REA'S POND PUMP STATION REPLACEMENT

Overcoming Obstacles to Remove Reservoir Contamination Threat

Bruce Thibodeau, PE, Town of North Andover, MA; Tim Willett, Town of North Andover, MA; Ken Carlson, PE, Woodard & Curran; Jason Kreil, PE, Woodard & Curran

Obstacles

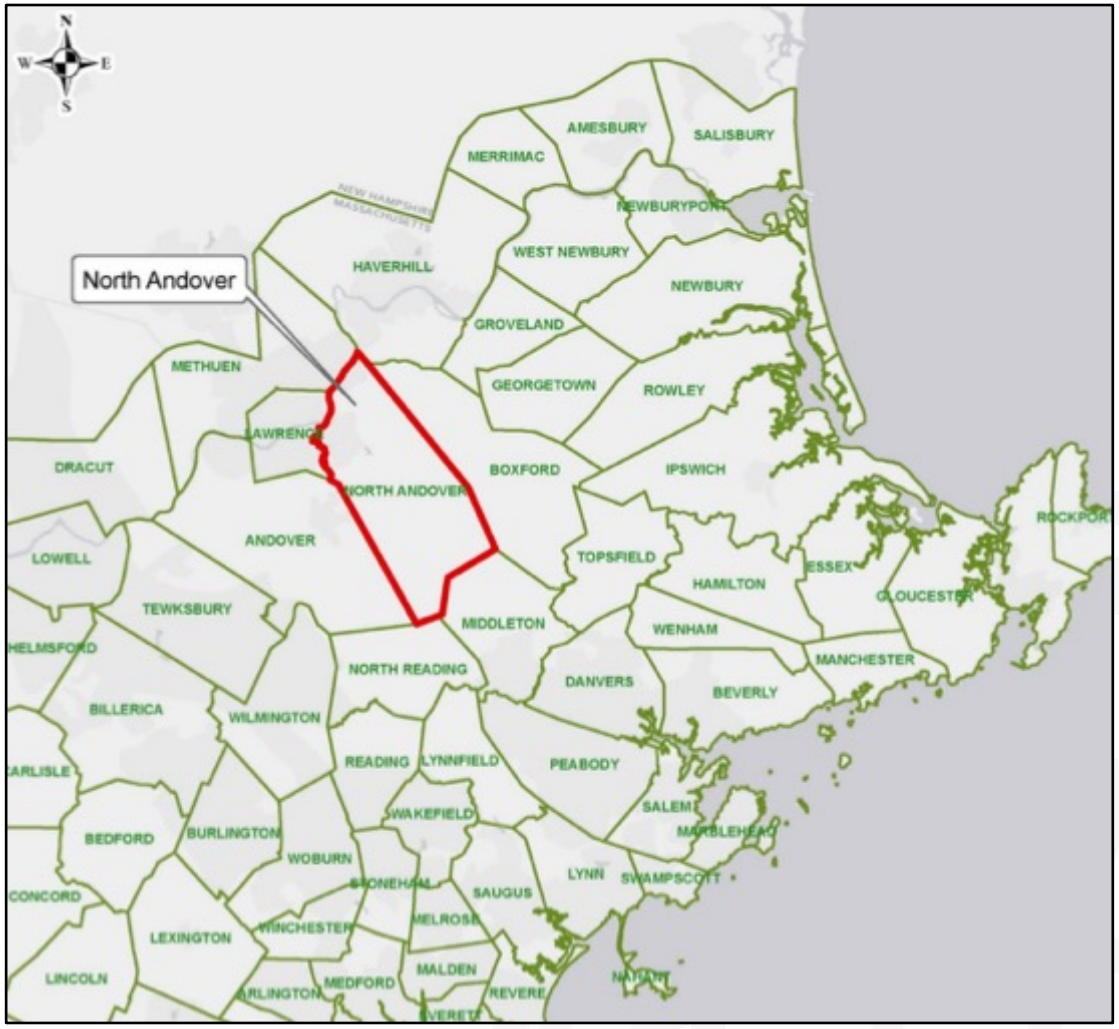
- Land Ownership
- Conservation Commission Approval of Land Swap
- Town Meeting Eminent Domain Taking
- Article 97 Legislative Action
- Reduced Site Size
- Stormwater Regulations
- Local Watershed Protection District
- Funding Limitations
- The “Tree”

Unique Features

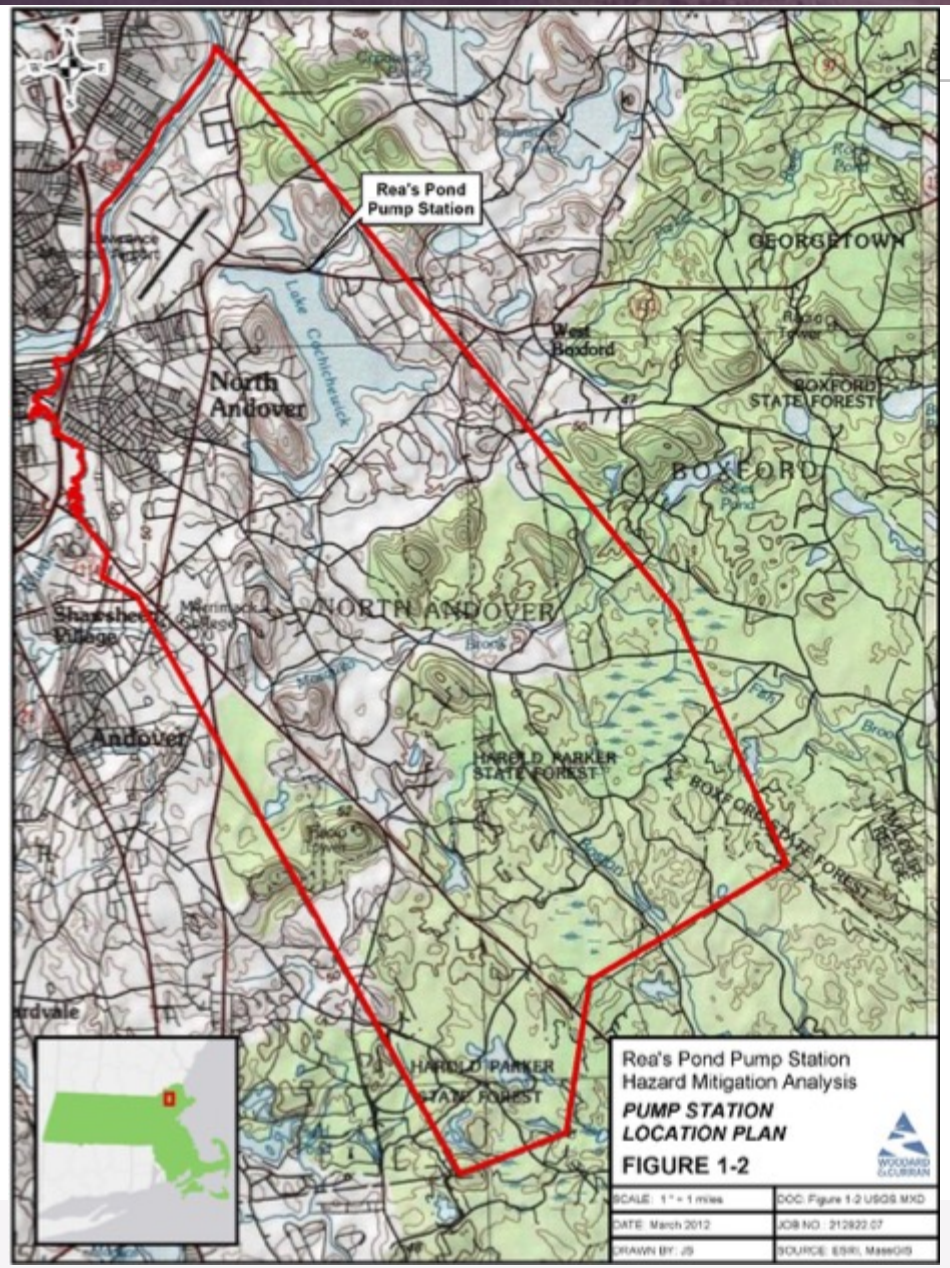
- Segmental Pre-Cast Concrete Structures
- Bypass Options
- Surge and Transient Protection

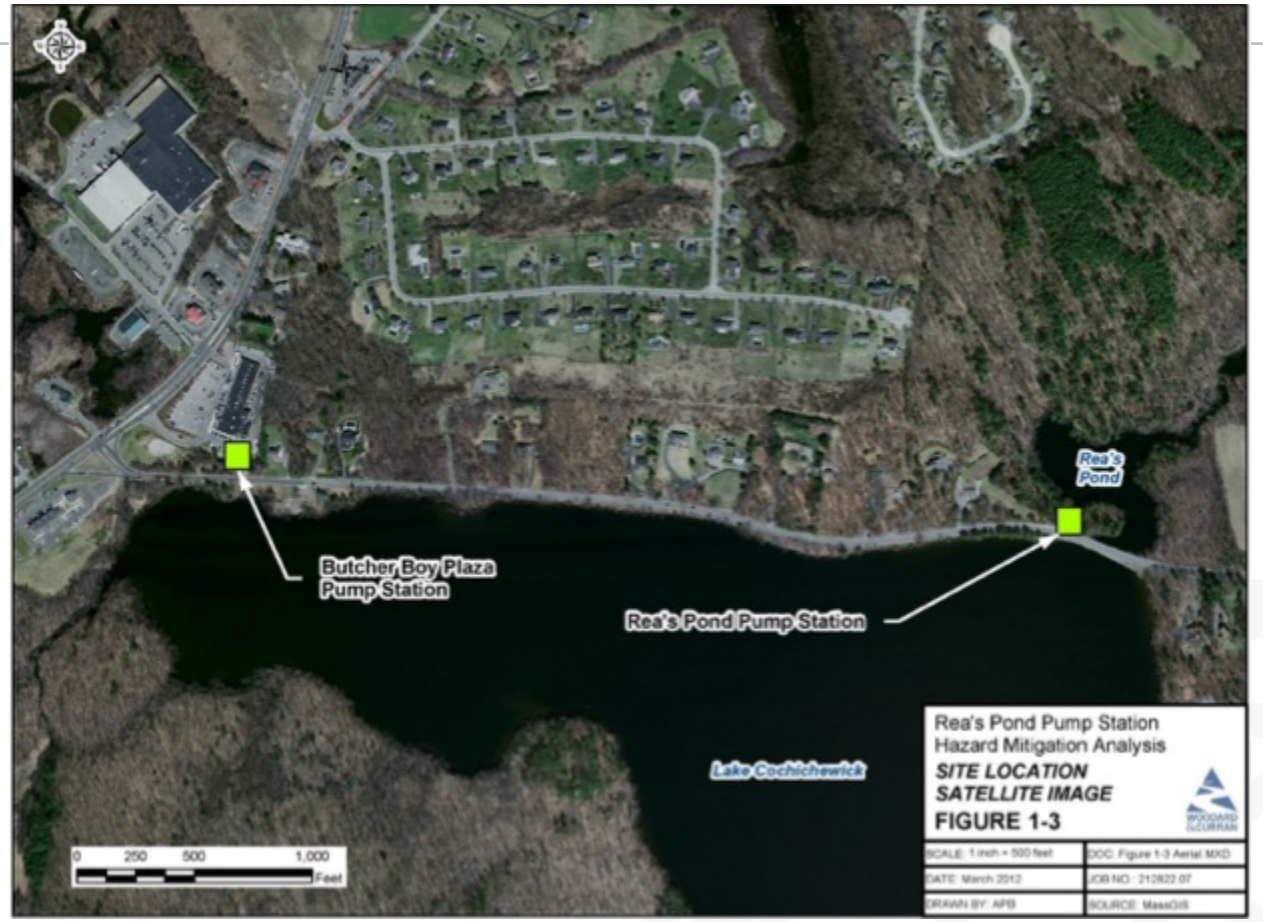
Town of North Andover

- 30 miles Northwest of Boston
- 27,000 Residents
- 91 Miles of Sewers
- 22 Pump Stations
- 60% Sewered
- Customer of GLSD

