

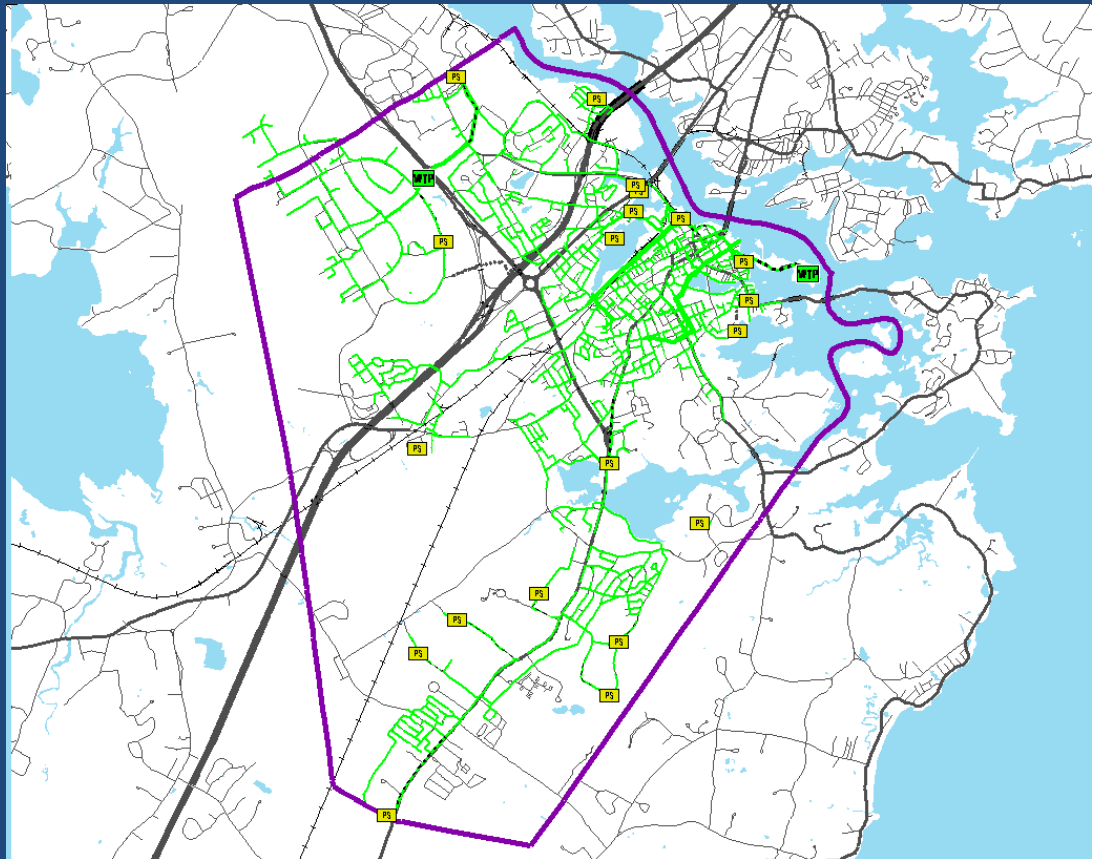
Public Input Meeting

Wastewater Master Plan

April 27, 2010

The Portsmouth Wastewater System

- ~ 115 miles of Collection System
- Urban area is Combined Stormwater and Sanitary Flow
- 20 pumping Stations
- 3 Permitted Active Combined Sewer Overflows (CSOs)





Permit
Limits

Site
Selection

Affordability

Master Planning

Sustainability

Complex Decision Making Process

Regulatory
Input

Public
Input

Wastewater
Flows

Technology



Master Planning Process

- Iterative planning process reduces complexity
- Start at the 30,000 foot level and work down as information becomes available
- Findings will evolve as planning process progresses
- Public input throughout process reduces re-evaluations and re-work

Key Issues

- The regulatory framework is constantly changing
- City has been working to comply with the Clean Water Act since its passage
- Required improvements are not due to growth
- Low permit limits = complex technologies
- Solution must be implementable
- Solution must be affordable
- Solution must be acceptable to City

Regulatory History

- Clean Water Act passed in 1972.
 - Required Facilities Planning (201 Plan)
 - Required secondary treatment of sewage discharges
 - Set timetable for compliance
- Amendment in 1977 provided for a “301 (h)” waiver, allowing primary treatment for specific marine discharges.

City's Wastewater History

- Pre-1964 – Sewer collection system discharged directly to river at multiple points
- 1964 - Peirce Island Primary Treatment Plant Constructed
- 1972 - Clean Water Act passed
- 1977 – First 201 Facilities Plan prepared

History (cont.)

- 1980 - Secondary plant designed
- 1982 - State prepares 301(h) waiver
 - State and City jointly submit to EPA.
- 1985 - Permit issued w/301(h) waiver
- 1987 – Advanced primary WWTF designed
- 1990 – First EPA Consent Decree issued
 - CSO related issues

History (cont.)

