CITY OF PORTSMOUTH WASTEWATER DIVISION

PEIRCE ISLAND FACILITIES UPGRADE

CITY COUNCIL WORKSHOP

APRIL 8, 2013

Topics for Discussion

- Introduction
- History
- Wastewater Master Plan
- Technology Selection Pilot Study
- Current Alternatives
- Next Steps
- Questions and Comments

History

- 1964 – Original Peirce Island WWTF Built
- 1980 - Secondary Treatment Plant was Designed
- 1982 - State Prepares 301(h) Waiver State and City Jointly Submit to EPA
- 1985 – NPDES Permit Issued w/301(h) Waiver
- 1987 - RSA – 149-B:1 - 95% State and Federal Funding
- Peirce Island WWTF Upgraded in 1990, 2002 as Advanced Primary Treatment
- 2005 - Draft Permit Issued by EPA with 301(h) Waiver – Appealed
- 2007 - New Permit Issued with Secondary Requirements

Public Process History

- During the Course of this Process, Have Given Over 40 Presentation on this Topic Including:
  - Wastewater 101 and 202
  - Numerous Quarterly Updates
  - Council Briefings and Public Input Sessions
  - Council Retreats
  - City-wide Neighborhood Association Meetings
  - Pilot Open House
  - City Wastewater Master Plan Website (www.portsmouthwwmp.com)

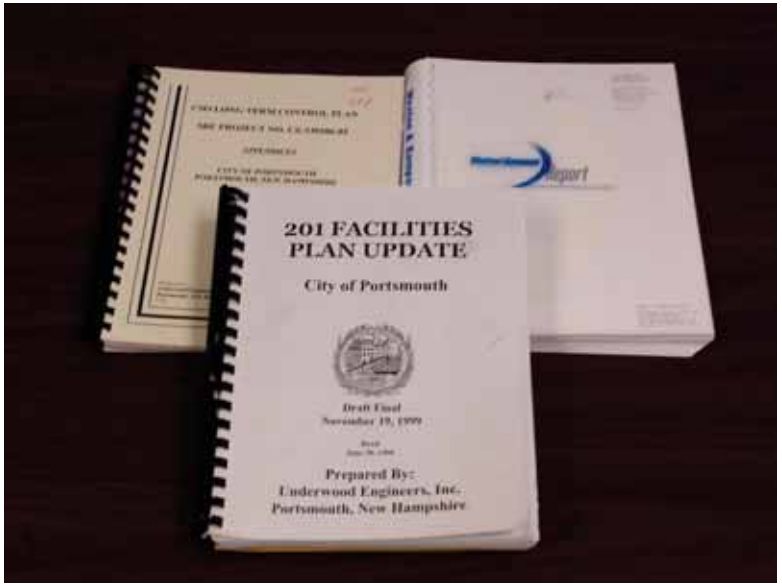
Wastewater Master Plan's Two Components

Collection System - Combined Sewer Overflows (CSO) Long Term Control Plan (LTCP)

Wastewater Treatment Facilities

Master Planning Goal

- Master Planning effort to ensure the selected treatment plant and collection system CSO LTCP alternatives would be:
  - Sustainable
  - Cost effective
  - Environmentally sound
  - Fulfills regulatory requirements
  - Fulfills funding requirements



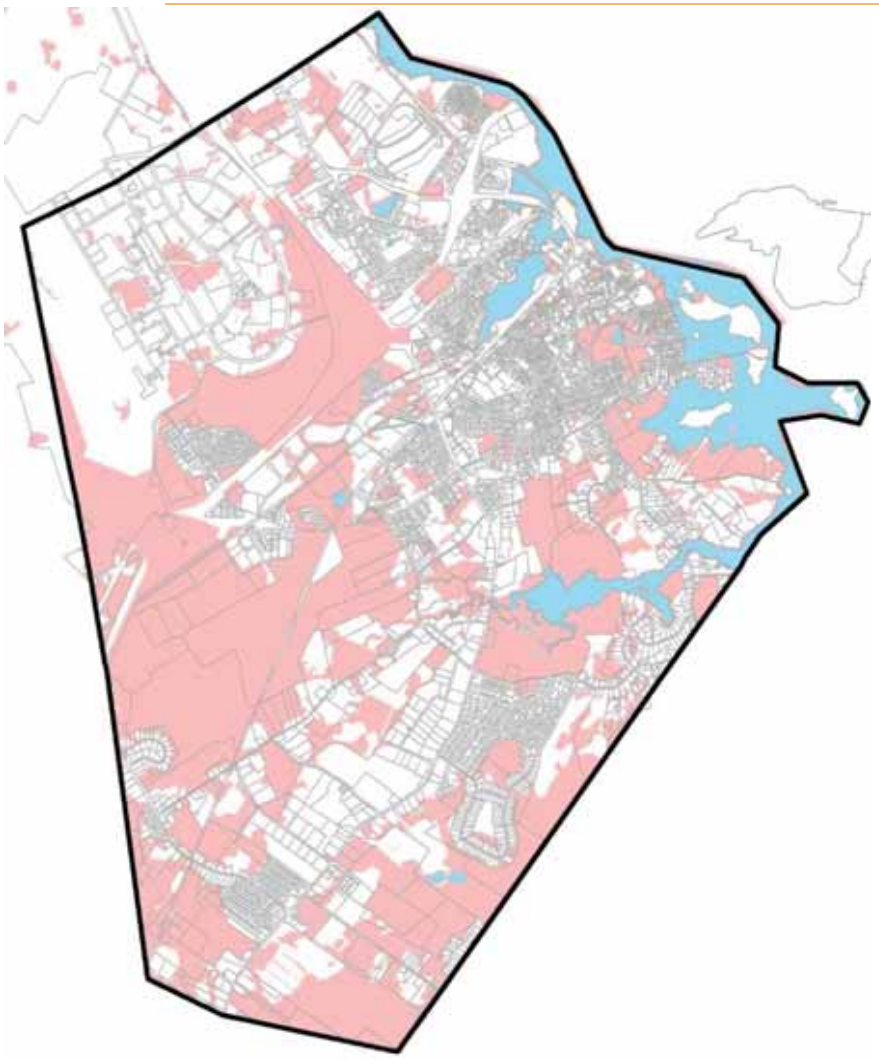
Wastewater Master Plan

- Development was not Driving Force for the Wastewater Master Plan
- Master Plan to Determine:
  - Current and projected flows and loads
  - Extent of regional involvement
  - Regulatory requirements
- Lay Ground Work to Size and Select Appropriate Technologies for New Treatment Plant and Collection System CSO LTCP Upgrades

