Narragansett Bay Commission

CSO Control Facilities Phase III Reevaluation Alternative Plans Workshop

27 April 2015

MWH
BUILDING A BETTER WORLD

PARE CORPORATION

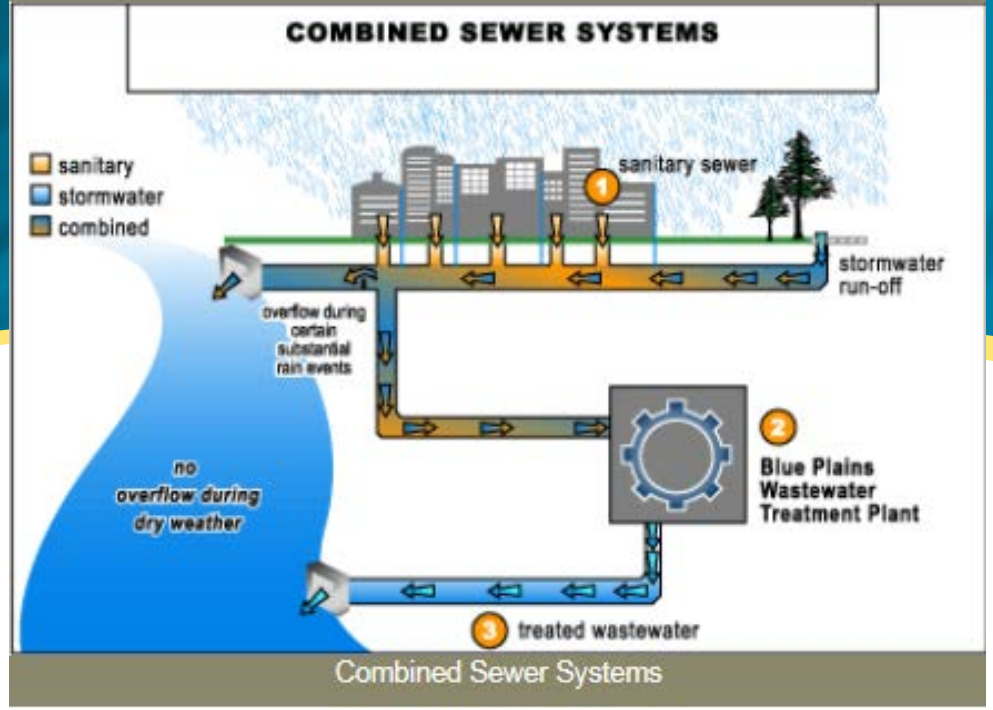
Clean Water Act - 1972

- What is required by the Clean Water Act for Combined Sewer Overflow (CSO) control?
- Need to meet Water Quality standards **all the time**
- Cost prohibitive to meet standards for **all storms**
- EPA Approach
  - Spend what you can afford
  - Affordability based on 2% MHI
  - Reevaluate every 5 years
- Focus on Alternatives 1, 2 and 3
  - Board indicated #4 should not be further considered
  - However, #4 is evaluated in the water quality impact analysis

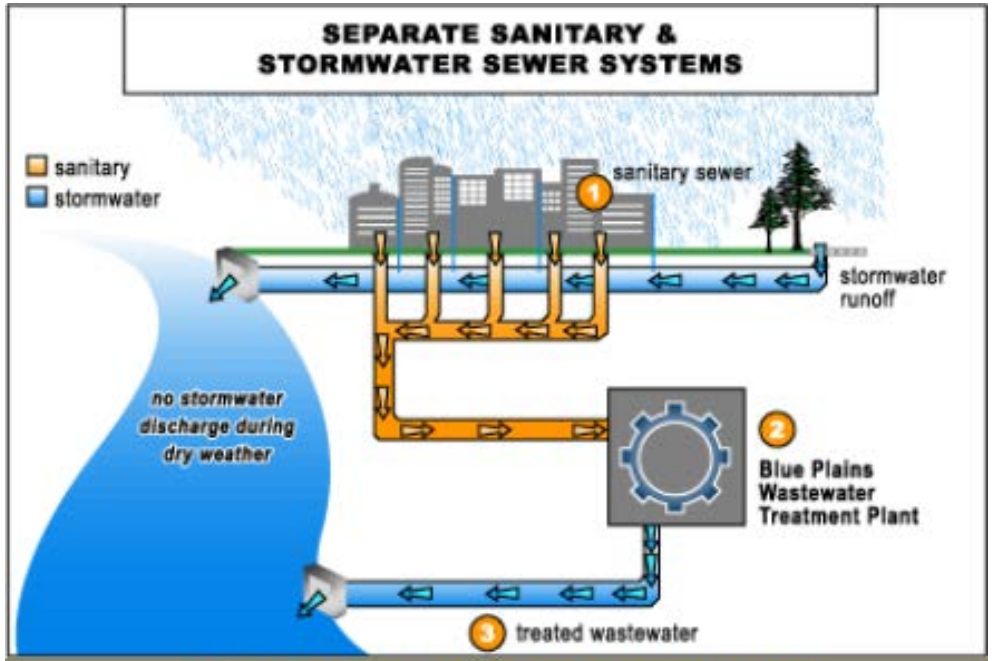
Why Don’t We Meet Water Quality Standards in Wet Weather?

- Primary pollutant of concern for CSO’s is Bacteria

- Sources of bacterial pollution (wet weather)
  - CSO’s
  - Stormwater (storm sewers or overland)
  - Wastewater Treatment Facilities (WWTF’s)



Combined Sewer Systems



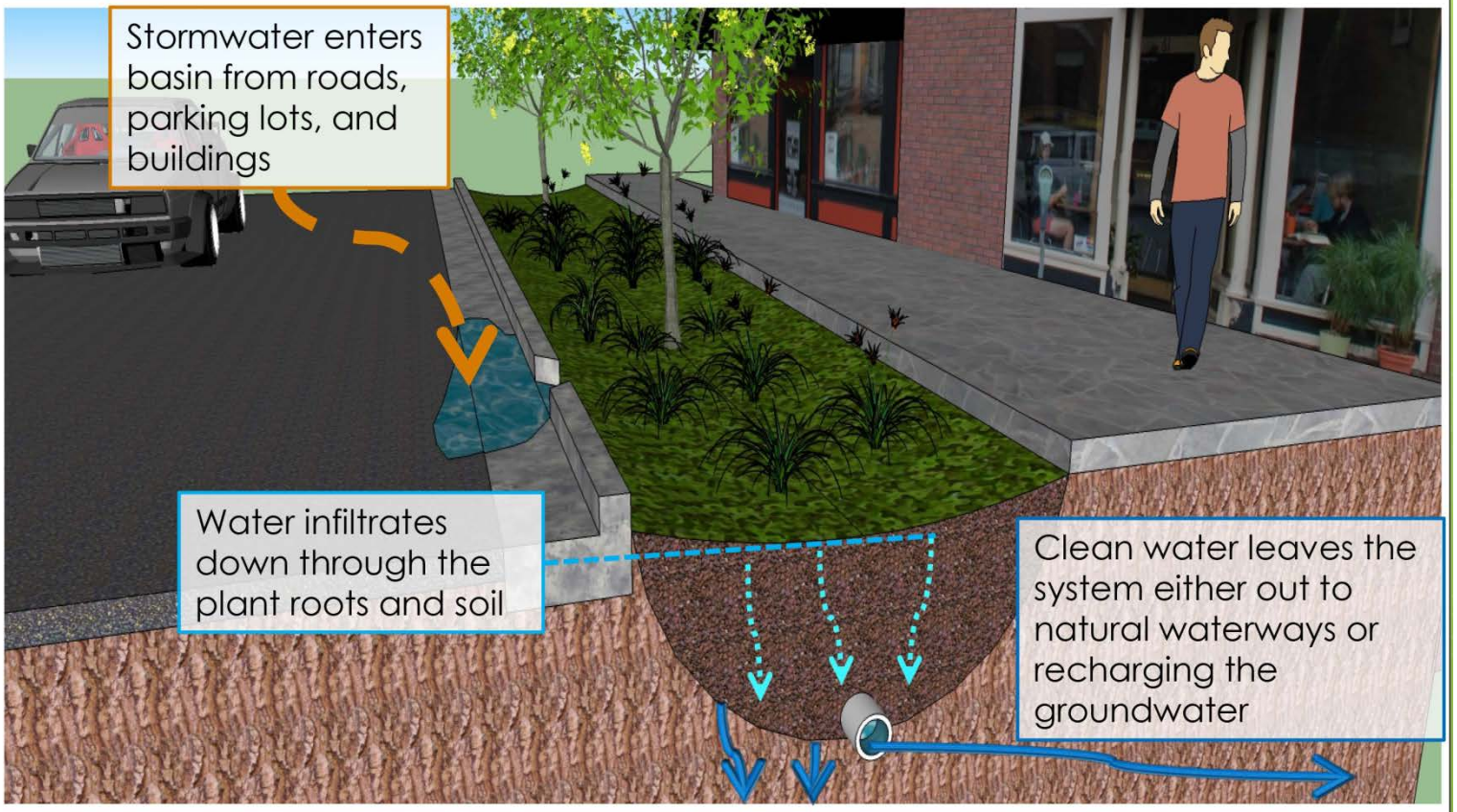
Separate Sanitary and Stormwater Sewer Systems

What Can be Done to Control CSO's to Meet Water Quality Standards?

- Green Infrastructure – prevent storm flow from getting to the combined sewer or storm sewer
- Sewer Separation – Install new storm drains to collect stormwater
- Storage and Treatment – Tunnels or Holding Tanks
- Treatment – Screening and disinfection

Green Infrastructure

Bioretention basins capture pollutants from impervious surfaces.