- 1992 - Plant upgrades completed
 - Permit application submitted w/301(h)
- 2002 - City prepares collection system
CSO - LTCP
- 2005 - EPA issues draft permit w/301(h)
 - Twenty years after first permit issued
 - Five year permit cycle, no permit renewal for 15 years

History (cont.)

- 2007 – EPA rescinds draft permit
 - NPDES permit issued requiring Secondary Treatment,
 - Master Plan begins
- August 2007 – EPA issues Administrative Order
- May 2009 – DES states 8 mg/L TN limit for Great Bay WWTFs

History (cont.)

- September 2009 – EPA issues Consent Decree
 - Concurred with City that phased expansion of Pease WWTF is preferred option
- October 2009 – EPA / NHDES performed dye tracer study

History (con't)

- December 2009 – City issues Treatment Alternative memorandum identifying phased expansion of Pease WWTF as preferred option
 - EPA indicates 8 mg/L TN limit unsupportable
- January 2010 – NHDES states that Pease Outfall may not be viable for higher flows
- March 2010 - City Staff briefed by regional and national EPA

History (cont.)

- April 2010 – NHDES states that a phosphorus limit will likely be added to a future NPDES permit for both Pease and Peirce Island WWTFs
- June 2010 – Draft Wastewater Master Plan is required to be submitted to EPA and NHDES
- September 2010 – Final Wastewater Master Plan is required to be submitted to EPA and NHDES

Regulatory Summary

- The City must construct a new/upgraded WWTF
- Consent Decree requires submission of complete draft Master Plan by June 1, 2010 with final submission September 1, 2010
- The WWTF must be designed to treat to the required permit limits, which are yet to be determined
- Direction on permit limits from regulators has been constantly evolving
- The City will continue to work with regulators to clarify the permit limits

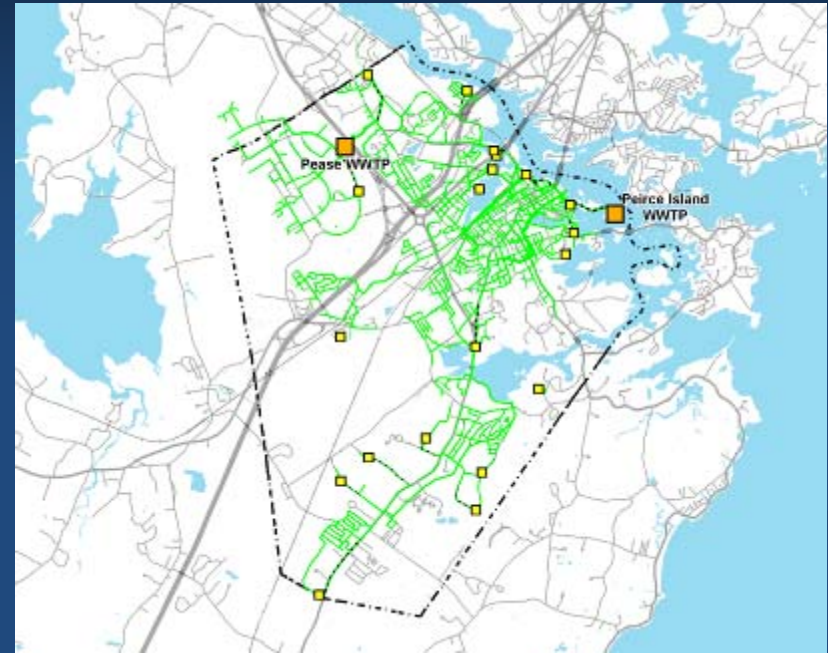
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Projects Completed Since 1997 (over \$25M)