Wastewater Master Plan Alternatives Assessment

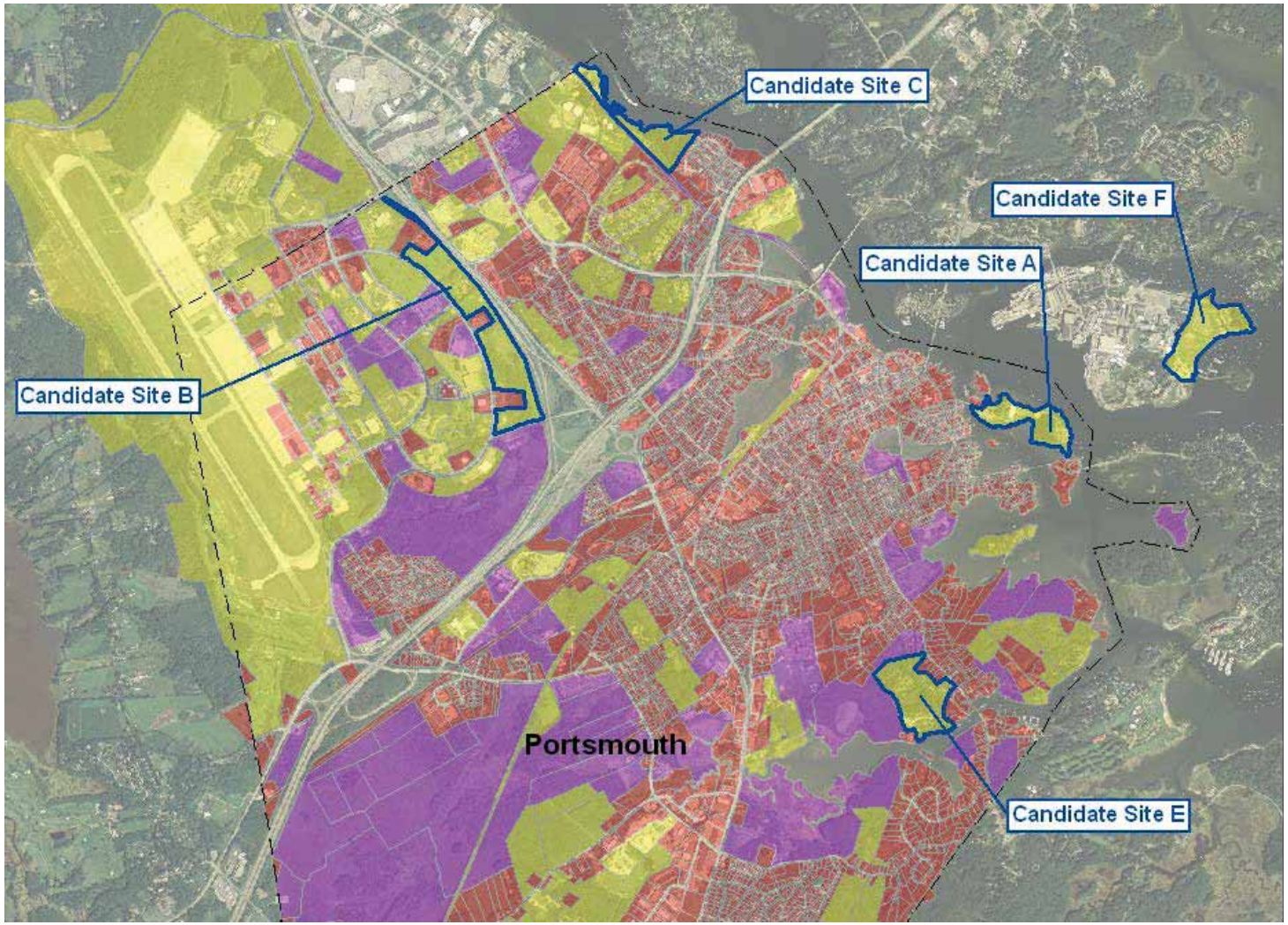
- WMP Alternatives Assessment to Include:
  - Collection system CSO mitigation strategies
  - Treatment plant upgrade options
    - Type of treatment technology
    - Plant location

Potential Wastewater Treatment Facility Locations



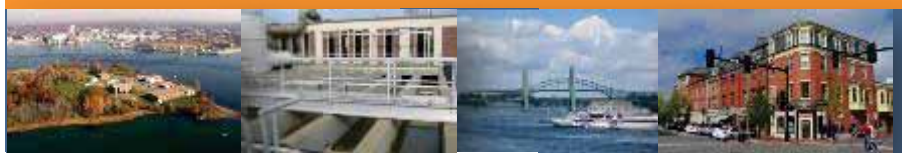
- Lot Size
- Ownership
- Protected Land
- Proximity to Residential Areas
- Proximity to River

Alternative Locations



Potential Plant Alternatives

- Over 30 Alternatives Evaluated
- Throughout WMP Process Meetings were Held with Regulators and Non Governmental Groups
- Treatment Plant Upgrade Alternatives
  - Expand the Peirce Island plant
  - Expand the Pease plant
  - Construct a new plant at a new location
  - Combination of redirecting flow and plant expansion/upgrade
- Each Alternative Impacts the Collection System CSO LTCP



Draft Wastewater Master Plan Alternatives

- Phased Expansion of Pease WWTF – Redirection of all the City's Sanitary Flow Over 15 Years, Incremental Expansion of the Existing Pease WWTF

- Peirce Island WWTF Upgrade - Upgrade of the Existing Peirce Island Chemically Enhanced Primary Treatment (CEPT) System to a Secondary Process with Nutrient Removal

Preferred Alternative Submitted to EPA in July 2010

- Upgrade Pease WWTF to 8 mg/L Total Nitrogen
- Phased expansion Over 15 Years
- Use the Existing Pease WWTF Outfall Location