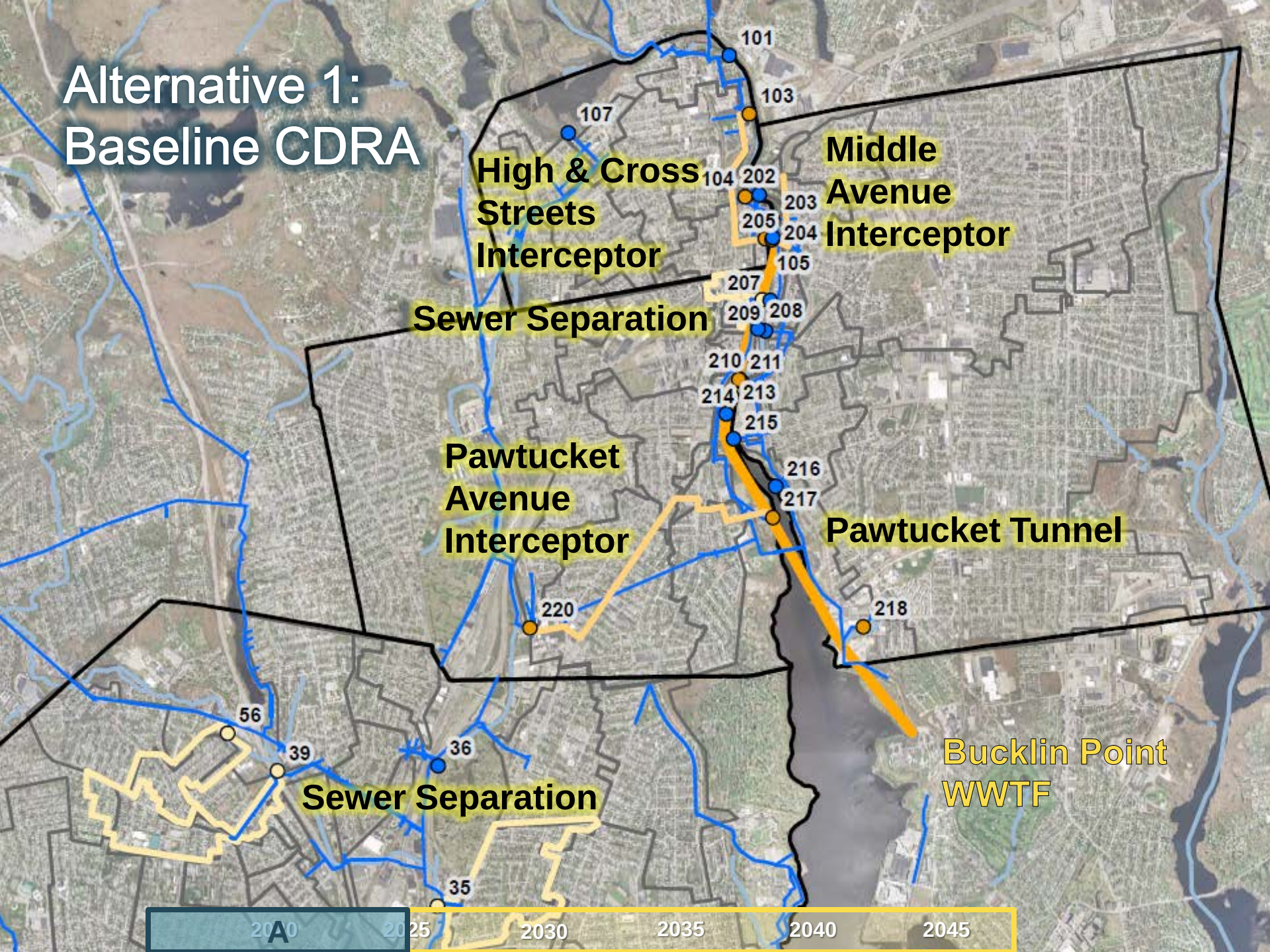
Bioretention Swale

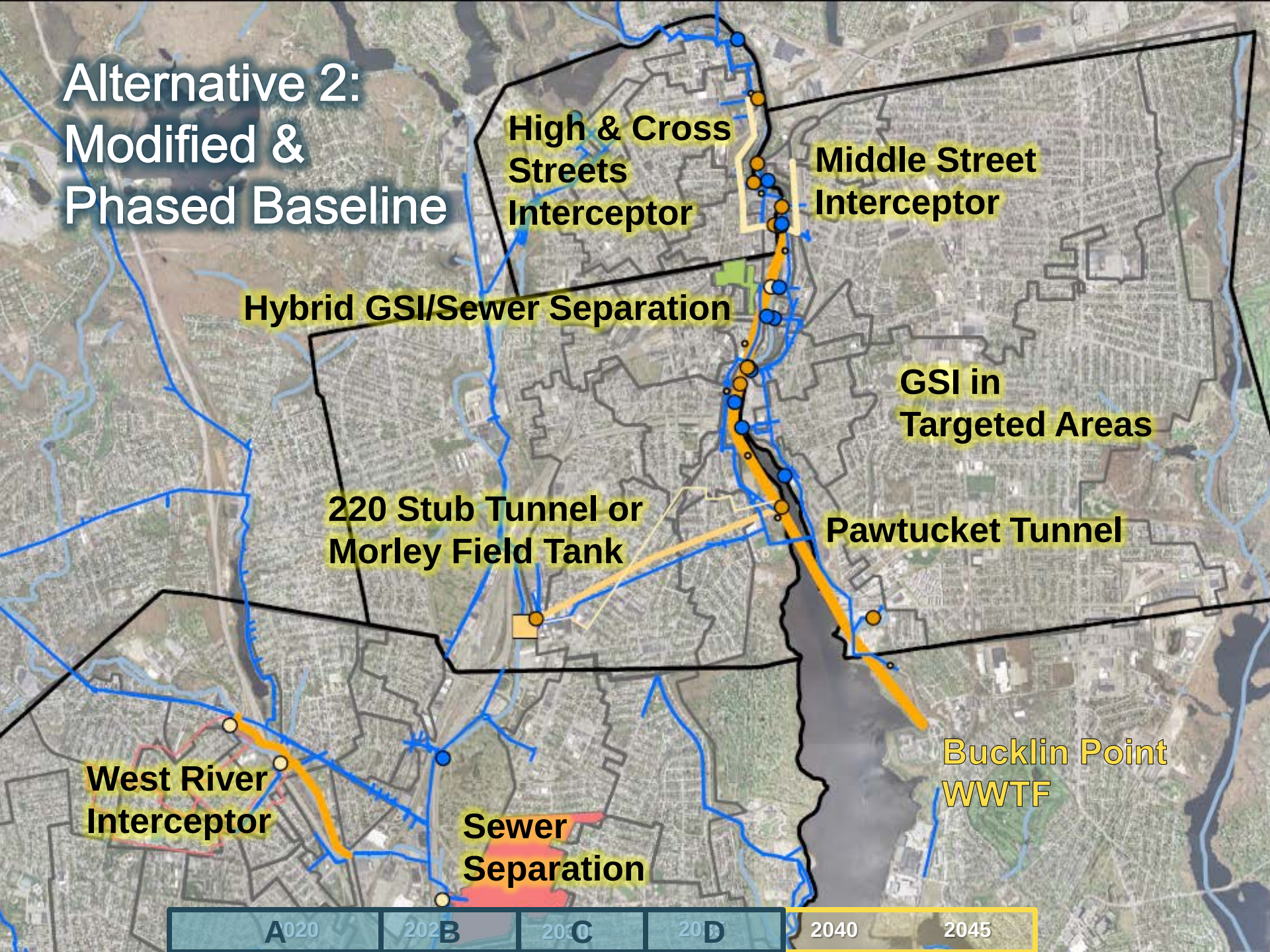
Grand Broadway-No GSI

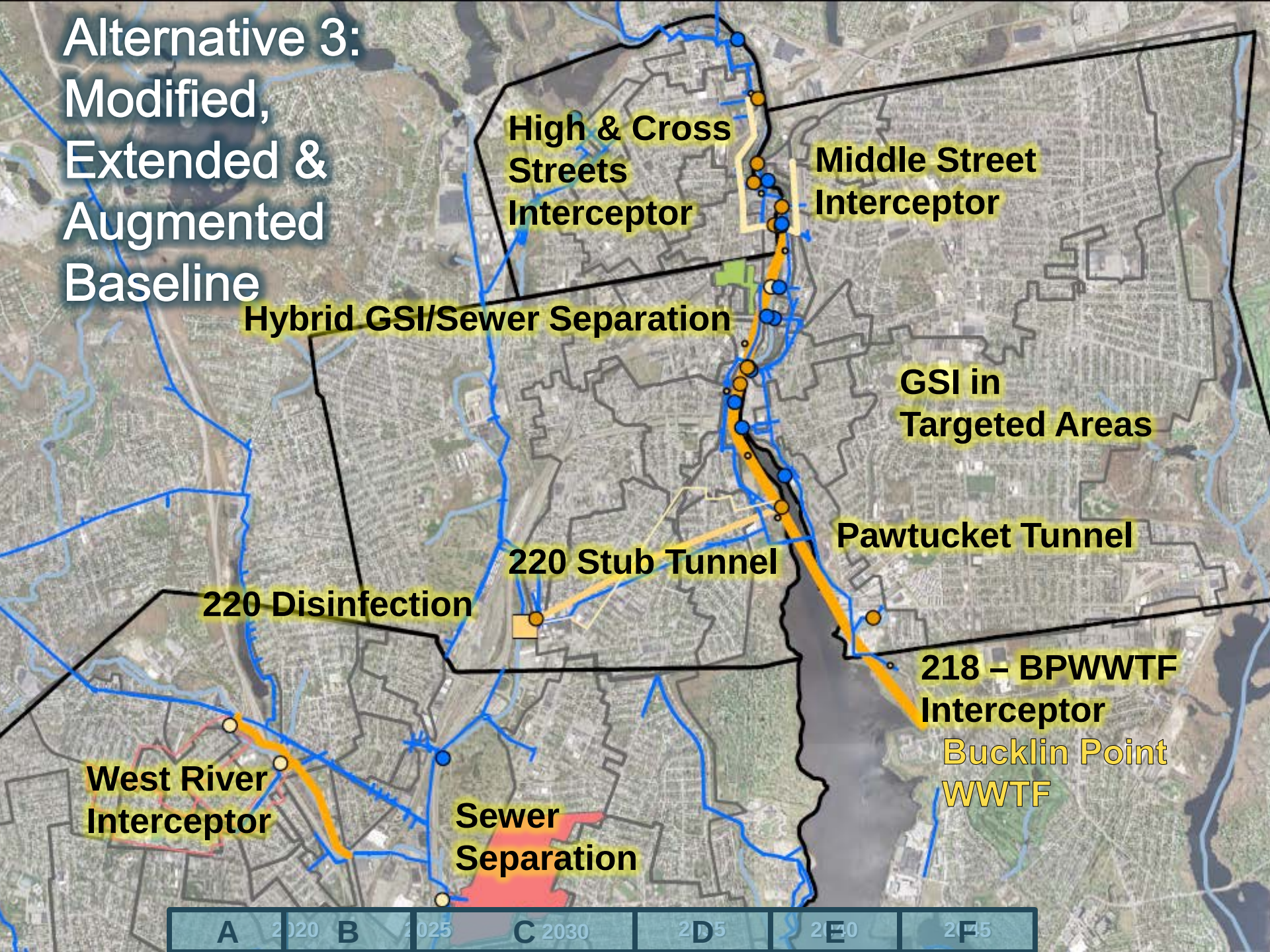
Grand Broadway-Pervious Pavement with Rain Garden Bump-outs

Green Infrastructure Considerations

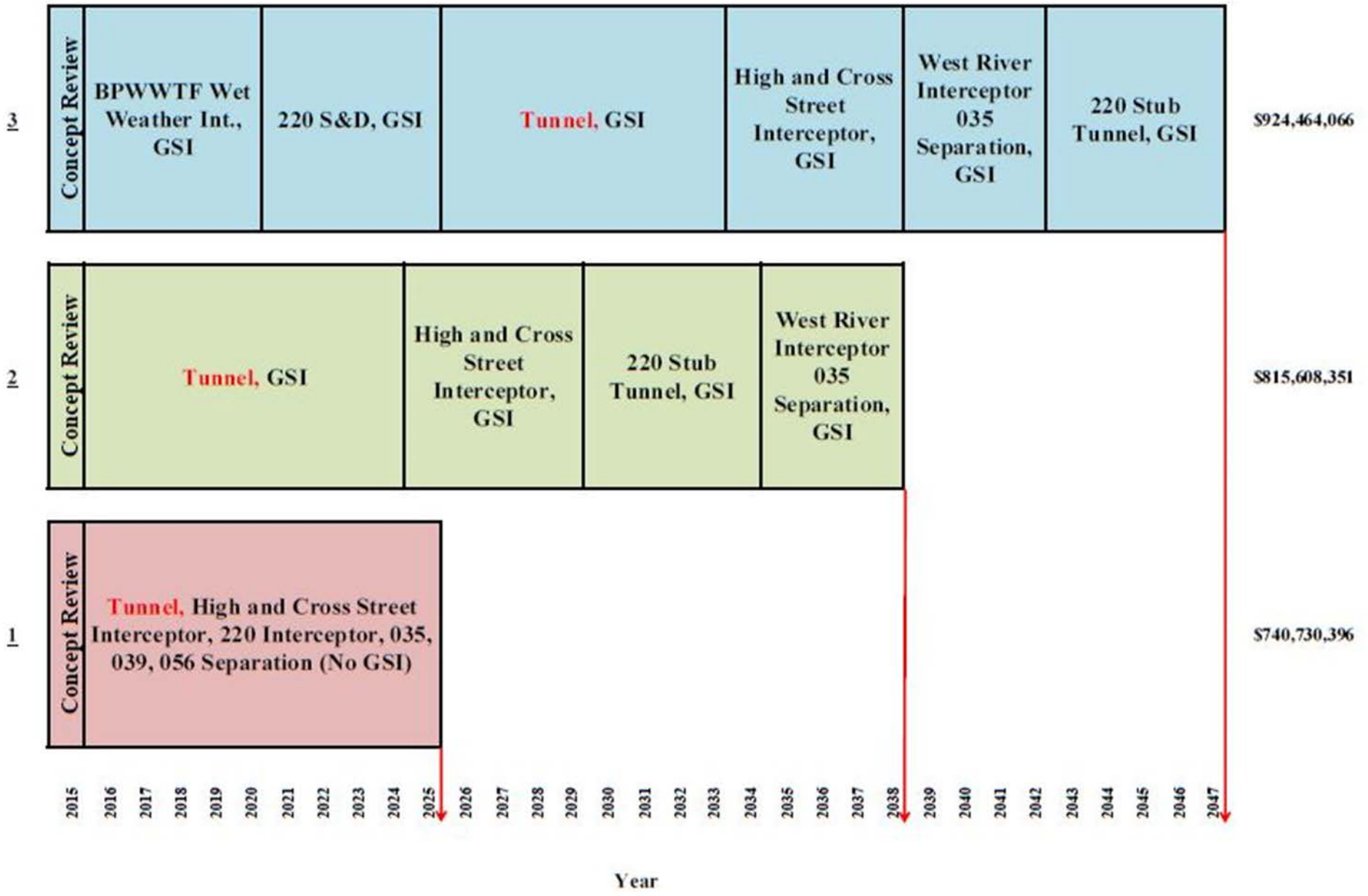
- Using all suitable GSI locations identified by MWH can only achieve 36% reduction in CSO volume
- Capital cost for 36% reduction is $540M
- Who would maintain the Facilities?
- Maintenance costs **are not well defined**


Alternative 1:
Baseline CDRA
High & Cross Streets Interceptor
Middle Avenue Interceptor
Sewer Separation
Pawtucket Avenue Interceptor
Pawtucket Tunnel
Sewer Separation
Bucklin Point WWTF
101
103
107
104
202
203
205
204
105
207
209
208
210
211
214
213
215
216
217
220
218
56
39
36
35
A
2020
2025
2030
2035
2040
2045


Alternative 2: Modified & Phased Baseline
High & Cross Streets Interceptor
Middle Street Interceptor
Hybrid GSI/Sewer Separation
GSI in Targeted Areas
220 Stub Tunnel or Morley Field Tank
Pawtucket Tunnel
Bucklin Point WWTF
West River Interceptor
Sewer Separation
A
B
C
D
2040
2045