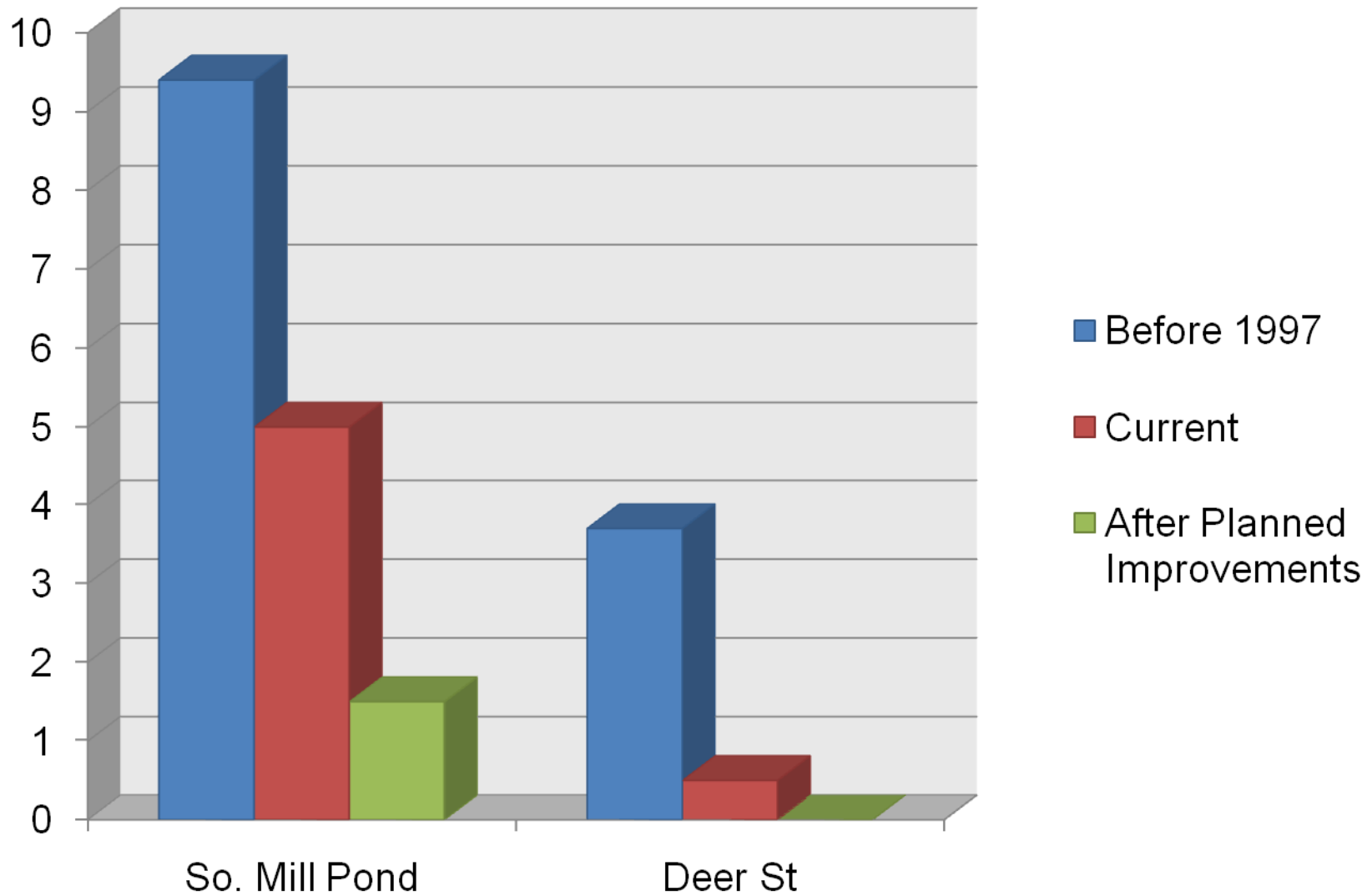
- Peirce Island Bridge Forcemain
- Essex Sheffield Separation
- Thaxter Fells Separation
- Pannaway Manor Separation
- Brickbox Cleaning
- Brackett Road Sewer Extension
- Peirce Island WWTP Improvements
- Mechanic Street Pumping Station Upgrade
- Route One Sewer Improvements
- Upper Court Street (LTCP)
- South Mill Pond Area - Contract 1 (LTCP)



Projects Completed Since 1997 (con't)

- South Street Sewer Separation
- Pease Interceptor Upgrade
- Lafayette Road Pumping Station Upgrade
- SCADA System Upgrade
- Gosling Road Pumping Station Upgrade
- Dennett Street Sewer Separation
- Pleasant Point Sewer Extension
- Lower Court Street (LTCP)
- Deer Street Pumping Station (LTCP)
- Borthwick Avenue Sewer (LTCP)

Estimated Typical Year CSO Volumes Discharged



Projects Concurrent with Master Plan

- Mechanic Street - **Completed**
- Bartlett Street – **Under Construction**
- Lincoln Area 3A – **Construction Starts Summer 2010**
- State Street – **Under Construction**
- Cass Street Area – **Under Design**
- Evaluating interim measures to control nitrogen and total suspended solids which can be implemented within the current NPDES Permit cycle – **On-going**