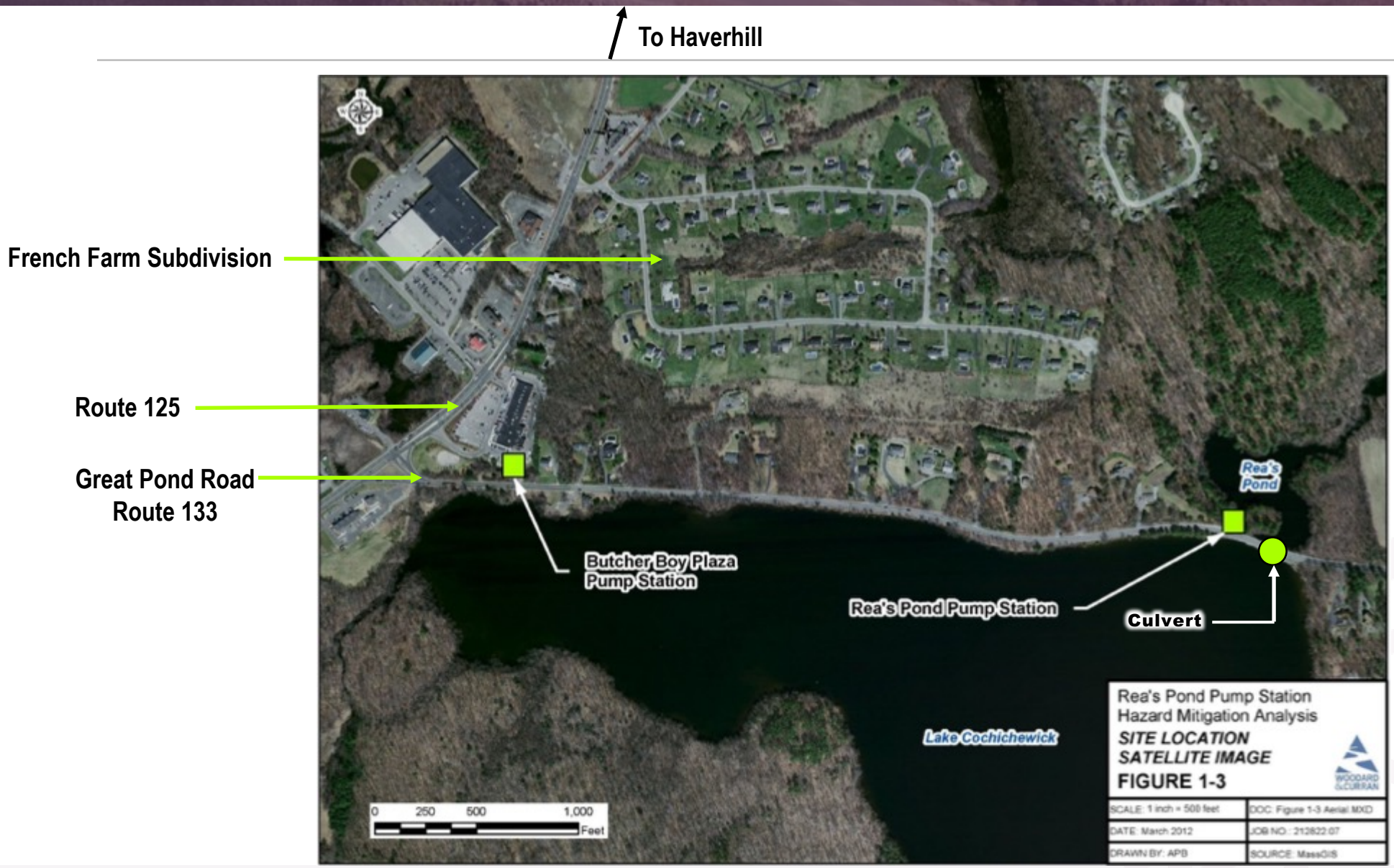


Location Plan



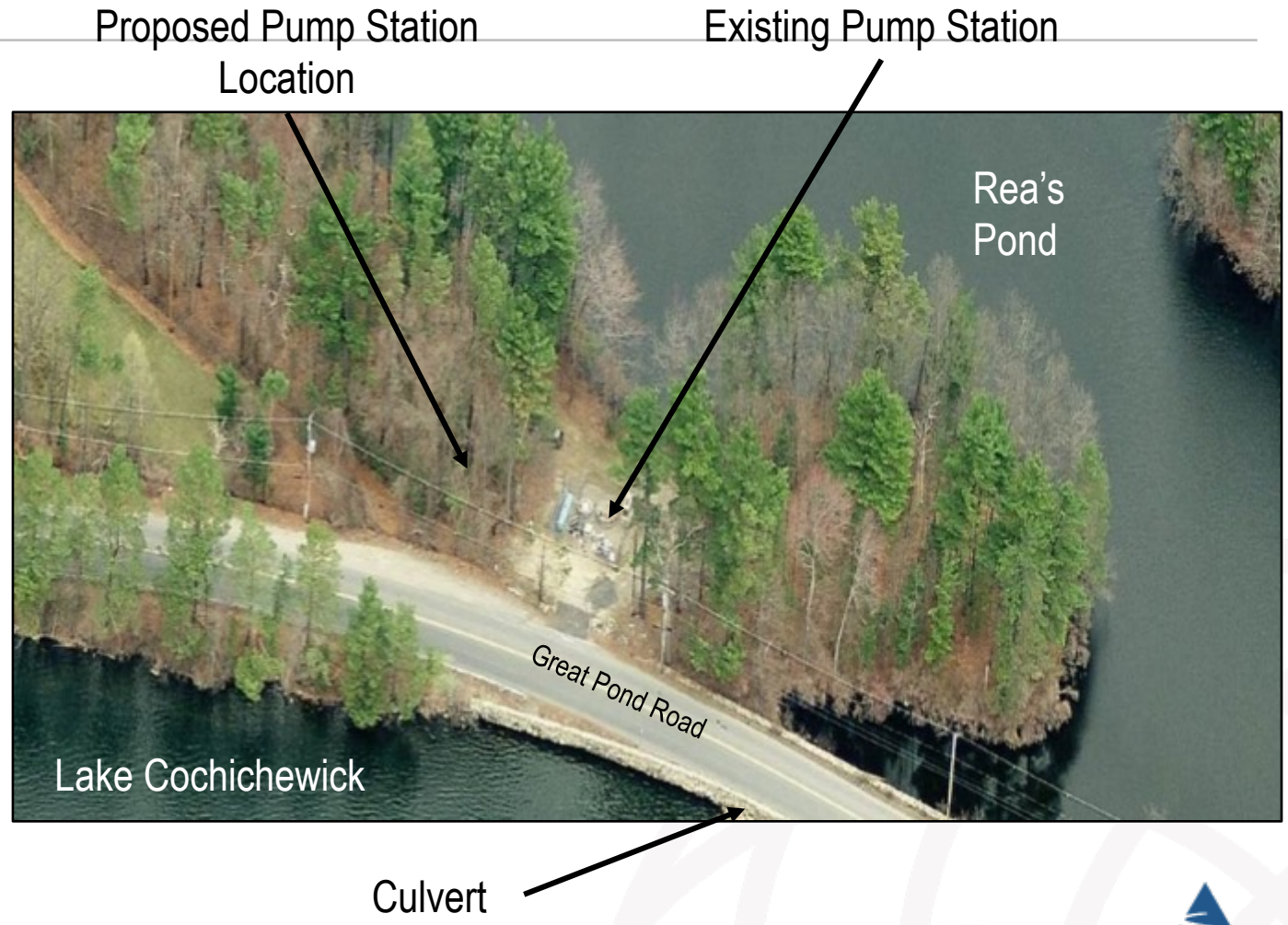


Rea's Pond Pump Station Location



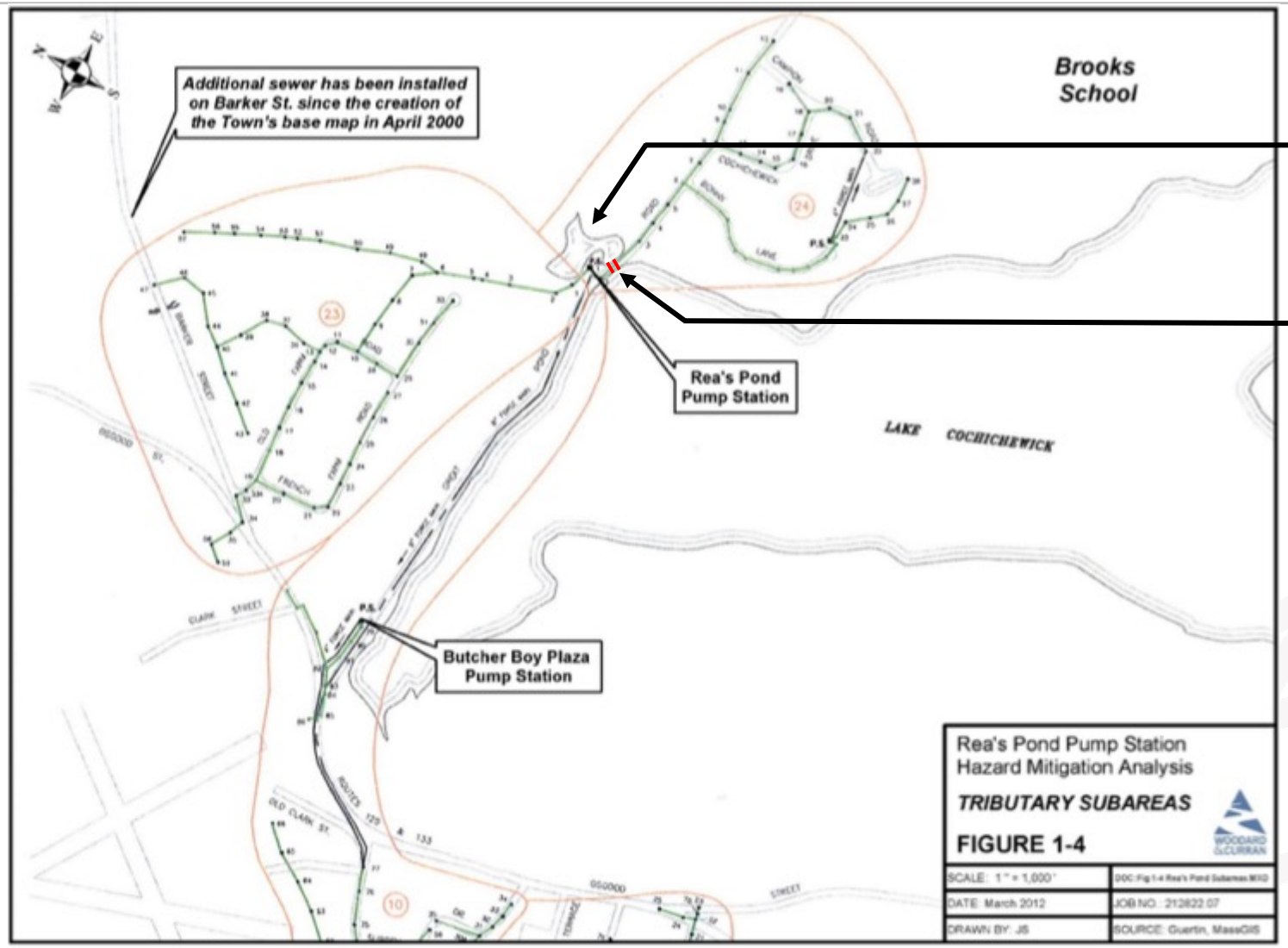
Rea's Pond Pump Station Site

- Located on Conservation Land and the Town's Water Supply
- Rea's Pond and Lake Cochichewick connected by Culvert



Source: Pictometry Bird's Eye 2015 MDA Geospatial Services, Inc.; accessed from Bing® Images

Tributary Sewered Area



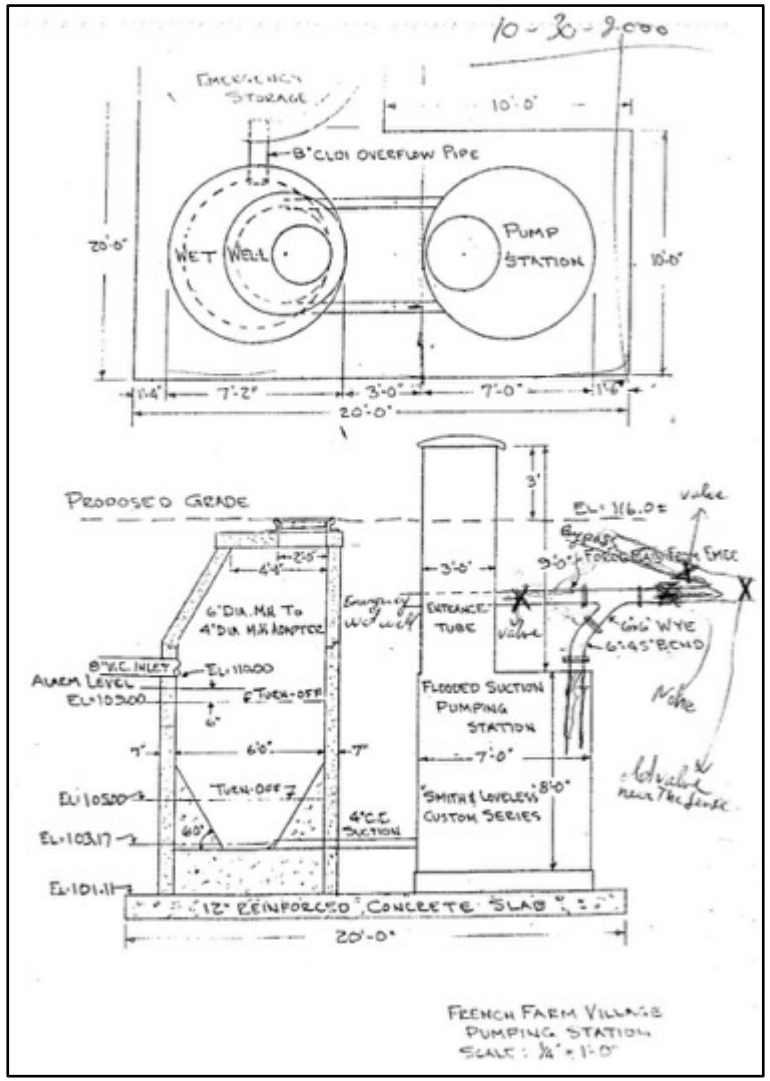
Rea's Pond

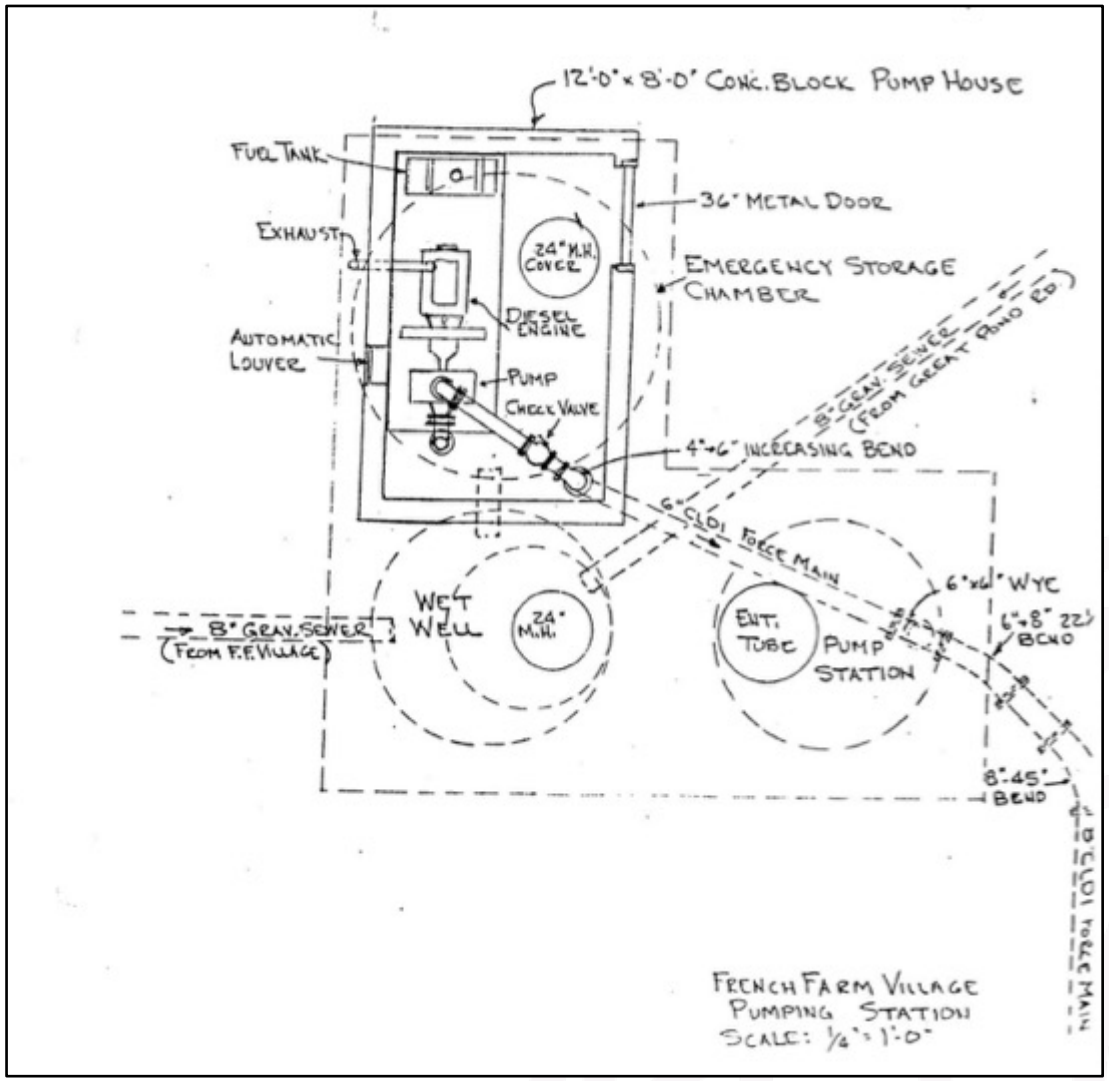
Culvert

Existing Pump Station

- Constructed 1992 for French Farm Subdivision
- Brooks School & Other Subdivisions Added Later
- Pre-Cast Concrete Wet Pit/Dry Pit Type
- 500 gpm capacity
- 8” FM, Approx. 1 Mile in Length
- No Record Plans

Existing Pump Station Drawings





Existing Pump Station

WOODARD &CURRAN

A History of Overflows and Flooding

- Station Capacity Exceeded During Spring Storm Events within a Few Years
- Overflow Wet Well Added pre-1999
- Emergency Pump Connection Added
- Portable Diesel Pumps and Vactors Needed for High Flows
- 10+ Years of Emergency Pumping
- Several Overflow Close-Calls

May 2006 Mother's Day Storm

- 17" of Rain in New England
- Probable 100-Year Storm
- Flood Waters Within 1 Foot of Structure Tops
- Station Isolated from Access
- Flood Waters at Elev. 118.0+/-
- 1999 Mitigation Raised Top of Structures to El. 119.0

