





***Nut Island Headworks  
Odor Control and HVAC Improvements  
Contract 7548***

January 15, 2020



# Nut Island Headworks





## Project Includes

- Replace and rehabilitate odor control system
  - Carbon adsorbers, wet scrubber components, fans, ductwork, dampers, pumps, tanks, instrumentation
- New stairhouse and access hatches into odor control room
- Replace HVAC system
  - Air handling units, boilers, building management system, unit heaters
- Replace underground fuel storage tanks
- Replace emergency spillway gates



# Odor Control System Fire January 25-26, 2016





# Access Into Odor Control Room



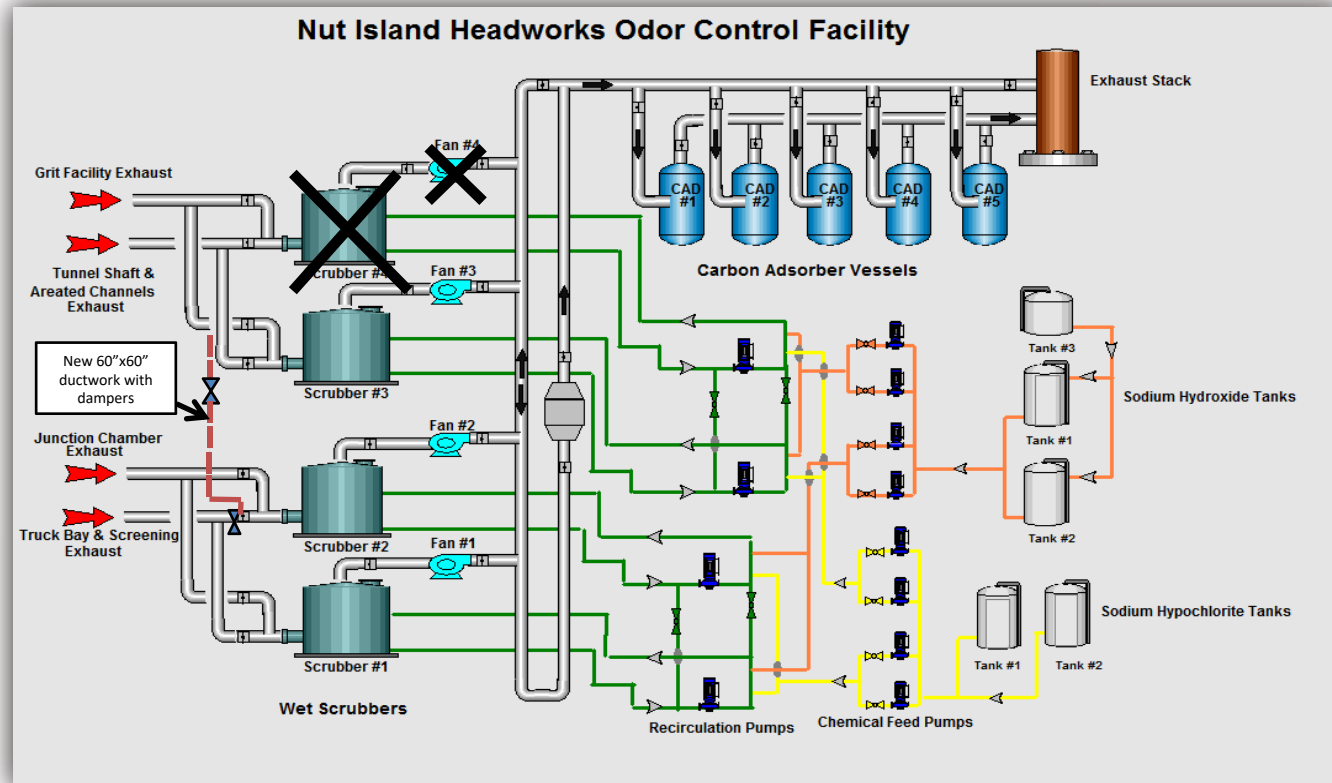
Opening Made into Odor Control Room During Fire