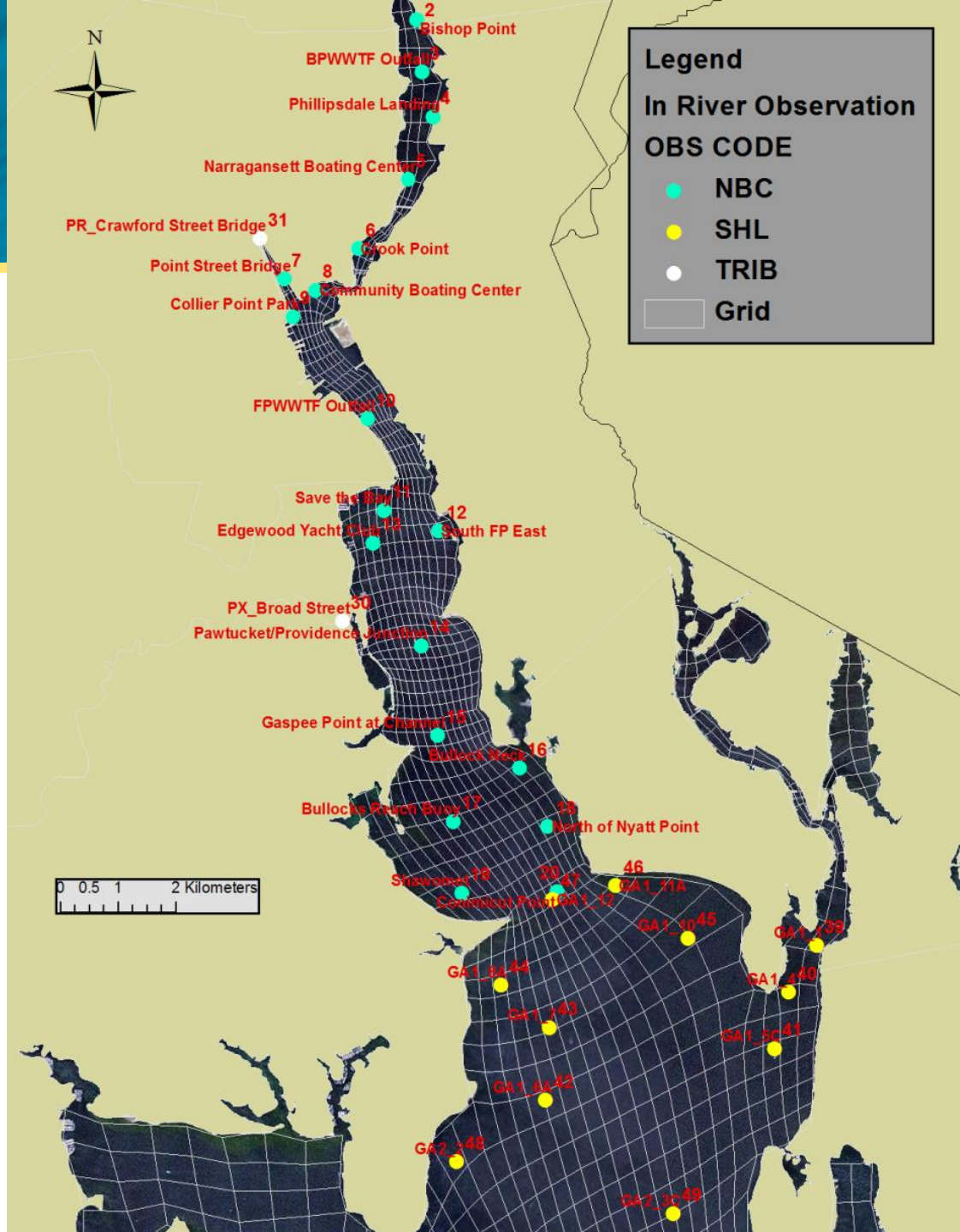

Alternative 3: Modified, Extended & Augmented Baseline
High & Cross Streets Interceptor
Middle Street Interceptor
Hybrid GSI/Sewer Separation
GSI in Targeted Areas
Pawtucket Tunnel
220 Stub Tunnel
220 Disinfection
218 – BPWWTF Interceptor
Bucklin Point WWTF
West River Interceptor
Sewer Separation
A
2020
B
2025
C
2030
D
E
F

Alternatives 1-3: Timeline & Cost

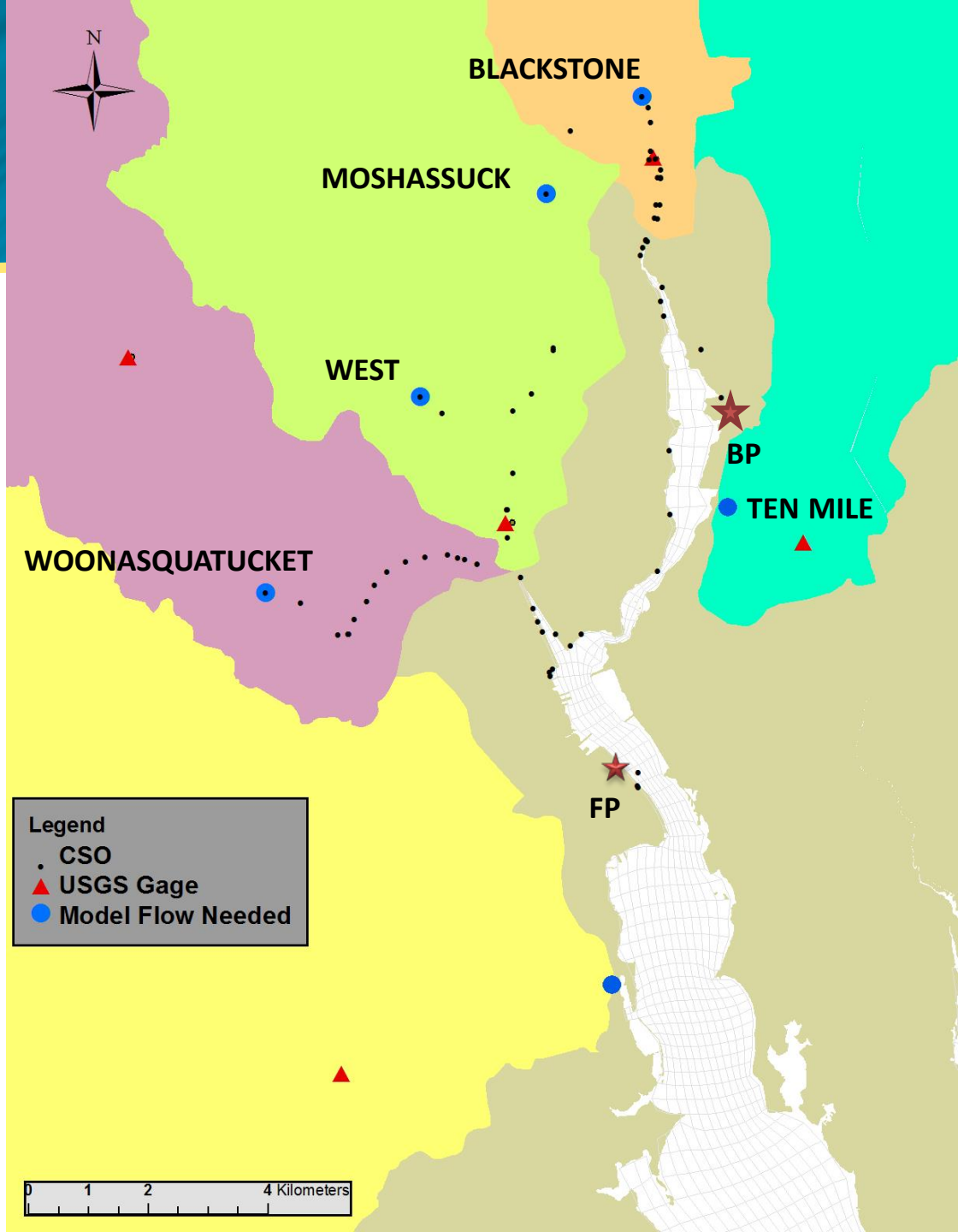


What Water Quality Improvements can we expect with Phase III?

MODEL GRID


N
Legend
In River Observation
OBS CODE
NBC
SHL
TRIB
Grid
2
Bishop Point
BPWWTF Outfall
Phillipsdale Landing
4
Narragansett Boating Center
PR_Crawford Street Bridge
31
6
Cook Point
Point Street Bridge
7
8
Community Boating Center
Collier Point Park
FPWWTF Outfall
Save the Bay
12
South FP East
Edgewood Yacht Club
PX_Broad Street
30
Pawtucket/Providence Junction
Gaspee Point at Channel
15
Bullocks Neck
16
Bullocks Reach Buoy
North of Nyatt Point
Shawomet
20
47
46
GA1_11A
Conimicut Point
GA1_12
GA1_38
45
GA1_44
44
GA1_43
GA1_40
GA1_39
41
GA1_42
42
GA2_48
48
GA2_49
0 0.5 1 2 Kilometers

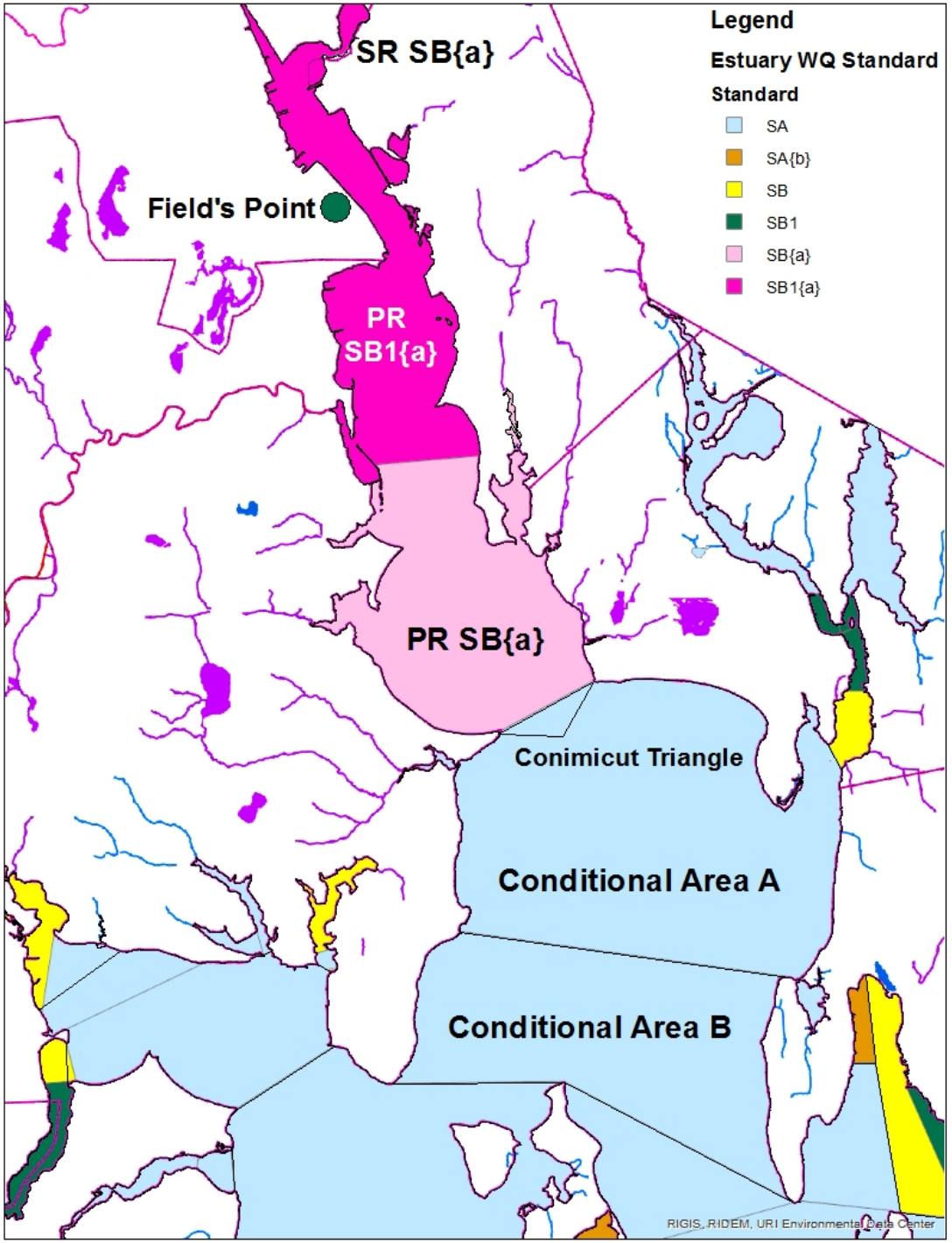
Source Loads

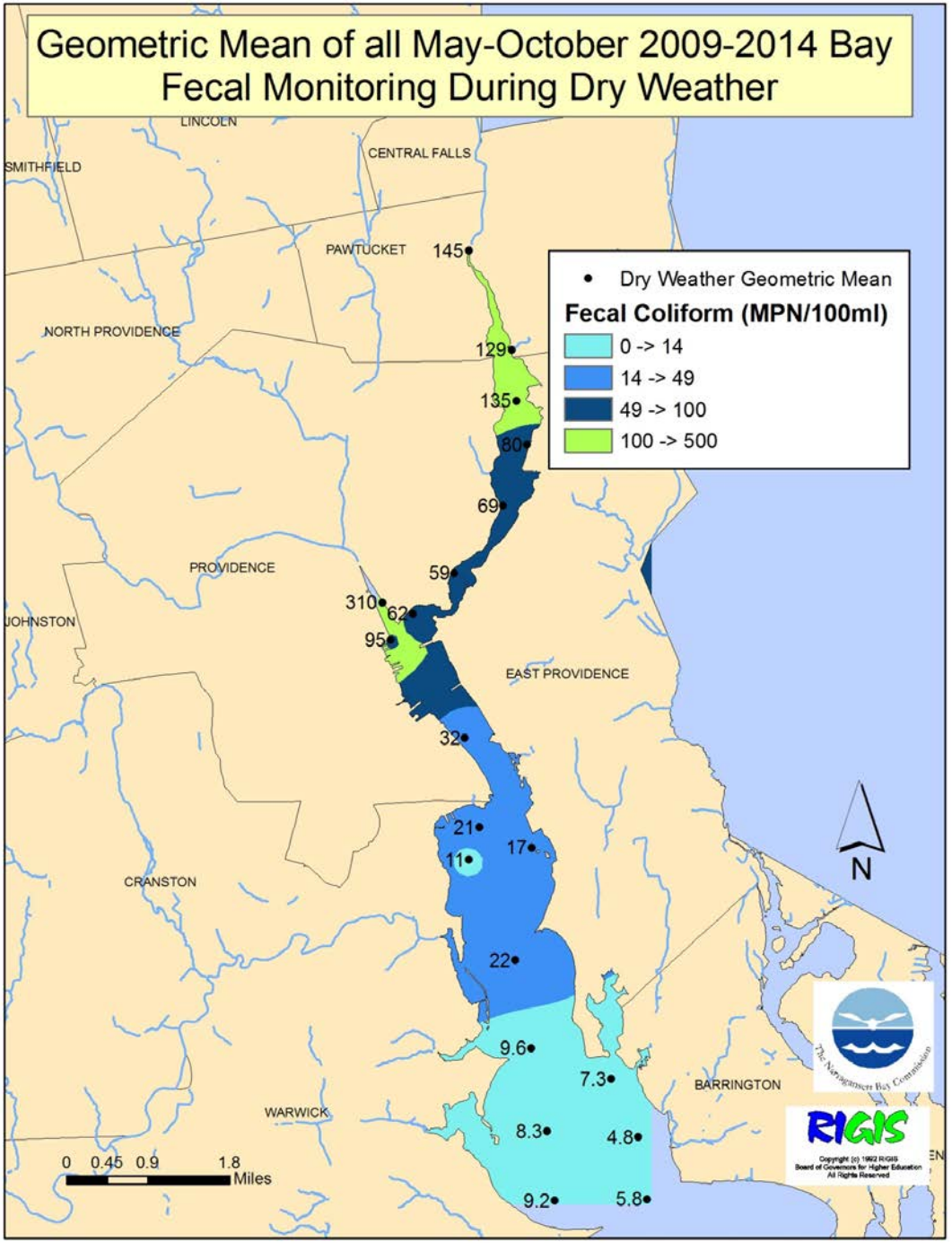


Source Loads for 3 month storm – Post Phase I

Source	Bacterial Load	% of Total Bacterial Load
	Concentration	
CSO	240,000	89
WWTF's	4-40	0
Tributaries	200-2,000	3.9
Storm Sewers	10,000	6.6