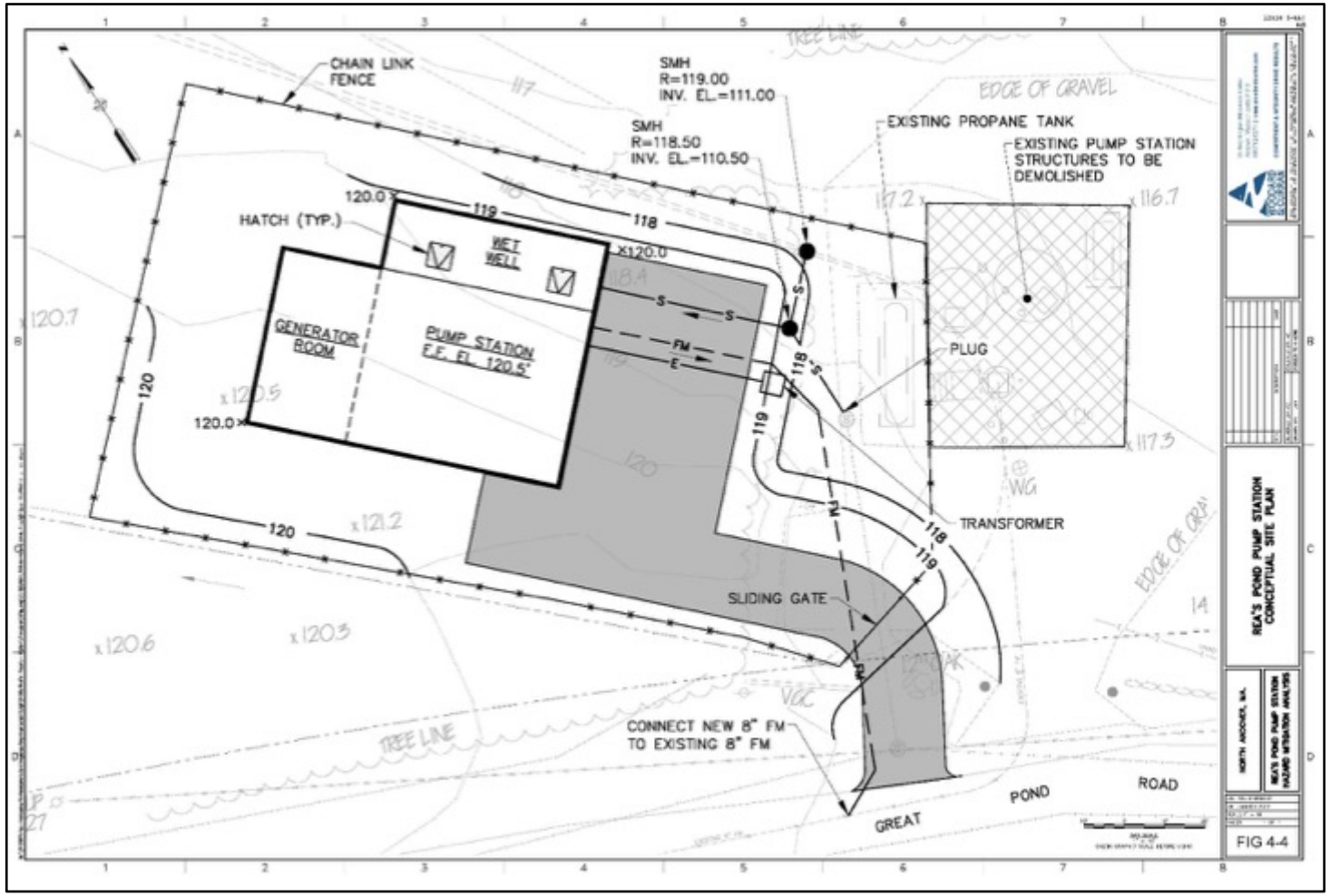
Congressional Earmark Funds – $100,000

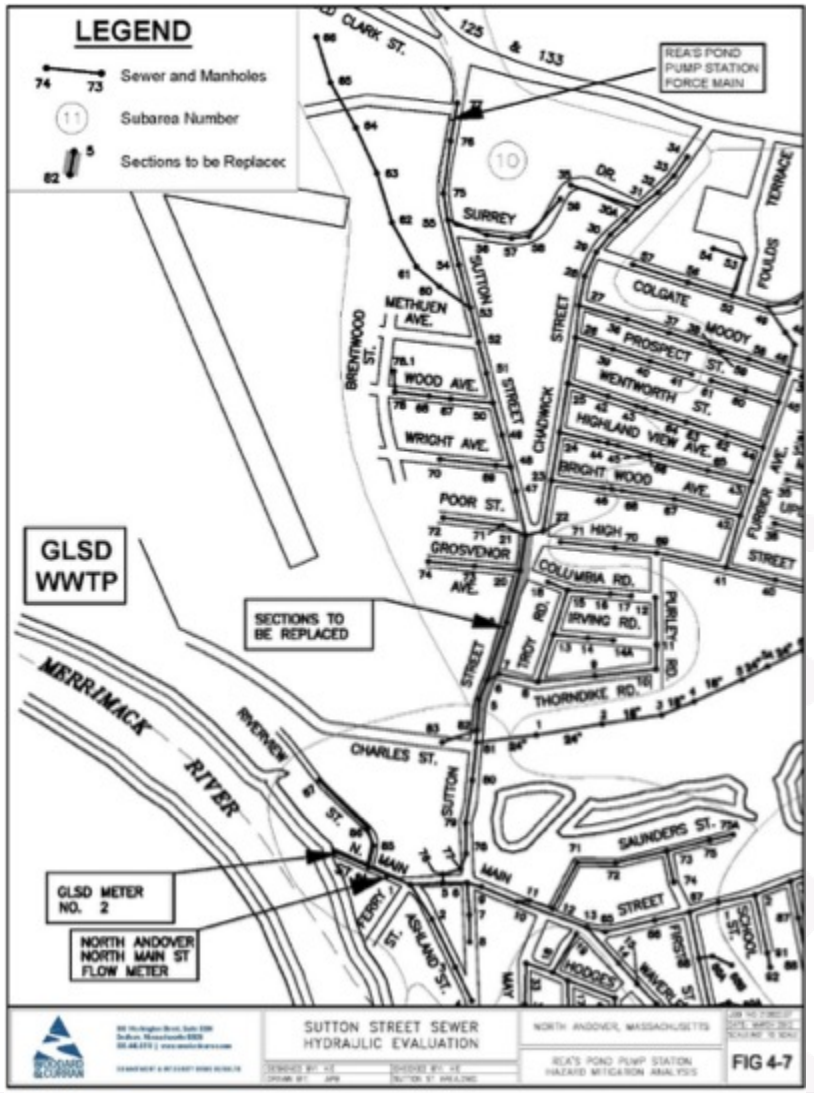
- Initially to Address Shawsheen River Flooding Elevations
- ACOE Completed Flood Elevation Survey Negating Funding Need
- 2010 Town Suggests Using Funding Towards Replacement of Rea's Pond Pump Station
- Town receives OK to Use FEMA as Funding Agency with 25% Town Match
- FEMA Approval of Hazard Mitigation Analysis Scope and Budget – 2011

March 2012 Hazard Mitigation Analysis

- Established Design Flow
- Condition Assessment
- Evaluated Alternatives
  - Gravity Bypass
  - Replacement/Upgrade
  - Relocate
- Recommendations:
  - New 950 gpm Station on Adjacent Conservation Land
  - Higher Elevation
  - Replace Sewers in Sutton Street

Proposed Pump Station Site Plan and Sewer Plan





New Pump Station Location

- 13.5 Acre Mazurenko Farm Land Purchased by the Town in 1975 for Conservation Purposes
- Land Placed under Article 97 Protection
- Land Swap with Conservation Commission Recommended
  - Proposed Site for Existing Site
  - Existing Site to be Restored after Station Demolition
- Required Legislative Approval

WOODARD &CURRAN

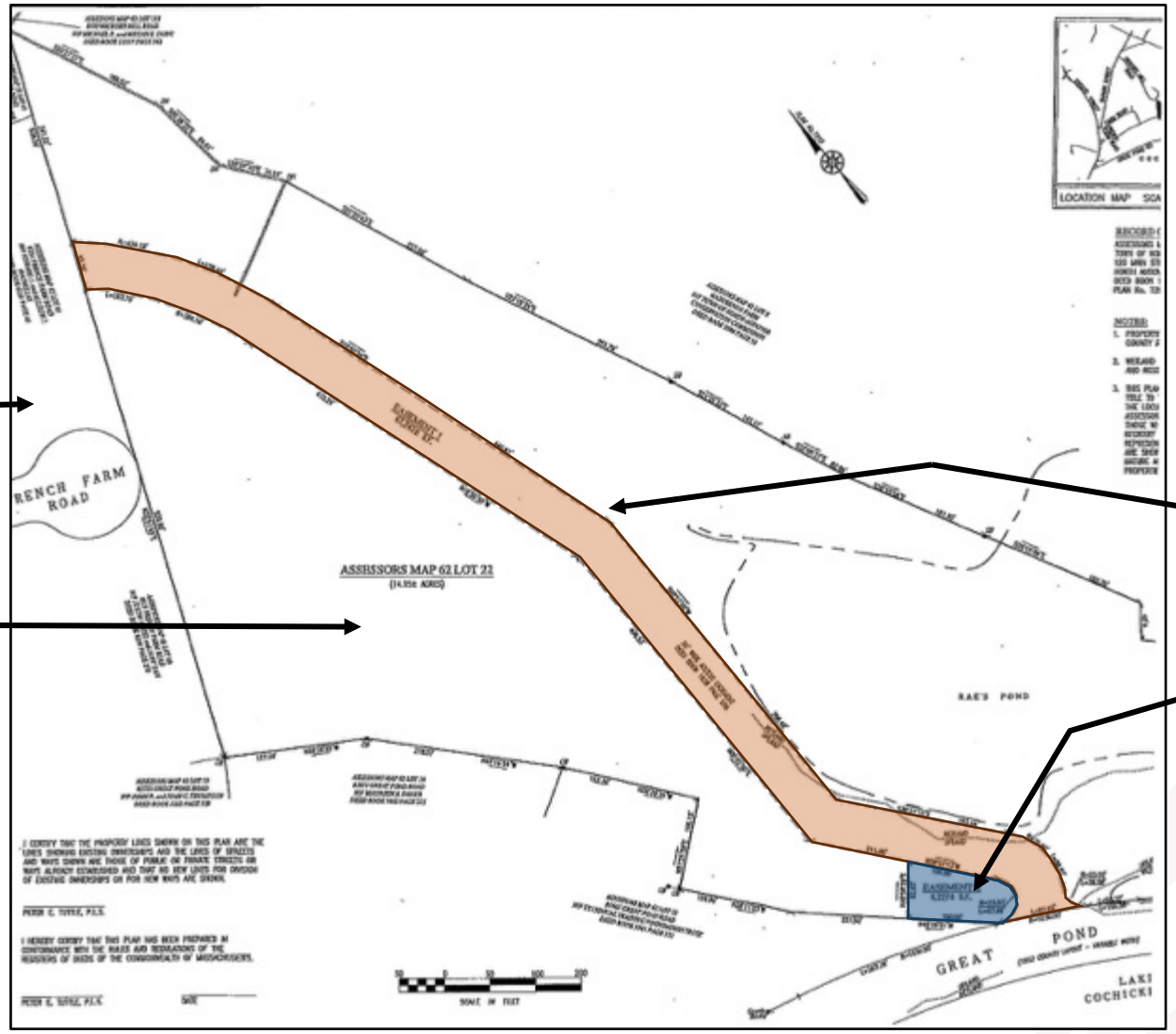
EOEA Disposition Process - Article 97

- EOEA's Disposition Process
  - ConCom Vote that the Land is Surplus to its Needs
  - Town Meeting Vote to Remove the Land from Protected Status
  - File an Environmental Notification Form with EOEA's MEPA Unit
  - Request Must Pass by a Two-Thirds Vote of the Massachusetts Legislature and be Signed by the Governor
- "No Net Loss" – Land Swap Required to Offset Land Removed by Article 97 Action