Locations of New Hatches and Stairway to Odor Control Room

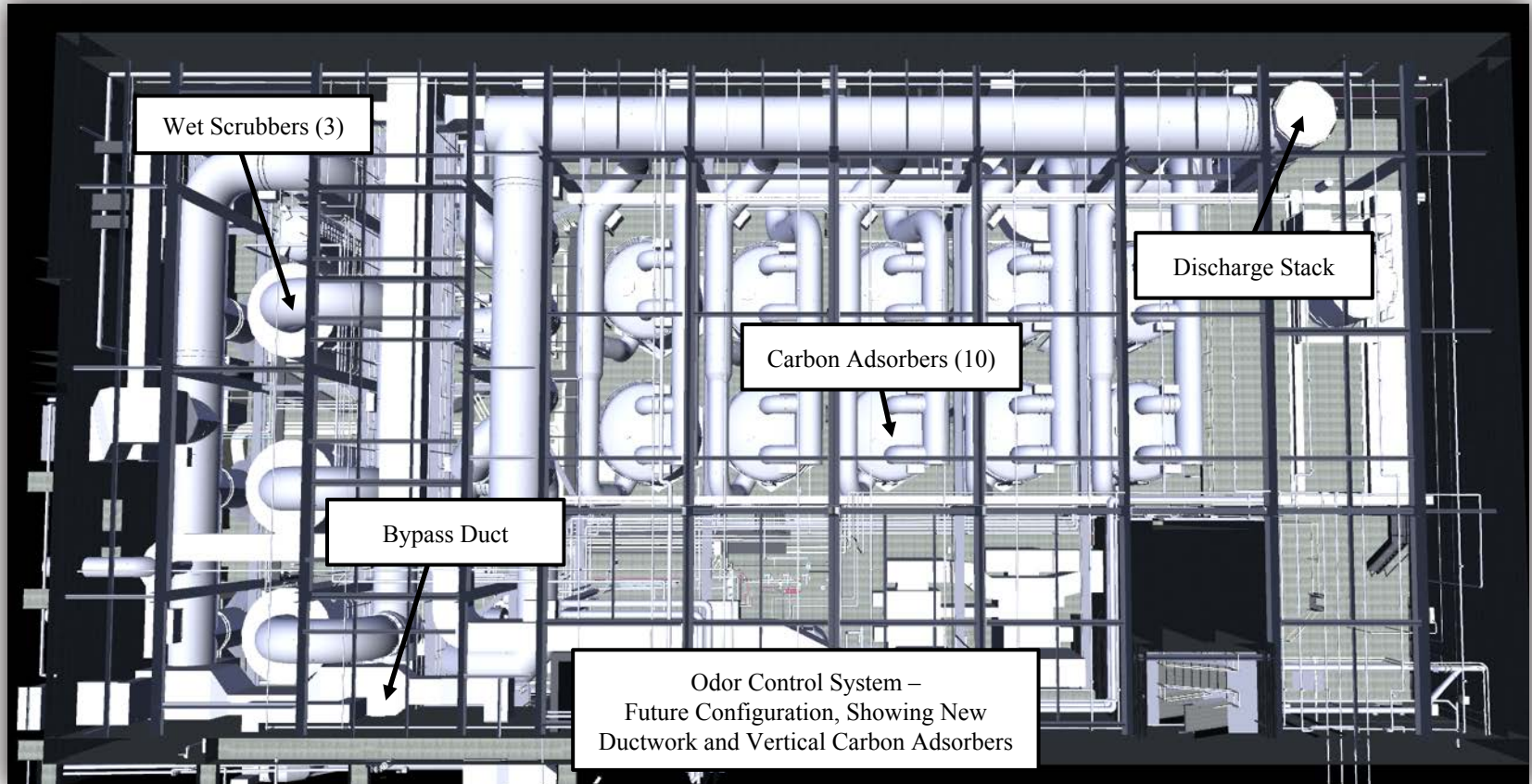


# Current Odor Control System





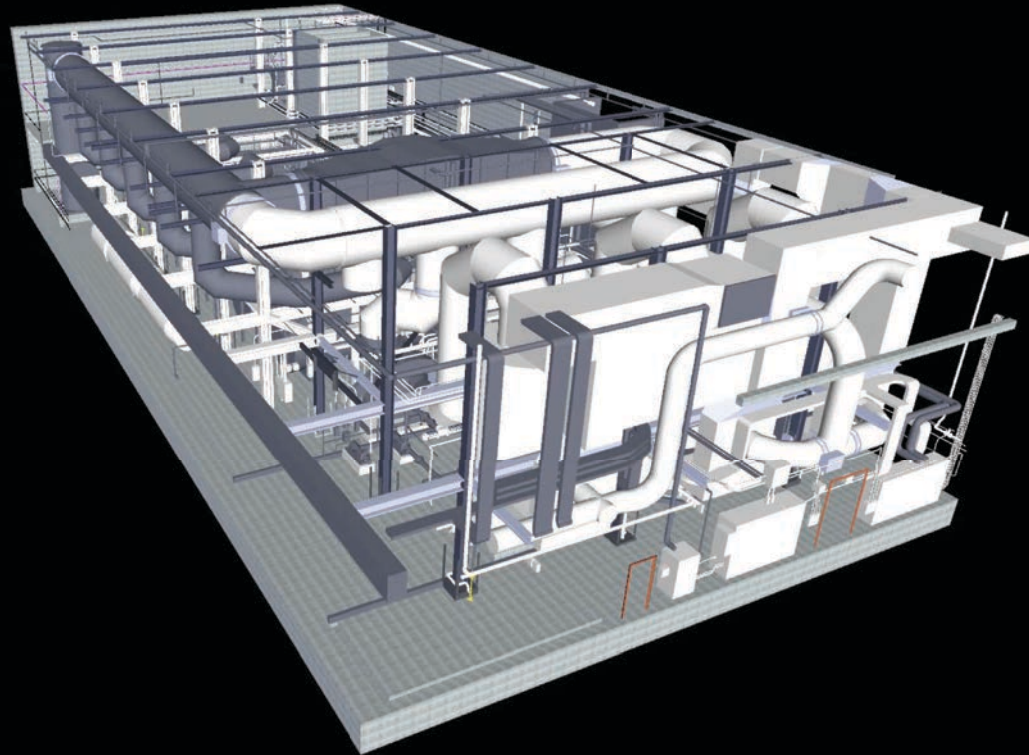
# Future Odor Control System







# Odor Control Construction Sequence





# HVAC Equipment Replacement

## Replace

- Building management system
- 16 air handling units
- 11 exhaust fans
- 211 air volume dampers
- 3 boilers
- 18 unit heaters
- 3 air conditioning units



Air Handling Unit-4  
Pump & Blower Room



Air Handling Unit-11  
Odor Control Room



# Boilers



Boiler-1



Boiler-1,2 and 3  
Boiler Room



# Emergency Spillway Gates





# Procurement Process

Bids Opened October 8, 2019	Bid Amount
<i>Engineer's Estimate</i>	<i>\$52,672,000</i>
Walsh Construction Company II, LLC	\$57,565,399
Daniel O'Connell's Sons, Inc.	\$57,725,000
Barletta Heavy Division, Inc.	\$57,763,000

Construction duration 34 months





***Nut Island Headworks  
Odor Control and HVAC Improvements***

***Contract 7517, Amendment 1***

January 15, 2020



# Nut Island Headworks







# Proposed Amendment 1

## Additional Time Request of 23 Months

- Extension of 13 months to design services
  - Design required more time than provided for in contract
- Extension of 10 months to ESDC services
  - Construction is 34 months; contract includes 24 months ESDC



# Proposed Amendment 1

## Out of Scope Services





***Remote Headworks and Deer Island Shafts Study***

***Amendment 2***

January 15, 2020



# Overview of North and South System Tunnels/Shfts





# Shaft Study Project

- Contract 7237 awarded in September 2018
- Includes headworks and Deer Island shaft/effluent channel inspections, evaluations and assessments


Consultant	Budget	Terms	Spent to Date
Mott MacDonald	\$1,372,000	*16-months	\$525,388

\*Contract was extended from 10 months to 16 months under Delegated Authority (Amendment 1)



# Project Work



- Entry, visual inspection, hammer sounding, and extraction of concrete cores for laboratory testing of effluent channels and shafts
- 3D scans of all shafts 
- Sonar inspections
- Ventilation study for effluent structures
- Final Study Report





# Dewatering Pump Setup







## Project Challenges Requiring Additional Time



- Cleaning grease layer in Deer Island shafts
- Unable to inspect during wet weather or high flow condition
- Enhanced safety requirements
- Remote headworks' shafts  
grating/supports prohibiting diver's inspection
- 6-7 weeks to receive results from samples sent for laboratory testing



## Amendment 2



- This amendment
  - Five month extension to complete lab tests and finalize recommendations
  - Minor modifications to scope of work, sub-consultant payment items
  - No increased cost



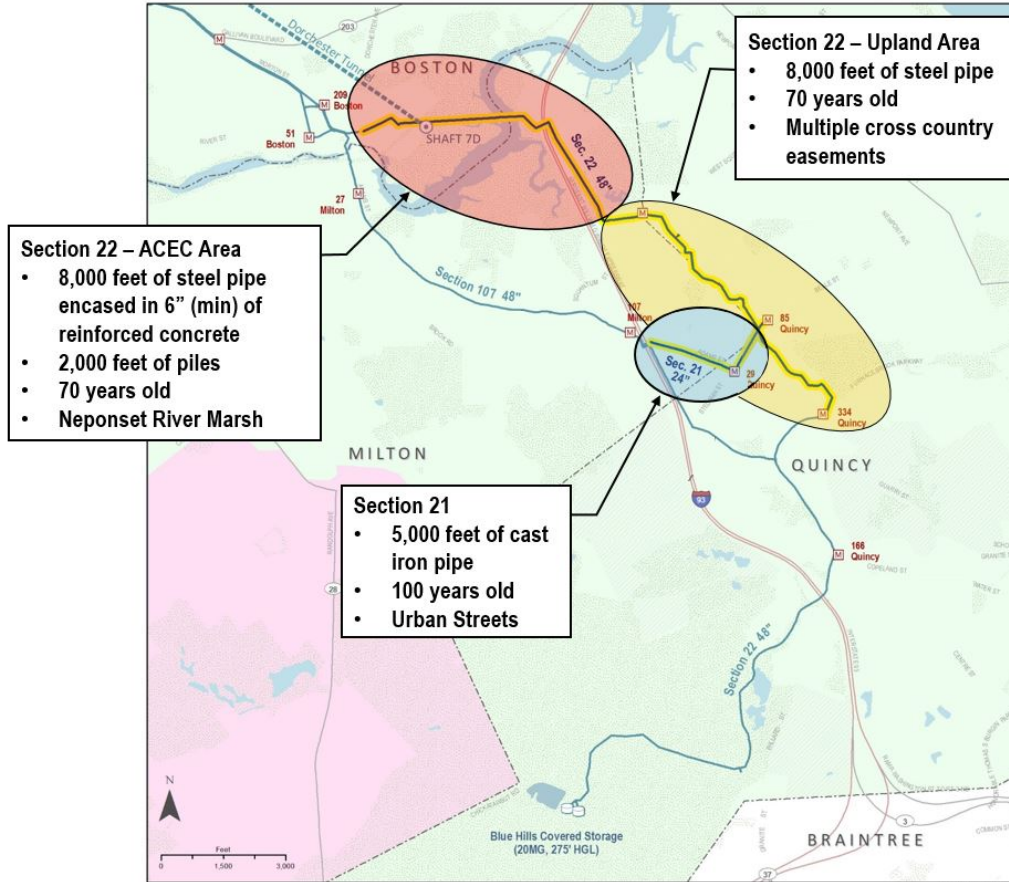


***Section 22 Rehabilitation Alternatives Analysis and  
Environmental Permitting  
Contract 7155 - Quarterly Update***

January 15, 2020



# Distinct Project Segments





# Sections 21 and 22



Section 22 – Neponset River Estuary



Section 22 – Forbes Hill Road, Quincy



Section 22 – Neponset River Estuary



Section 21 – Adams Street, Milton



## Current Work - 3 months

- Review of existing information
- Review leak history; 14 leaks
- Perform leak detection by MWRA – No active leaks December 2019
- Develop Phase 1 test pit program
- Develop Phase 1 boring program (if required)
- Permit applications for Phase 1 program
- Develop hydraulic model runs