EPA/NHDES Response to July 2010 Draft WMP Submission

- Draft WMP Schedule did not Achieve Secondary Treatment Quickly Enough
- Affordability Issues do not Warrant an Extended Schedule
- EPA Required City to Achieve Secondary Treatment of Peirce Island Flows in next 5-7 Years (i.e. 2017)
- EPA Required Preliminary Engineering and Pilot Study to be Underway by July 1, 2011

Following the EPA/DES Response to Draft Submission

- Final Submission Date Extended to November 15, 2010
- Development of Alternative Compliance Strategy on Peirce Island
- Preliminary Engineering Efforts Including Pilot Testing of Potential High Rate Treatment Technologies

Revised Wastewater Master Plan

- Included Timeline to Meet Secondary Treatment at Peirce Island (EPA incorporated into Consent Decree)
  - Evaluate high rate treatment technologies options
  - Pilot appropriate treatment technology
  - Permitting
  - Design
  - Bidding
  - Construction
- Continue to Implement Long Term Control Plan Measures

City Council Meeting, November 8, 2010

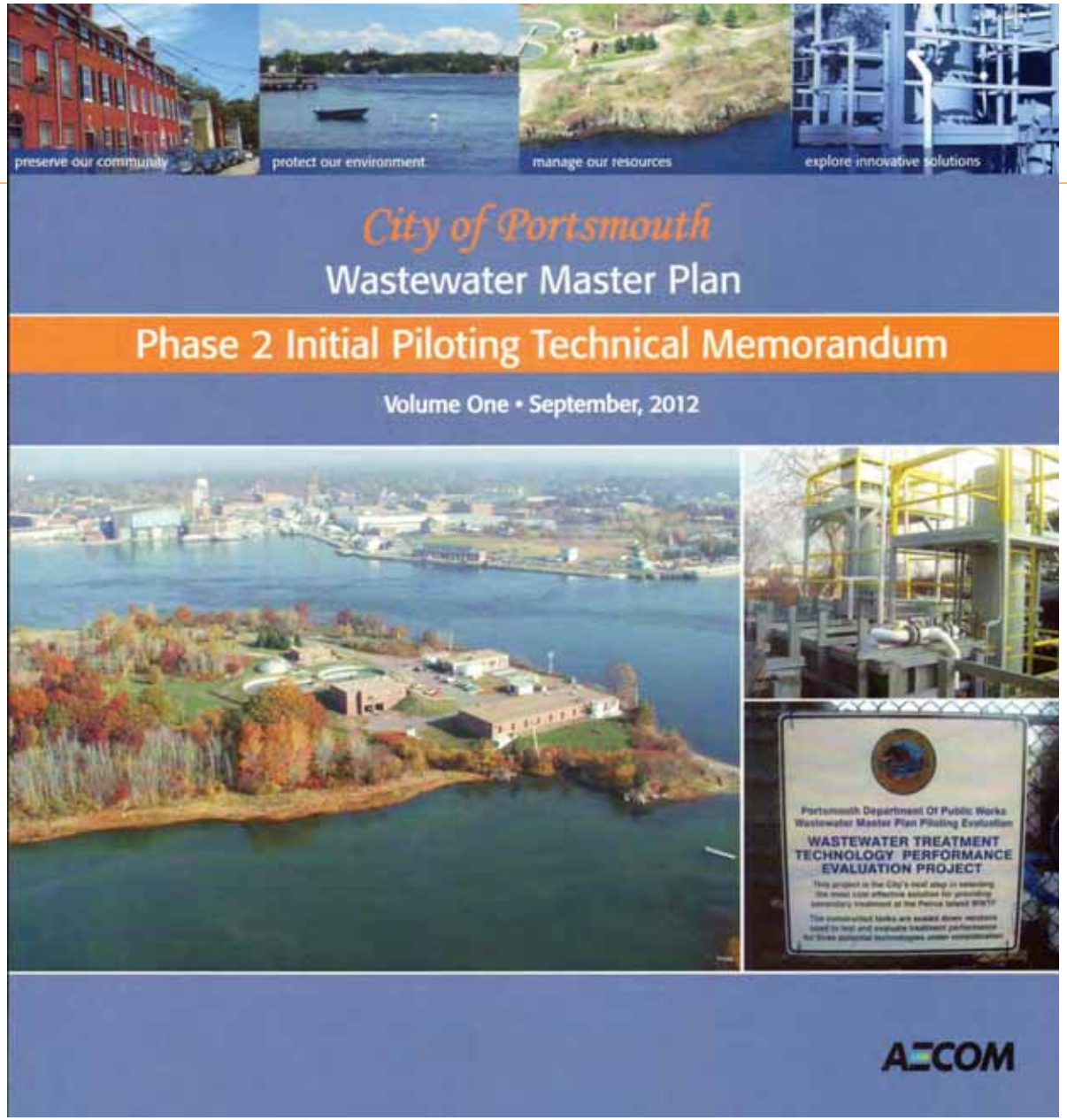
- Revised Wastewater Master Plan presented to City Council

  Revised plan summarized as follows: “we are looking for a viable plan to implement secondary treatment at Peirce Island within the fence line.”

- Council voted: “to authorize the City Manager to submit its final Wastewater Master Plan to EPA”
- Final Supplement Wastewater Master Plan submitted to EPA November 15, 2010

Questions

Pilot Study


preserve our community
protect our environment
manage our resources
explore innovative solutions
City of Portsmouth
Wastewater Master Plan
Phase 2 Initial Piloting Technical Memorandum
Volume One • September, 2012
Portsmouth Department Of Public Works
Wastewater Master Plan Piloting Evaluation
WASTEWATER TREATMENT
TECHNOLOGY PERFORMANCE
EVALUATION PROJECT
AECOM

Pilot Study

- Upgrading PI WWTF While Staying Within Existing Fence-line Required Use of Small Footprint, High Rate Emerging Treatment Technologies

- Technologies Were Piloted to :
  - Define technology performance under varying flow and load conditions and assess capacity for each technology
  - Determine the ability to upgrade to meet future nutrient requirements
  - Identify operational and maintenance factors specific to each technology
  - Confirm Manufacturer/Vendor sizing criteria and space requirements to provide secondary treatment for each technology

Why Pilot?

