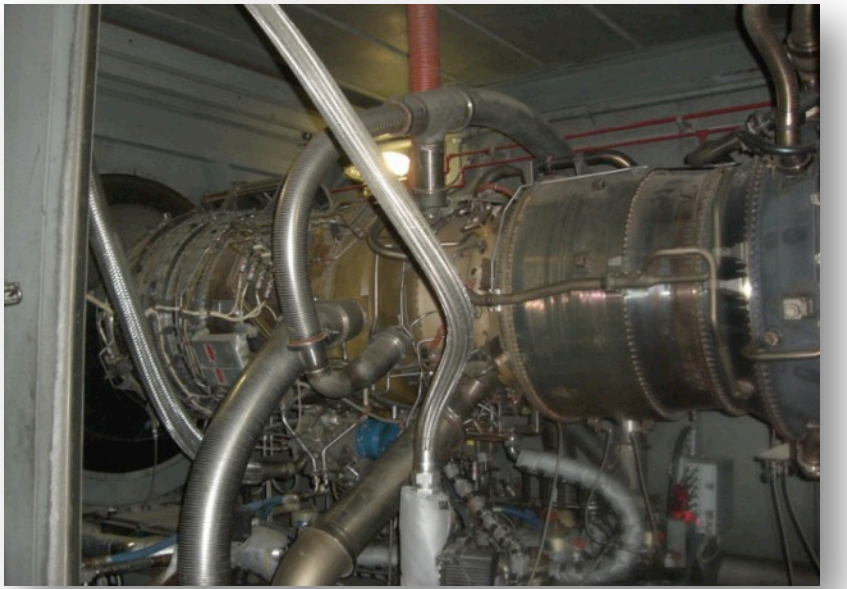
February 15, 2017

Energy Supply

- Cross Harbor Electrical Cable
- Fuel Oil
- Digester Gas from sludge
- Hydro
- Wind
- Solar

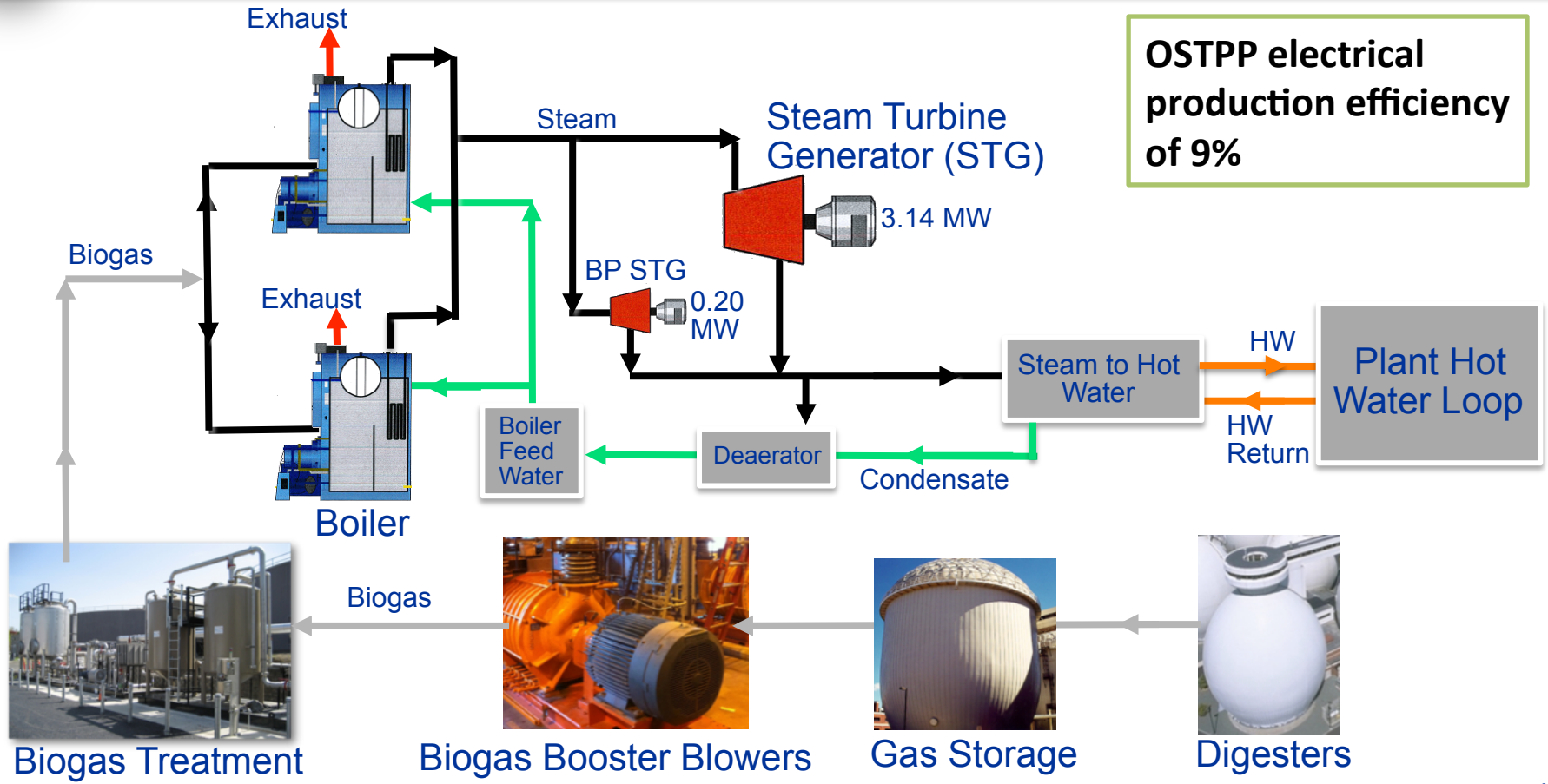
Energy Generation Equipment

- Steam Boilers (Heat and Steam)
- Steam Turbine Generator
  (Electricity Generation)
- Back Pressure Steam Turbine Generator
  (Electricity Generation)
- Combustion Turbine Generators
  (Permit required Backup Generation)



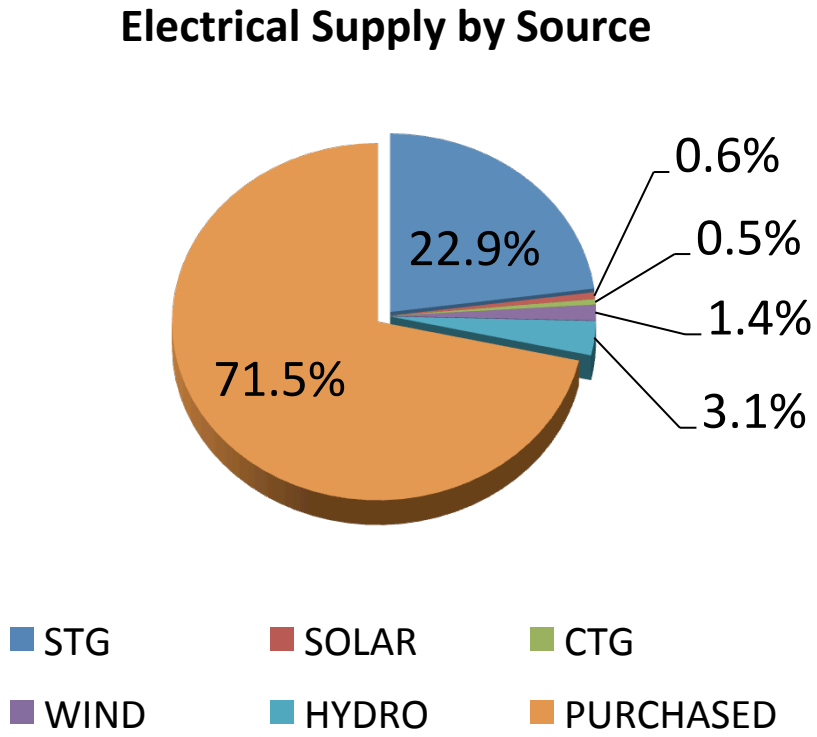
Existing On Site Thermal Power Plant Schematic