# Test Pits and Borings in ACEC Area





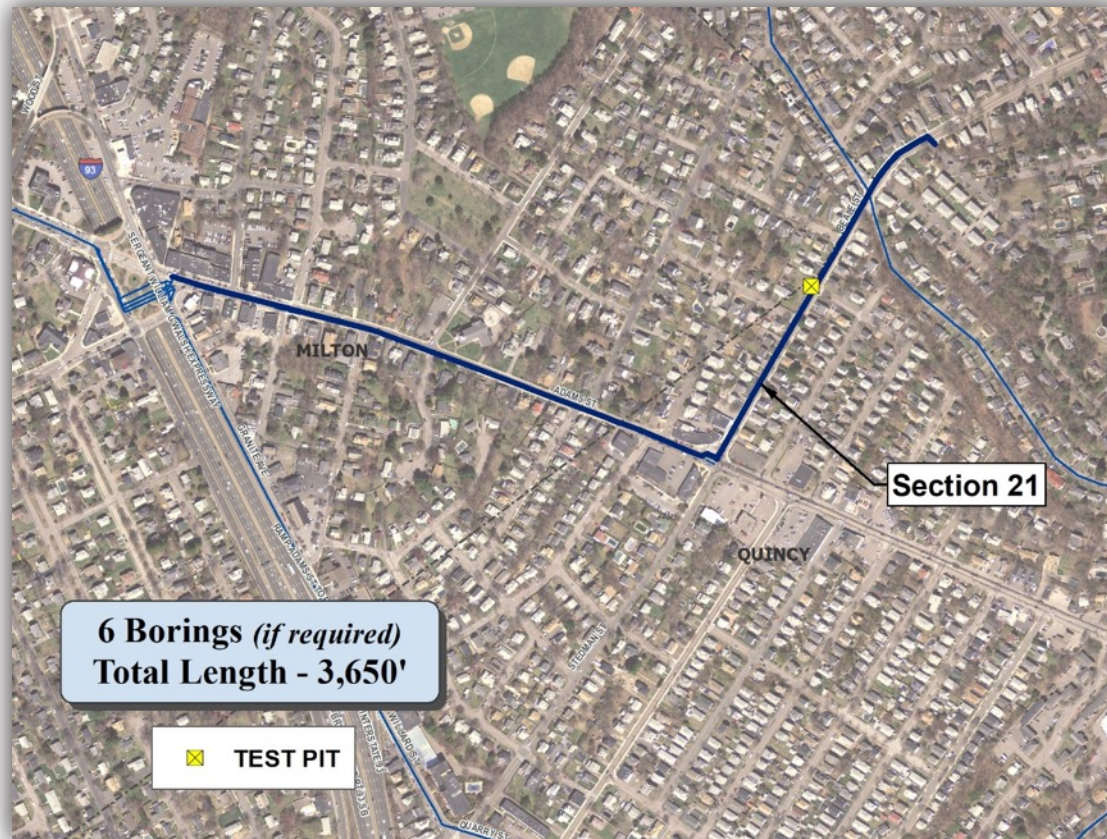


# Test Pits and Borings in Upland Area – Section 22



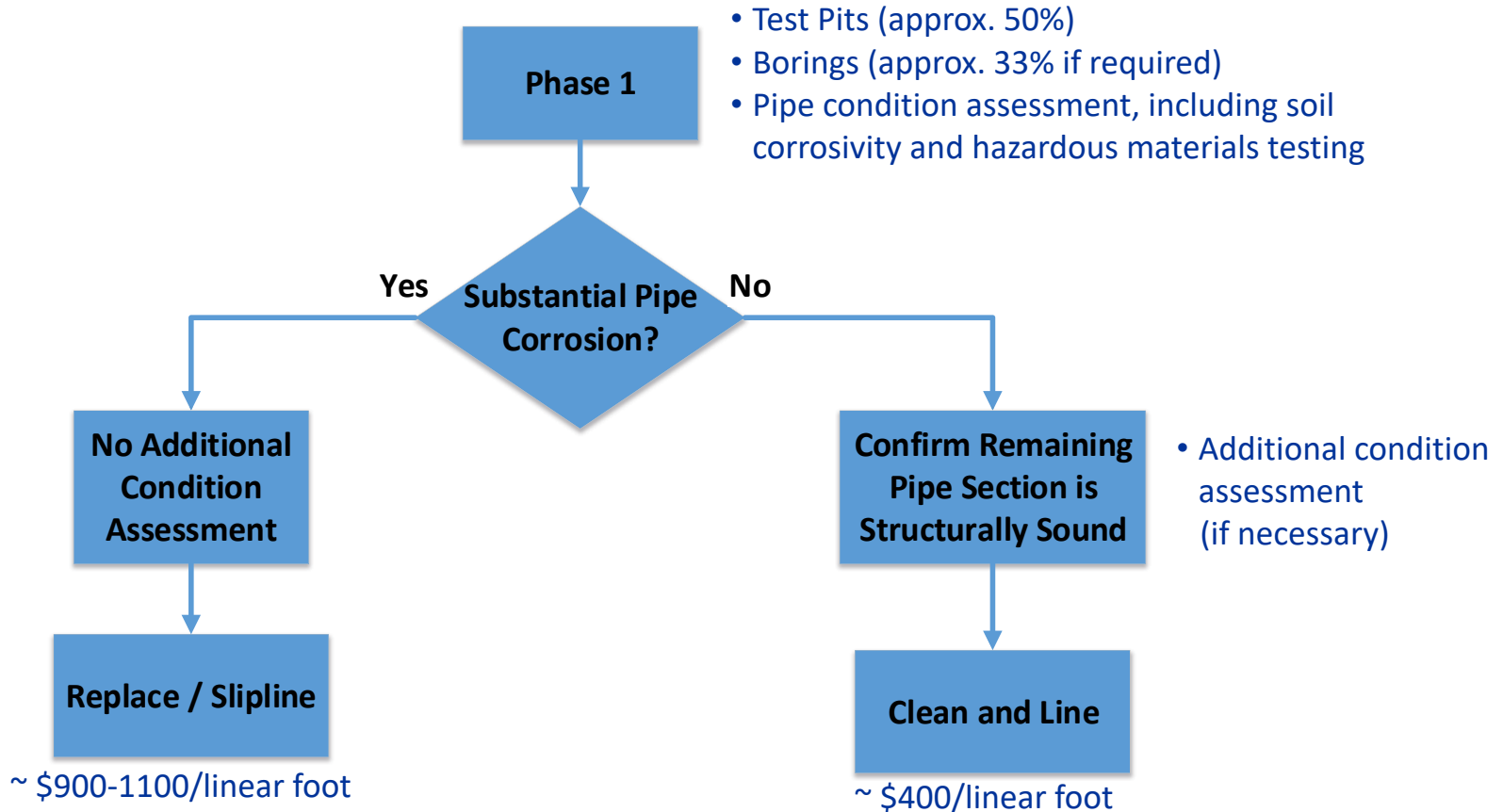


# Test Pit and Borings – Section 21





# Condition Assessment Flow Chart





## Next 4-6 months

- Complete phase 1 test pit and borings (if required)
- Complete permit process
- Review results of pipe condition assessment, soil corrosivity, soil hazardous materials
- Complete hydraulic model runs
- Determine additional condition assessment, if necessary
- Begin preparation of Environmental Notification Form