Piloting will Avoid the Situation that Occurred with the Existing Filter Building

Pilot Technology Screening Criteria

- Capital Costs
- Life Cycle Costs
- Operational Track Record/Established Process
- Operability (No. of Processes/Complexity of Processes)
- Ability to Retrofit to Meet Future Permit Limits
- Constructability
- Site Layout Hydraulic Complexity
- Ability to Stay Within Fence Line
- Ability to Treat High FOG Levels

Technologies Selected for Piloting

- From the Eight Technologies Evaluated
  - Biological Aerated Filter (BAF)
  - Conventional Activated Sludge with BioMag (CASB)
  - Moving Bed Bioreactor (MBBR) and Dissolved Air Flotation (DAF)
- Initially Pilot Units Were Configured for Secondary Treatment
- Pilot Units Were Reconfigured for Nitrogen Removal


SIEMENS

Lessons Learned During Pilot Study

- Wastewater Characteristics are Changing due to Success of Sewer Separation Projects
- Consent Decree Requires Secondary Treatment EPA is now Indicating that City Permit will Include a Nutrient Limit of 8 mg/L
- EPA and City are in Discussions Over Treatment Plant Capacity
  - Why is this Important
    - Additional tanks and capital costs
    - Additional operations and maintenance costs

Pilot Study Summary

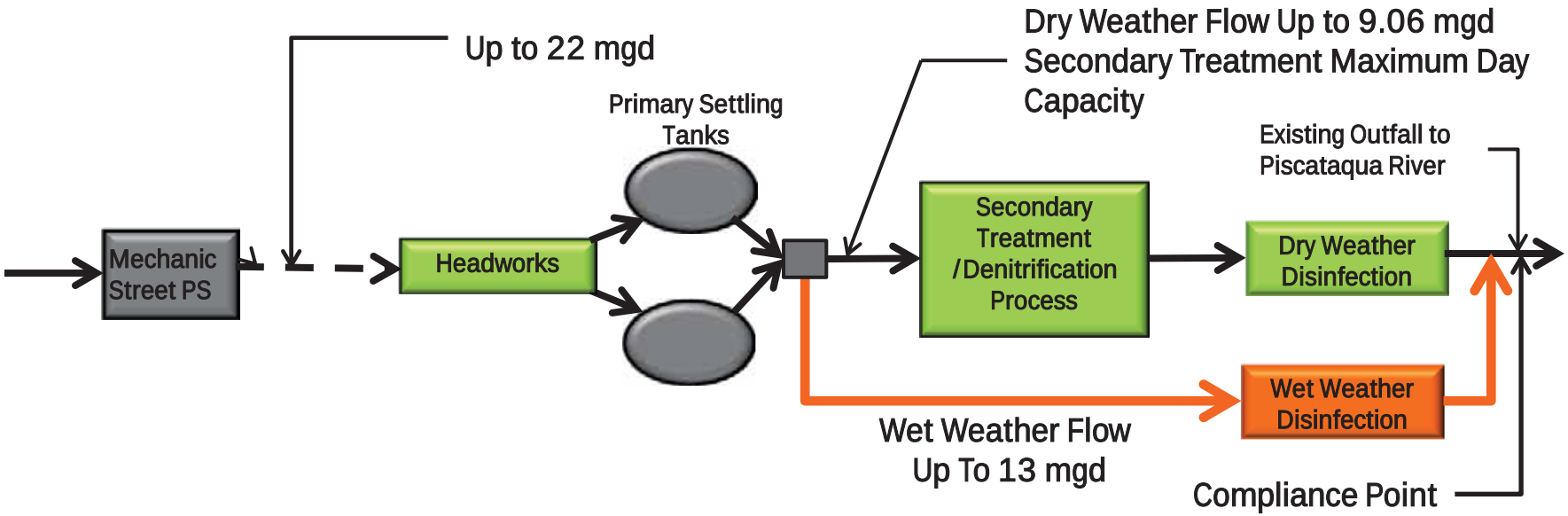
- All Piloted Technologies Meet Secondary and Total Nitrogen Limit of 8 mg/L
- At a Total Nitrogen Limit of 8 mg/L, Initial Layout of All Three Technologies are Outside the Existing Plant Fence Line
- Given the Lessons Learned from Pilot Study Previously Screened Technologies Should be Revisited to Confirm Final Selection
- Regulatory Uncertainty Impacts Design and may Impact Schedule

Initial Pilot Recommendations

- Biological Aerated Filter Sized to Meet Secondary Treatment Standards with the Ability to Meet a Total Nitrogen Limit of 8 mg/L
- Treat Annual Average of 6.13 Million Gallons per Day Through BAF
- Treat Maximum Day Flow of 9.06 Million Gallons per Day Through BAF
- Treat Excess Wet Weather Flows Through Chemically Enhanced Primary Clarifiers