OSTPP electrical production efficiency of 9%



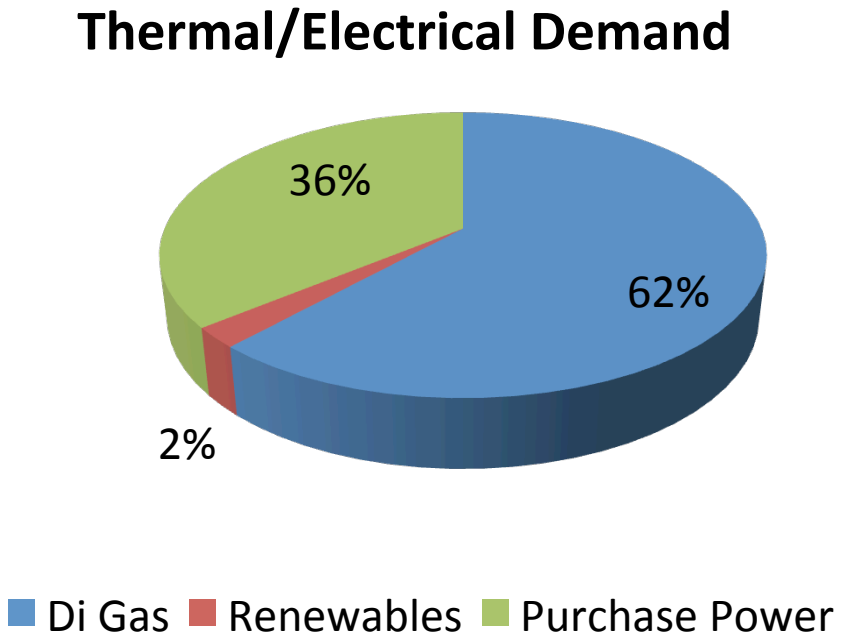
Electrical Supply Breakdown

- Produced 28% of electricity with renewable energy
- Plant electrical demand reduced 15% in 7 years



Total Energy Supply Breakdown (thermal + electrical)

- Digester gas meets of 95% of the plant's thermal demand
- Produced 64% of thermal and electricity demand with renewable energy



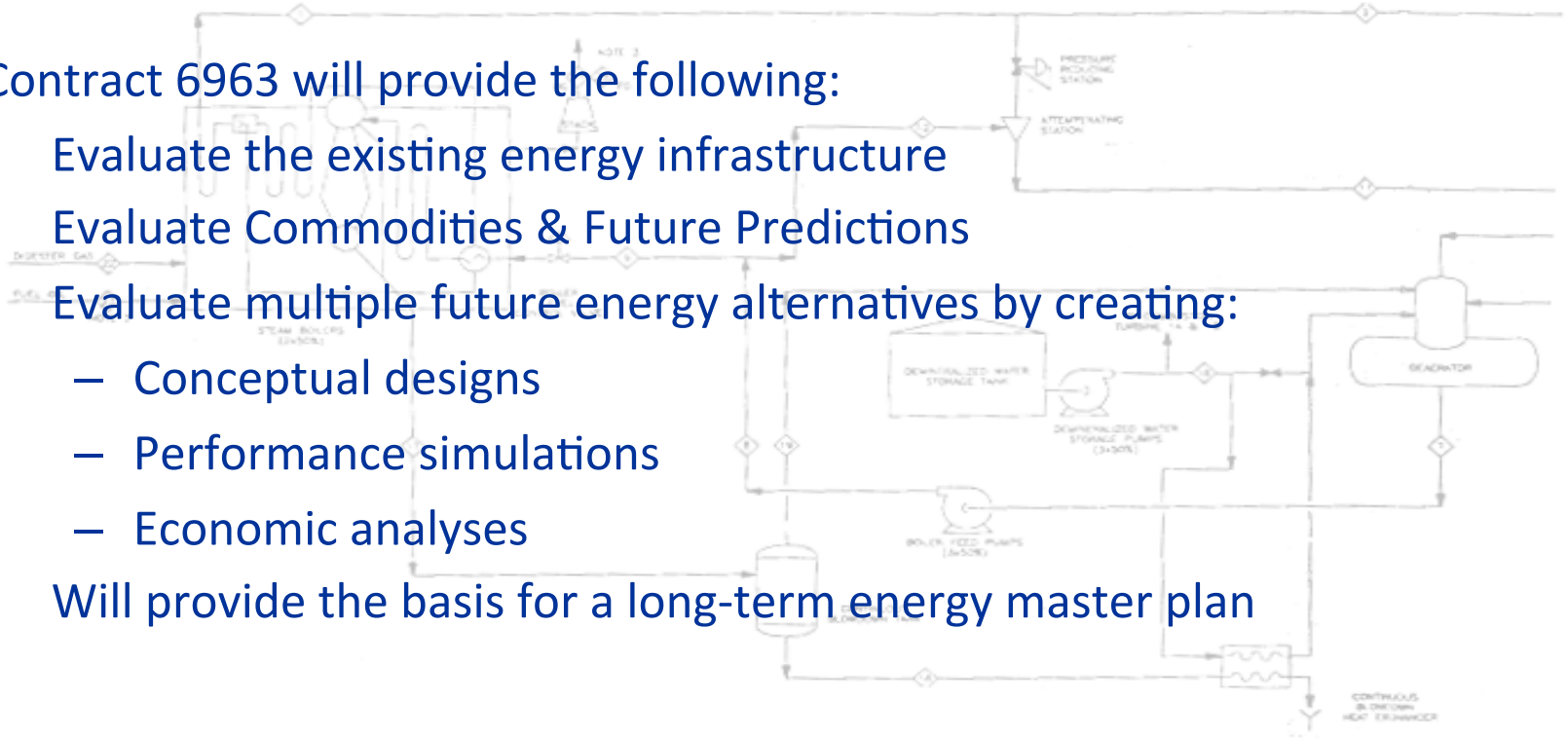
Project Justification

- Existing equipment is nearing end of useful life
- Increased energy efficiency (newer technology)
- Energy Cost Savings
- Roadmap for the DITP energy supply future

Consultant Activities

Contract 6963 will provide the following:

- Evaluate the existing energy infrastructure
- Evaluate Commodities & Future Predictions
- Evaluate multiple future energy alternatives by creating:
  - Conceptual designs
  - Performance simulations
  - Economic analyses
- Will provide the basis for a long-term energy master plan



Energy System Alternatives

- Alternative Group 1: Existing Equipment with new electrical and natural gas supplies (4 Alternatives)
- Alternative Group 2: New CHP with existing fuels (2 Alternatives)
- Alternative Group 3: New CHP with the addition of natural gas (4 Alternatives)
- Alternative Group 4: Consultant Proposed Alternatives (2 Alternatives)

What Does This Really Mean?

- Will evaluate existing energy equipment, future commodities market and forward capacity market to determine the most cost-effective operation for the future:
  - Direct replacement of all equipment
  - New electric line and/or possible gas line to Deer Island
  - Installation of a new CHP designed to meet plant electrical/ thermal demand
  - Installation of a new CHP designed to exceed plant demand, export and take advantage of the forward capacity market

Summary

Contract 6963 – Deer Island Long-Term Energy Supply Alternatives Analysis

- Recommended Consultant: Burns & McDonnell
- Guaranteed Maximum Price: $829,500
- Contract Term: 12 Months