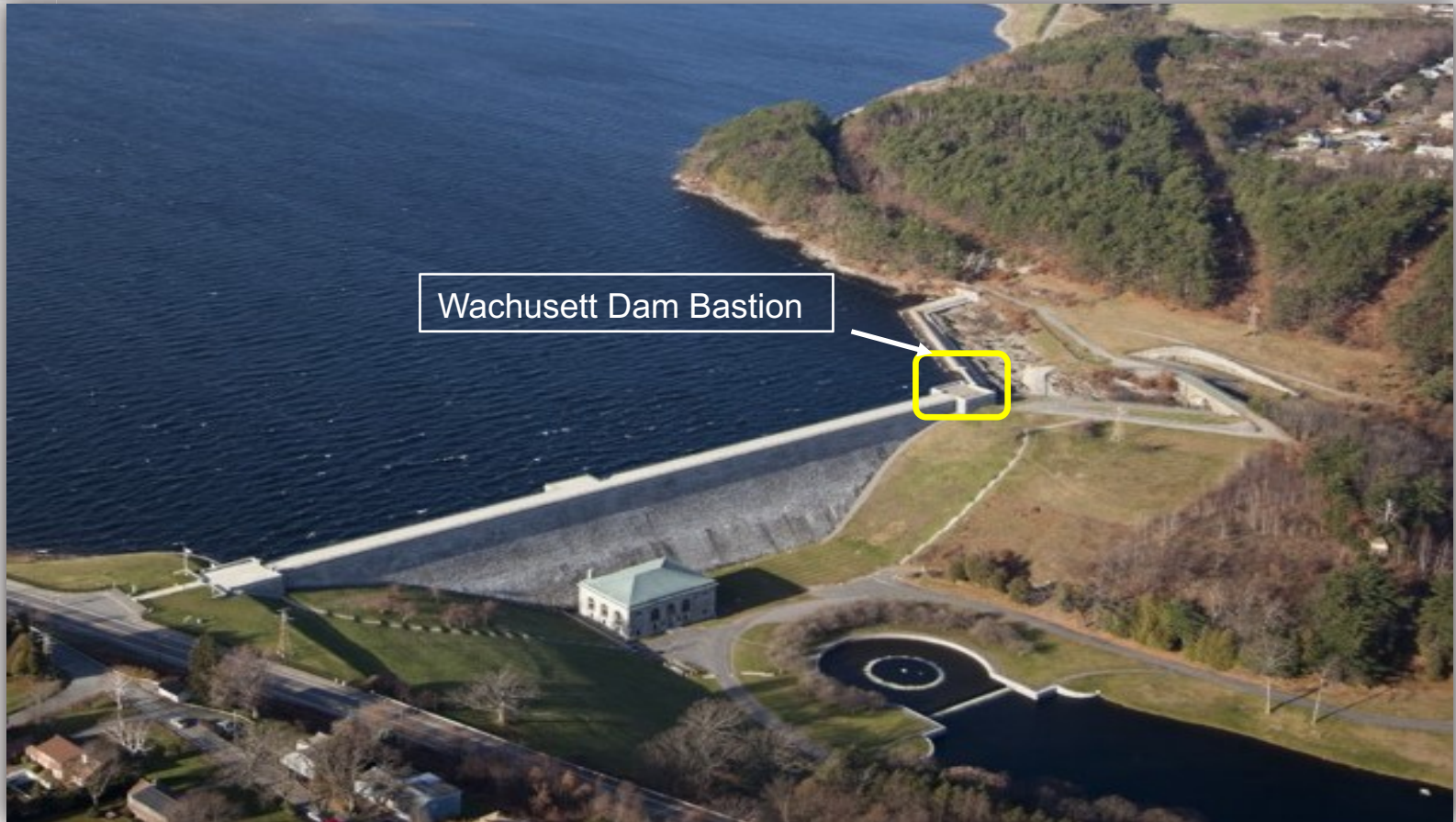


***Wachusett Dam Bastion Improvements  
Design and Engineering Services During Construction  
Contract 7333***

January 15, 2020



# Location





# Project Purpose

- Bastion improvements required due to structural deficiencies/leaks in roof







## Scope of Work

- Design
  - New roof structure, including waterproofing and drainage system
  - Demolish top 3' of walls to sound concrete and rebuild with reinforced concrete doweled into existing concrete
  - Rebuild arched doorway and stairs
  - Rout and seal existing cracks in walls and floor
  - Remove and reinstall granite parapet blocks/granite façade
  - Design shoring to support existing walls during roof removal
- Engineering Services During Construction



# Procurement Process and Project Cost

Proposer	Cost	Hours
Kleinfelder	\$768,274	5,118
Engineer's Estimate	\$798,500	4,490
Simpson, Gumpertz & Heger	\$1,063,682	6,317

- One step RFQ/P
- Selection Committee recommends Kleinfelder



# Project Schedule

Item	Start Date	Duration	End Date
Design	February 2020	18 Months	August 2021
Construction	September 2021	15 Months	December 2022
Warranty	January 2023	12 Months	January 2024





***FY21 Proposed  
Capital Improvement Program***

January 15, 2020

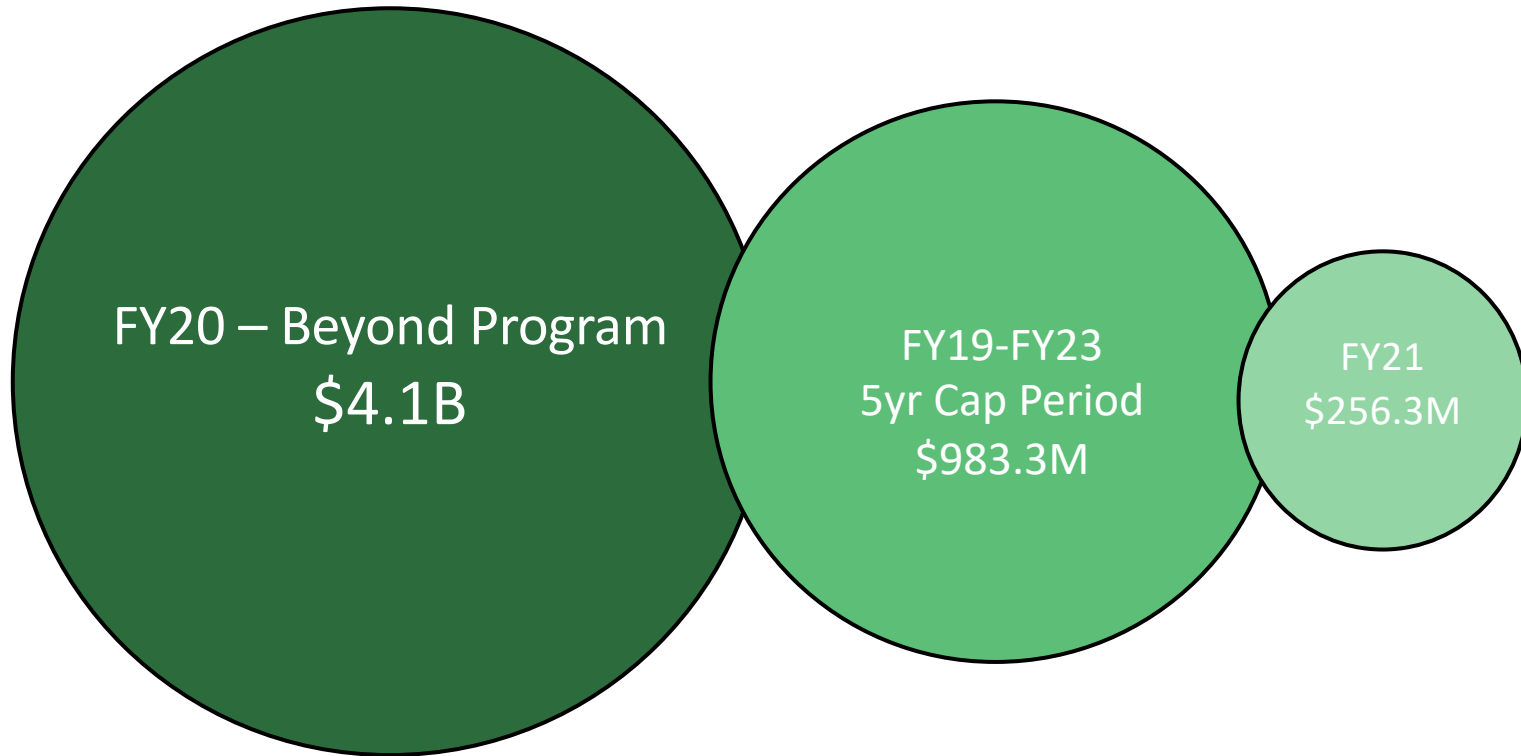


## FY21 Proposed CIP

- FY21 Proposed CIP complies with the Cap requirements
- Focus on Asset Protection and Long-Term Redundancy
- Metropolitan Tunnel Redundancy