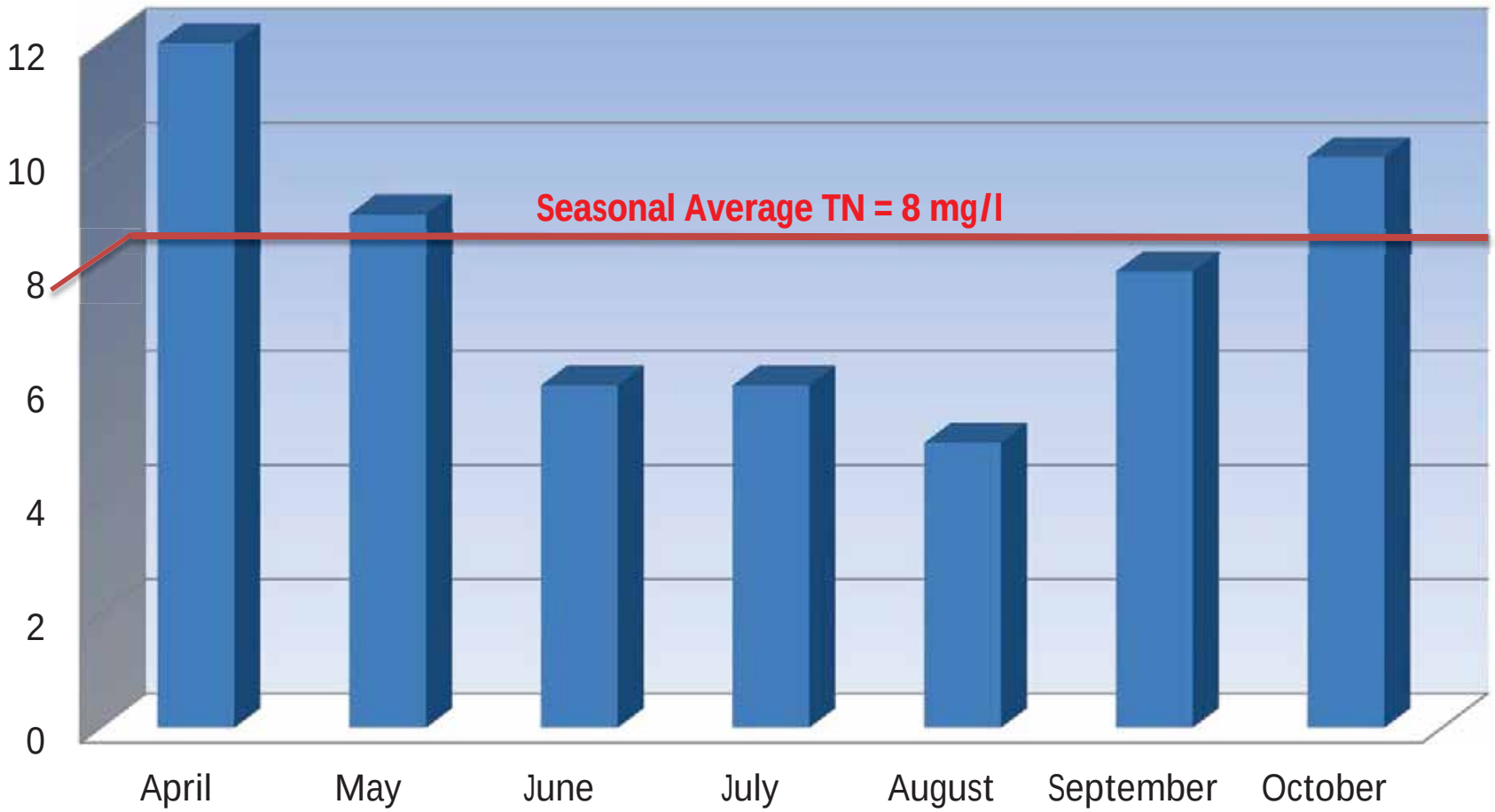
Questions

Proposed Process Flow Schematic



- Size of Plant: 9.06 mgd Maximum Day Flow to Secondary Treatment
- Measure of Compliance: 8 mg/L Total Nitrogen Seasonal Rolling Average on Blended Effluent