- City has been working to comply with the Clean Water Act since its passage

Key Issues

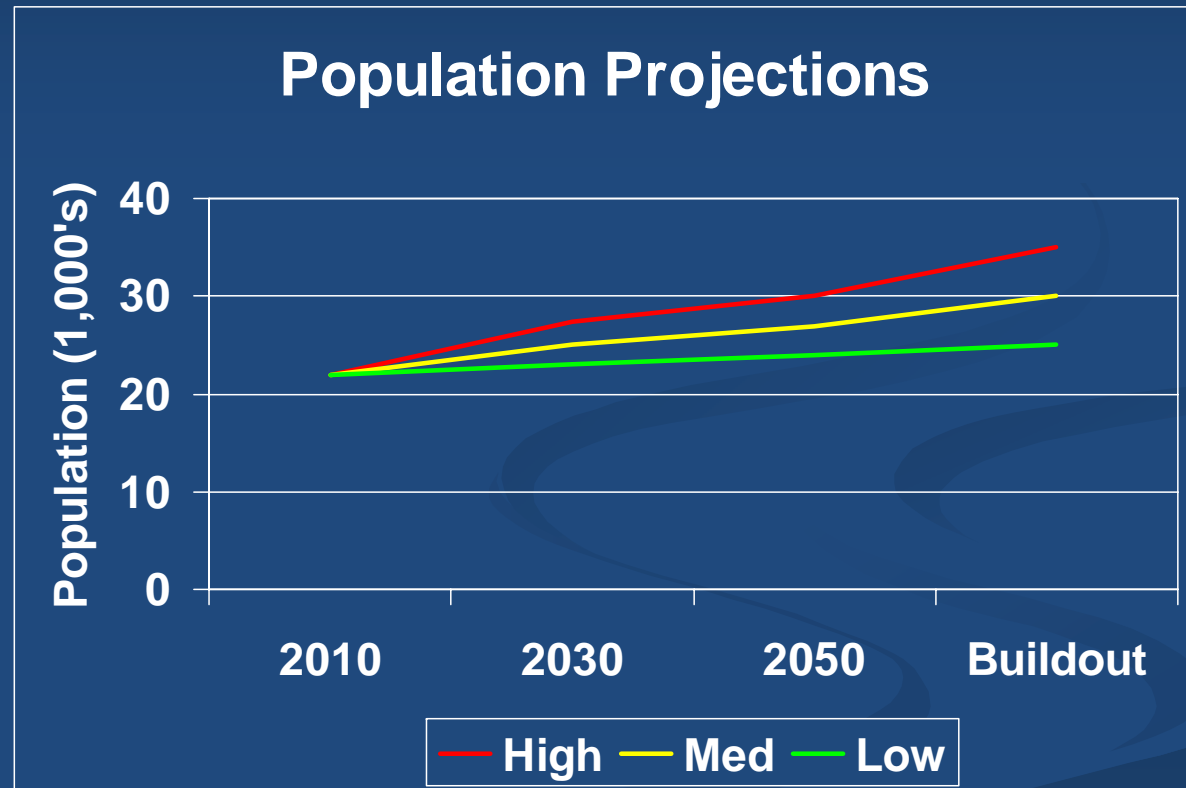
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Future Wastewater Flows

- Population / Employment
 - Current 20,800 / 28,800
 - Year 2030 24,400 / 35,700
- Wastewater Flows
 - Current Max Month Flow 10 MGD
 - Future Max Month Design Flow 12 MGD (2030)

Flow Projections

- Current Zoning
- Water use records
- Monitoring data
- Flow/person
- Flow/House
- Flow/Business