Schedule

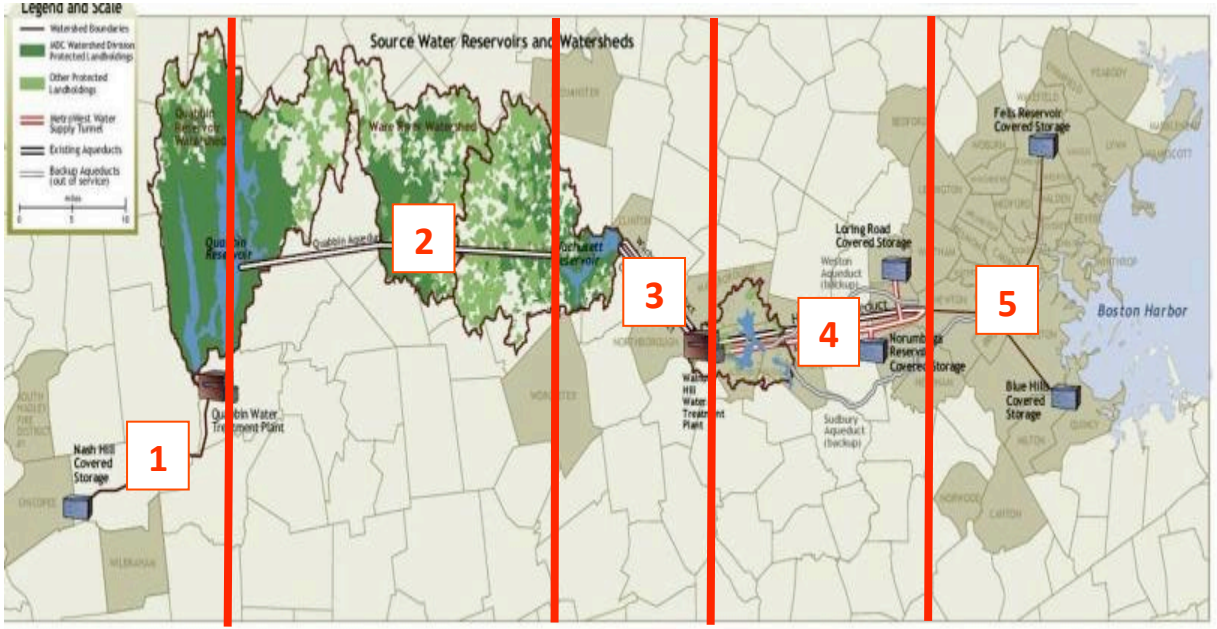
Item	Start Date	Duration	End Date
Award Professional Services Contract	March 2017	57 Months (including 1 year warranty period)	December 2021
Design	March 2017	17 months	August 2018
Bidding	August 2018	4 months	December 2018
Construction	December 2018	24 Months	December 2020


WATER RESOURCES AUTHORITY
MASSACHUSETTS

Metropolitan Tunnel Redundancy

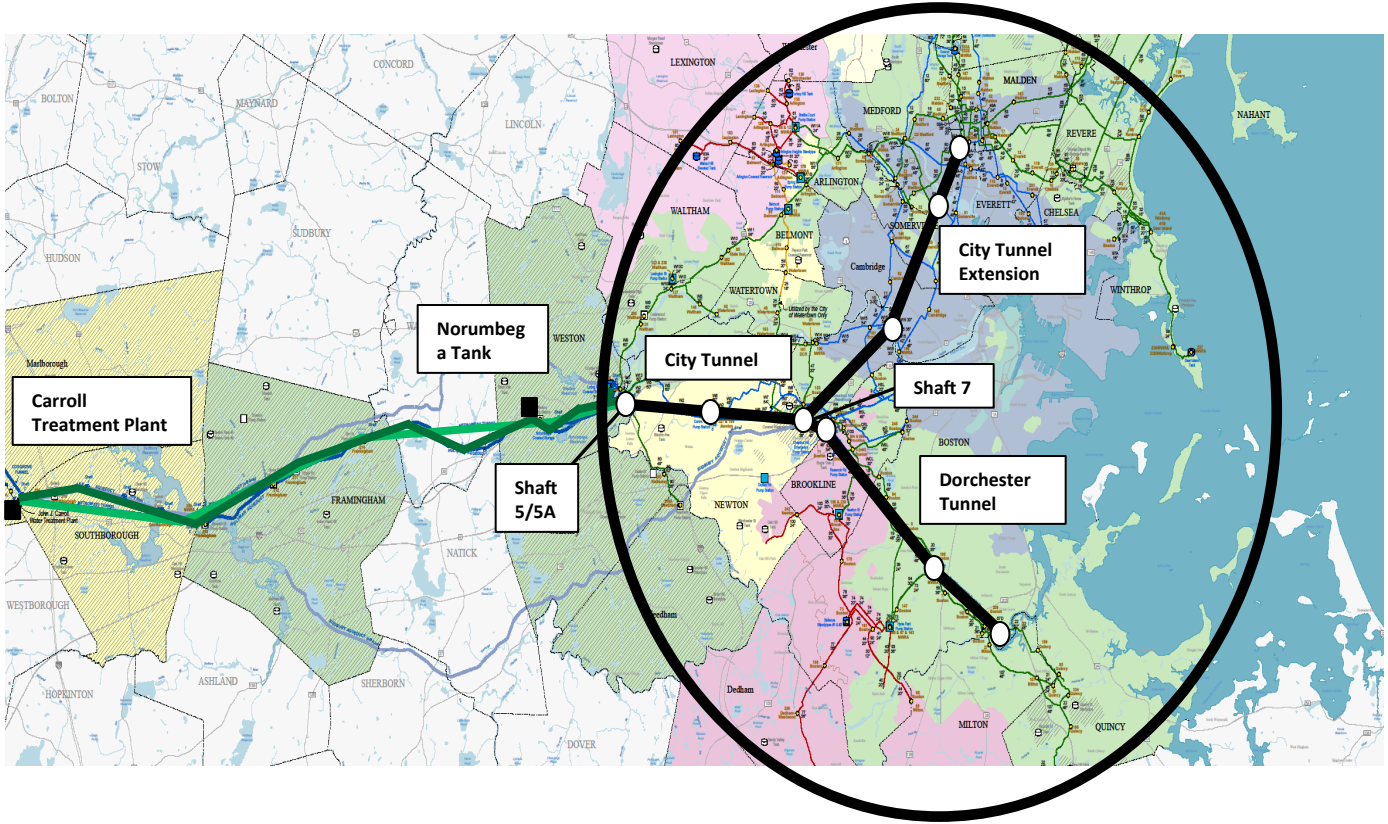
February 15, 2017

MWRA Water Transmission System



1. Chicopee Valley Aqueduct — 2007 Improvements
2. Quabbin Aqueduct — Inspection planned
3. Cosgrove Tunnel / Wachusett Aqueduct — Project underway
4. MetroWest Tunnel / Hultman Aqueduct — 2003/2013 Improvements
5. Metropolitan Tunnels — Significant Needs

Metropolitan Tunnel System



Condition of Metropolitan Tunnel System

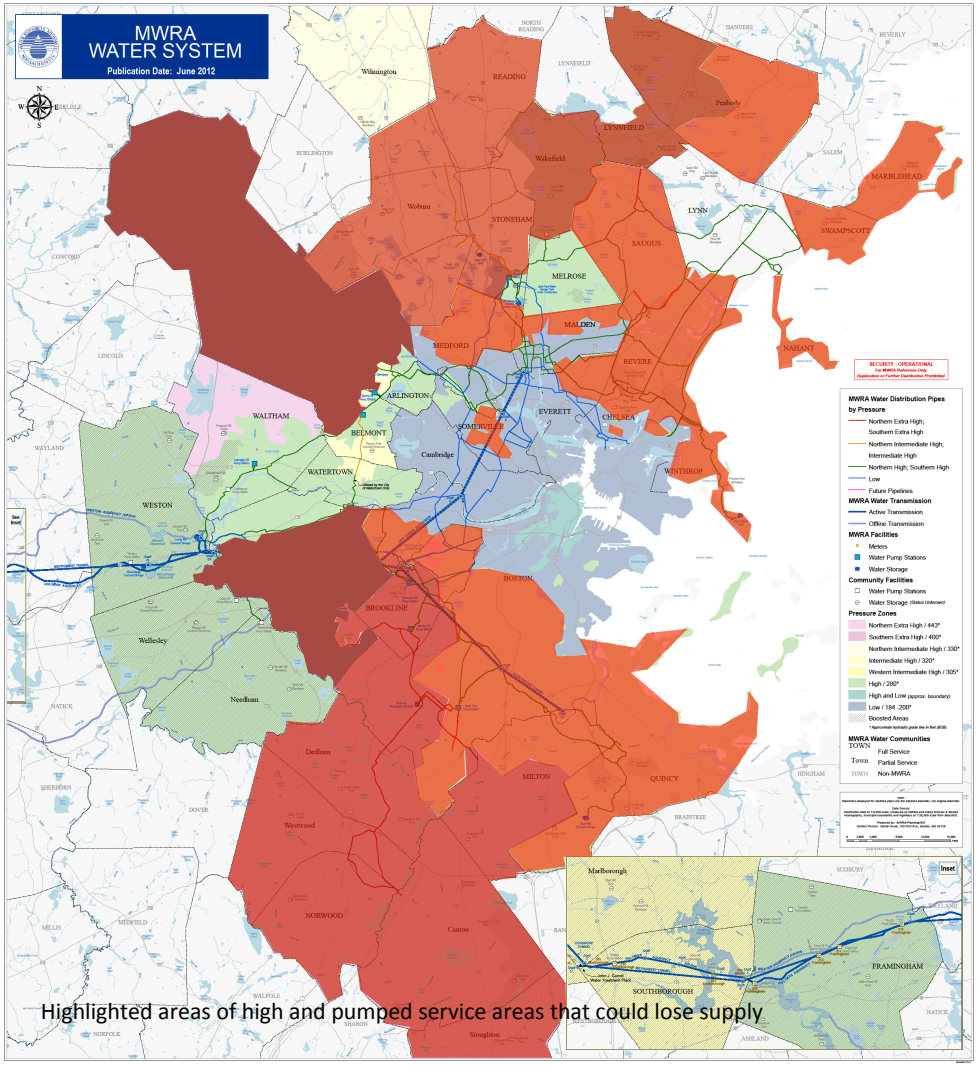
- Tunnel system:
  - Concrete-lined deep rock tunnels
  - Steel and concrete vertical shafts
  - Surface pipe, valves and appurtenances