Seasonal Rolling Average



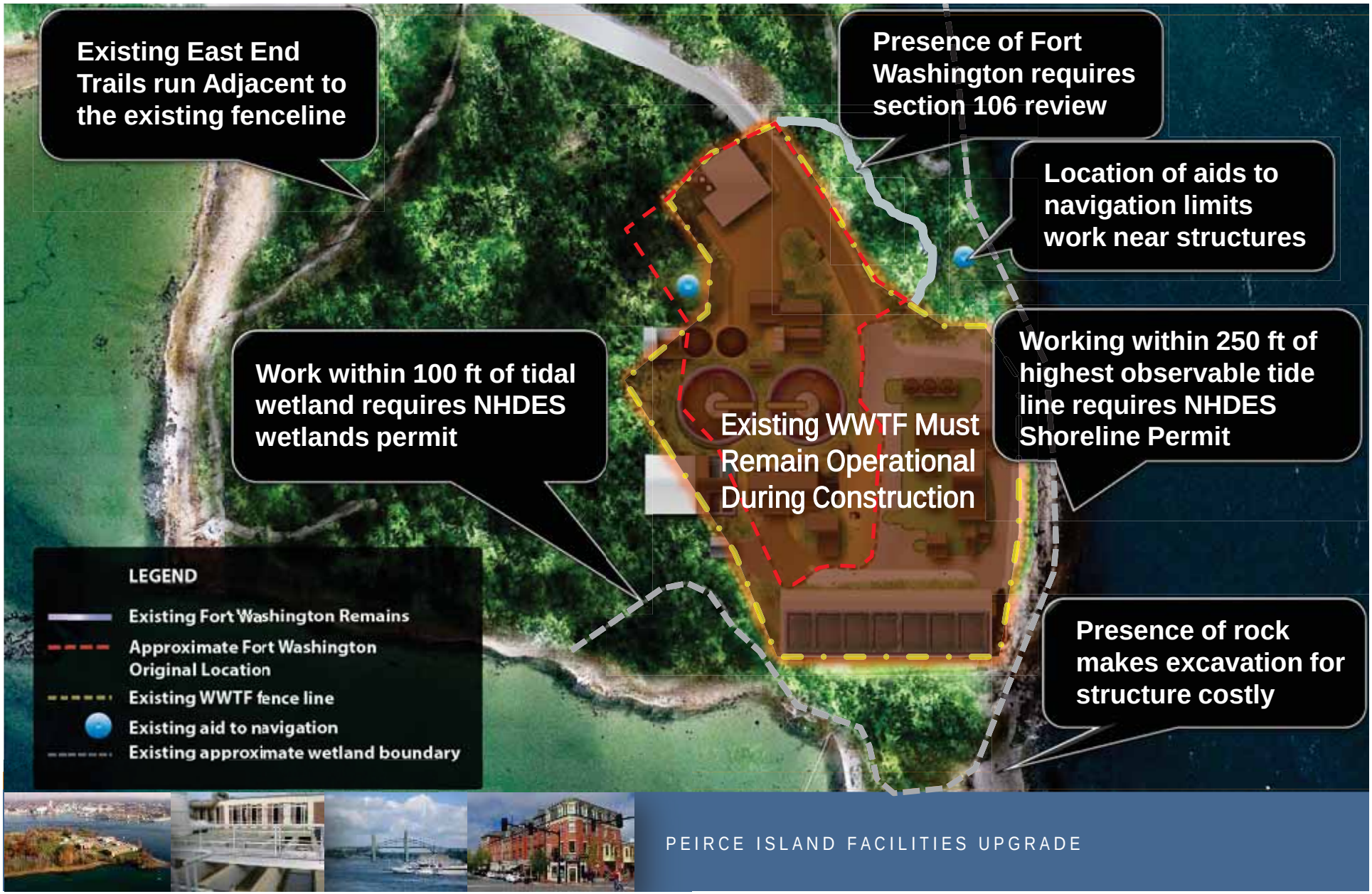
Current Alternatives

Biological Aerated Filter

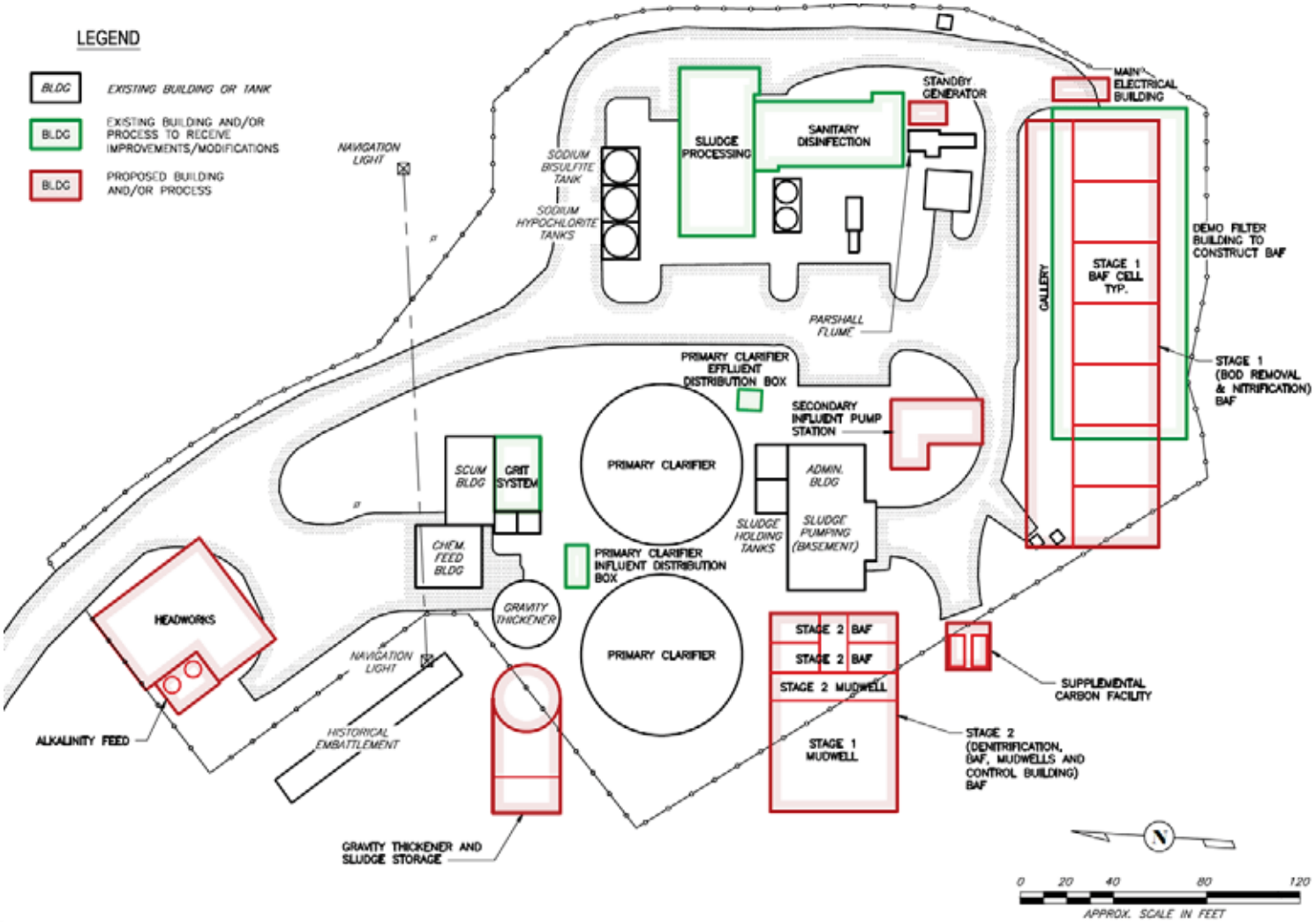
Conventional Activated Sludge

Existing Site

Site Constraints

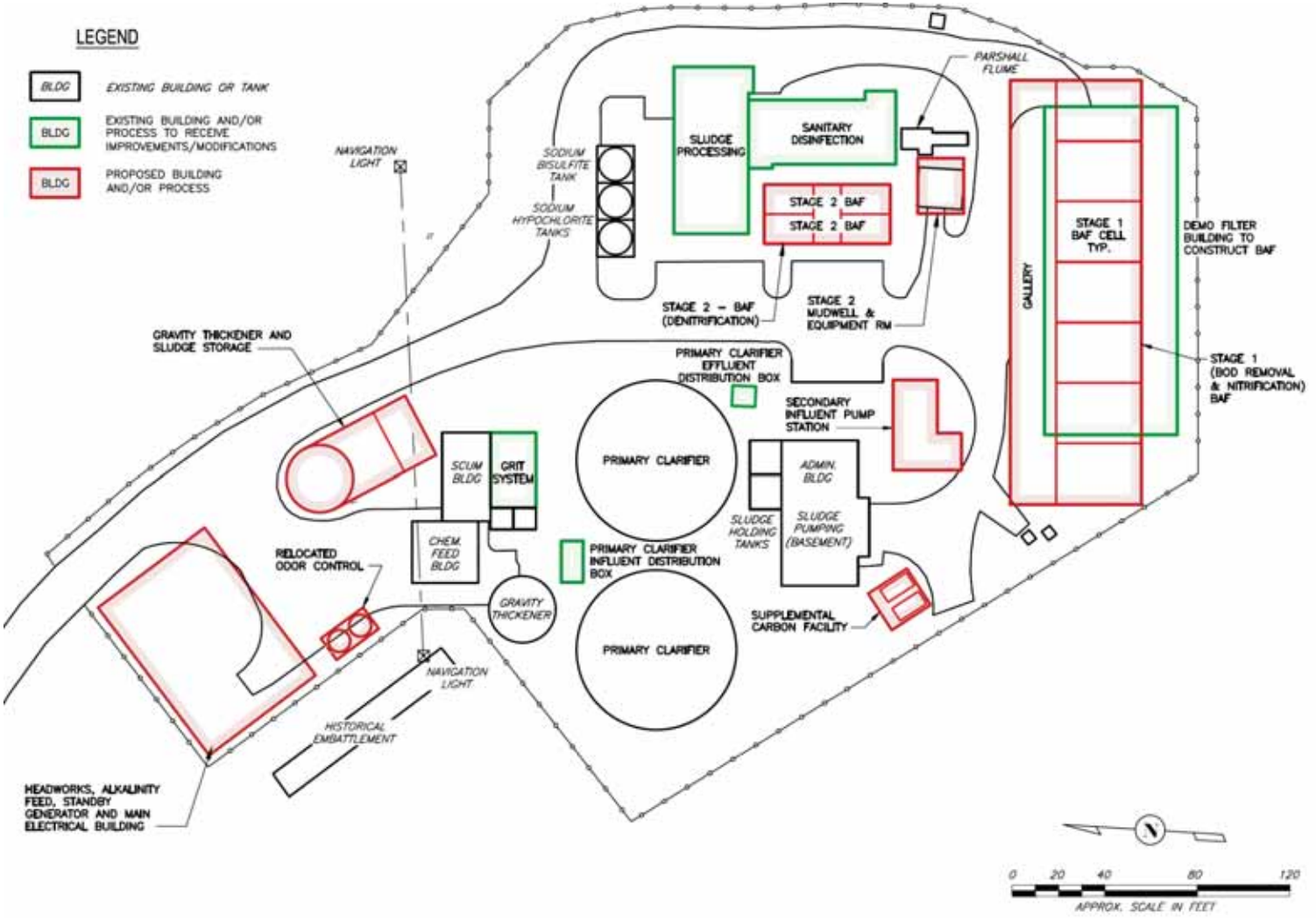


Initial Layout Biological Aerated Filter - $60.5M






Revised Biological Aerated Filter Layout - $61M

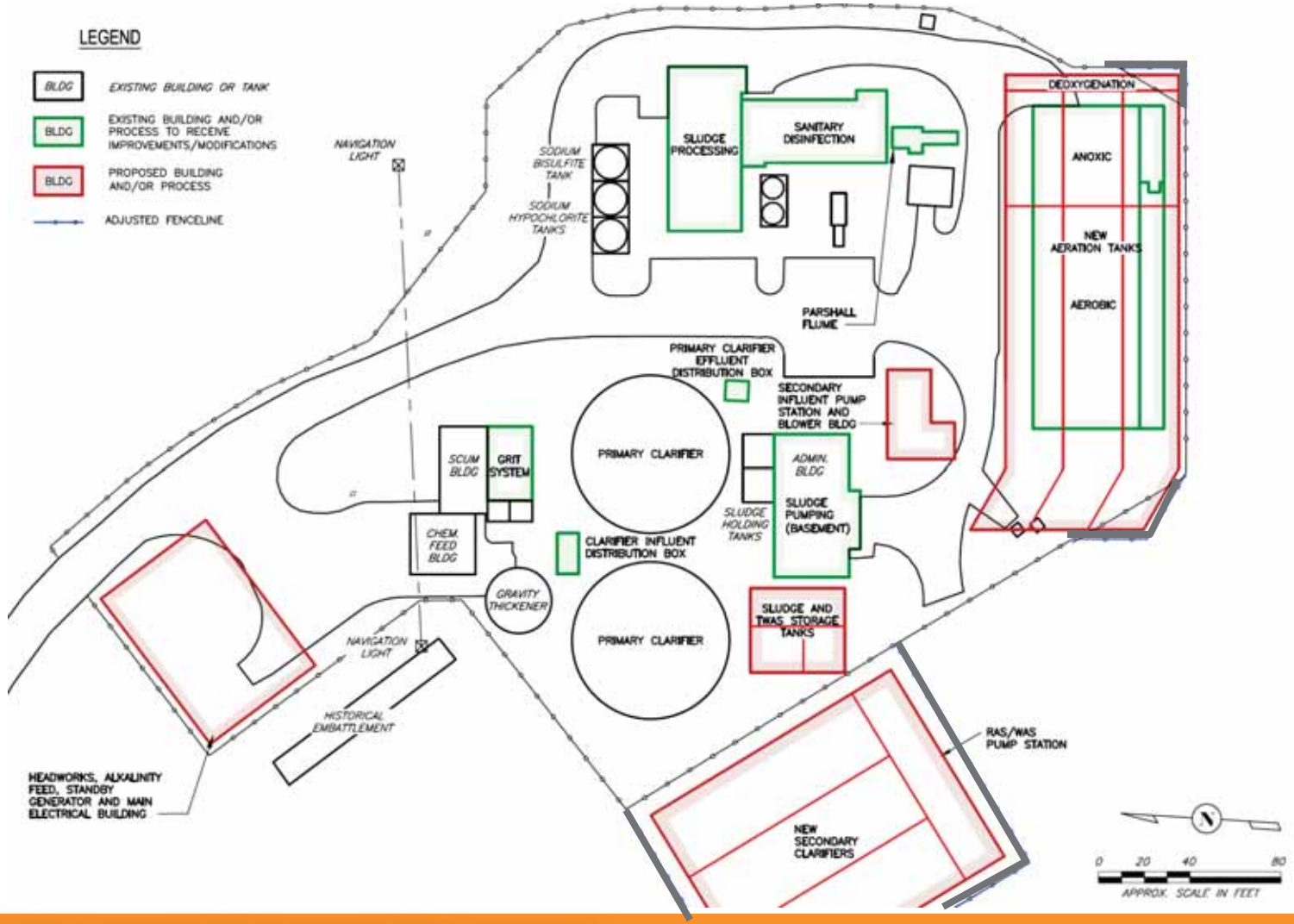


Revised Biological Aerated Filter Layout - $61M

Existing Site

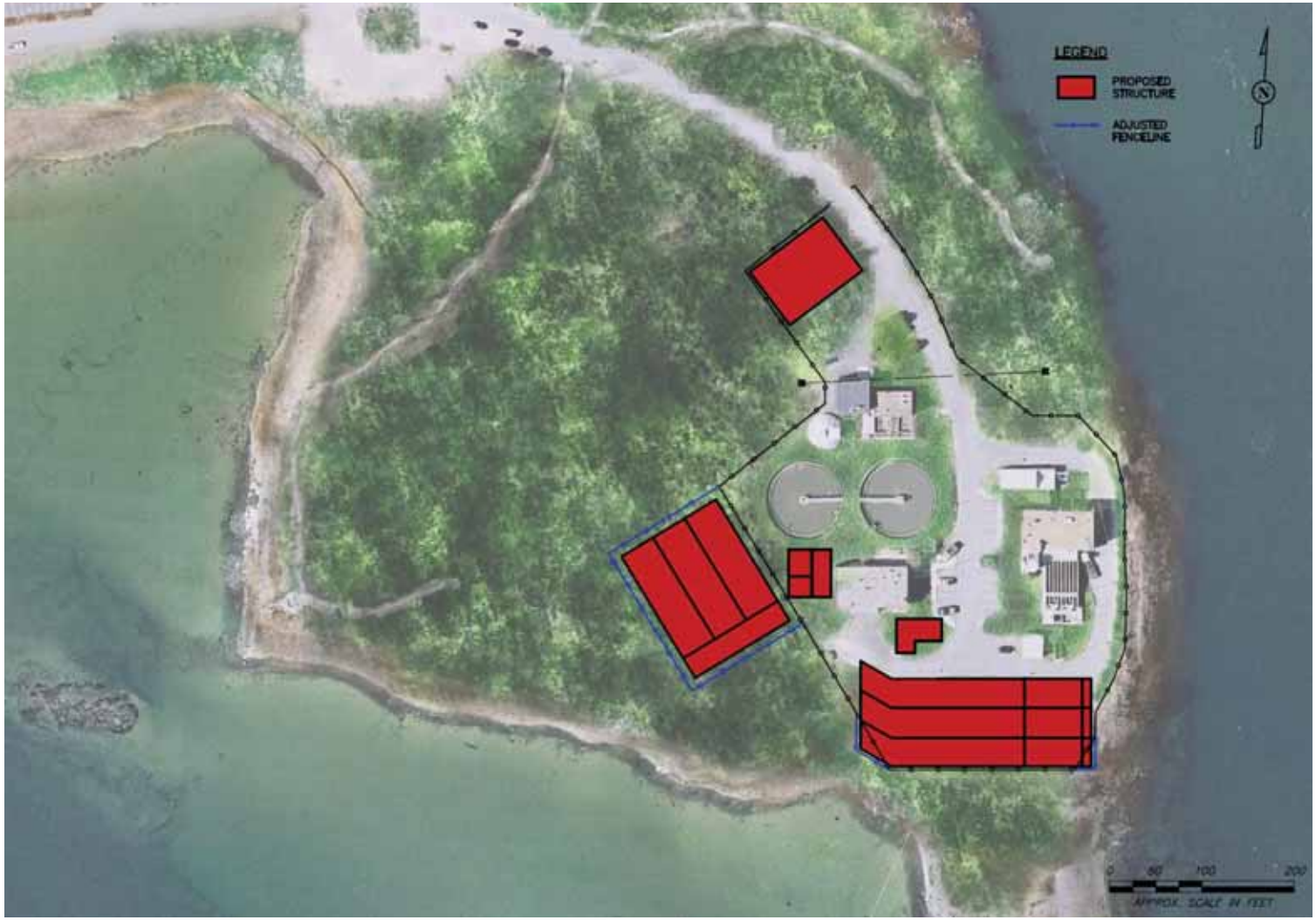
Biological Aerated Filter Rendering

Conventional Activated Sludge - $57M






Conventional Activated Sludge - $57M



Existing Site

Conventional Activated Sludge Rendering

Advantages/Disadvantages

Process	Advantages	Disadvantages
Conventional Activated Sludge (CAS)	• Lowest Initial Capital Cost • Lowest O&M Cost • Commonly Used Technology • Not a Proprietary Process • Longer Operating History • Easier to Operate • Reduced Solids Handling Costs	• Larger Footprint – Outside Fence • Increased Potential for Site Permitting Challenges • Additional Capital Upgrade Needed to Achieve Lower Nitrogen Limits • Performance Deteriorates at Higher Flow