Existing and Proposed Easements

French Farm Subdivision

Mazurenko Property / Conservation Land



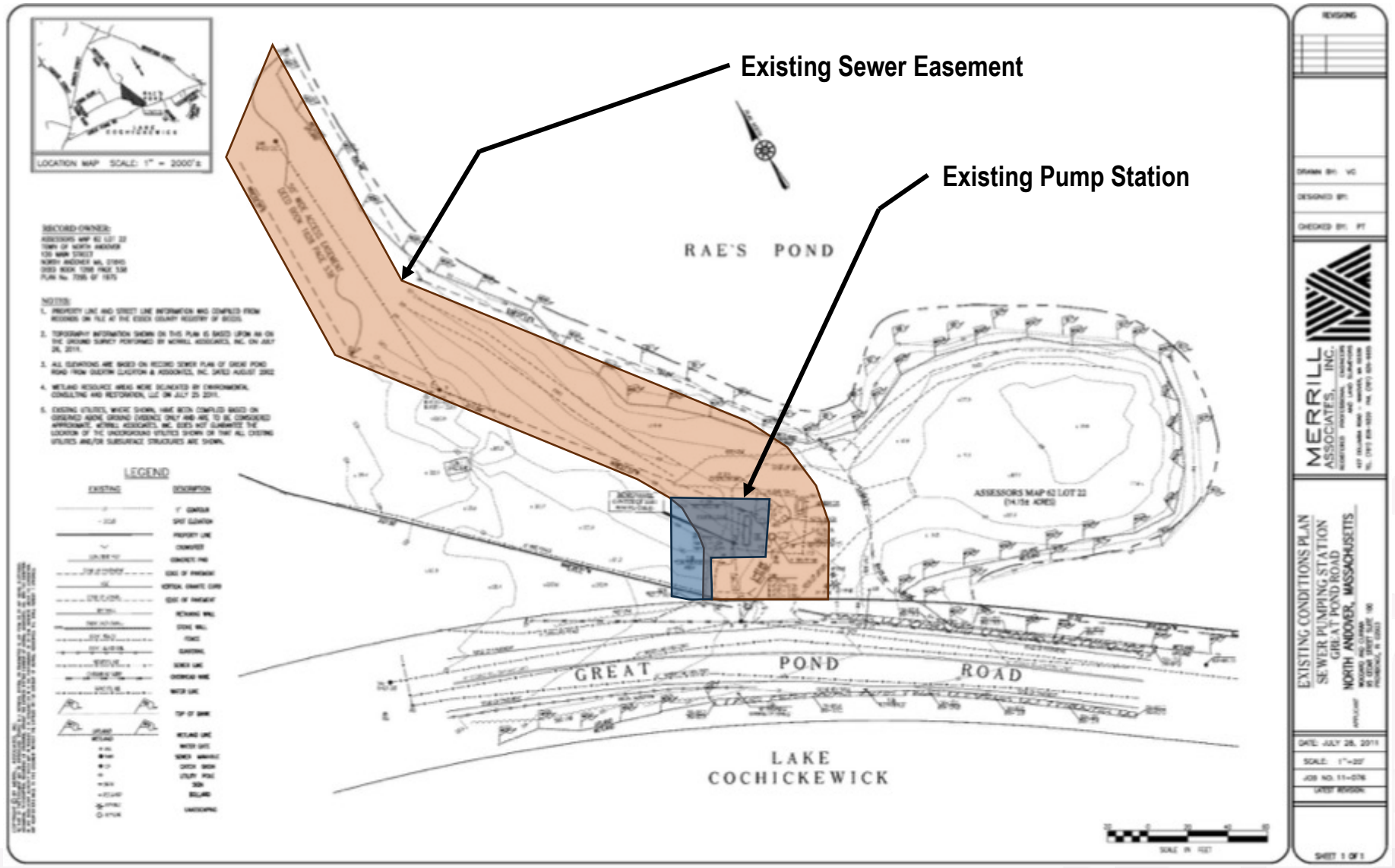
Existing Easement

New Pump Station Easement

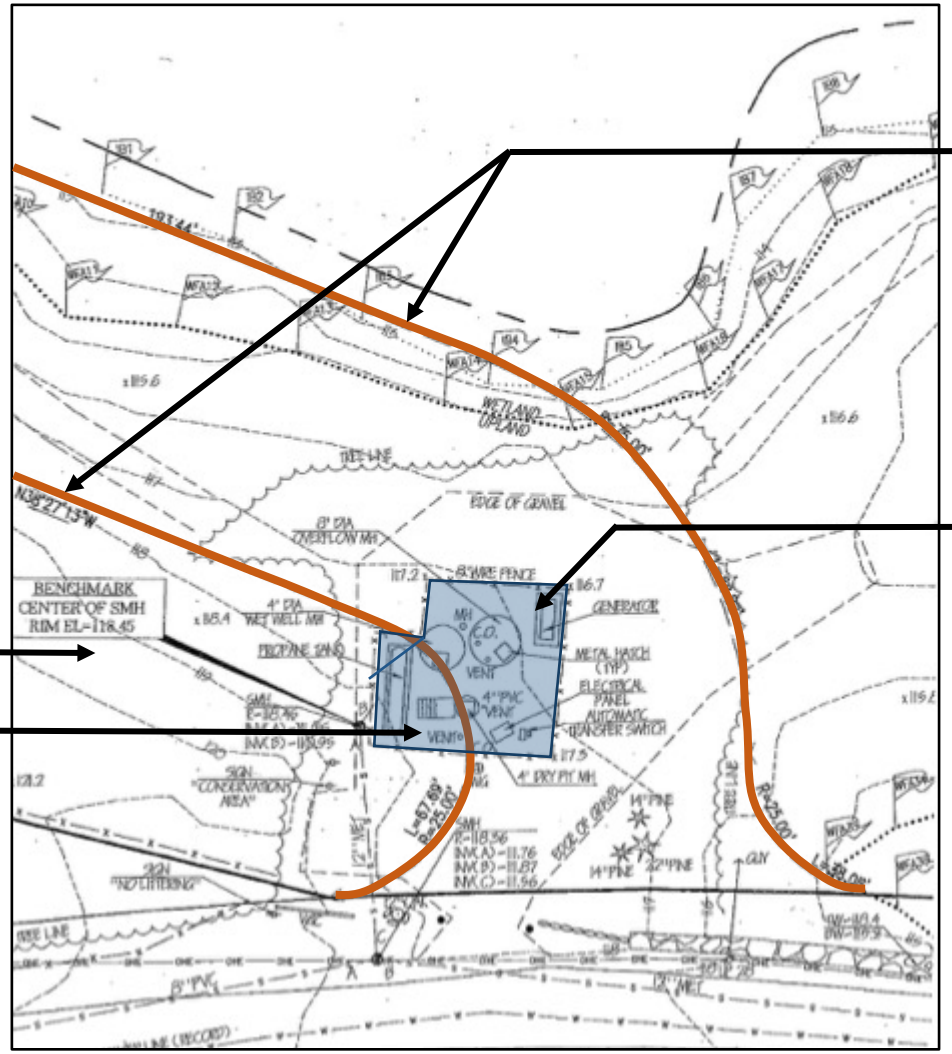
Easement Issues Uncovered Fall 2012

- Research Reveals Developer Owns Existing Easement
- 50-foot Right-of-Way was Retained by Property Owner in 1975
- Town has No Rights to Existing Sewer and Pump Station Easement
- Existing Pump Station Constructed Partially on Conservation Land

Existing Pump Station Location



Encroachment on Conservation Land



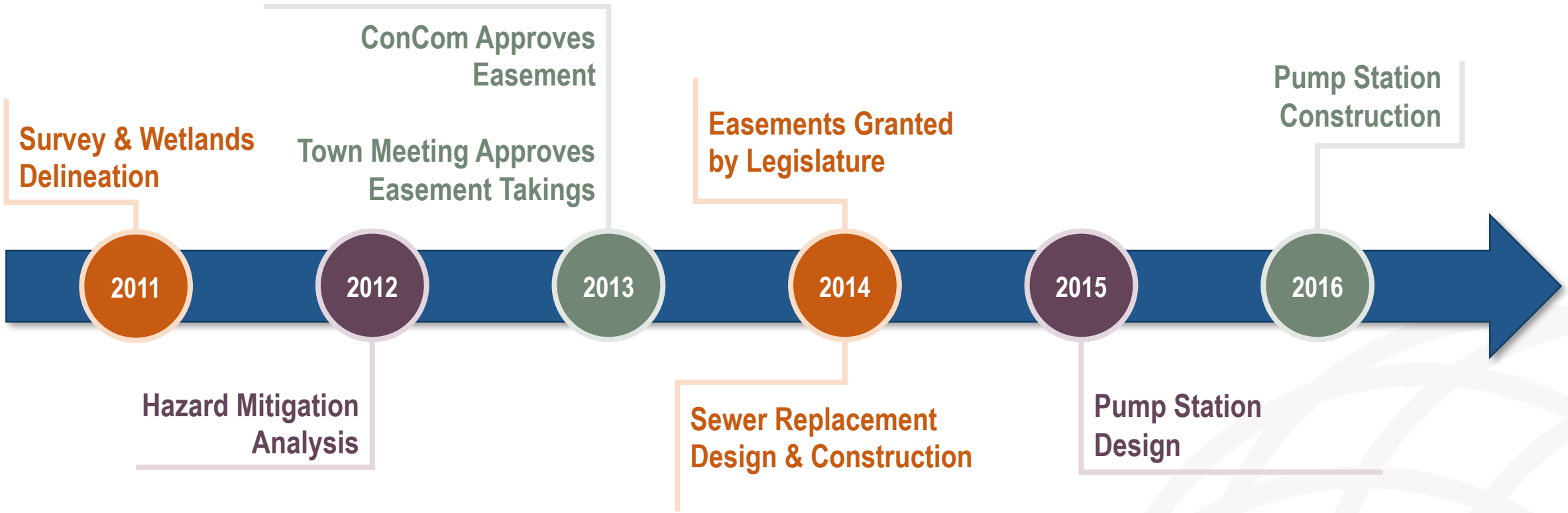
Site Issues Resolved

- Reduced New Pump Station Site per Conservation Commission Requirements and No Net Loss per Article 97
- Conservation Commission Vote Approves Land Swap per Article 97
- April 2013 – Town Meeting
  - Takes Sewer and Pump Station Easements and Facilities By Eminent Domain
  - Approves Filing Special Legislation for Article 97 Taking
- October 2014 – Article 97 Action Approved by Legislature

Pump Station Design Changes

- Building Eliminated to Reduce Footprint to Fit Reduced Site
- Segmental Pre-Cast Concrete Wet and Dry Well Proposed
- Pump Station Changes Also Addressed Funding Limitations