- Little maintenance required for tunnels and shafts. **Little risk of failure**

- **Pipe, valves and appurtenances need maintenance, replacement, rehabilitation**

Wide-Spread Impact

- Sudden shut down of Metropolitan Tunnel system
- Loss of supply to high service areas
- Pumped Service Areas lose supply as tanks empty
- Whole system would be on boil order

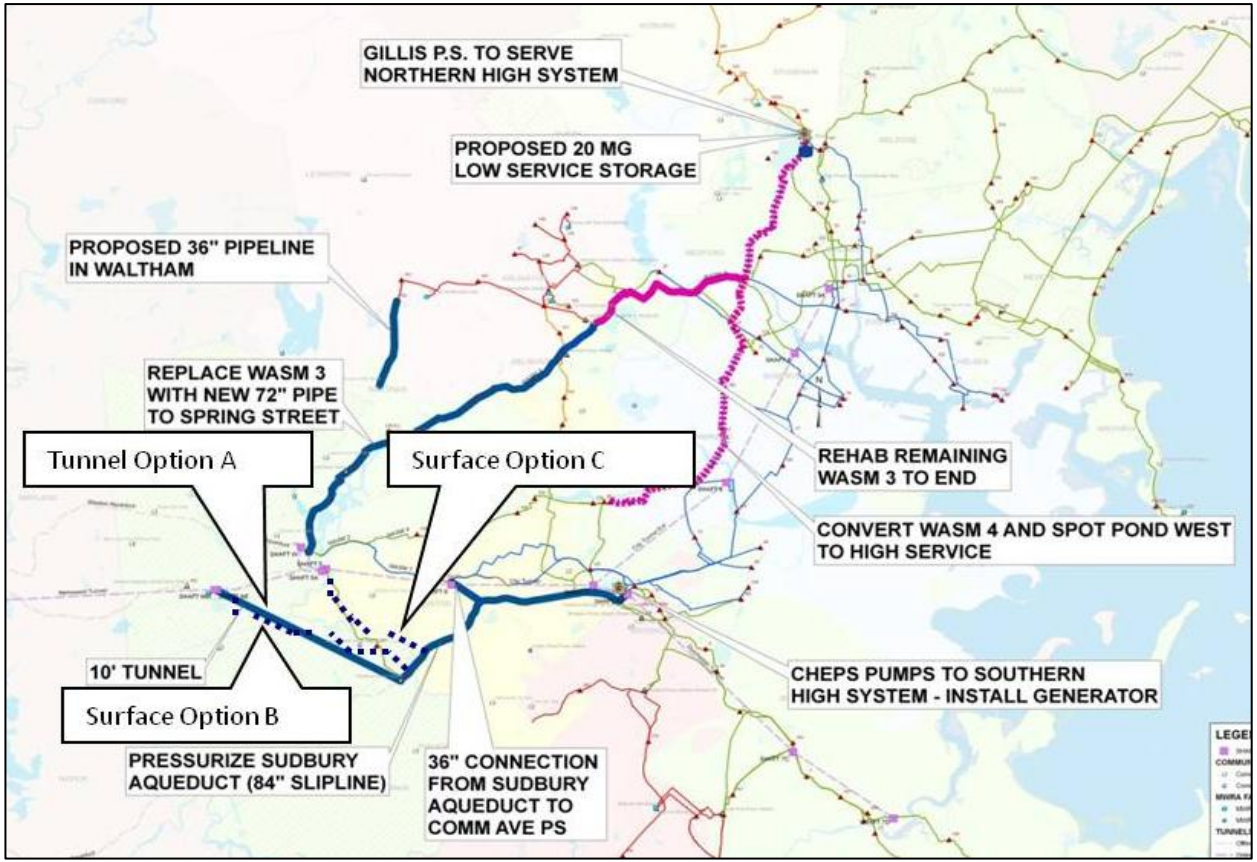


Highlighted areas of high and pumped service areas that could lose supply

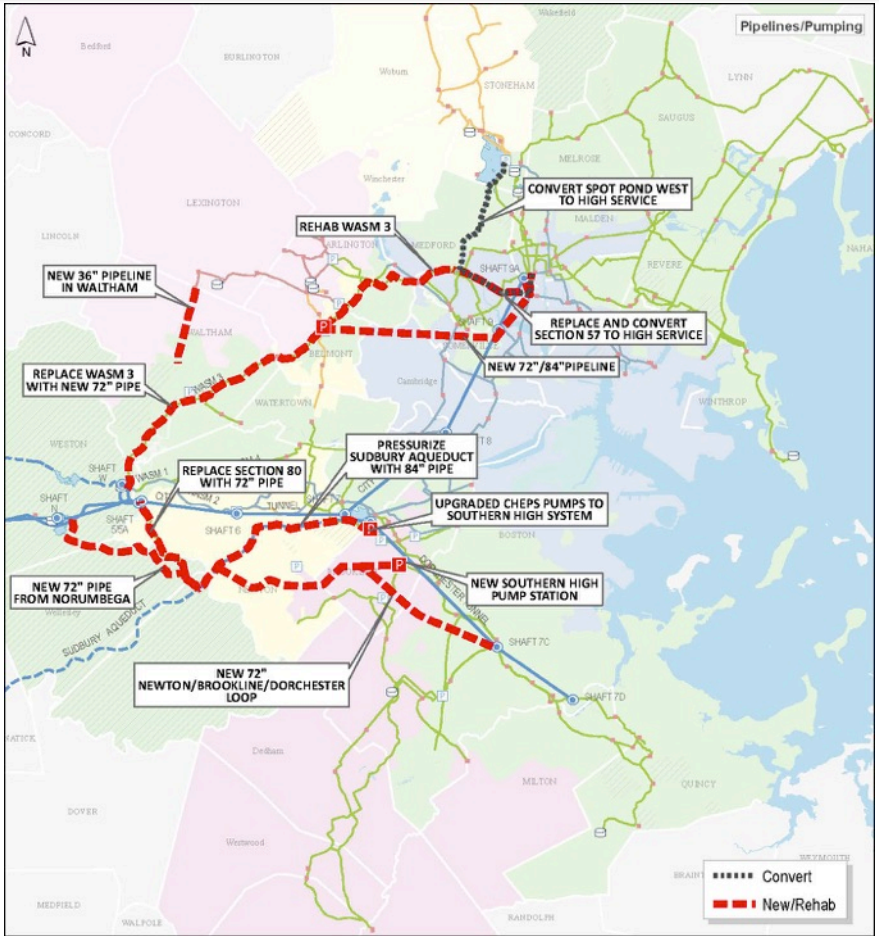
Tunnel System Shut Down – Back-Up Supply

- Partially supplied communities use alternate supplies
- Water use restrictions
- Northern Communities served by pumping from Open Spot Pond Reservoir (High Chlorine Dose and Boil Order)
- Southern Communities served by Open Chestnut Hill Reservoir and Sudbury Aqueduct (High Chlorine Dose and Boil Order)
- Pressure swings, main breaks possible in southern communities
- Regional economic impacts ~ $300 million per day