Estuary Water Quality Standard




Geometric Mean of all May-October 2009-2014 Bay Fecal Monitoring During Dry Weather
LINCOLN
SMITHFIELD
CENTRAL FALLS
PAWTUCKET
NORTH PROVIDENCE
PROVIDENCE
JOHNSTON
EAST PROVIDENCE
CRANSTON
WARWICK
BARRINGTON
Dry Weather Geometric Mean
Fecal Coliform (MPN/100ml)
0 -> 14
14 -> 49
49 -> 100
100 -> 500
145
129
135
80
69
59
310
62
95
32
21
17
11
22
9.6
7.3
8.3
4.8
9.2
5.8
0 0.45 0.9 1.8
Miles
N
RIGIS

Fecal Coliform concentrations 0.5 day after start of 3-month storm

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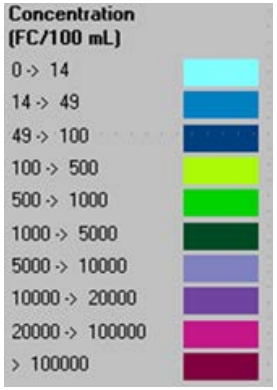
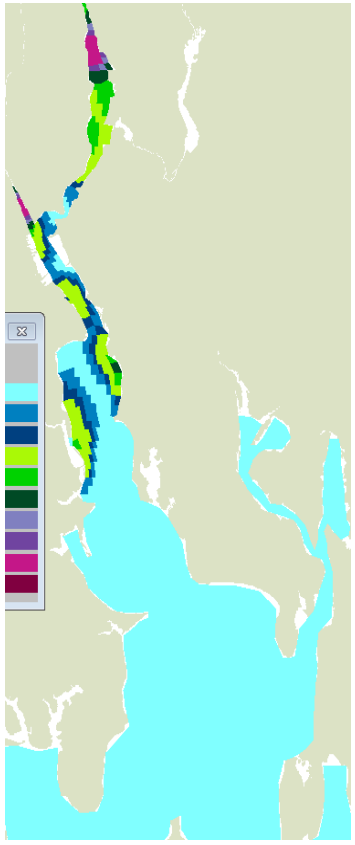
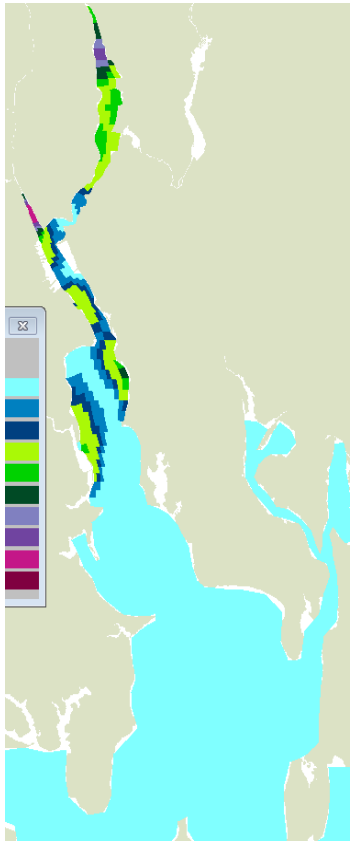
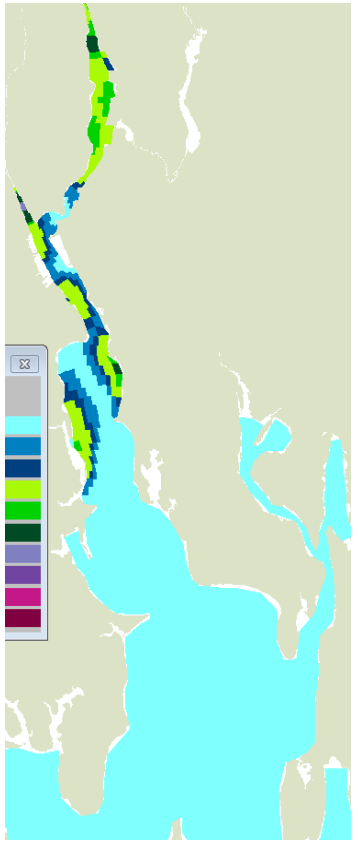
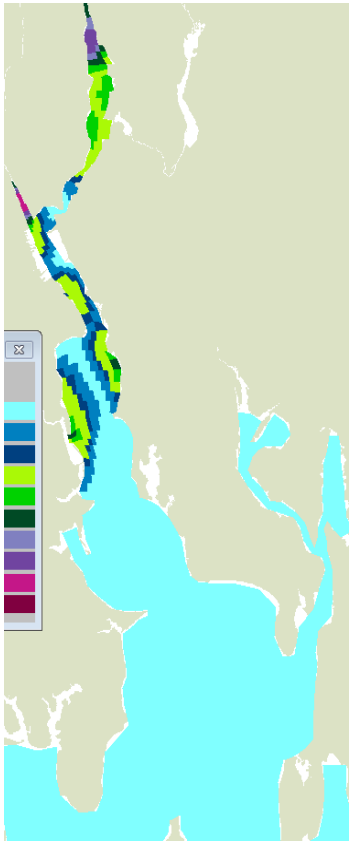
SB



Phase II (2015)	**Tunnel Only** (Alt 1&2: 2023, Alt 3: 2032)	**Full Phase III** (Alt 1: 2025, Alt 2: 2038, Alt 3: 2047)	**Alternative 4** (2038)
			

Fecal Coliform concentrations 1 day after start of 3-month storm

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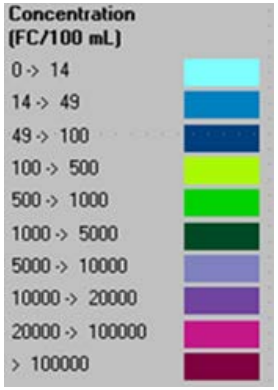

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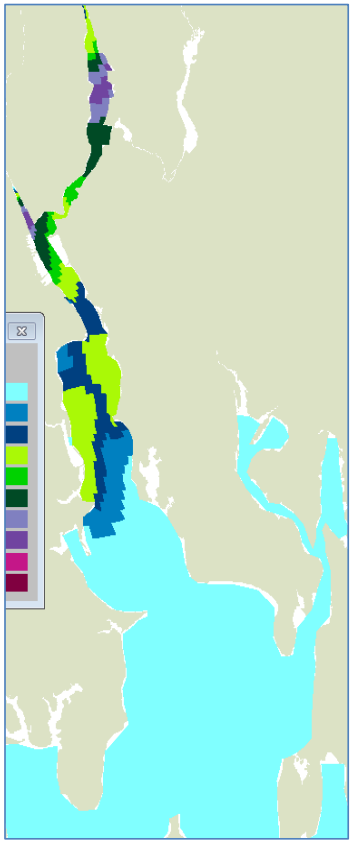	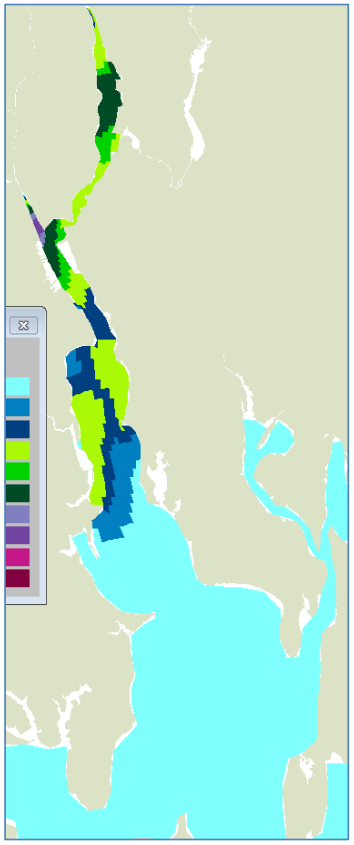	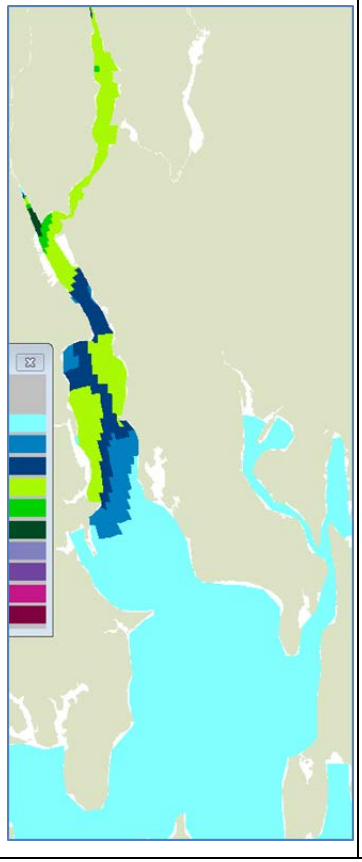	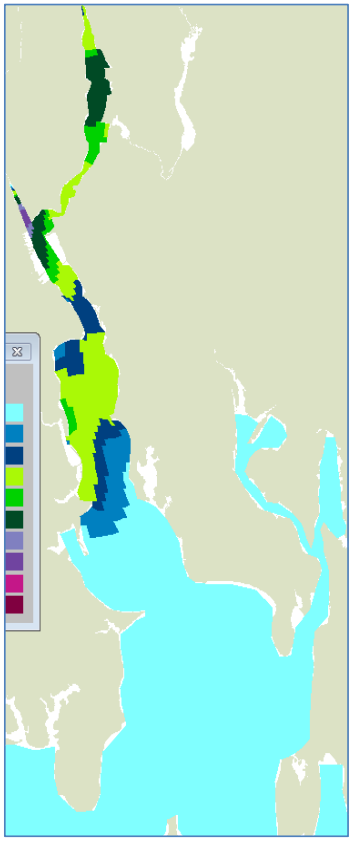

Fecal Coliform concentrations 2 days after start of 3-month storm

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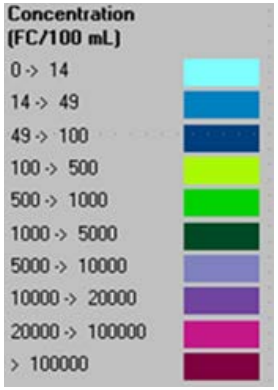