Project Timeline



Water Protection Considerations

- Station Designed Provide Additional Protection from Failure to Protect Water Quality of Adjacent Drinking Water Supply
  - Raised Structures and Site Above the Estimated Flood Plain
  - Increased Storage with Larger Wet Well
  - Standby Power for Complete Pump Station Operation
  - Additional Alarms for High Water, Power Failure at Site and at Control Panel
  - All Pumps on Timed Relays to Provide Backup in Event of CP Failure
  - Bypass Piping for Various Bypass Pumping Configurations

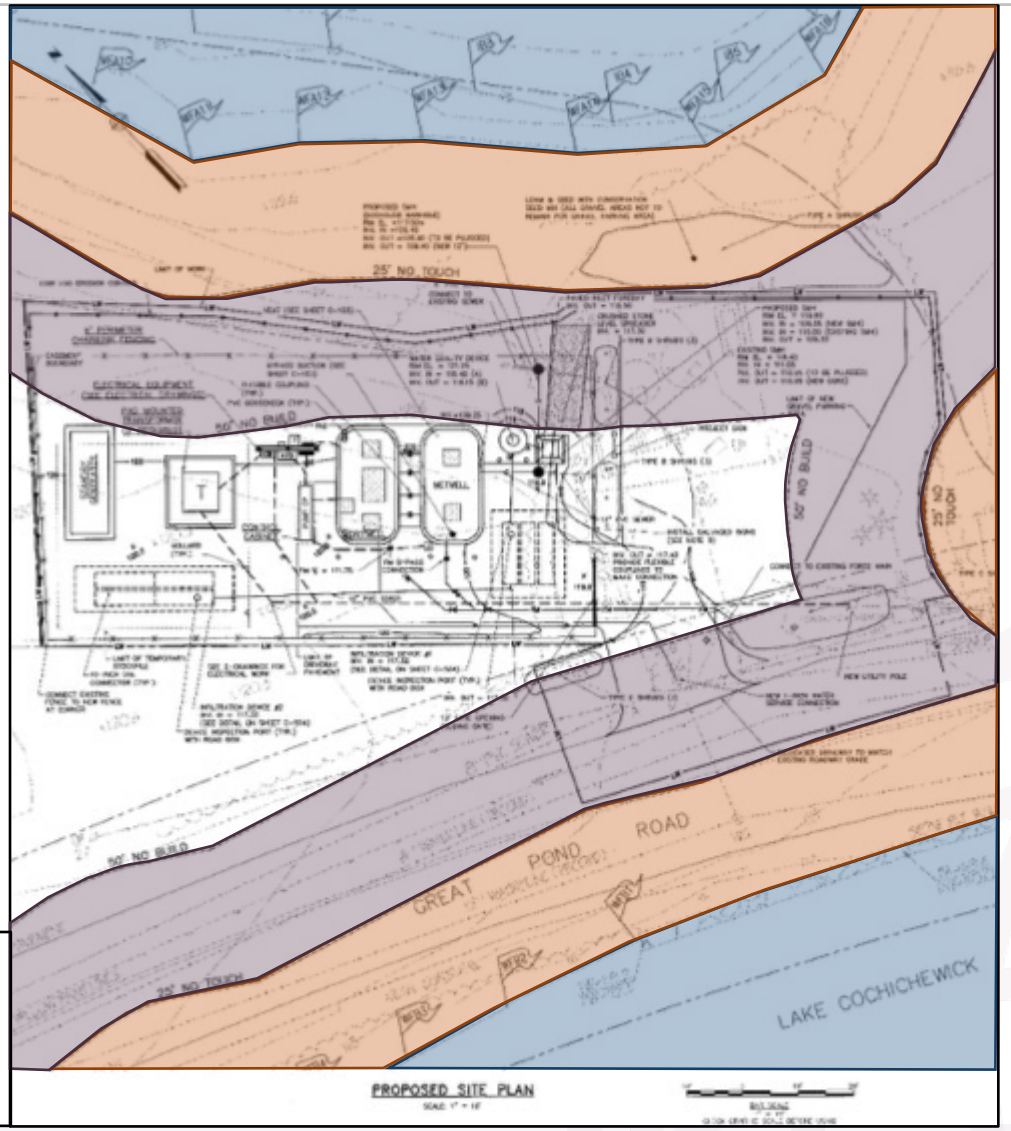
Water Quality Reminder

Design

- Site Limitations
  - Small Site Footprint
  - Within 100-foot Buffer of Pond and Lake
  - Located in Zone A for Drinking Water Supply / Watershed Protection District
    - Infiltration Prohibited
    - No Diesel Storage
- Utility Limitations
  - Unreliable Grid Power at Site
  - Natural Gas Not Available

Design

- Pump Station to be Located West of Existing Location
  - Ground Surface 3 feet above Existing Location
  - Pump Station Driveway Accessible in 100-year Flood Condition



Resource Area:	
Inside 25-Foot Buffer:	
Inside 50-Foot Buffer:	

Design

- Stormwater Consideration
  - Town Wanted Paved Driveway for Convenience and Maintenance
  - Stormwater Runoff
    - Insufficient Space for Treatment of Stormwater via Overland Flow
    - Insufficient Area for Retention/Detention
    - Zone A Infiltration Prohibition
  - Project Required to Meet Stormwater Standards by Conservation Commission
- Stormwater Infiltration within Zone A Approved by MADEP
- Stormceptor and Subsurface Infiltration Most Effective Option

Design

- Standby/Emergency Power
  - Power
    - No Natural Gas – Considered Propane
  - Propane Required Significant Amount of Tank Storage Limited by Overall Site Footprint
  - Propane Storage Triggered Additional Permitting
- Diesel Fuel Storage Prohibited in Watershed Protection District
  - Planning Board Issued Special Permit Allowing Diesel Generator with Double Walled Tank and Active Leak Sensors
  - Conservation Commission Agreed

Design

- Package Precast Concrete
- 10’ x 20’ Rounded Corner Precast Structures
- Approximately 23 Feet Below the Ground Surface
- Geotechnical Report – Sand over Glacial Till
- Shoring Specifications Required Sheet Pile Excavation
- Dewatering Specifications Required a Well Point System

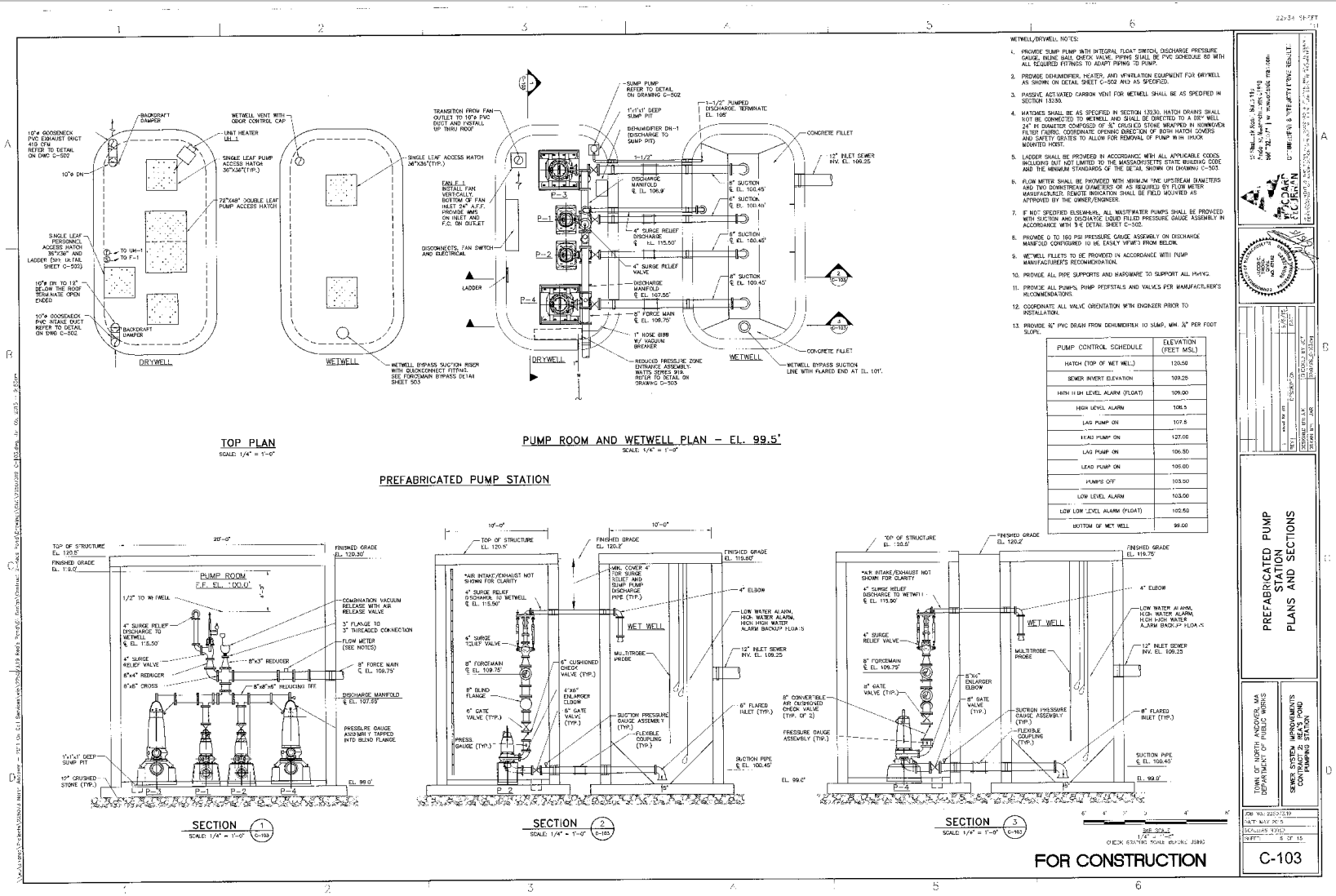
Forcemain Design

- Connect to Existing Forcemain on Site
- Performed Pump Tests to Determine Forcemain Characteristics and System Curve
  - Approximate Hazen Williams C Value Range – 85 to 120
  - Design C Value – 95