Next Phase of System Improvements - 2011 Plan



14 Surface and Pump Station Alternatives
$531 - $1,102 million



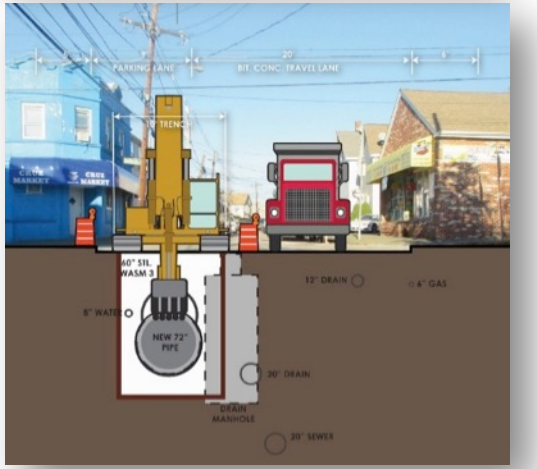
Pump Stations In Lieu of Building Pipeline Capacity

Concerns with using pumps instead of increasing capacity:

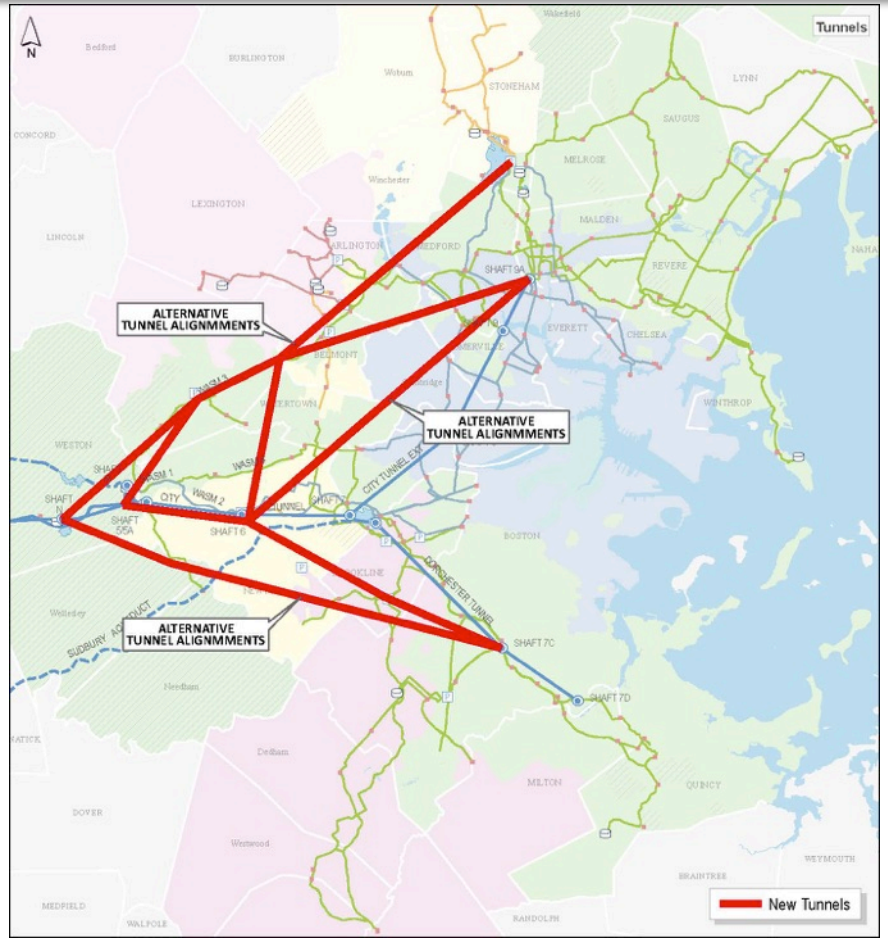
- Too high or too low pressure; inadequate service to some customers and risk of pipeline breaks in community and MWRA systems;
- Pressure surges in MWRA and local community systems on sudden starts/stops;
- Use only in emergency situations; readiness concerns.

Impacts of Large Diameter Surface Pipeline Projects

- Traffic
  - Street Closures and Detours
  - Congested City Streets/Gridlock
- Business Disruption
  - Access Disruption
  - Loss of Business
- Permitting & Approval
  - Multiple Environmental and Agency Permits
  - Street Opening Approvals
- Community Disruption
  - Noise
  - Dust
  - Utility Relocation
  - Long Period of Impacts Over Large Areas