# FY21 Proposed CIP





# FY21 Proposed CIP - FY19-23 vs. Base-Line Cap

FY19-23 Base-Line Cap		FY19	FY20	FY21	FY22	FY23	Total FY19-23
	Projected Expenditures	\$179.2	\$276.1	\$251.3	\$194.9	\$150.4	\$1,051.8
	I/I Program	(19.2)	(25.7)	(24.3)	(27.9)	(26.1)	(123.2)
	Water Loan Program	(8.3)	(8.4)	(7.2)	(5.6)	(2.8)	(32.4)
	<b>MWRA Spending</b>	<b>151.7</b>	<b>241.9</b>	<b>219.7</b>	<b>161.4</b>	<b>121.4</b>	<b>\$896.2</b>
	Contingency	9.9	15.9	14.5	11.0	8.2	59.4
	Inflation on Unawarded Construction	0.7	5.0	7.8	7.2	8.5	29.3
	Chicopee Valley Aqueduct Projects	(0.0)	0.0	0.0	0.0	0.0	(0.0)
<b>FY19 Final FY19-23 Spending</b>	<b>\$162.3</b>	<b>\$262.8</b>	<b>\$242.0</b>	<b>\$179.6</b>	<b>\$138.1</b>	<b>\$984.8</b>	



FY21 Proposed		FY19	FY20	FY21	FY22	FY23	Total FY19-23
	Projected Expenditures	\$142.9	\$173.3	\$256.3	\$255.1	\$261.2	\$1,088.9
	I/I Program	(39.6)	(24.9)	(25.7)	(28.3)	(23.6)	(142.1)
	Water Loan Program	(13.8)	(8.0)	(6.0)	(10.6)	3.0	(35.5)
	<b>MWRA Spending</b>	<b>89.4</b>	<b>140.4</b>	<b>224.6</b>	<b>216.3</b>	<b>240.6</b>	<b>\$911.3</b>
	Contingency	0.0	9.0	13.8	14.4	16.4	53.7
	Inflation on Unawarded Construction	0.0	0.0	2.0	5.8	10.6	18.4
	Chicopee Valley Aqueduct Projects	(0.0)	0.0	0.0	0.0	0.0	(0.0)
<b>FY21 Proposed FY19-23 Spending</b>	<b>\$89.4</b>	<b>\$149.5</b>	<b>\$240.5</b>	<b>\$236.5</b>	<b>\$267.5</b>	<b>\$983.3</b>	







# FY21 Proposed CIP – Top Projects Excluding Loans FY19-23 Cap Period Spending

Project	Subphase	FY19-23 Spending (\$000)	% of Total
DI Treatment Plant Asset Protection	Clarifier Rehab Phase 2 - Construction	\$111,900	10.3%
I&P Facility Asset Protection	Chelsea Creek Upgrades - Construction	\$51,381	4.7%
Corrosion & Odor Control	NI Odor Control HVAC Improvement Construction	\$49,563	4.6%
I&P Facility Asset Protection	Prison Point Rehabilitation - Construction	\$36,143	3.3%
NIH Redundancy & Storage	Section 89 & 29 Replacement - Construction	\$21,300	2.0%
NIH Redundancy & Storage	Section 89 & 29 Redundancy Construction Phase 2	\$19,776	1.8%
SEH Redundancy & Storage	Redundancy Pipeline Sect 111 - Construction 3	\$19,325	1.8%
DI Treatment Plant Asset Protection	Gravity Thickener Rehabilitation	\$19,275	1.8%
DI Treatment Plant Asset Protection	Fire Alarm System Replacement - Construction	\$15,857	1.5%
New Connect Mains-Shaft 7	CP3-Sect 23,24,47, Rehabilitation	\$14,700	1.4%
Metro Tunnel Redundancy	Preliminary Design & MEPA Review	\$14,166	1.3%
SEH Redundancy & Storage	Redundancy Pipeline Sect 111 - Construction 2	\$14,120	1.3%
<b>Top FY19-23 Spending Suplicates</b>		<b>\$387,506</b>	<b>35.6%</b>
<b>Other Changes</b>		<b>\$701,371</b>	<b>64.4%</b>
<b>Total FY19-23 Spending</b>		<b>\$1,088,877</b>	<b>100.0%</b>



# FY21 Proposed CIP – Top Projects Excluding Loans FY21 Spending

Project	Subphase	FY21 (\$000)	% of Total
DI Treatment Plant Asset Protection	Clarifier Rehabilitation Phase 2 - Construction	\$34,475	13.4%
I&P Facility Asset Protection	Chelsea Creek Upgrades - Construction	\$16,091	6.3%
I&P Facility Asset Protection	Prison Point Rehabilitation - Construction	\$15,490	6.0%
Corrosion & Odor Control	NI Odor Control HVAC Improvement Construction Phase 2	\$14,854	5.8%
NIH Redundancy & Storage	Section 89 & 29 Repl - Construction	\$9,150	3.6%
DI Treatment Plant Asset Protection	Gravity Thickener Rehabilitation	\$6,444	2.5%
Central Monitoring System	CWTP SCADA Upgrade Construction	\$5,000	2.0%
<b>Top FY21 Spending Subphases</b>		<b>\$101,504</b>	<b>39.6%</b>
<b>Other Changes</b>		<b>\$154,824</b>	<b>60.4%</b>
<b>Total FY21 Spending</b>		<b>\$256,328</b>	<b>100.0%</b>



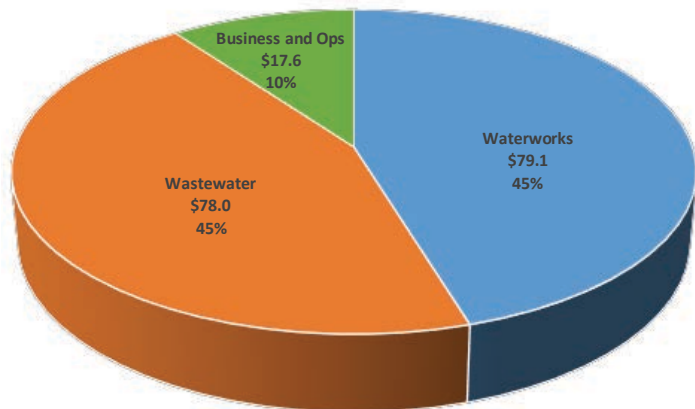
# FY21 Proposed CIP FY21 Spending

Spending Composition	
Ongoing Awarded Contracts	\$140.9M
Proposed Contract Awards	\$82.5M
Budgeted Loan Programs	<u>\$32.9M</u>
Total Proposed Expenditures	\$256.3M