Improvements Required due to Regulatory Changes, not Growth

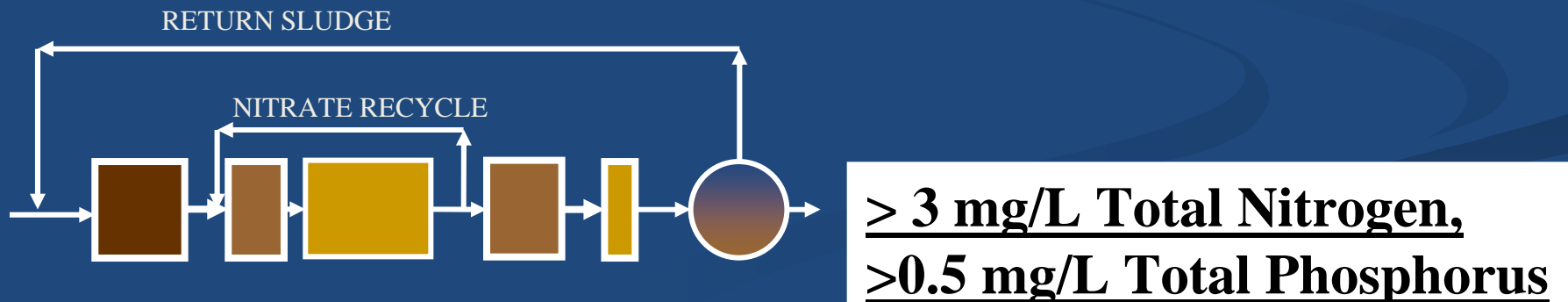
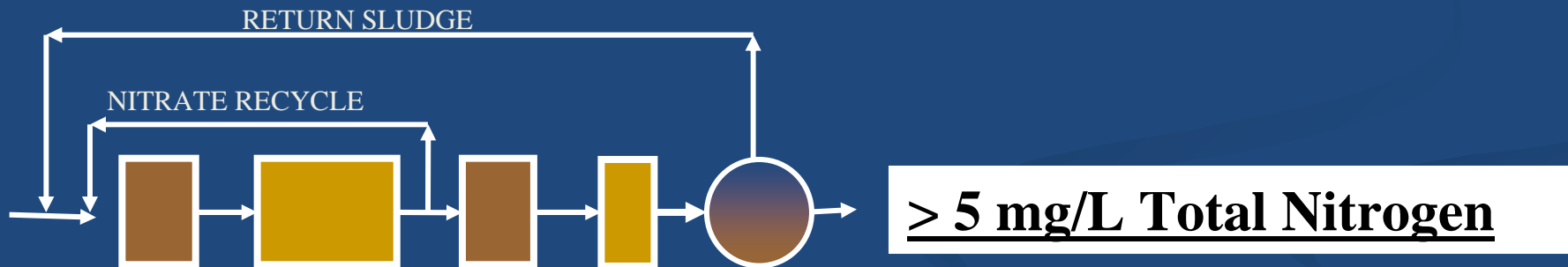
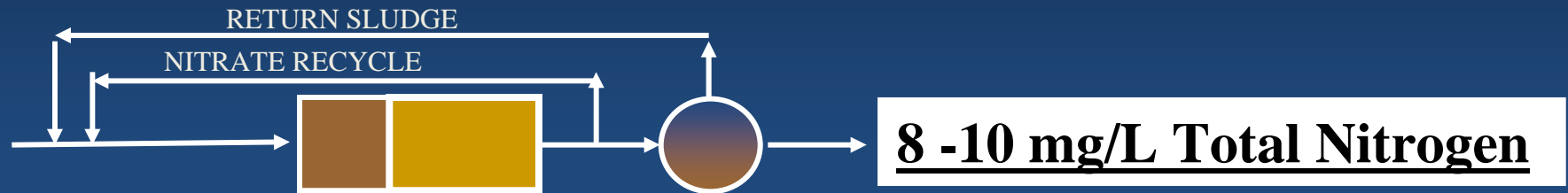
- Limited growth within Portsmouth through 2060
- Loss of the 301(h) waiver requires the City to treat its wastewater to secondary levels
 - The Peirce Island WWTF cannot meet secondary treatment levels as configured
 - The Pease WWTF is too small to treat City's wastewater flows
- Regulatory actions concurrent with Master Plan will require additional treatment for nutrient removal

- Required improvements are not due to growth

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Nitrogen Reduction



What Will the Nutrient Limits Be?

- EPA has suggested that a total nitrogen limit of 3 mg/L may be required
 - This is considered the limit of technology in warmer climates
 - To reach these limits, methanol will be required in the treatment process
- The previous support by NHDES of an 8 mg/L limit appears to be fading
- The phosphorus limit may be 1 mg/L
 - This is achievable biologically, but will require additional treatment tanks

Current Alternatives



Current WWTF Alternatives

- Expand the Pease facility
 - Pumping back to Peirce Island may be required
- Upgrade Peirce Island facility
 - Regulatory and construction issues may impact ability to stay within the fence line