Biological Aerated Filter (BAF)	• Smaller Footprint – Inside Fence • No Additional Capital Cost Required to Achieve Lower Nitrogen Limits • Vendor Performance Guarantee • Robust Cold Weather Operation • Less Susceptible to High Flow Washout	• Higher Initial Capital Cost • Higher O&M Cost • Fewer Operating Installations (333 total world wide, 38 in North America) • More Mechanical Equipment • Proprietary Process

Comparison of Estimated Costs

Process	Projected Capital Cost	20 Year Life Cycle Cost
Conventional Activated Sludge (CAS)	$57.0	$68.6
Biological Aerated Filter (BAF)	$61.0	$75.6

Note: All Costs in $ millions
Costs Include Engineering and Contingencies
Based on a seasonal rolling average limit of 8 mg/L TN
Assumes no changes in permit limits over the next 20 years

Comparison of Costs for Future Permit Limits

Process	Projected Initial Capital Cost	Projected Future Capital Cost	20 Year Life Cycle Cost
Conventional Activated Sludge (CAS)	$57.0	$16.5	$87.4
Biological Aerated Filter (BAF)	$61.0	-	$76.5

Note: All Costs in $ millions
Costs Include Engineering and Contingencies
Assumes change in permit limit from seasonal average TN of 8 mg/L to seasonal average TN of 3 mg/L after 5 years

Current Status

- Final Design
- Continued Regulatory Uncertainty
  - Seasonal rolling average of 8 mg/L total nitrogen
  - Plant capacity of 9.06 MGD
  - Construction schedule

PI WWTF Consent Decree Deadlines

Item	*Consent Decree Deadline*	*Project Status*
Complete Pilot Testing	*6/30/12*	*Complete*
Submit Pilot Memo	*10/1/12*	*Complete*
Begin Final Design	*7/1/13*	*In Progress*
Complete Final Design	*8/31/14*	*Pending*
Begin Construction	3/1/15	*Pending*
Complete Construction	*3/1/17*	*Pending*
Achieve Compliance	*5/1/17*	*Pending*

Major Project Considerations

- Site Constraints/Permitting
- Odor Control
- Regulatory Issues
- Consent Decree Schedule
- Communication
- Plant Operation During Construction
- Reduce Project Cost

Questions and Answers