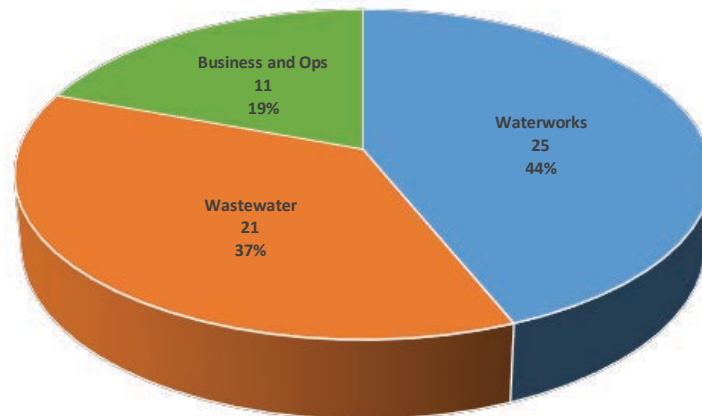


# FY21 Proposed CIP – Proposed FY21 Contract Awards

Contract Value



Contract Awards

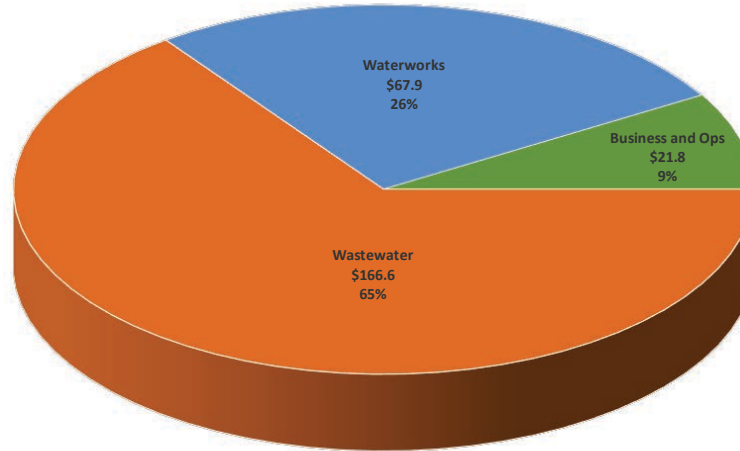


*\$s in millions*



# FY21 Proposed CIP – Proposed FY21 Expenditures

Total Proposed FY21 Expenditures: \$256.3 million



*\$s in millions*



## FY21 Proposed CIP – New Projects

14 New Projects Added in FY21: \$57.0 million

- Waterworks: \$50.3 million
- Wastewater: \$6.7 million



## FY21 Proposed CIP – New Projects > \$1.0 Million

- Water Tank Painting Bellevue 1 & 2, Park Circle, Walnut Hill, DI - \$27.9 million
- Cosgrove Tunnel Rehab. Design - \$10.0 million
- Beacon Street Line Rehabilitation - \$9.3 million
- Deer Island Roof Replacement: \$2.0 million
- CSO Study/Prel. Design Alewife Brook and Lower Charles River Basin: \$1.5 million
- Clinton Landfill Cell #1 Closure: \$1.0 million



# FY21 Proposed CIP – Asset Protection and Water Redundancy

Project Category	FY14-18	FY19-23	FY24-28
Asset Protection	\$222.8	\$607.7	\$1,209.3
Water Redundancy	\$174.6	\$232.8	\$376.9
CSO	\$64.7	\$10.6	\$0.1
Other	\$123.5	\$237.7	\$235.4
<b>Total</b>	<b>\$585.6</b>	<b>\$1,088.9</b>	<b>\$1,821.6</b>
<b>Asset Protection</b>	<b>38.0%</b>	<b>55.8%</b>	<b>66.4%</b>
<b>Water Redundancy</b>	<b>29.8%</b>	<b>21.4%</b>	<b>20.7%</b>
CSO	11.0%	1.0%	0.0%
Other	21.1%	21.8%	12.9%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

- Asset Protection and Water Redundancy including Deer Island and water tunnel redundancy projects are the principal drivers of future capital expenditures.





# FY21 Proposed CIP – FY21 Top Spenders – Asset Protection

## Clarifier Rehabilitation Phase 2 Construction

FY 21 Budget: \$34.5M

Total Contract: \$148.9M

NTP: May 2020

SC: May 2024





# FY21 Proposed CIP – FY21 Top Spenders – Asset Protection

## Chelsea Creek Headworks Upgrade Construction

FY21 Budget: \$16.1M

Total Contract: \$82.9M

NTP: November 2016

SC: November 2020





## Prison Point Rehabilitation Construction



FY 21 Budget:

Total Contract:

NTP: June 2020

SC: June 2022



# FY21 CIP – FY21 Top Spenders - Asset Protection

## Nut Island Odor Control & HVAC Improvements Construction

FY 21 Budget : \$14.9M

Total Contract: \$57.6M

NTP: January 2020

SC: November 2022





# FY21 CIP – FY21 Top Spenders - Redundancy

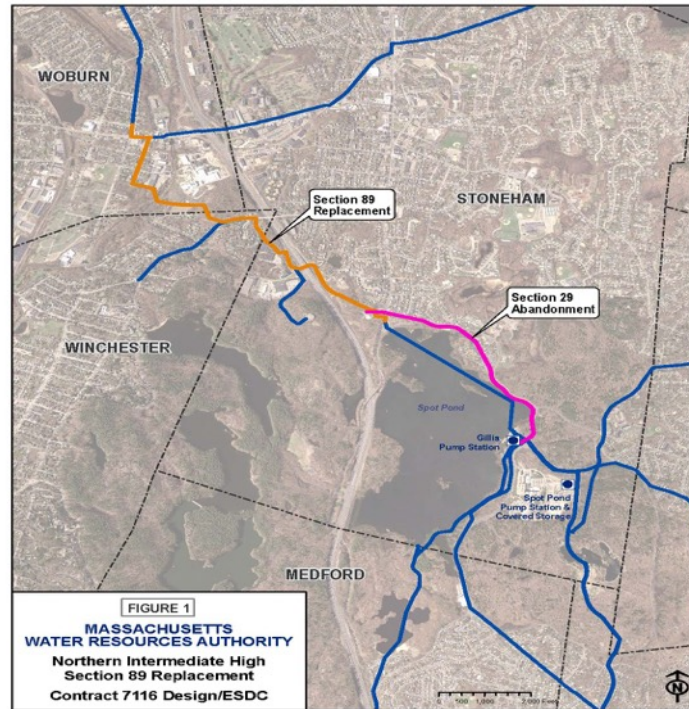
## Northern Intermediate High Redundancy Section 89 and 29 Replacement Constr.