Each alternative impacts the collection system
CSO LTCP

Modifications to Pease for 7.5 mgd WWTF TN of 5 mg/L



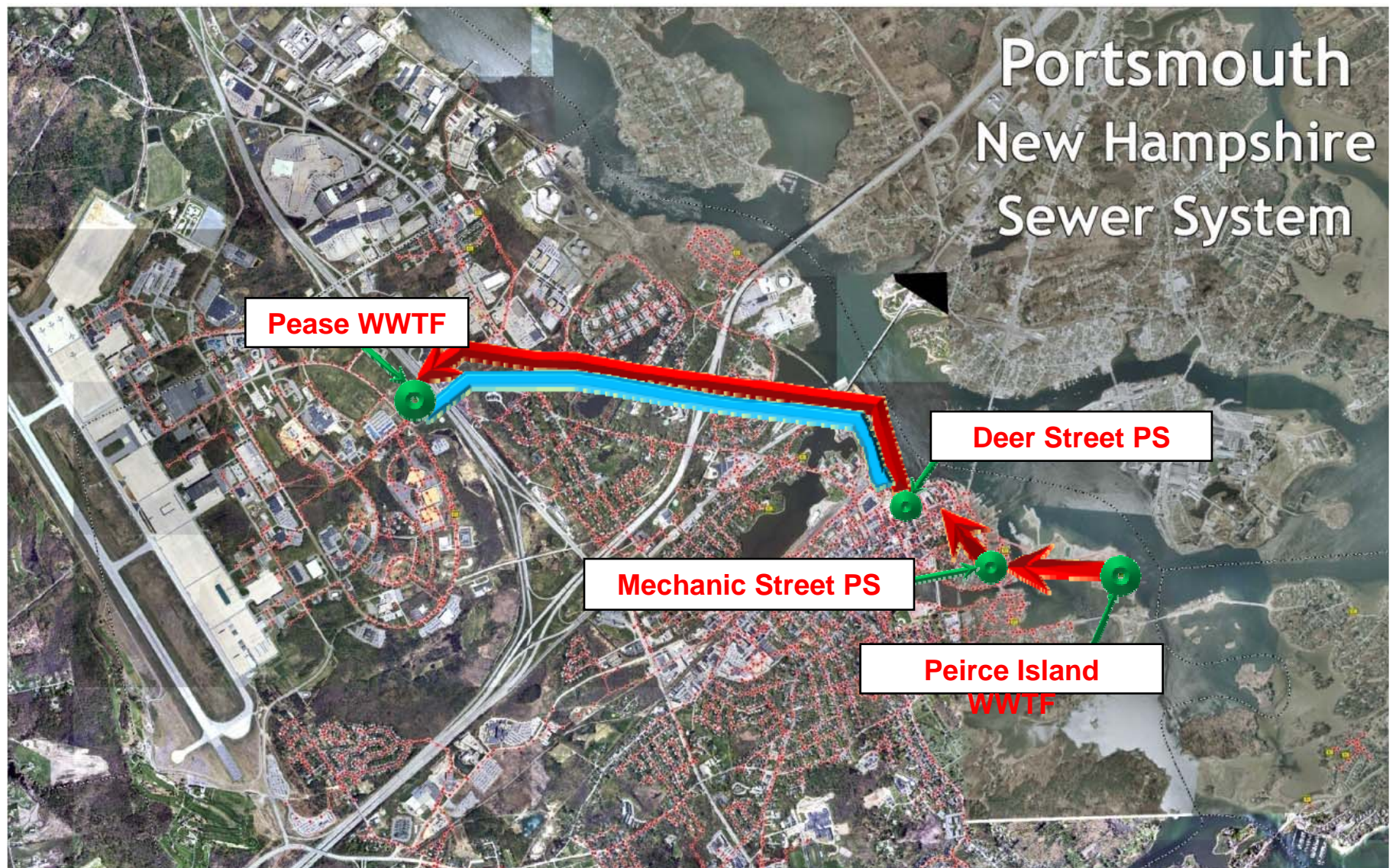
Pease SBR Expansion - Pros

- Can meet low total nitrogen limits
- Proven technology
- City currently runs SBR system
- Construction can be phased over time to reduce rate impacts
- Consistent with Public Goal of not expanding the Peirce Island WWTF

Pease SBR Expansion - Cons

- Will require additional pumping to reroute flow to Pease
- May require pumping back to Peirce Island outfall for discharge increasing cost
- If Pease outfall is used, EPA may impose stricter permit limits than at the Peirce Island outfall
- The Peirce Island WWTF will continue to operate as a wet weather treatment system