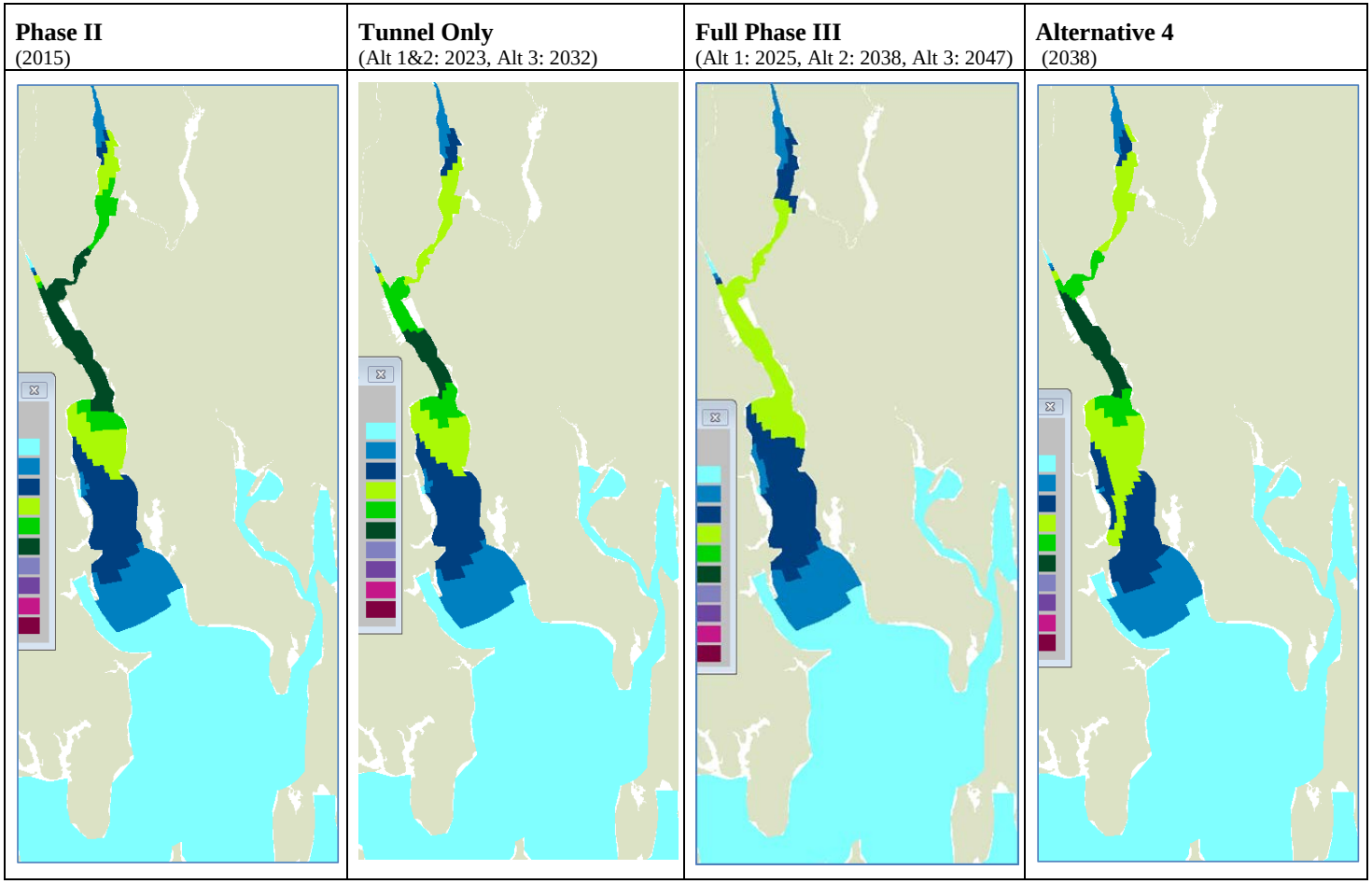

Fecal Coliform concentrations 4 days after start of 3-month storm

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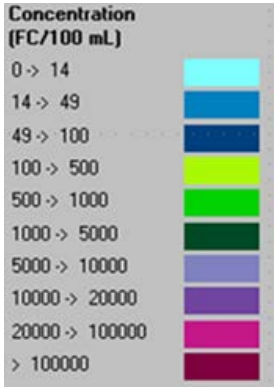

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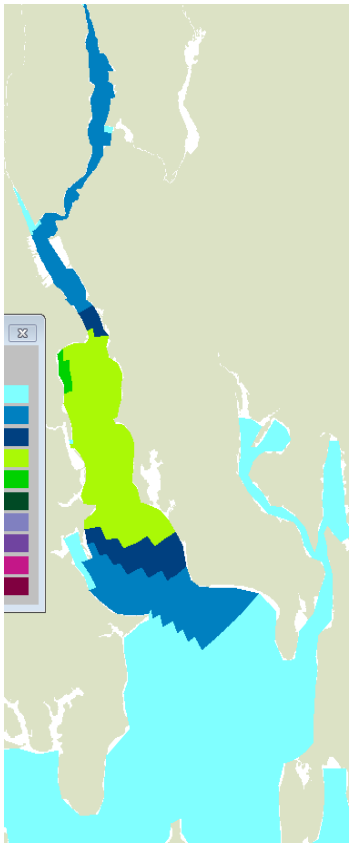	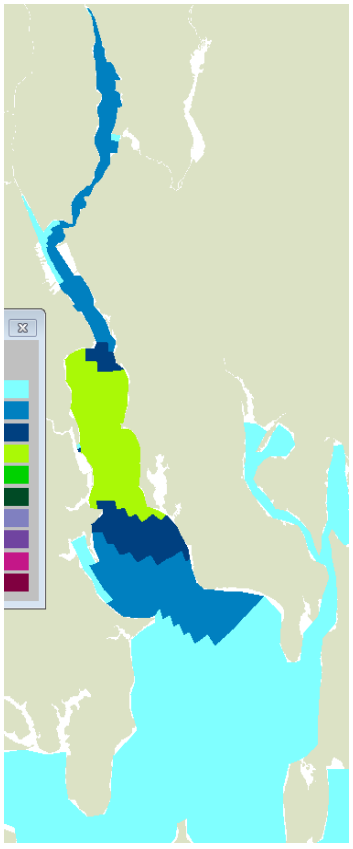	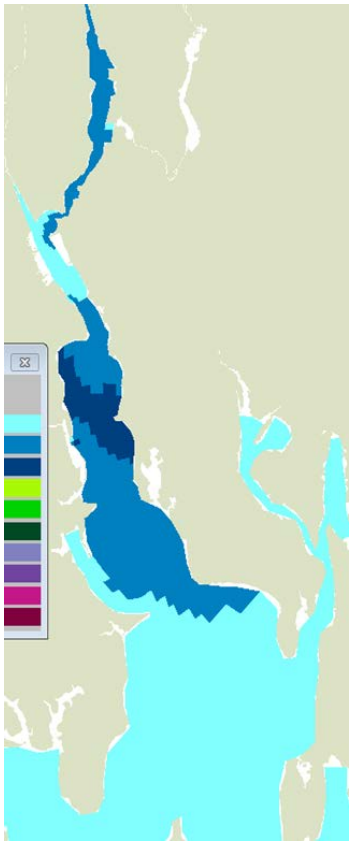	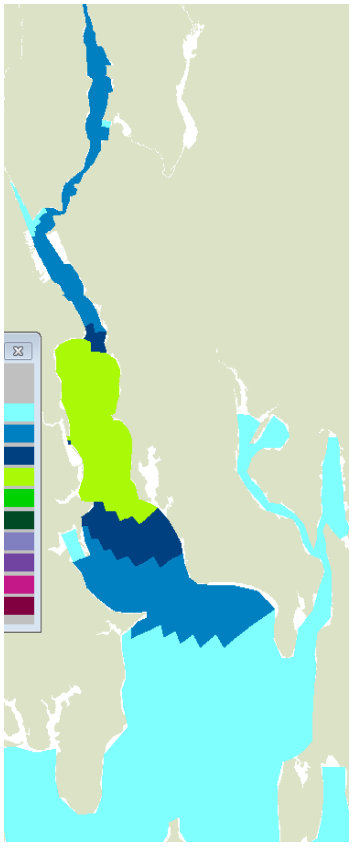

Fecal Coliform concentrations 6 days after start of 3-month storm

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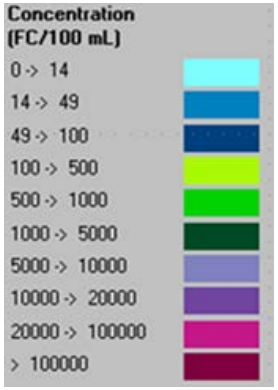
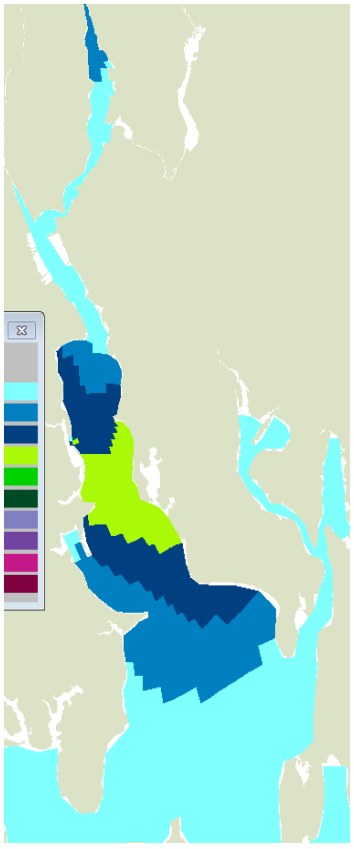
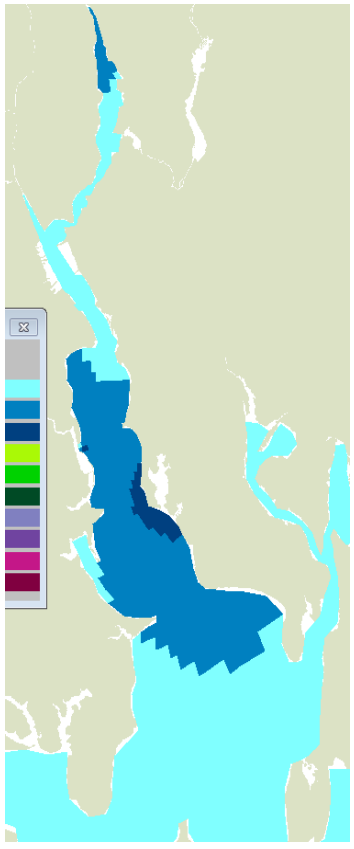
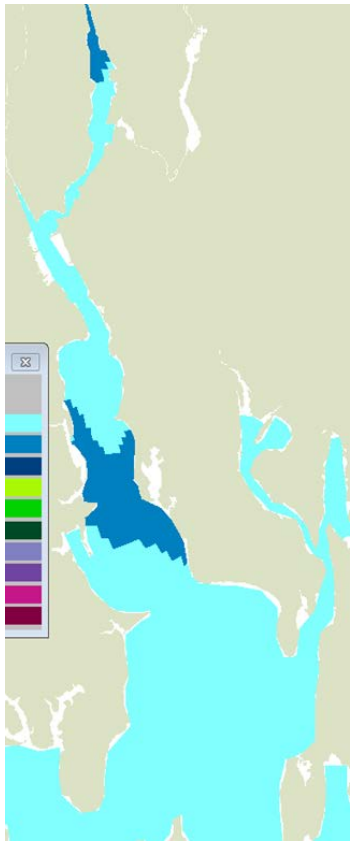
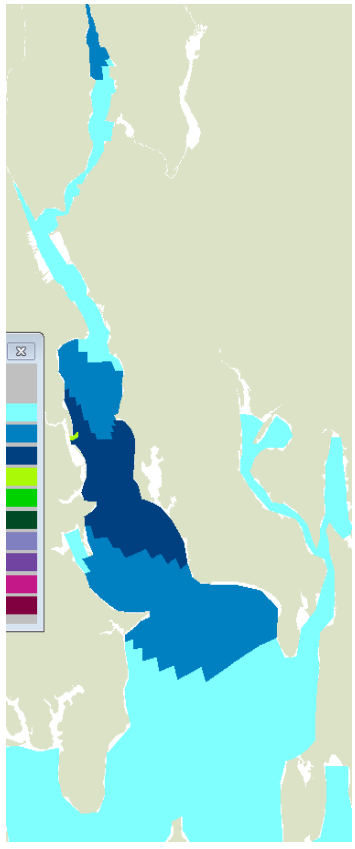


Phase II (2015)	**Tunnel Only** (Alt 1&2: 2023, Alt 3: 2032)	**Full Phase III** (Alt 1: 2025, Alt 2: 2038, Alt 3: 2047)	**Alternative 4** (2038)
			

Fecal Coliform concentrations 8 days after start of 3-month storm

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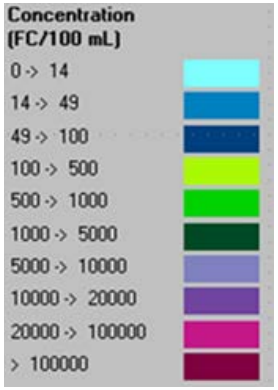

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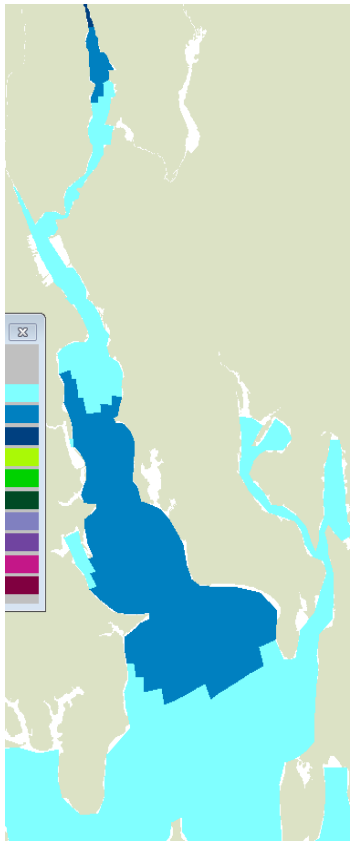	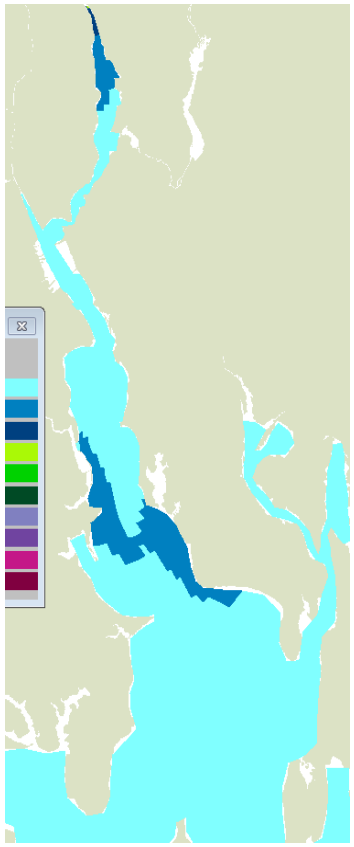	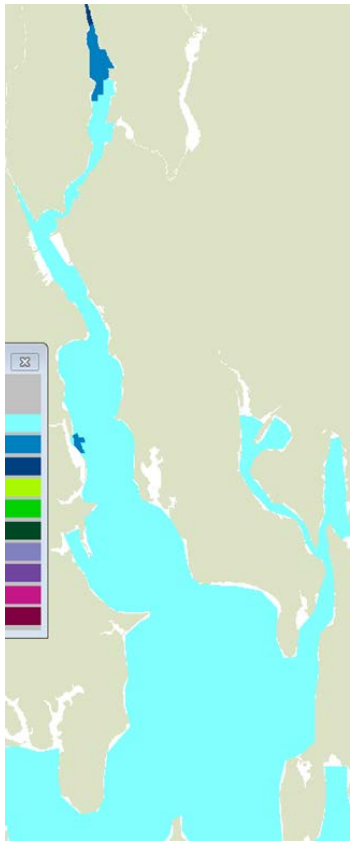	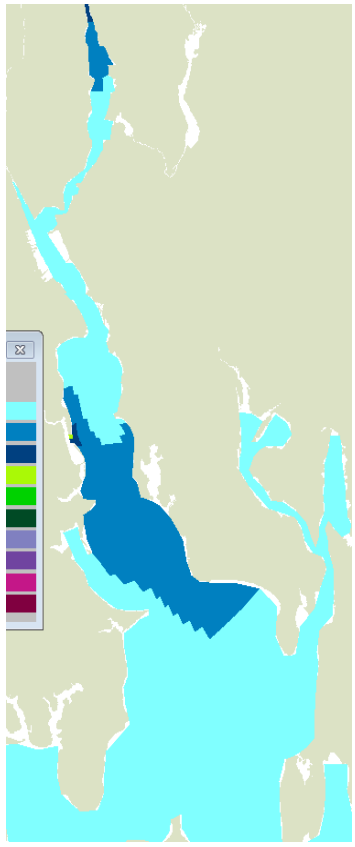