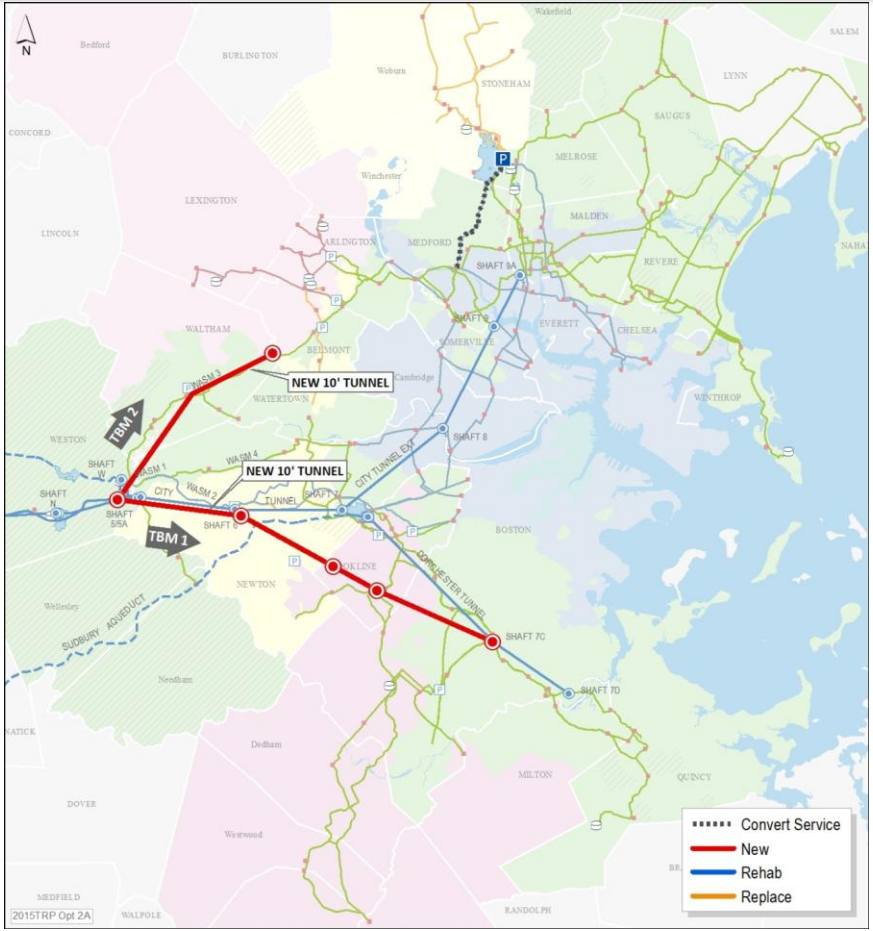


Tunnel Alternatives : $1,188 - $2,326 million

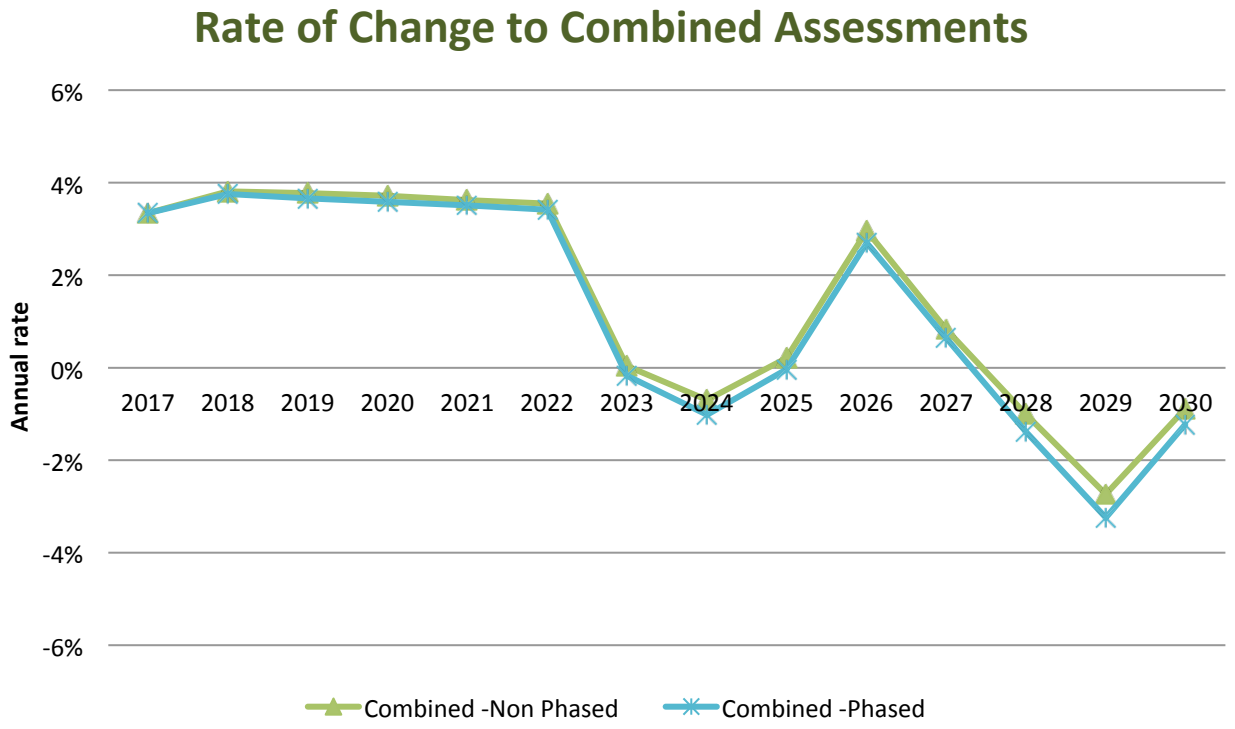


Preferred Alternative for Long-Term Redundancy

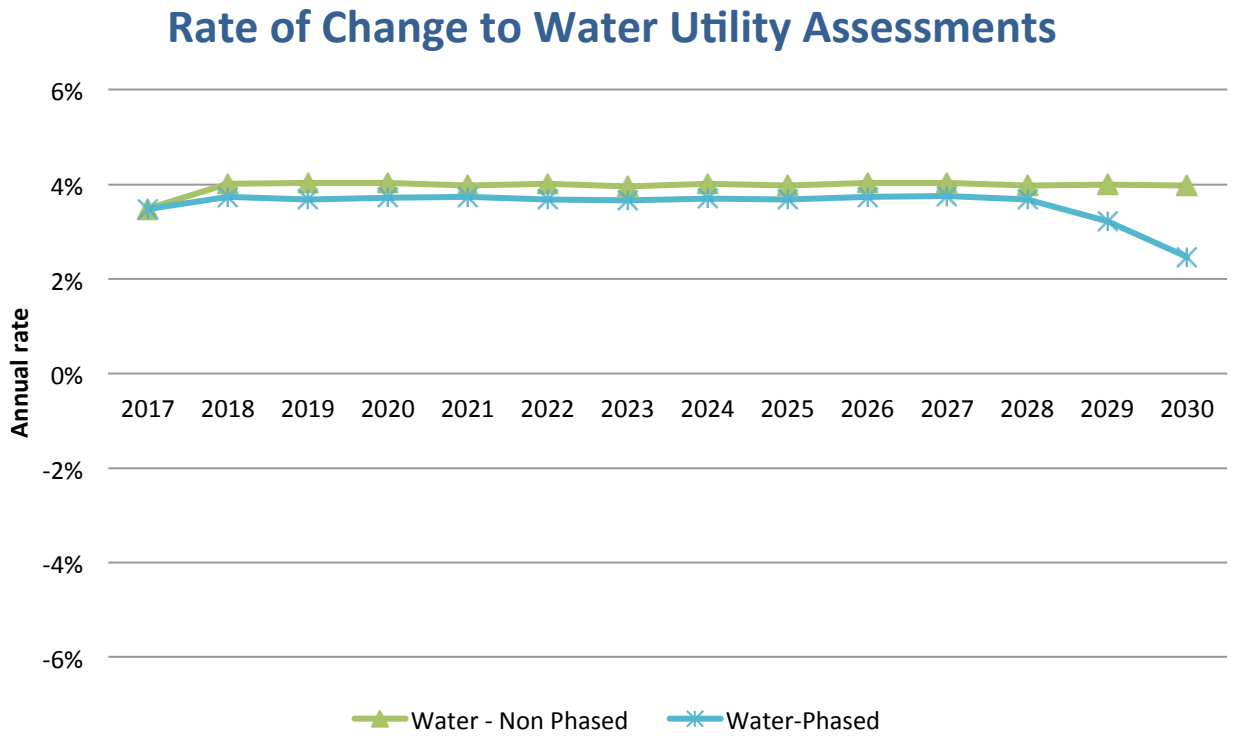
- Midpoint of Construction Cost: $1.470 billion
- Time to Complete: ~17
- Tunnels begin in the Mass Pike/ Route 128 vicinity
- Northern Tunnel - 4.5 miles, ends in Waltham/Belmont area
- Southern Tunnel - 9.5 miles, ends in Mattapan



Combined Rate Projections



Water Utility Rate Projections



Summary

- Redundancy for Metropolitan Tunnel system is necessary for maintenance and emergency response
- Extensive alternatives were identified and evaluated
- Long distance large diameter pipeline alternatives present significant implementation challenges
- Tunnel alternatives meet service objectives and goals
  - Allows planned maintenance of 60+ year old infrastructure that are beyond their useful life
  - Allows emergency response at normal level of service
  - Constructible


WATER RESOURCES AUTHORITY
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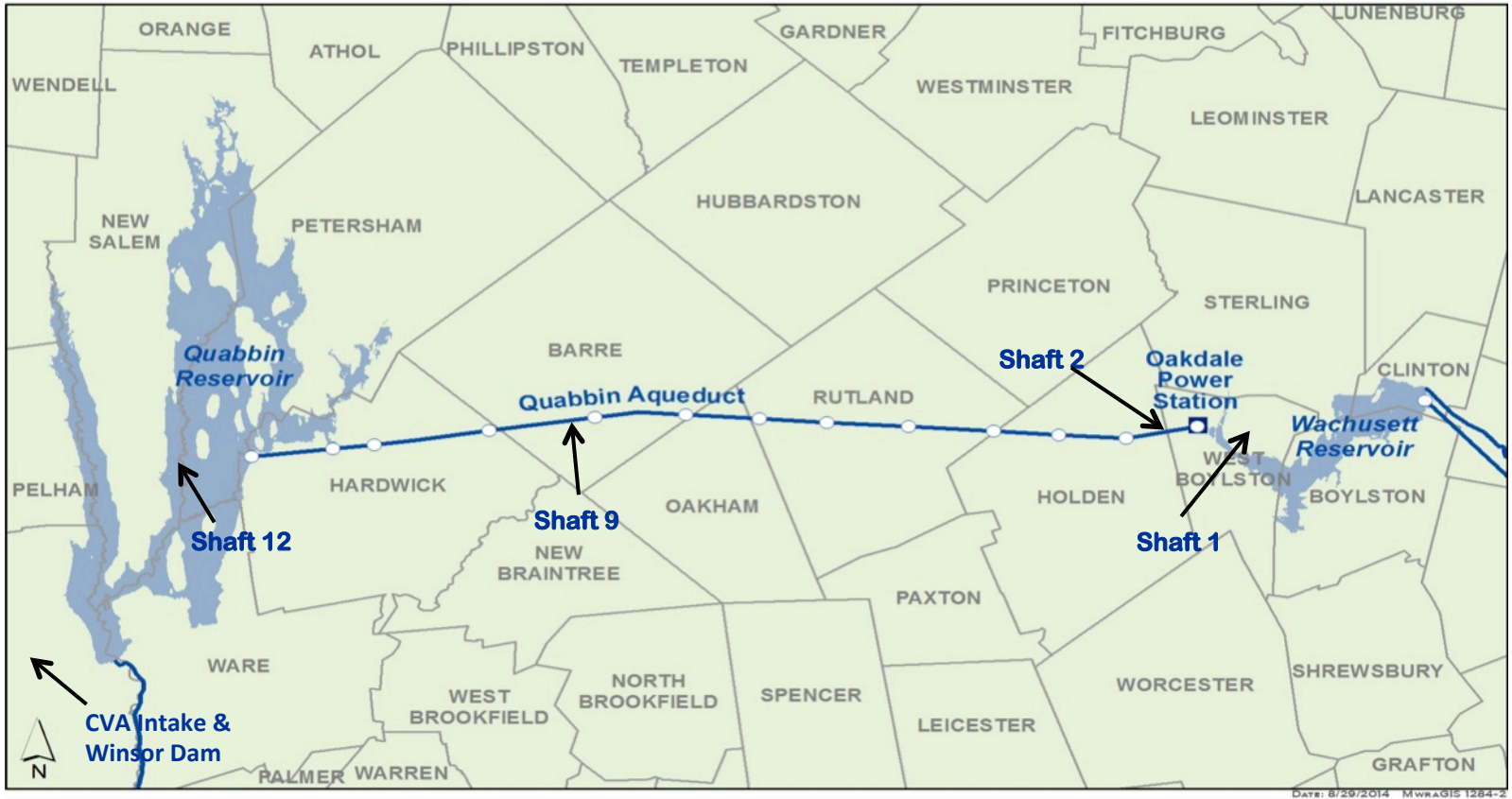
Shaft 12 Isolation Gate Design