Re-routing Flows to Pease WWTF



Re-routing / CSO Capital Costs- Pease Option

Re-Routing

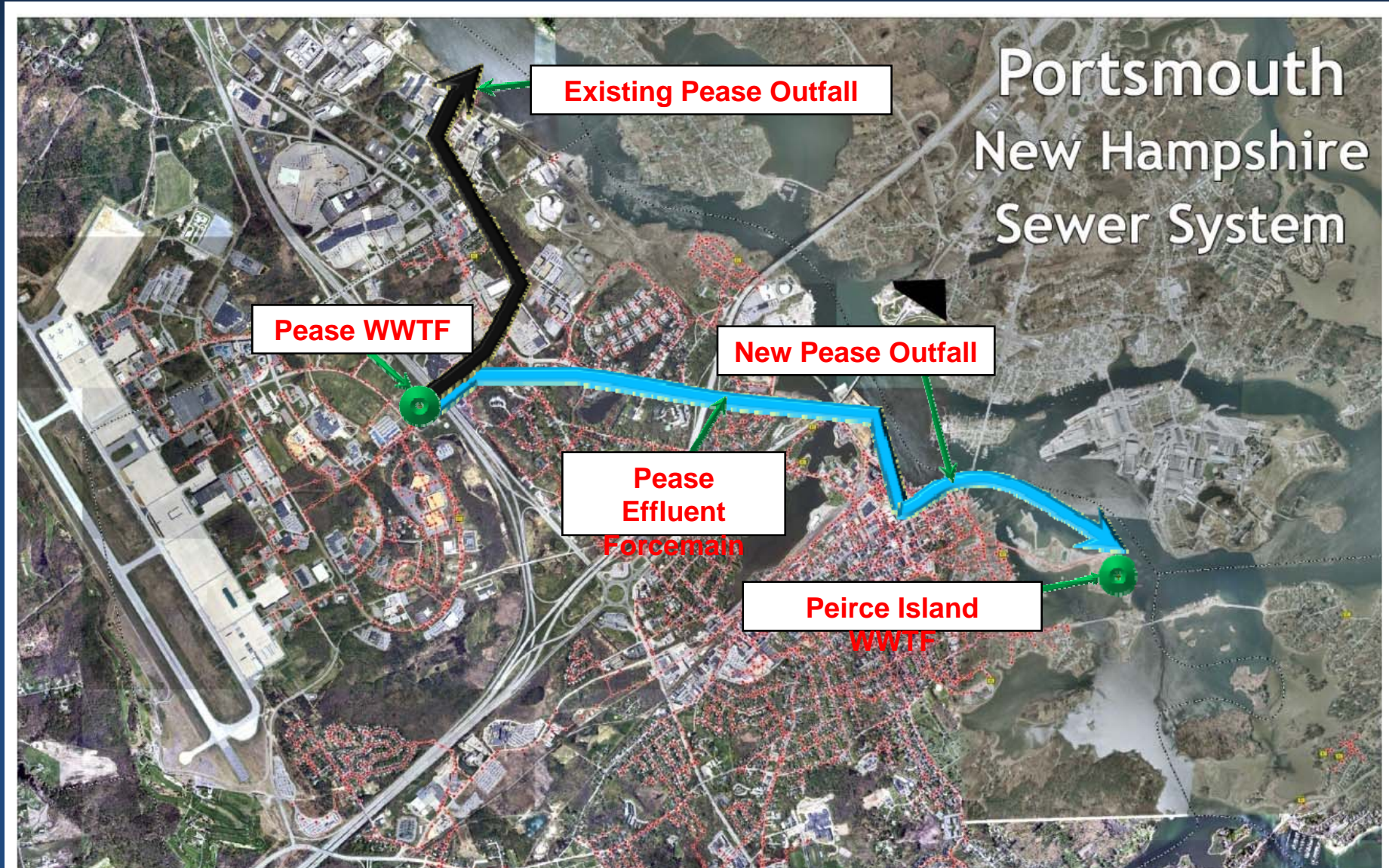
Deer Street PS/FM	\$ 5 M
Mechanic Street DW PS/FM	\$ 9 M
Peirce Island PS/FM	<u>\$ 2 M</u>
	\$ 16M

CSO Improvements

Parrott Avenue Upgrade	<u>\$ 4 M</u>
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Total \$ 20 M

Effluent Pumping to Peirce Island WWTF



Pease Effluent PS/FM to Peirce Island Outfall Capital Costs

Effluent Pump Station	\$ 2 M
FM Pease WWTF to North Mill Pond	\$ 4 M
<u>Subaqueous FM to Existing Outfall</u>	<u>\$ 8 M</u>
Total	\$ 14 M

Modifications to Peirce Island for 6.3 mgd WWTF TN of 5 mg/L



Peirce Island High Rate System - Pros

- Can meet low total nitrogen and phosphorus limits
- Maximize use of existing infrastructure
 - Both with collection system and WWTF

Peirce Island High Rate System - Cons

- Limited upgrade capacity
 - Upgrade to 2030 flows pushing limits of existing fence line
 - No room for future expansion within fence line
 - Waiver of the Shoreline Protection setback will likely be required for any work outside fence line
- Upgrade at Pease facility would still be necessary (particularly if phosphorus limit is issued)

Peirce Island High Rate System - Cons

- MBR process eliminated during technology screening
- Wet weather capacity cannot be utilized without
 - A new outfall or wet weather bypass to the existing outfall
- Difficulty of on-island construction
- Potential need for nested tanks will increase construction costs

Peirce Island High Rate System - Cons

- Counter to City's expressed goal of reclaiming Peirce Island
- Potential impacts to Fort Washington 106 Historic Review Process
- Additional truck traffic through central business district during construction and operations
- Challenging operations
- Upgrade cannot be phased

Benefits of Phased Construction

- Construction period is spread over time
 - May allow the development of an affordable, implementable schedule
 - Requires EPA approval
- Additional science can be collected
 - Potential to prove the viability of the Pease WWTF outfall
 - Would reduce the overall cost of the project
 - Would reduce the timeframe to implement
 - May prove higher nutrient limits are acceptable

- Low permit limits = complex technologies

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Implementation Concerns

Pease WWTF

- The NHDES has verbally stated that the Pease outfall cannot support the required effluent flow rate
- Loss of the Pease outfall, with use of an expanded Pease WWTF as the solution will require pumping back to the Peirce Island WWTF
 - This will add \$14 million to capital cost of project and \$50,000 in O&M costs per year

Implementation Concerns

Peirce Island WWTF

- There is no room for expansion, if required, within the fence line
 - With a potential phosphorus limit, it may not be possible to stay within the existing fence line with new construction
- Construction cannot be phased
- A high rate treatment system will be required
 - High energy cost
 - Challenging to operate