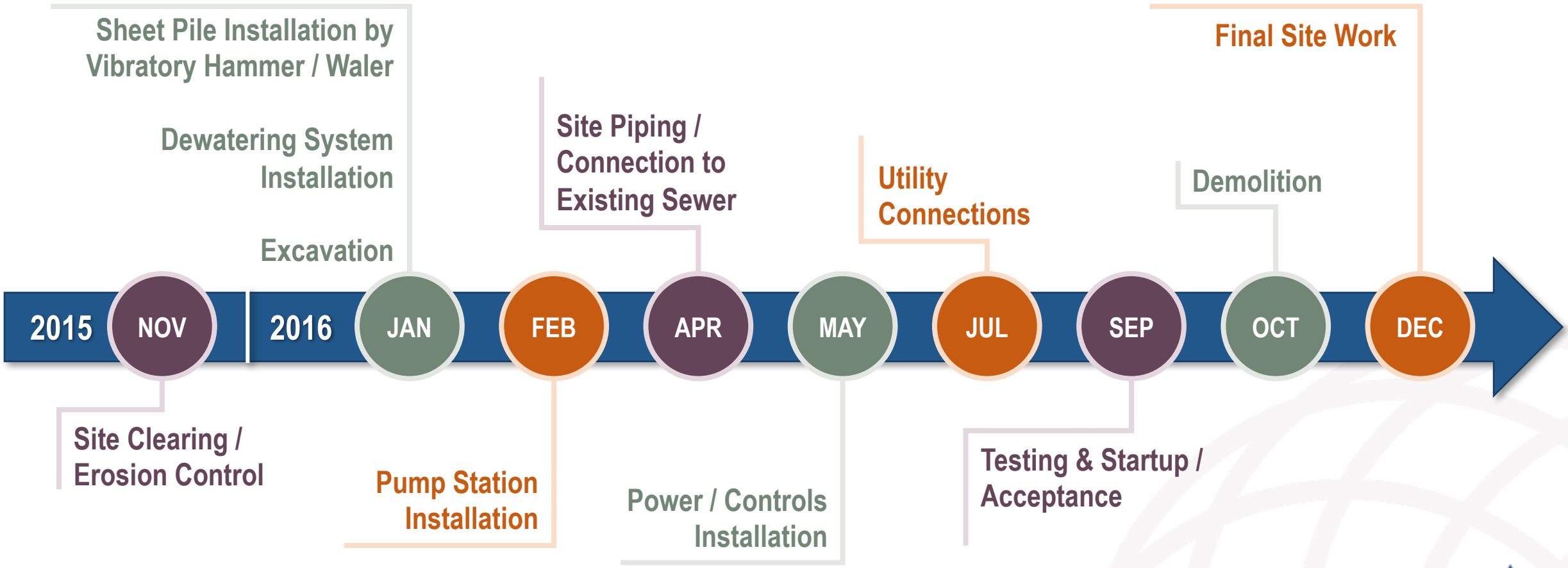
Pump Design

- Design Flow
  - Existing Flow/Normal Conditions – 450 gpm, 160 feet TDH
  - Seasonal High Flows/Buildout – 950 gpm, 257 feet TDH
- Concern about Water Hammer and Transients during High Flow Operation
  - Slow closing/Dampened Check Valves
  - Air/Vacuum Release Valve
  - Surge Relief Valve

Design


WETWELL/DRYWELL NOTES:
PUMP CONTROL SCHEDULE
ELEVATION (FEET MSL)
TOP PLAN
PUMP ROOM AND WETWELL PLAN – EL. 99.5'
PREFABRICATED PUMP STATION
SECTION
SECTION
SECTION
PREFABRICATED PUMP STATION PLANS AND SECTIONS
FOR CONSTRUCTION
C-103

Construction Timeline



Construction

- Initial Site Work Began November 2015
  - Project Used Force Labor from Town of North Andover to Reduce Cost
- Full Time RPR Began Mid-January 2016
  - Layout and Excavation

Construction

- Sand over Glacial Till
- Sheet Pile and Dewatering Installation
- Contractor Provided Internal Sump in Lieu of Wellpoints
  - Aided by Drought and Low Pond and Lake Levels

Construction

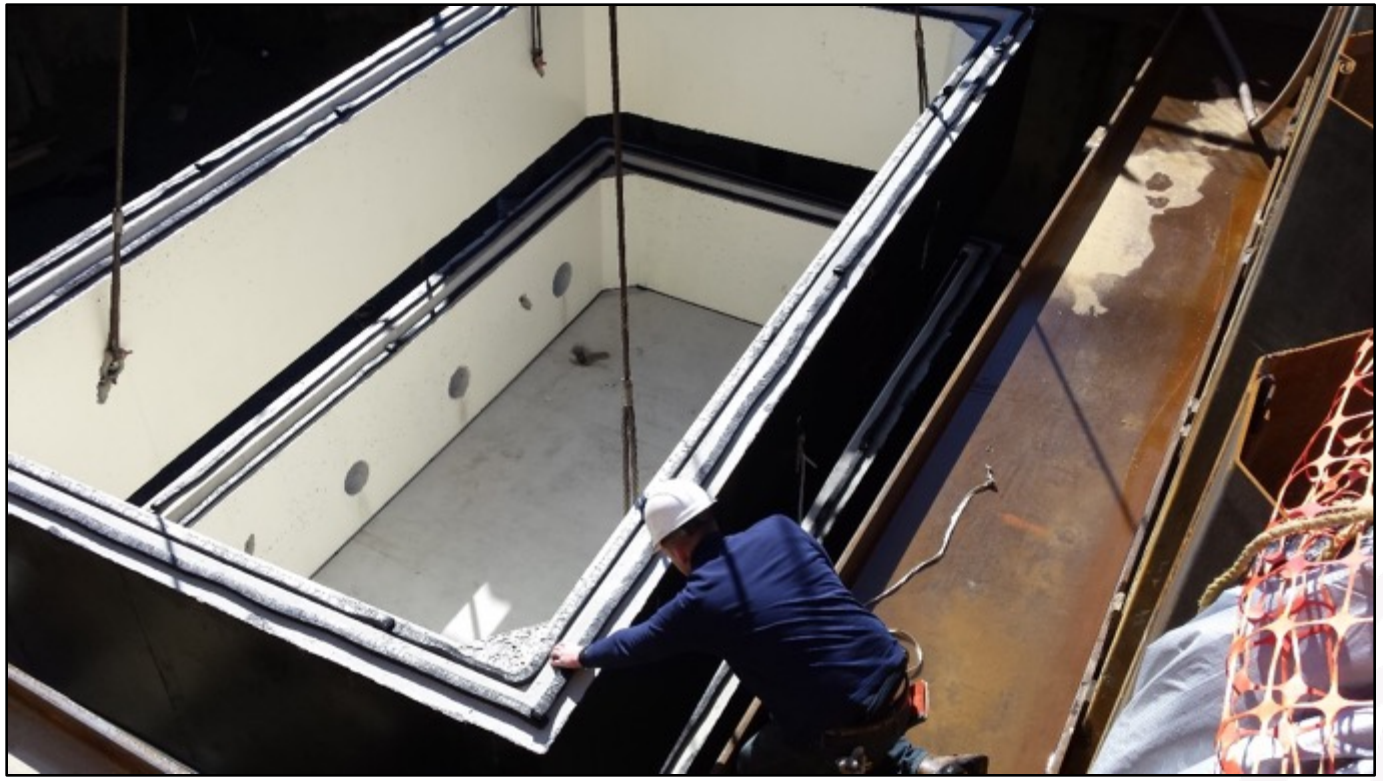
- Precast Structure Installation
  - Limited Space – No Staging
  - Narrow, Busy Roadway with Traffic Control
  - School Vacation Week Allowed for Staging of Delivery Trucks in Nearby School Parking Lot