Fecal Coliform concentrations 10 days after start of 3-month storm

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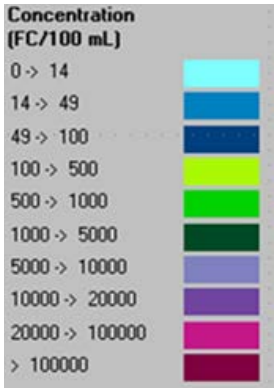

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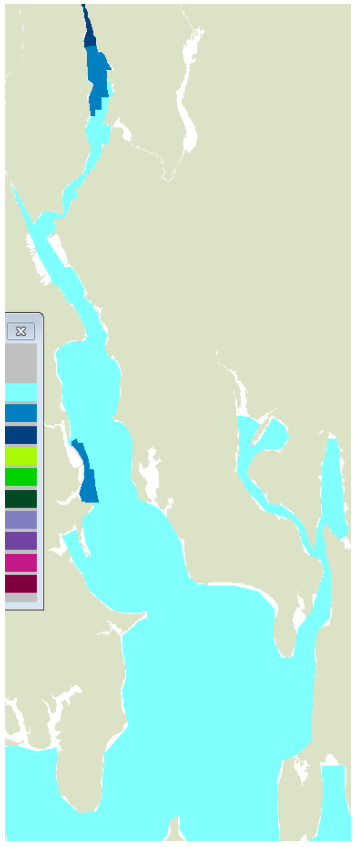
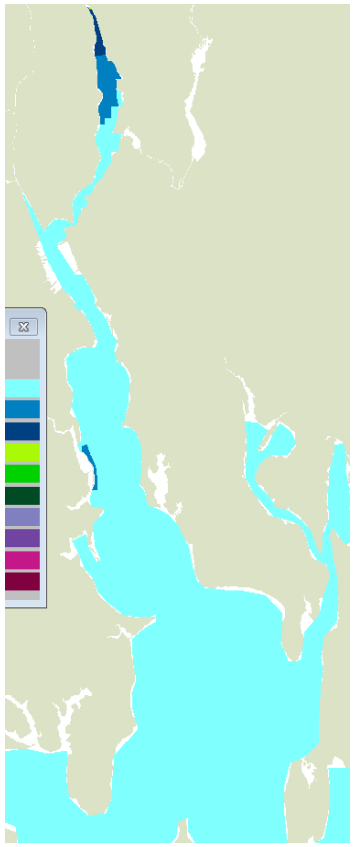
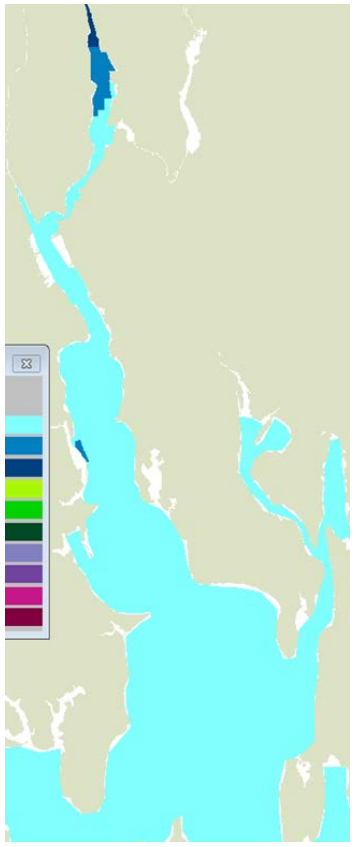
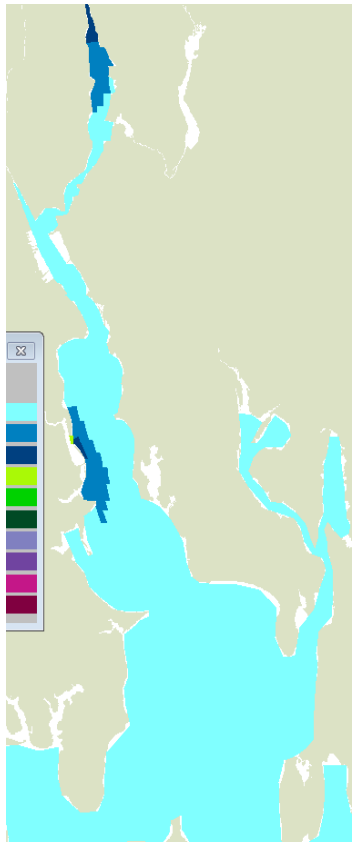
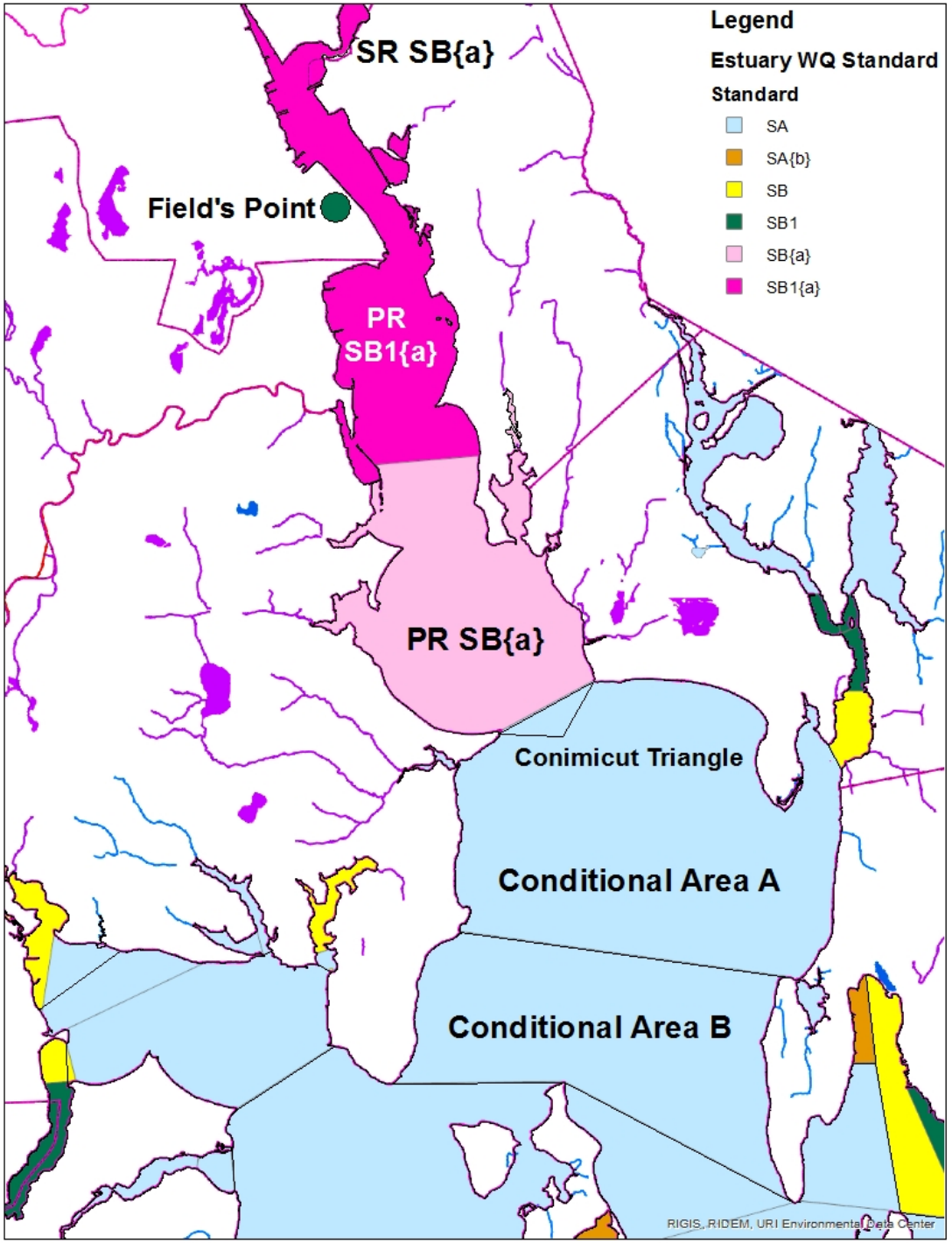
			

Estuary Water Quality Standard



Expected Water Quality Improvements by Alternative – 3 month storm

Alternative	Acre Days not Meeting Standard				
	Shellfishing		Swimming		
	Area B	Area A	PRSB	PRSBI	SRSBI
Post Phase II	1	10,700	8,920	9,200	1,400
1,2,3 (Tunnel Only)	0	5,640	5,440	7,550	1,260
1,2,3 (Full Phase III)	0	1,790	1,710	5,500	1,180
Alternative 4	0	7,660	6,960	8,460	1,300

Conclusions about Water Quality Improvements

- Water Quality standards are not met for the design storm for any of the alternatives
- Completed Alternatives 2 and 3 provide much better water quality results than Alternative 4
- Completed Alternative 4 is less effective than tunnel only under Alternatives 2 and 3

What’s Affordable?

EPA Affordability Criteria Phase I Evaluation

Financial Impact	Cost per Household
Low	Less than 1.0 percent of MHI
Mid-Range	1.0 - 2.0 percent of MHI
High	Greater than 2.0 percent of MHI

Baseline NBC Capital Plan

Year	WWTF Improvements	Infrastructure Management	Sewer Improvements & Interceptor Repair	CSO Phase II	CSO Phase III	Annual Total
2015	$22,476,211	$1,965,578	$3,018,930	$35,594,214	$10,655,899	**$73,710,832**
2016	25,743,500	1,686,900	5,226,363	8,924,731	10,655,899	**52,237,393**
2017	5,056,024	856,761	4,532,276	4,773,530	21,311,798	**36,530,389**
2018	2,125,922	621,300	5,325,966	0	2,841,573	**10,914,761**
2019	2,191,826	722,207	5,167,229	0	91,831,056	**99,912,317**
2020	2,259,772	564,943	2,259,772	0	97,340,231	**102,424,719**
2021	2,329,825	582,456	2,329,825	0	158,255,266	**163,497,372**
2022	2,402,050	600,512	2,402,050	0	158,255,266	**163,659,878**
2023	2,476,513	619,128	2,476,513	0	90,729,431	**96,301,586**
2024	2,553,285	638,321	2,553,285	0	49,717,079	**55,461,970**
2025	2,632,437	658,109	2,632,437	0	49,136,897	**55,059,880**
2026	2,714,043	678,511	2,714,043	0	0	**6,106,596**
Total	**$74,961,407**	**$10,194,726**	**$40,638,689**	**$49,292,475**	**$740,730,396**	**$915,817,693**

Determination of Cost Per Household for Baseline Case

Row	Item	Unit	Value
Current Costs			
100	Annual O&M Costs	($s)	$ 40,955,964
101	Annual Capital and Debt Service	($s)	45,461,965
102	Subtotal	($s)	$ 86,417,929
Projected Costs			
103	Estimated Annual O&M Costs	($s)	$ 489,850
104	Estimated Annual Capital and Debt Service	($s)	66,675,714
105	Subtotal	($s)	$ 67,165,564
106	Total Current and Projected Costs	($s)	$ 153,583,493
107	Residential share of total costs	($s)	$ 93,753,926
108	Total number of Households in Service Area		118,683
109	Cost Per Household	($s)	$ 789.95

Determination of EPA Phase I Evaluation Residential Indicator

NBC Service Area MHI (2015)*	$47,165
Cost Per Household	$790
CPH/MHI	1.67%

*All Communities

EPA Affordability Criteria Phase II Evaluation

Indicator	*Strong*	*Mid-Range*	*Weak*
Bond Rating	AAA-A (S&P) or Aaa-A (MIS)	BBB (S&P) or Baa (MIS)	BB-D (S&P) or Ba-C (MIS)
Net Debt/Property Value	Below 2%	2% - 5%	Above 5%
Unemployment Rate	>1% below National Ave.	±1% of National Ave.	>1% above National Ave.
Median Household Income	>25% above adj. Nat'l MHI	±25% of adj. Nat'l MHI	>25% below adj. Nat'l MHI
Prop. Tax/Property Value	Below 2%	2% - 4%	Above 4%
Prop. Tax Collection Rate	Above 98%	94% - 98%	Below 94%