- Solution must be implementable

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Affordability Evaluation

- EPA guidelines allow for an affordability evaluation
 - This evaluation is currently being refined to reflect most recent alternatives
- If project is above affordability threshold, implementation can be phased over time or water quality standards can be adjusted

Affordability Evaluation

- An upgrade to the Peirce Island WWTF cannot be phased
 - Its not possible to adjust compliance schedule with this option
- An upgrade to the Pease WWTF can be phased
 - This will allow scheduled compliance

Cost Definitions

- Capital Costs
 - Costs to construct a facility, including engineering.
- Operating and Maintenance (O&M) Costs
 - Costs to operate a facility, on an annual basis
- Life Cycle Costs
 - The total of present value of 20 years of O&M costs plus the capital costs
 - Used to identify the lowest cost alternative

Capital Cost Breakdowns

- Consent Decree Capital Costs
 - Costs directly related to meeting the Consent Decree
 - Expenditure will be mandated by EPA
- Capital Improvement Plan (CIP) Costs
 - Non-consent Decree related costs necessary to keep the City's WWTFs in compliance
 - Includes the need to meet future permit limits

Alternative Capital Cost Comparison

Scenario	Capital Cost (\$M)				
	WWTF	Collection System	CSO Treatment		Total
TN 8					
Peirce Island	\$50	\$0	\$21		\$71
Pease (Pease)	\$48	\$16	\$4		\$68
Pease (PI)	\$48	\$30	\$4		\$82
TN 5					
Peirce Island	\$50	\$0	\$21		\$71
Pease (Pease)	\$69	\$16	\$4		\$89
Pease (PI)	\$69	\$30	\$4		\$103
TN 3					
Peirce Island	\$50	\$0	\$21		\$71
Pease (Pease)	\$69	\$16	\$4		\$89
Pease (PI)	\$69	\$30	\$4		\$103

Alternative Capital Cost Comparison

Scenario	Capital Cost (\$M)				
	WWTF	Collection System	CSO Treatment	Additional CIP	Total
TN 8					
Peirce Island	\$50	\$0	\$21	\$30	\$101
Pease (Pease)	\$48	\$16	\$4	\$18	\$86
Pease (PI)	\$48	\$30	\$4	\$18	\$100
TN 5					
Peirce Island	\$50	\$0	\$21	\$31	\$102
Pease (Pease)	\$69	\$16	\$4	\$18	\$107
Pease (PI)	\$69	\$30	\$4	\$18	\$121
TN 3					
Peirce Island	\$50	\$0	\$21	\$31	\$102
Pease (Pease)	\$69	\$16	\$4	\$18	\$107
Pease (PI)	\$69	\$30	\$4	\$18	\$121

Life Cycle Cost Comparison

Scenario	Capital (\$M)	Annual O&M (\$M)	Present Value O&M (5% , 20 yrs, \$M)	Life Cycle Cost (\$M)
TN 8				
Peirce Island	\$101	\$5.1	\$60	\$161
Pease (Pease)	\$86	\$5.6	\$66	\$152
Pease (PI)	\$100	\$5.6	\$66	\$166
TN 5				
Peirce Island	\$102	\$5.8	\$68	\$170
Pease (Pease)	\$107	\$5.1	\$60	\$167
Pease (PI)	\$121	\$5.2	\$61	\$182
TN 3				
Peirce Island	\$102	\$6.0	\$70	\$172
Pease (Pease)	\$107	\$5.2	\$61	\$168
Pease (PI)	\$121	\$5.3	\$62	\$183

Estimated Impact on Sewer Rates

Additional Debt (\$M)	User Rate (\$/Year)	% of Median Household Income
\$40	\$1,400	2.3%
\$60	\$1,600	2.7%
\$80	\$1,800	3.0%
\$100	\$2,000	3.3%

- Current average user rate is \$600 per year
- EPA affordability threshold is 2%

- Solution must be affordable

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Acceptable Solution

- The cost and public goal of reclaiming Peirce Island must be balanced
 - Peirce Island option has the lowest capital and life cycle cost if a Pease solution with pumping back to Peirce Island is required
 - The Peirce Island solution cannot be phased
 - Expansion at Pease is the lowest life cycle cost if pumping back to Peirce Island is not required
 - This option can be phased over time, reducing impact to user rates

Acceptable Solution

The final option will be an EPA determination with City's consent.

Key Issues

- Solution must be acceptable to City

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Where do we go from here?

- City has to build secondary WWTP
 - Ability to remove nitrogen and phosphorus must be considered
- Continue to refine alternatives
- Regulatory hurdles
- Regional cooperation
 - Additional science and data gathering being considered to support cost effective and sustainable solutions

QUESTIONS

???