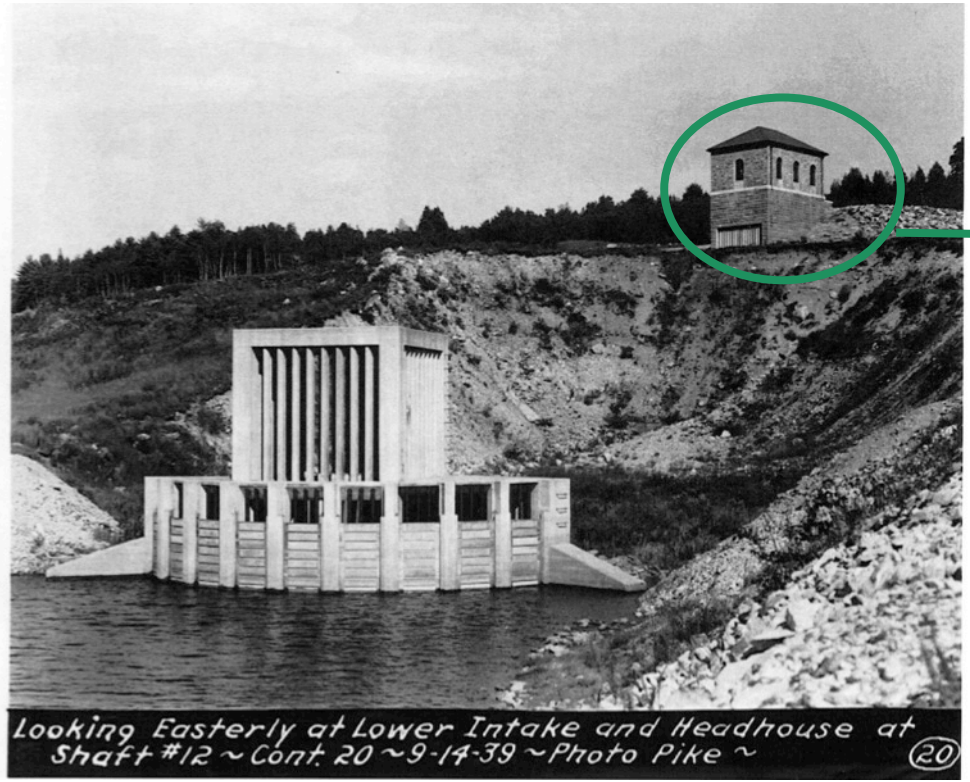
Contract 7509

February 15, 2017

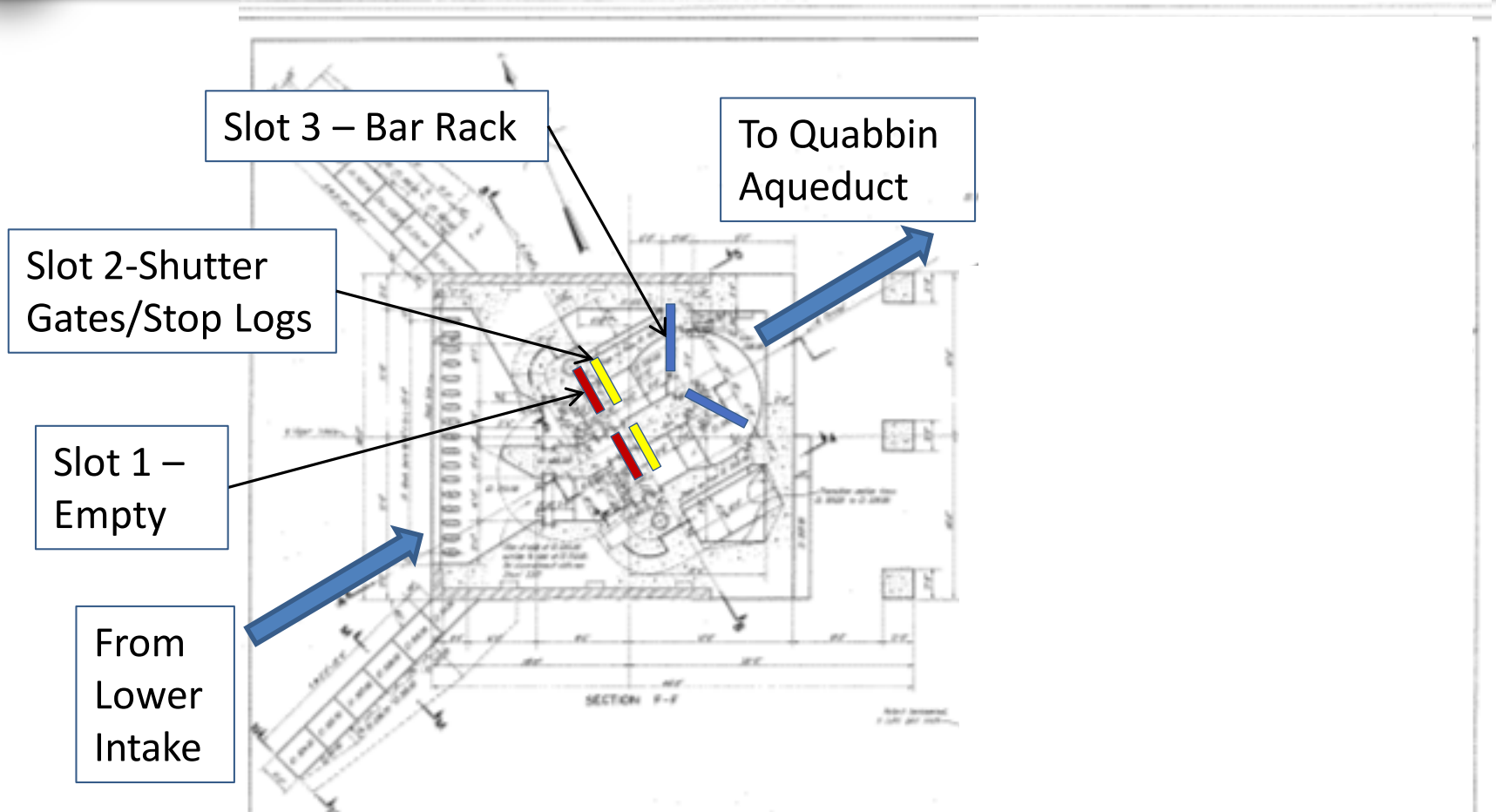
Project Location



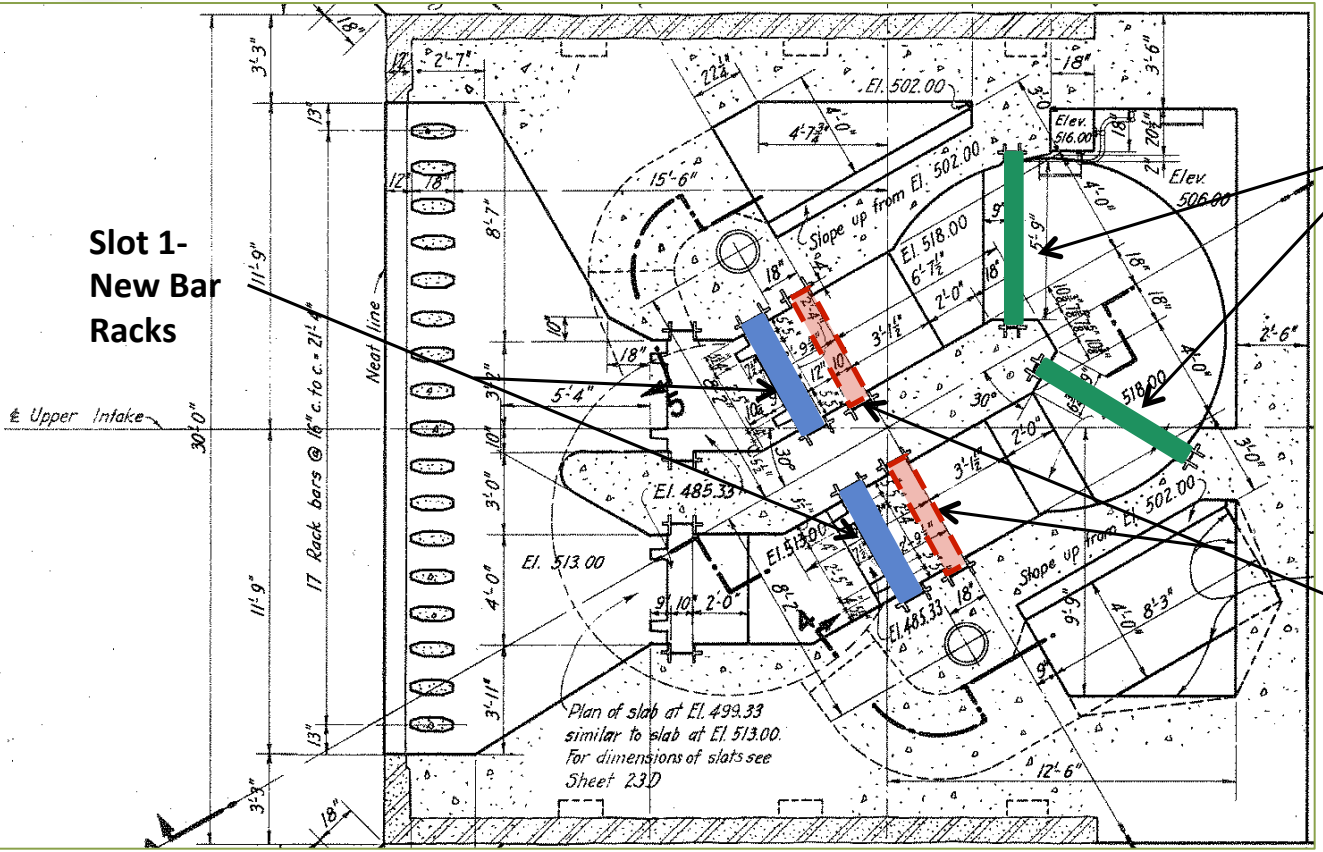
Shaft 12 Lower and Upper Intakes



Shaft 12 Existing Conditions



Proposed Isolation: Slide Gate in Slot 3 – Plan View



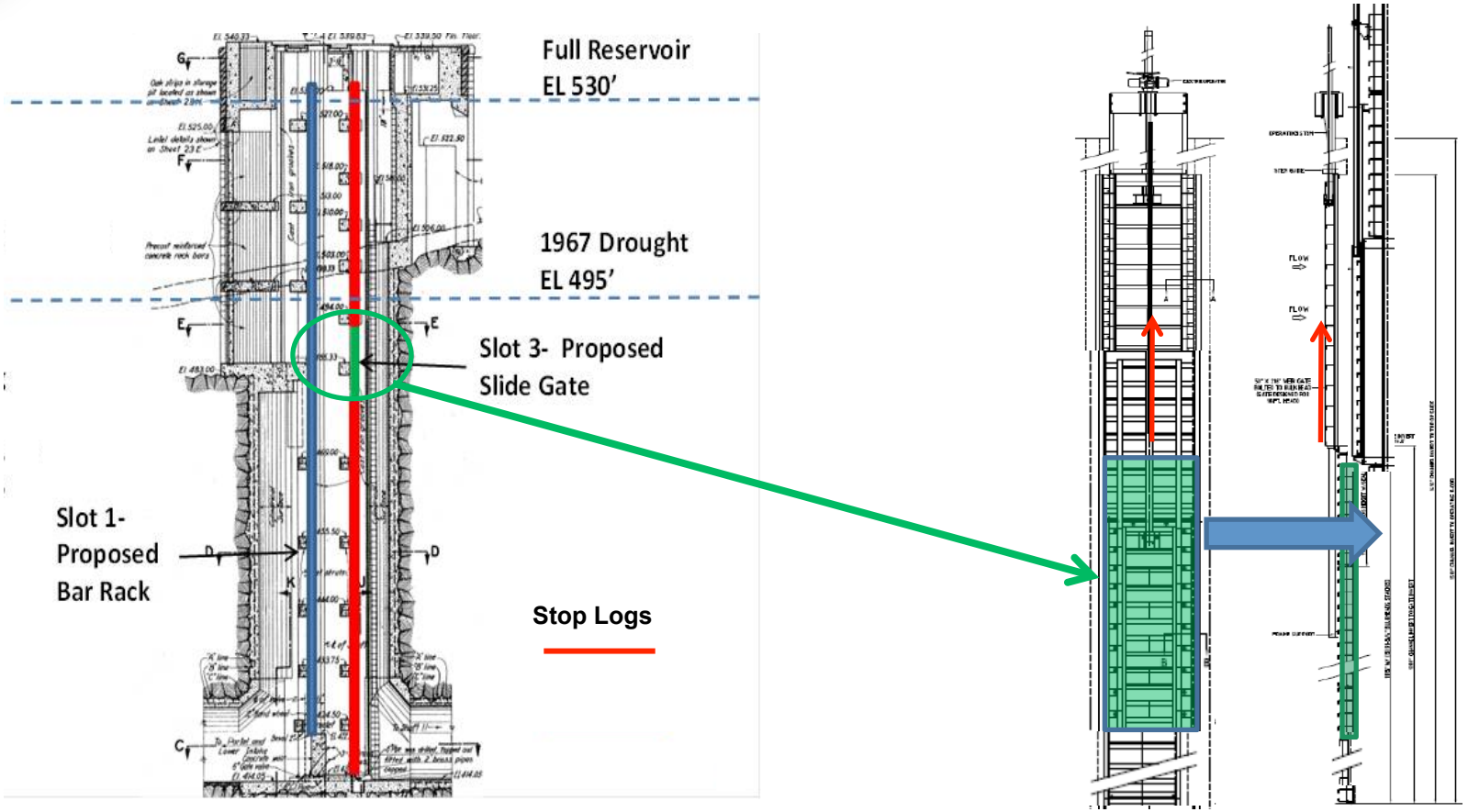
Shaft 12 Intake – Interior

Slide Gate

Stop Logs

Bar Racks

Shaft 12 - Slide Gate in Slot 3 - Profile



Procurement Process

- 1 Step Request For Qualifications/Proposals
- 1 Proposal

Source	Proposed Contract Cost	Level of Effort
Engineer's Estimate	$1,000,000	6,658 hours
Arcadis	$1,706,312	10,730 hours

Recommendation

- Selection Committee Recommends Award to Arcadis U. S. Inc.

- Arcadis proposal more accurately reflects level of effort than Engineer's Estimate, due to:
  - Specialized Design Services Needed for Underwater Construction;
  - Remote Location of Work;
  - Additional Drawings/ Level of Effort;
  - Uncertainty of Existing Shaft Conditions;
  - Design Specialists with Higher Salary Rates; and
  - Significant Sub Consultant Effort (Diving)

Schedule

Item	Start Date	Duration	End Date
Award Professional Services Contract	March 2017	40 Months (including 1 year warranty period)	July 2020
Design	March 2017	12 months	March 2018
Bidding	April 2018	2 months	June 2018
Construction	July 2018	12 Months	July 2019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