FY 21 Budget: \$9.2M

Total Contract: \$21.3M

NTP: July 2020

SC: July 2022





## Gravity Thickener Rehabilitation

FY 21 Budget: \$6.4M

Total Contract: \$19.7M

NTP: May 2018

SC: February 2021





# FY21 CIP – FY21 Top Spenders - Asset Protection

## Carroll Water Treatment Plant SCADA Upgrade Construction

FY 21 Budget: \$5.0M

Total Contract: \$9.9M

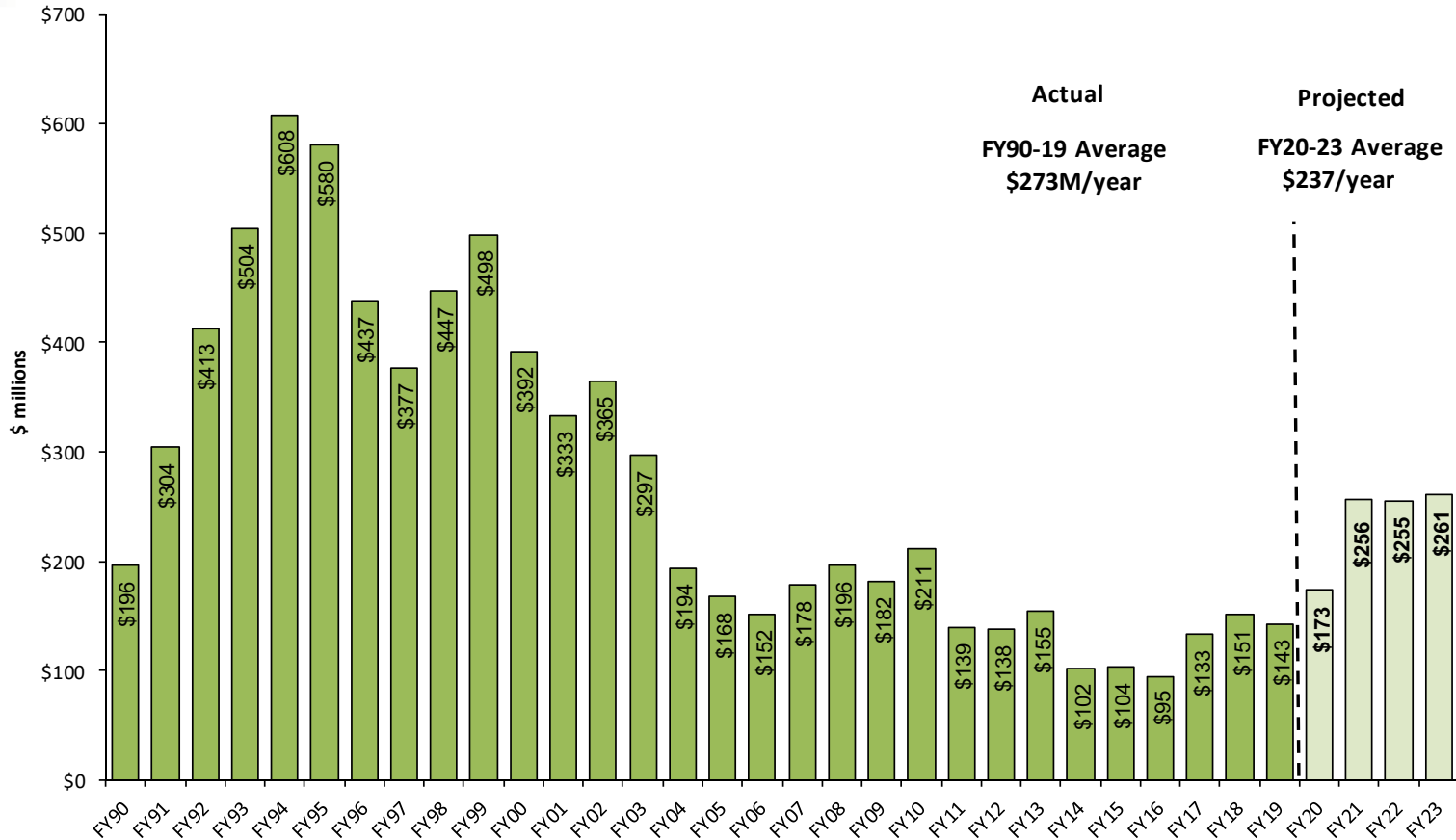
NTP: July 2020

SC: July 2022





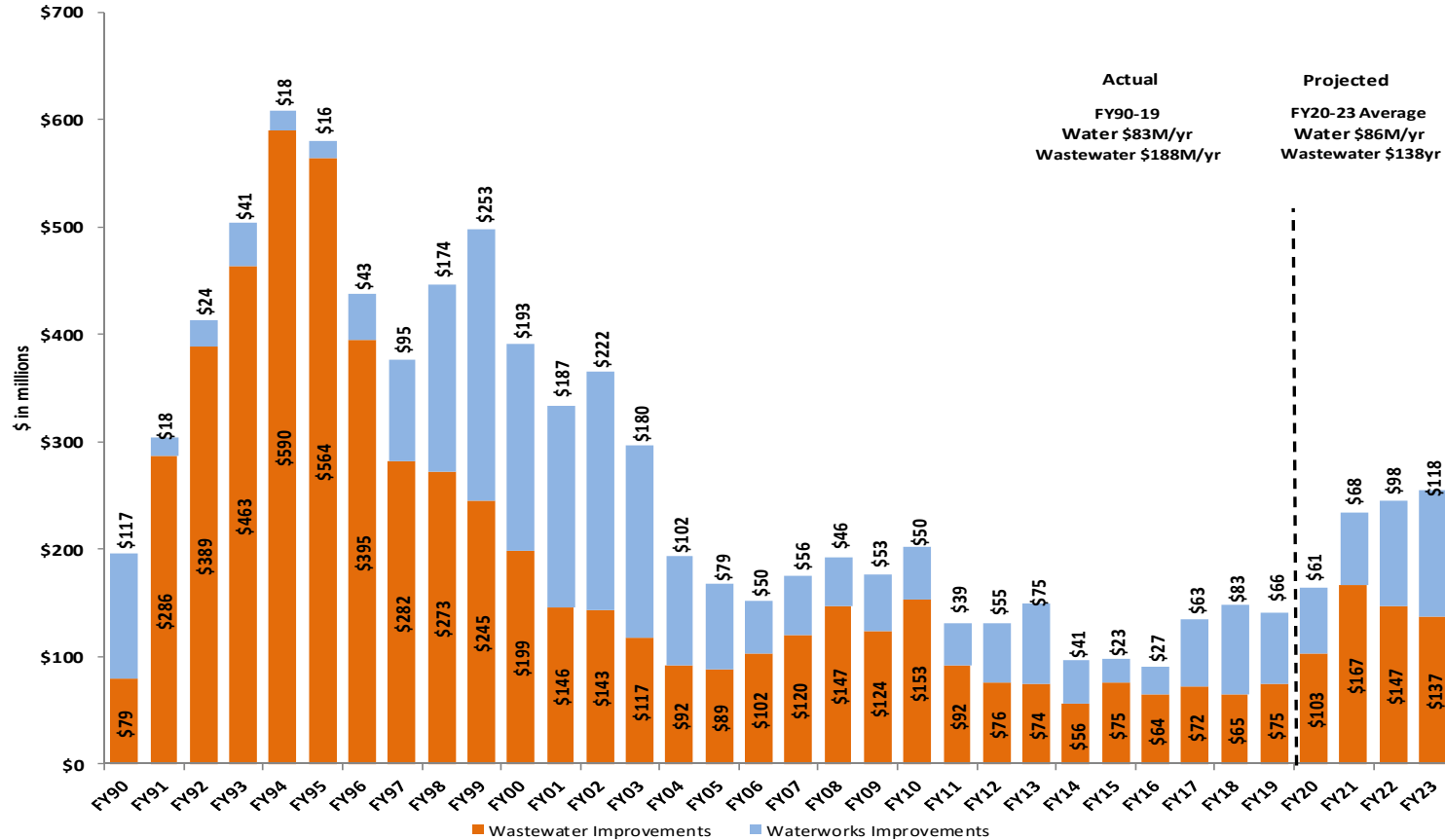
# Historic and Projected Capital Improvement Spending







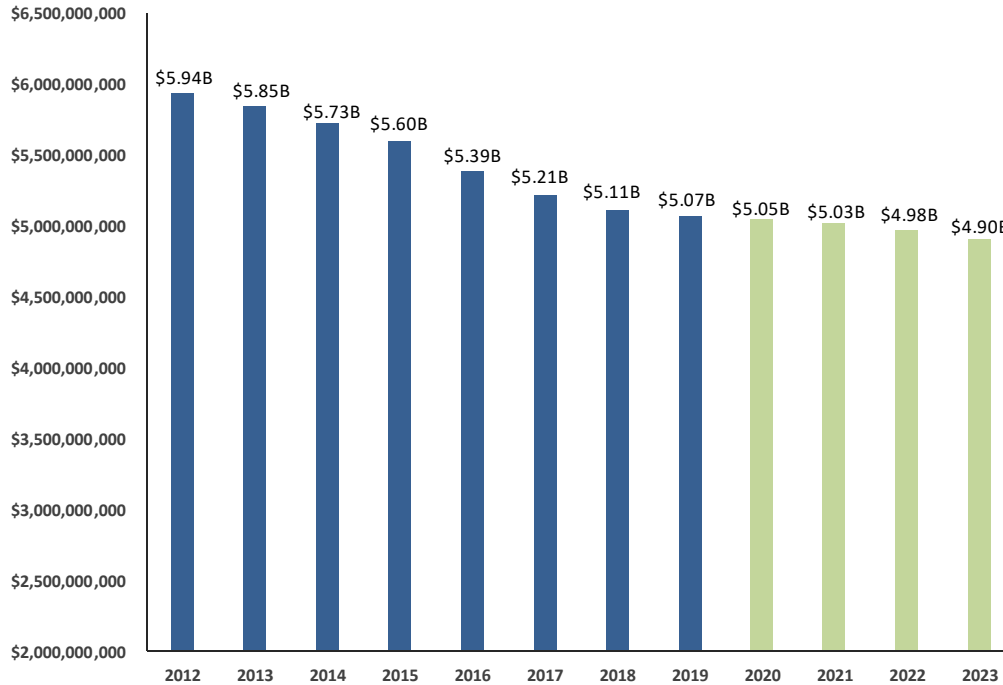
# Historic and Projected Capital Improvement Spending by Utility