Determination of EPA Phase II Evaluation Financial Capability Indicators

Row	Item	Value	Score
901	Bond rating	AA-	3
902	Net debt percent of property value	1.4%	3
903	Unemployment rate compared with national average	+ 1.9%	1
904	Median household income compared with national average	14.5%	2
905	Property tax revenue percent of property value	2.67%	2
906	Property tax revenue collection rate	96.25%	2
907	Permittee indicator score		2.17

EPA Financial Capability Matrix Phase I and II Evaluations

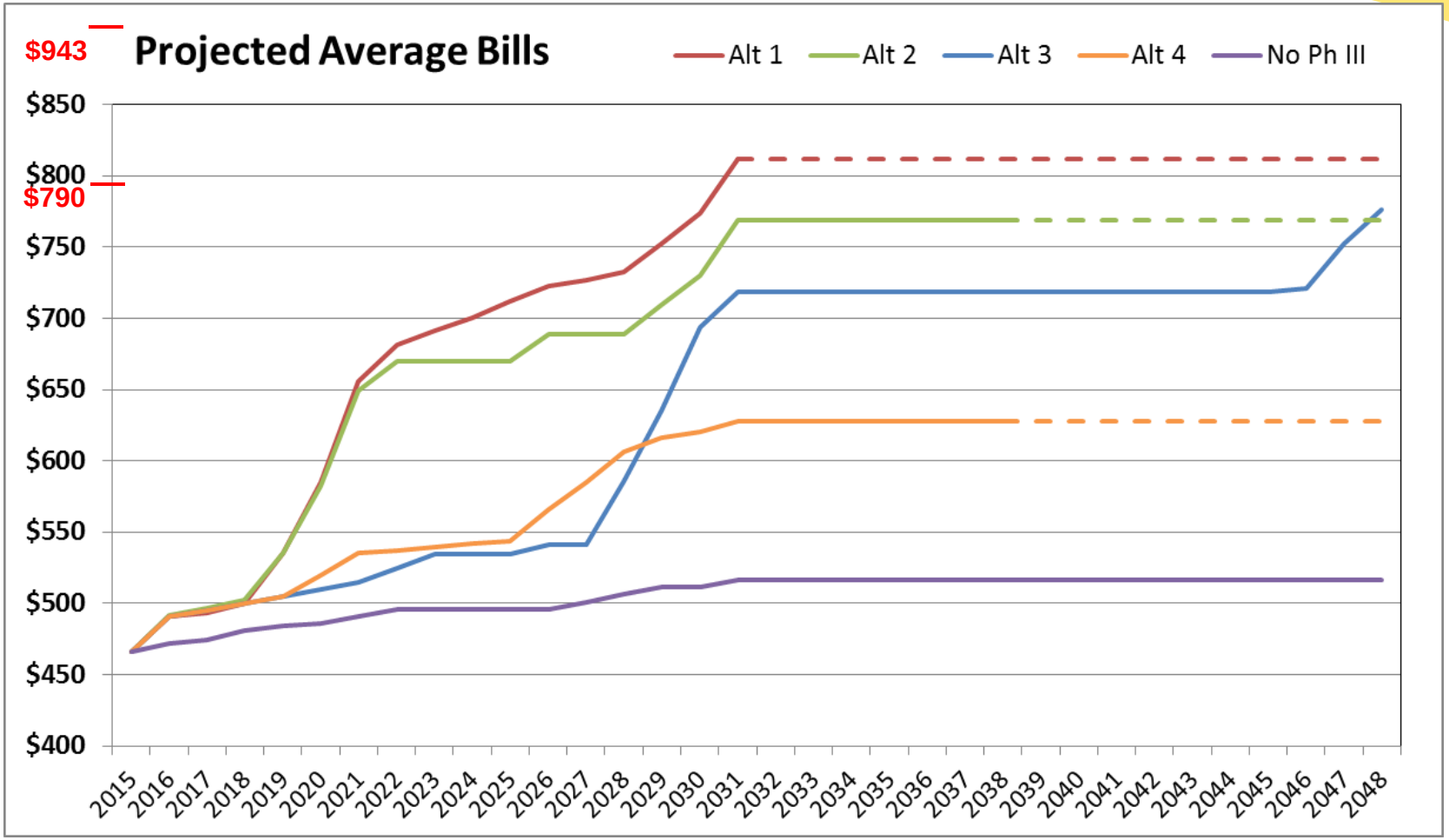
Permittee Financial Capability Indicators Score (Socioeconomic, Debt & Financial Indicators	Residential Indicator (Cost per Household as a percentage of MHI)		
	Low (below 1.0%	Mid-Range (between 1.0 and 2.0%)	High (greater than 2.0%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

MHI of Entire Service Area

1.67% → $790

2.00% → $943

Projected Average Bills



Conclusions of EPA Affordability Analysis

- Cost Per Household = $790 = 1.67%MHI = Medium Burden = Affordable
- Cost Per Household ≥ $943 = 2% MHI = Unaffordable
- All 4 Alternatives are affordable considering the entire service area
- More detailed analysis warranted for Providence, Pawtucket and Central Falls

2% of MHI by Community

Affordable Rates for Providence, Pawtucket and Central Falls

	2% MHI	Local Costs*	NBC Rate
Providence	$740	$159	$581
Pawtucket	$800	$174	$626
Central Falls	$560	$98	$462
Weighted Average	$742		$580

* For Sewer Maintenance and stormwater

Number of Households With Rate >2% MHI – Baseline Case

Year	Rate	# of HH > 2% MHI	% of HH > 2%
2015	$466	45,000	38%
2020	$568	50,000	42%
2023	$761	62,000	52%
2026	$812	64,000	54%

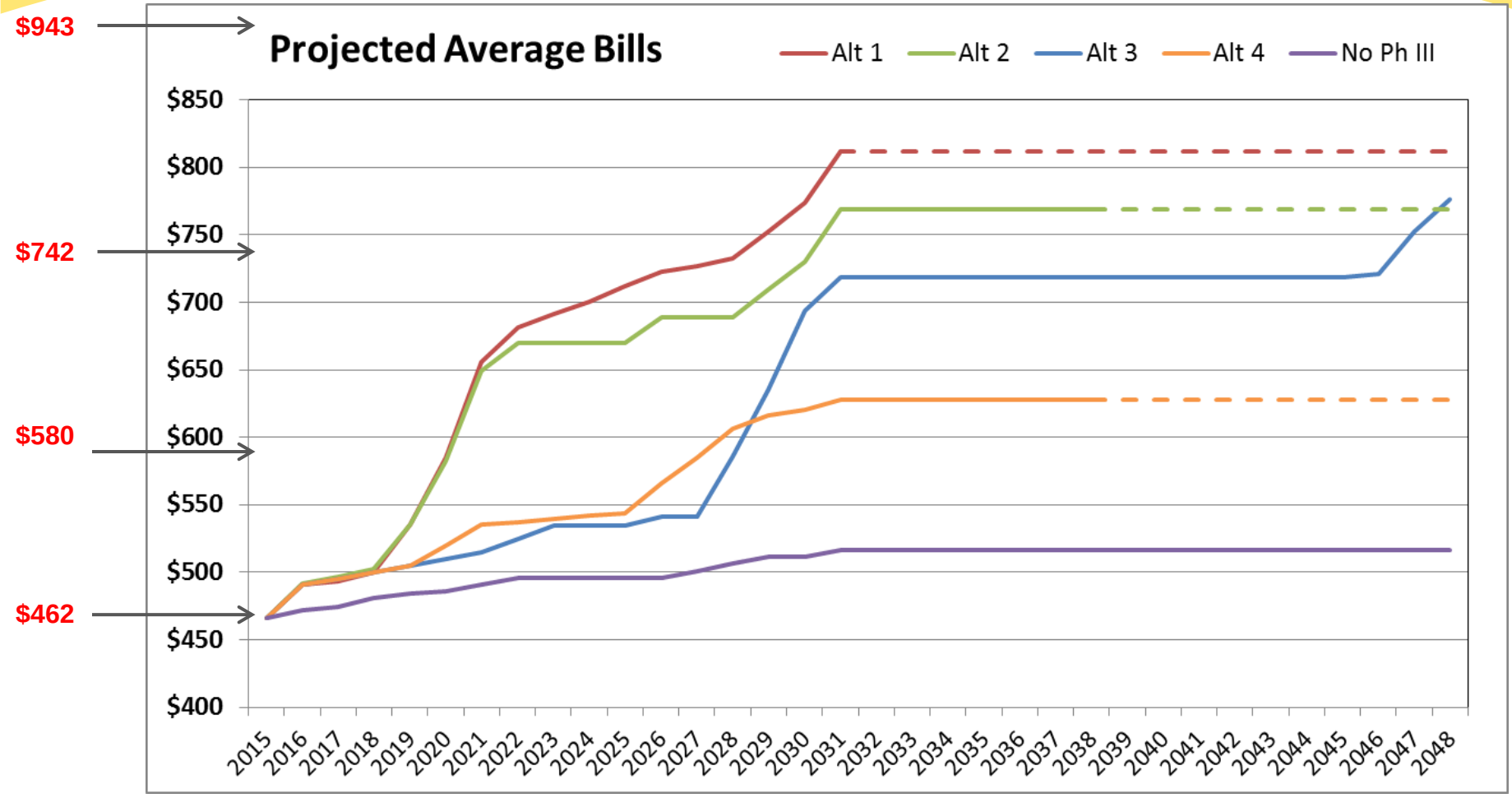
Notes: Total Number of Households in Service Area = 118,526

What is an Affordable Rate for NBC to Charge

Criteria	Rate
Central Falls 2% MHI minus Local Cost	$462
Providence, Pawtucket, CF 2% MHI minus Local Cost	$580
Providence, Pawtucket, CF 2% MHI (no local cost)	$742
2% MHI entire service area (no local cost)	$943

Projected NBC Rates with Phase III Assuming Baseline Case	
2015	$466
2020	$568
2023	$761
2026	$812

Projected Average Bills



PFM
Rate Modeling

- Consistent with NBC modeling methods for rate impact assessment
- Present values of the capital and O&M
  - Includes NBC's base capital plan
  - Layers on projected costs for the CSO Phase III Facilities
- Generates annual revenue requirements and the resulting cumulative rate impacts

PFM Assessment

- Differences between PFM and MWH Models:
  - First year of PFM model is 2016 (MWH is 2015)
  - CSO Phase III Capital Costs inflated at 3%/year through the first year of the implementation of that phase (MWH 2018)
  - Debt service reserves funded through bond proceeds (MWH cash)
  - No O&M reserve fund (MWH 90 day O&M reserve)
  - Prior year surplus revenues not used until the year after generated (MWH same year as revenue generated)
  - Level debt (MWH deferred principal)

PFM Assessment

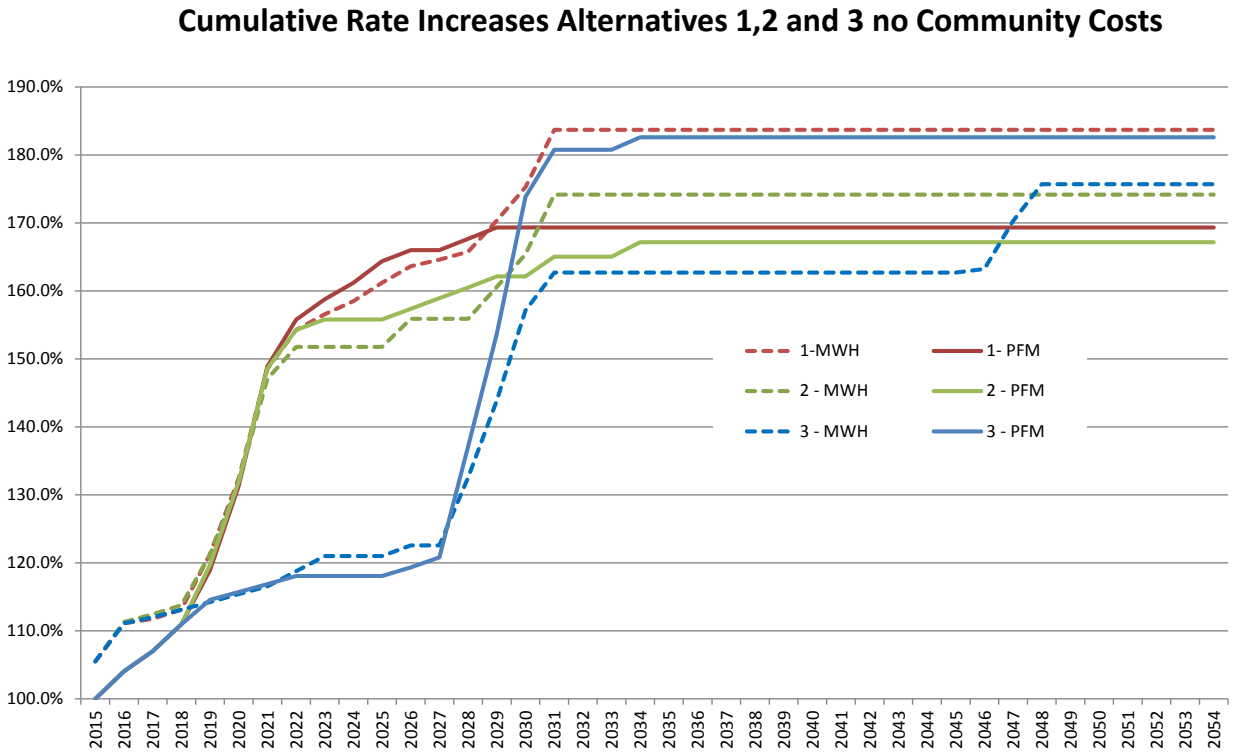
- The baseline cost of Alternative 1 is lowest, followed by Alternative 2, and then Alternative 3 as the most expensive
- Cost is defined as the present value (3% discount rate) of all incremental O&M costs, plus the present value of all debt service payments issued by bonds in years 2016 and after