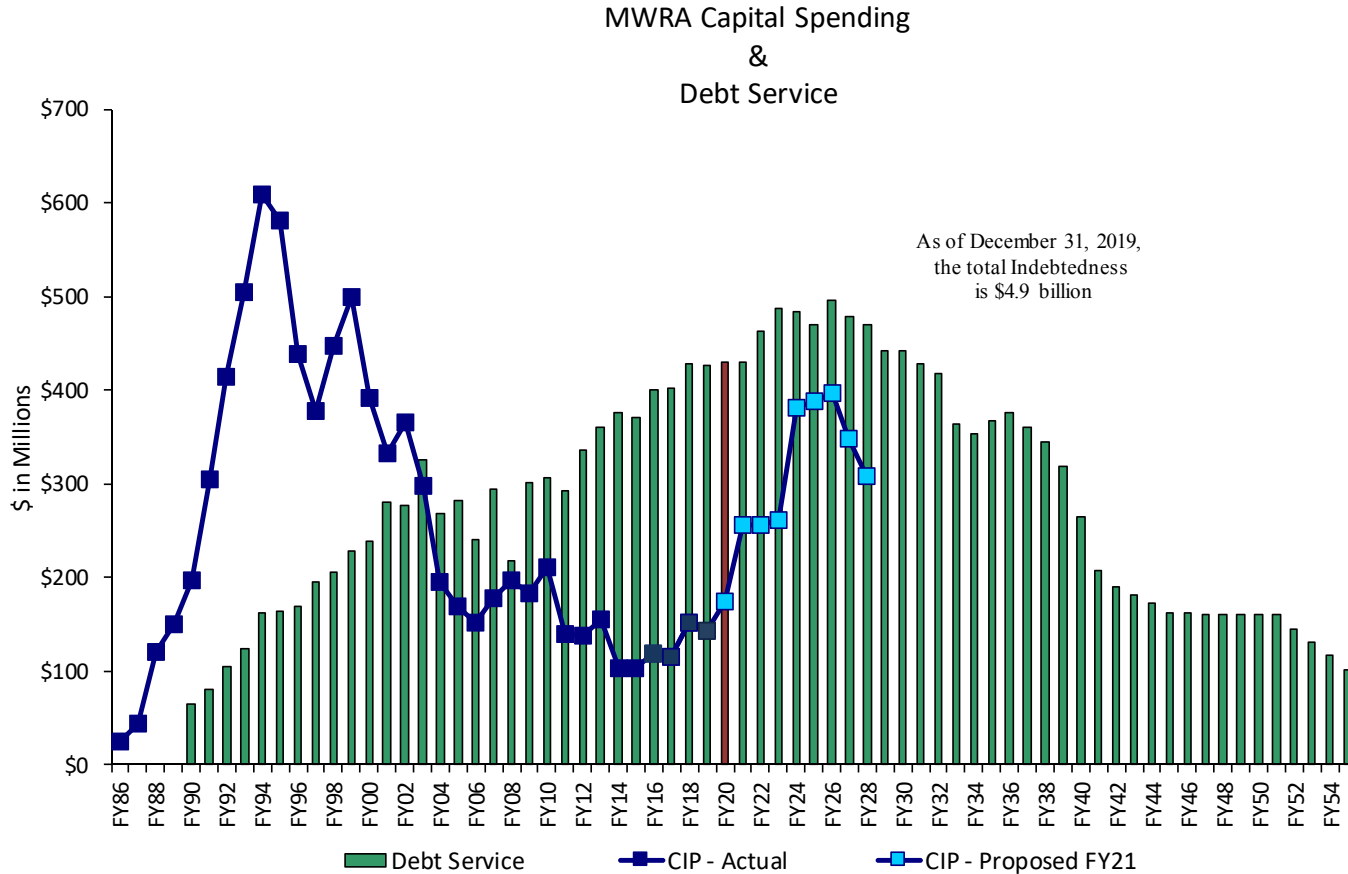
# Level of MWRA Indebtedness

Outstanding Debt on June 30 by Fiscal Year  
FY12-FY23





# Capital Spending and Debt Service





## Looking Ahead

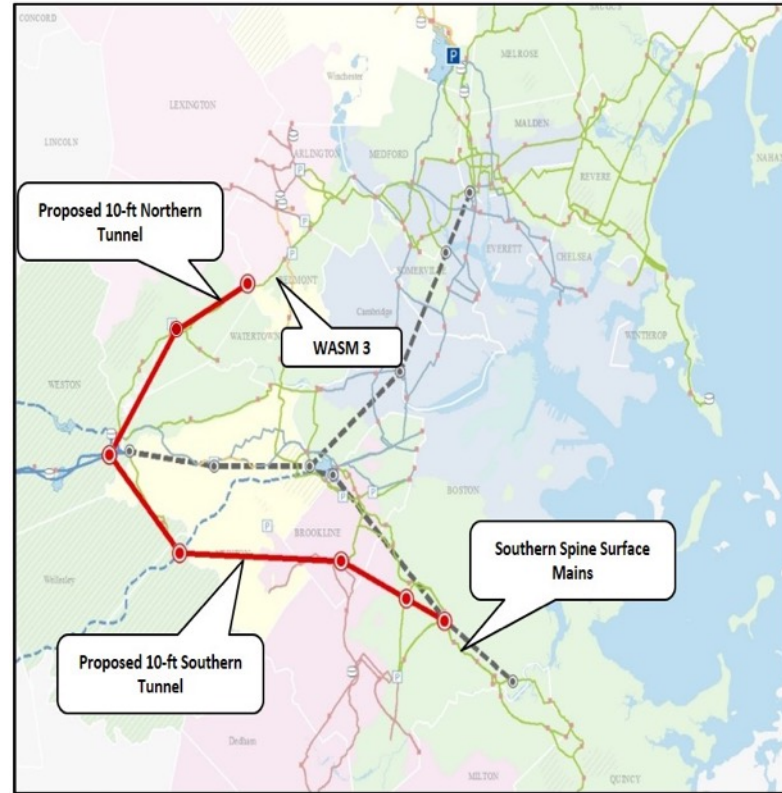
- Lessons learned from Chelsea Headworks Upgrades
- Continue Asset Protection
- Metropolitan Tunnel Redundancy



# Metropolitan Tunnel Redundancy Program

## FY19-23 Projected Expenditures

Contract Name	Start/ Duration (years)	Contract Budget (millions)	FY19-23 Spending (millions)
<b>Program Support Services</b> <i>Awarded</i>	FY19/9	\$17.5	\$8.3
<b>Preliminary Design/MEPA Review</b> <i>Anticipated award April 2020</i>	FY20/3.5	\$16.0	\$14.2
<b>Technical Assistance</b> <i>Anticipated Award January 2022</i>	FY22/6	\$4.1	\$1.2





# Review of Tunnel Program CIP

- October 2016 Special Board Meeting on Metropolitan Tunnel Redundancy
  - Staff Presented Preferred Two-Tunnel Alternative
  - 14 miles (4.5 miles North, 9.5 miles South) of 10-ft diameter deep rock tunnel
- Estimated midpoint of construction cost: \$1.47 - \$1.70 billion
  - 17 to 23 year program with preliminary design beginning in 2017 and tunnel construction beginning in 2022
  - Duration depends on program phasing (Advisory Board recommended concurrent construction of north and south tunnels)
  - 30% contingency factor
  - 4% annual escalation
- Current schedule is to begin Preliminary Design in 2020
- Current estimate for tunnel construction start is 2027-ish



## Review of Tunnel Program CIP (continued)

- Select key variables affecting Tunnel Program
  - Underground conditions (geology)
  - Selection of shaft sites and tunnel alignment/land acquisition
  - Future water demands (length of tunnel)
  - Schedule (time value of dollars)
- Many variables will be evaluated during preliminary design (2020-2023)
- Key findings will be presented to Board as preliminary design progresses



## Next Steps

- Work with the Advisory Board
- Finalize FY21 CIP
- Submit FY21 Final CIP to Board of Directors for approval in June 2020





**THANK YOU!**







# Christmas Day Water Usage