Cap Ex	Cost		
Alternative	PV DS	PV O&M	Total Cost
1	$ 702,980,358	$ 8,508,178	$ 711,488,536
2	720,674,027	16,343,082	737,017,109
3	$ 780,628,373	$ 37,426,777	$ 818,055,150

PFM Assessment

Cumulative Revenue Increases

- Alternative 1: 169.3%
- Alternative 2: 167.2%
- Alternative 3: 182.6%



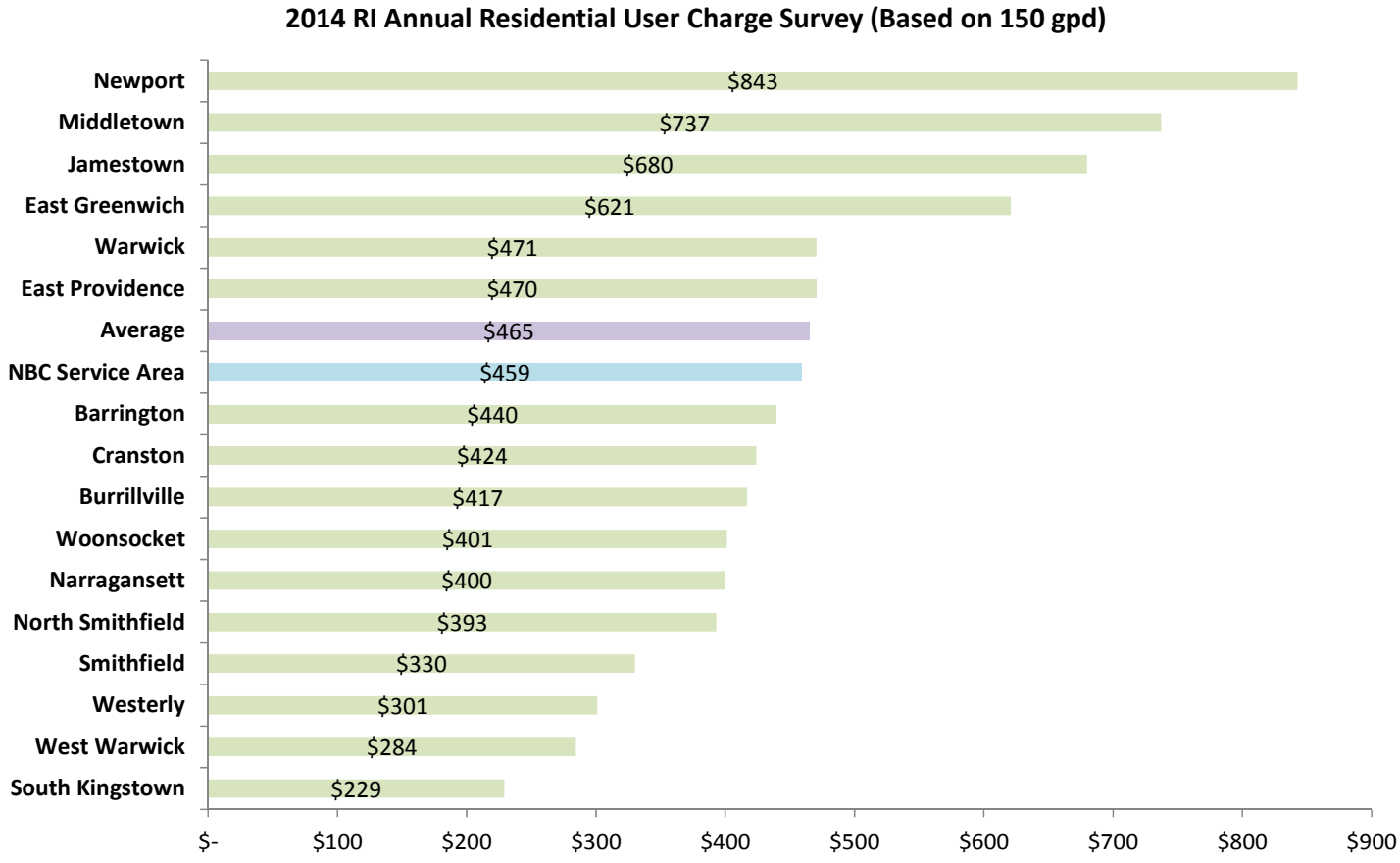
PFM Assessment

PFM Analysis shows that Alternative 2 has the least impact on rates

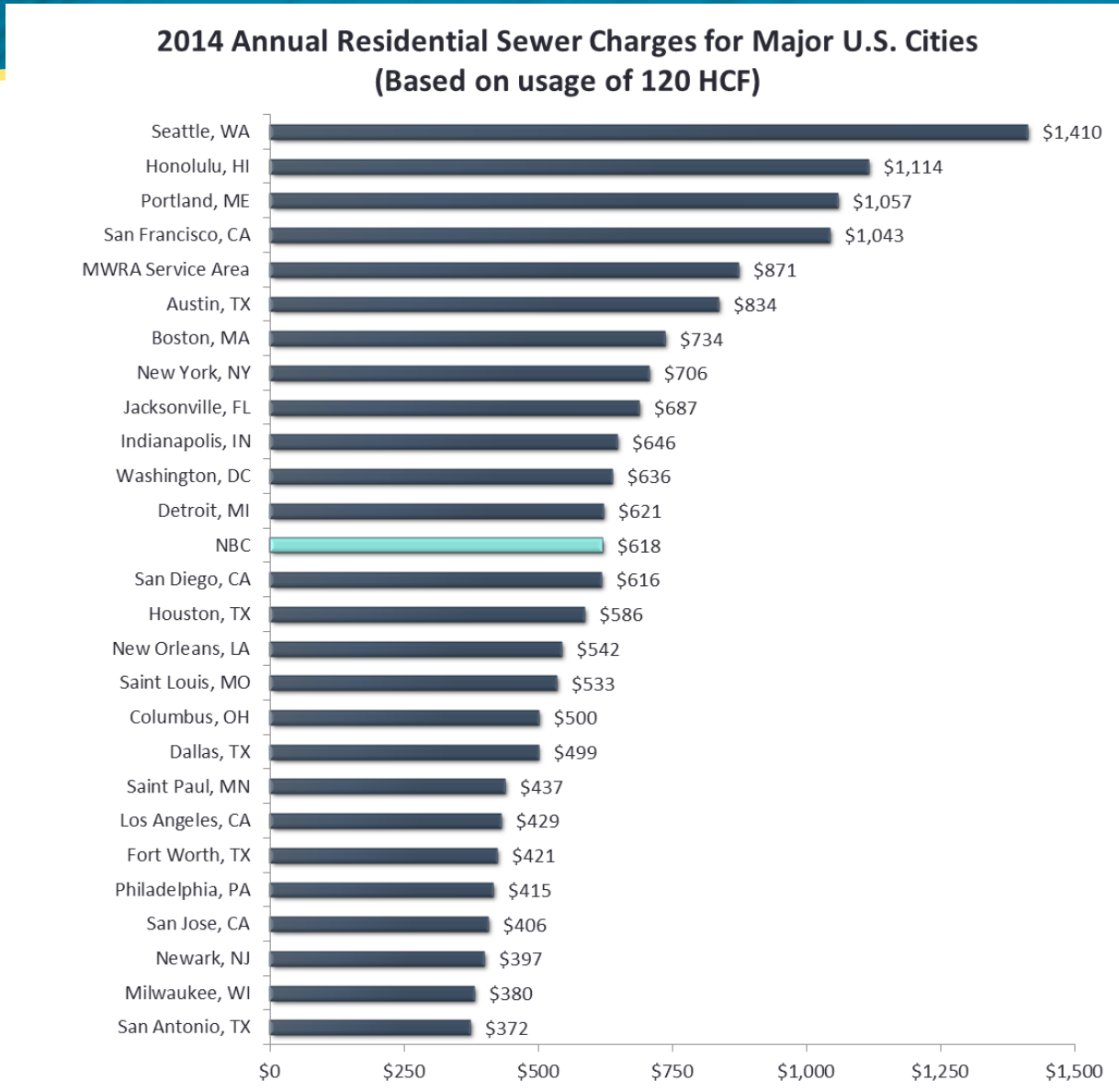
Projected Rates

Year	Annual Rate
2015	$ 459
2020	605
2025	715
2030	744
2035	767
2040	$ 767

2014 RI Annual Residential User Charges



2014 Annual Residential Sewer Charges for Major U.S. Cities vs. NBC



Next Steps

• Board Selects Alternative	April-May 2015
• Complete Reevaluation Report	June 2015
• Submit to RIDEM	July 2015
• DEM Review	July 2015-Nov 2015
• Negotiate Revision to Consent Agreement and Schedule	Nov-Dec 2015
• Sign Revised Consent Agreement	Jan 2016

Phase III Schedule for Implementation

• Preliminary Design	January 2016 - June 2017
• RIDEM Review	July 2017 - December 2017
• Final Design	January 2018 - June 2019
• RIDEM Review	July 2019 - December 2019
• Bid Award	January 2020 - June 2020
• Construction Phase III-A	July 2020 - July 2025

Narragansett Bay Sewer Economic Impact Analysis

Prepared for Narragansett Bay Commission – February 18, 2015

ECONOMIC AND REAL ESTATE ANALYSIS FOR SUSTAINABLE LAND USE OUTCOMES™

Economic Impact Analysis

The economic impacts of the various Combined Sewer Overflow Program's Phase 3 alternatives are highlighted below. In order to adequately detail and evaluate the economic impacts of the Phase 3 alternatives, 4ward Planning calculated the direct, indirect, and induced economic impacts associated with each scenario, over the course of the period of investment. According to our analysis, the four alternatives range from over 2,200 jobs (full- and part-time) by Alternative 4, to over 4,300 jobs created by Alternative 2. Similarly, Alternative 2 represents the greatest economic output and state and local taxes impacts relative to the other alternatives. As highlighted in the following section, Alternative 1 offers the greatest annualized return/increase on/of employment, economic output, and state and local taxes relative to the other alternatives. Consistent with its lower amount of total investment, Alternative 4 has the smallest economic impact in terms of employment, economic output, and state and local taxes.

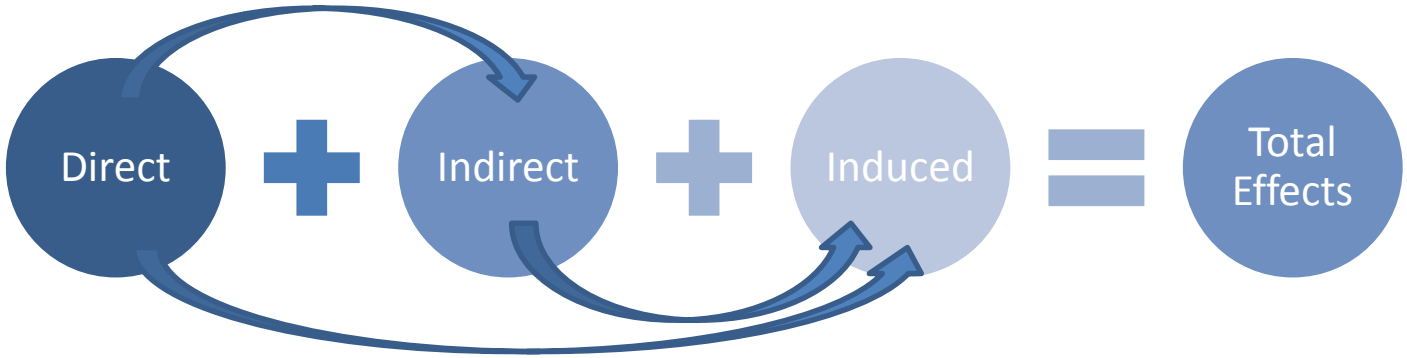
Summary of Total Economic Impacts of Phase 3 Alternatives

Narragansett Bay Commission Service Area

	Time Period	Total Investment (nominal dollars)	Employment	Output (millions, current dollars)	Output (millions, inflated-adjusted dollars)*	State and Local Taxes (millions, current dollars)	State and Local Taxes (millions, inflation-adjusted dollars)*
Alternative 1	2015-2025	$740,730,396	4,083	$638.4	$788.2	$18.9	$22.8
Alternative 2	2016-2038	$815,608,351	4,317	$675.1	$911.1	$19.9	$26.5
Alternative 3	2016-2047	$924,464,066	4,191	$655.2	$884.3	$19.4	$25.7
Alternative 4	2016-2038	$451,599,999	2,263	$353.8	$477.5	$10.5	$13.9

* Calculated by the year in which the investment period ends

General Input-Output Impact Modeling - Example



Direct impacts are the result of a change in final demand.

For example, if $10 million is invested in building construction, increasing demand for buildings by $10 million…

Indirect effects result from changes in demand for factors of production.

…the $10 million increase in the construction industry sector revenue causes a $4 million increase in purchase orders to related industries, like lumber and heavy machinery.

Induced effects result from changes in household spending.

Building construction, lumber production, and heavy machinery manufacturing pay their workers wages to deliver various products, enabling workers to spend an additional $100,000 within the regional economy.

Total effects are the combination of direct, indirect, and induced effects.

The total effect of a $10 million increase in building construction demand, then, is equal to $14.1 million ($10 million + $4 million + $100,000).