Construction

Construction

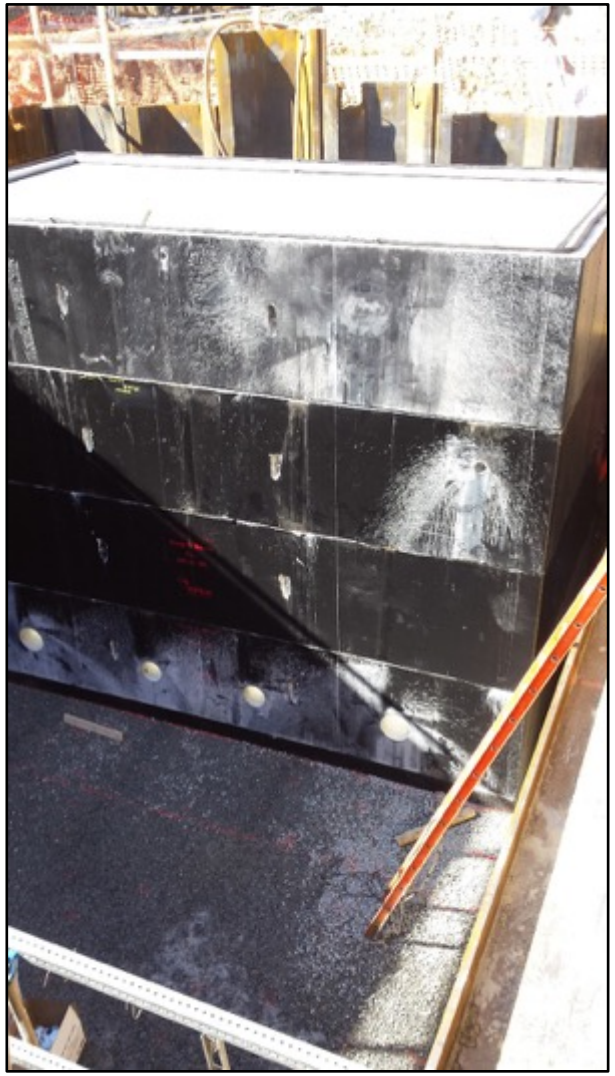
Construction

Construction



Construction

Construction



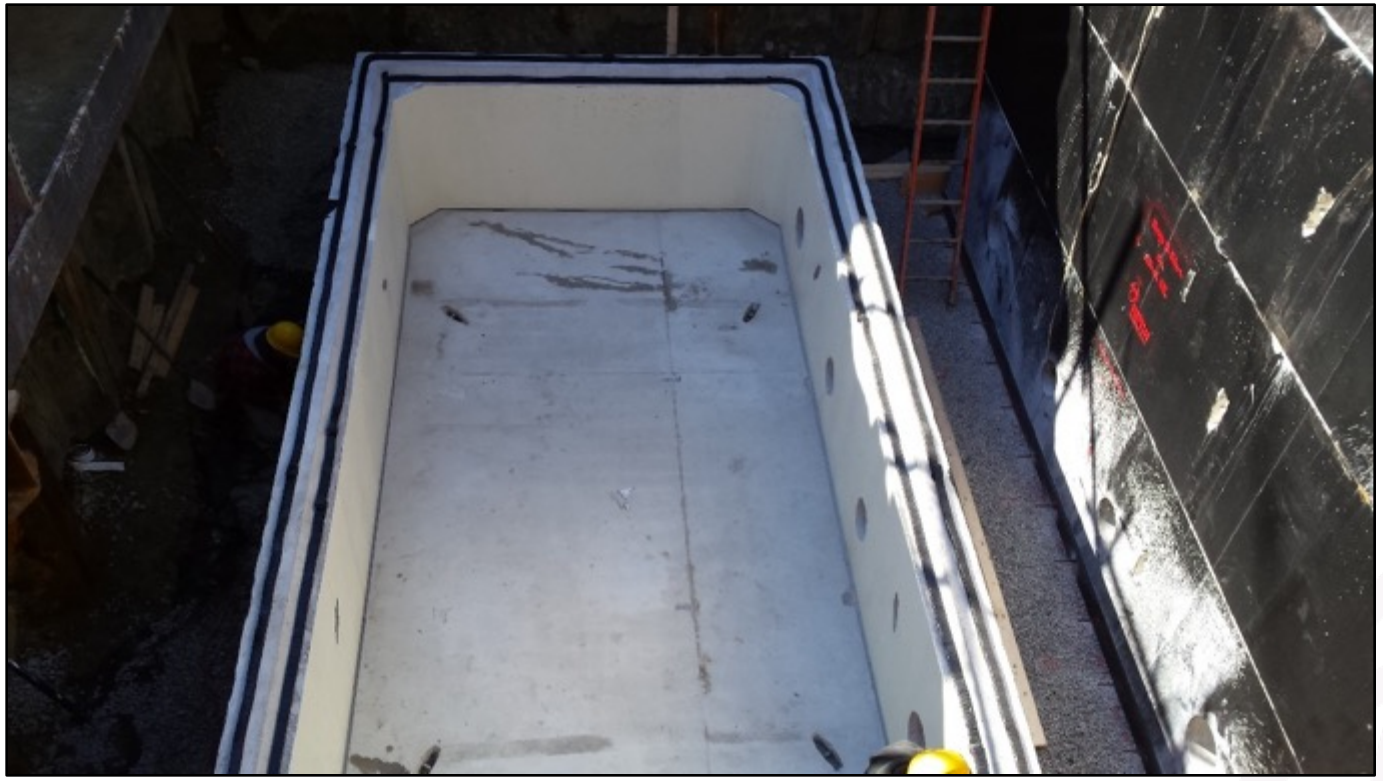
Construction

Construction

Construction

Construction

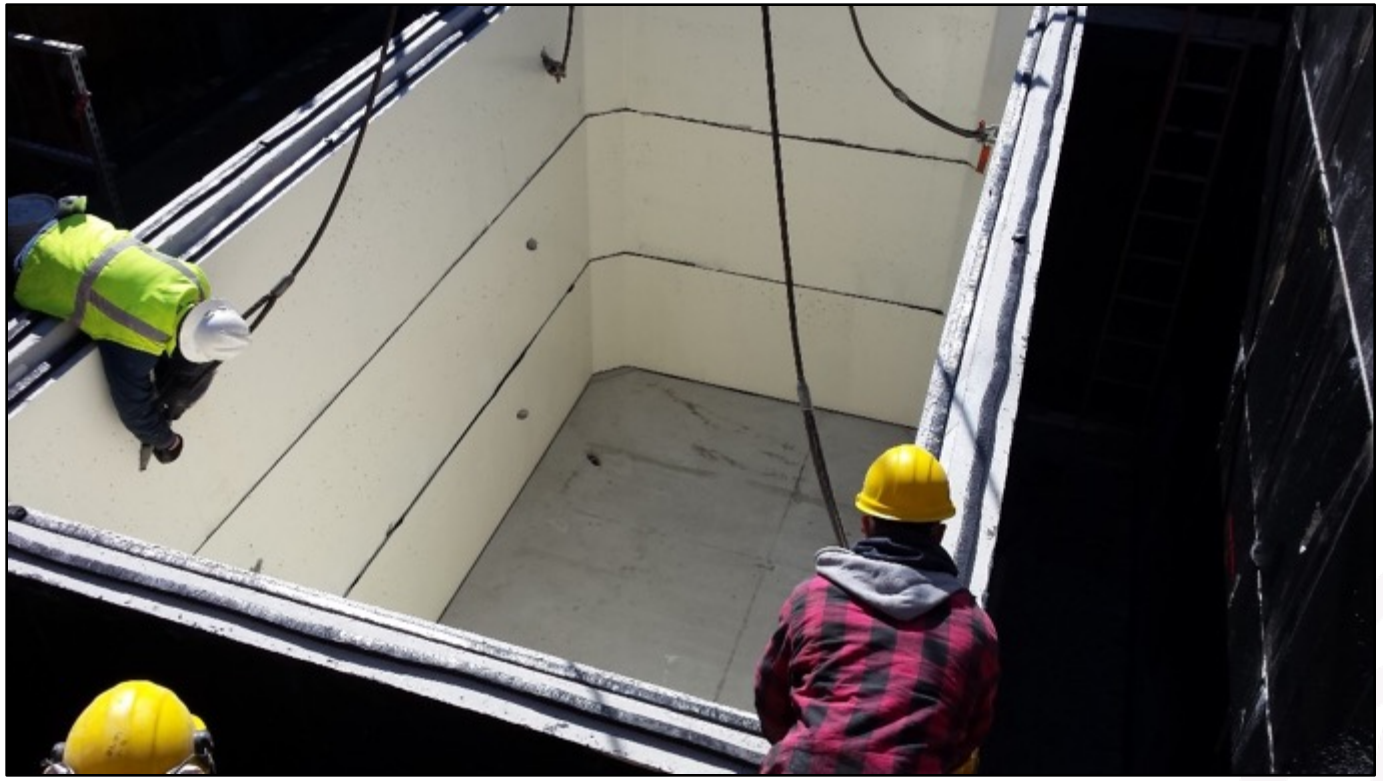
Construction



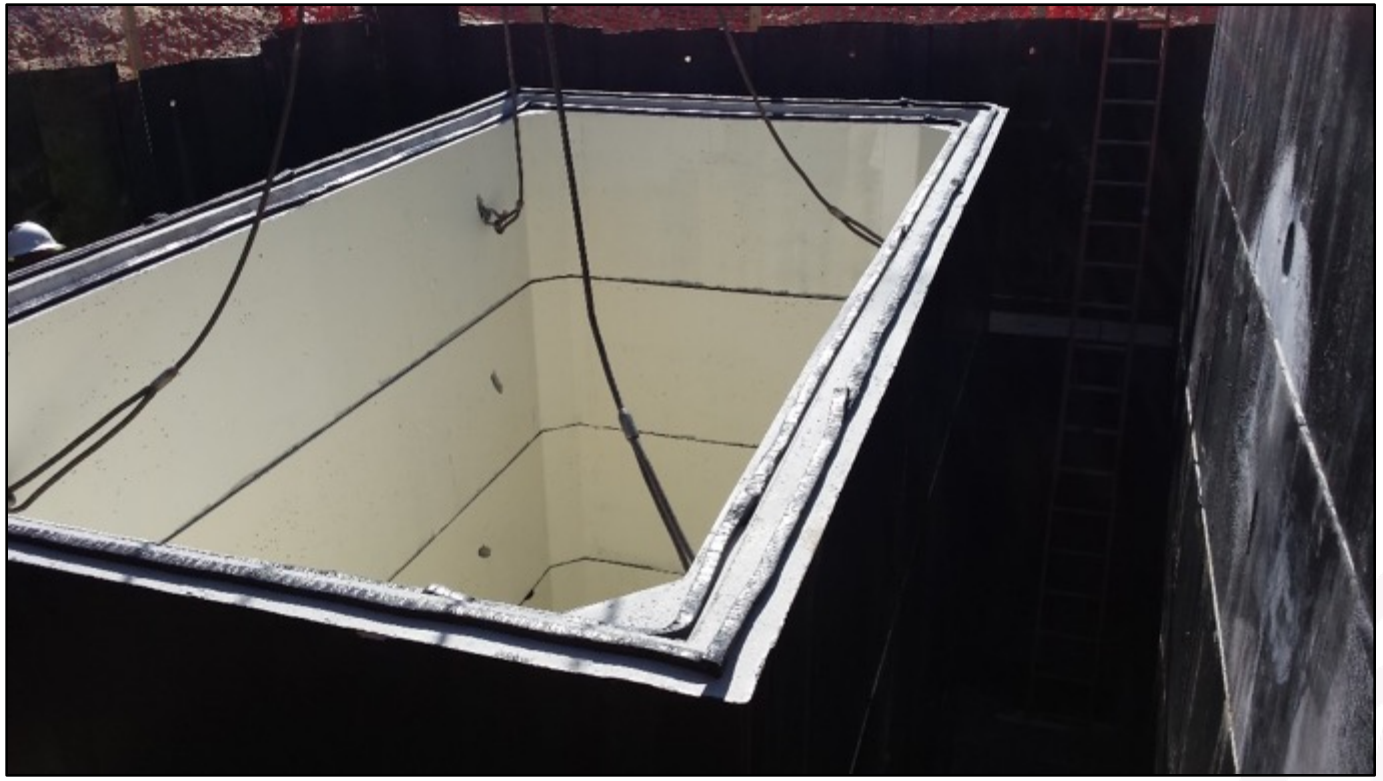
Construction

Construction

Construction



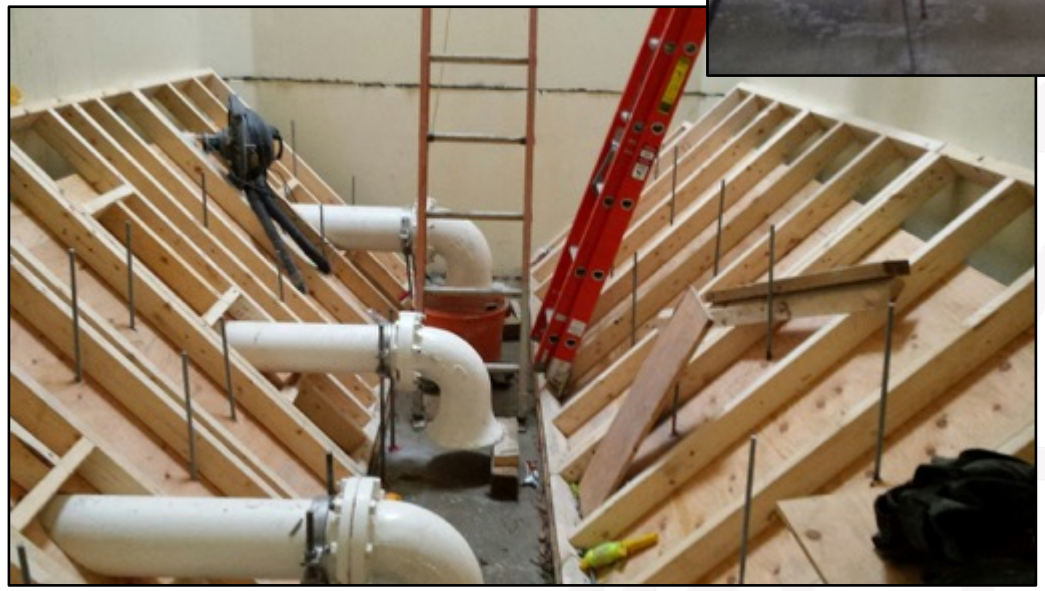
Construction



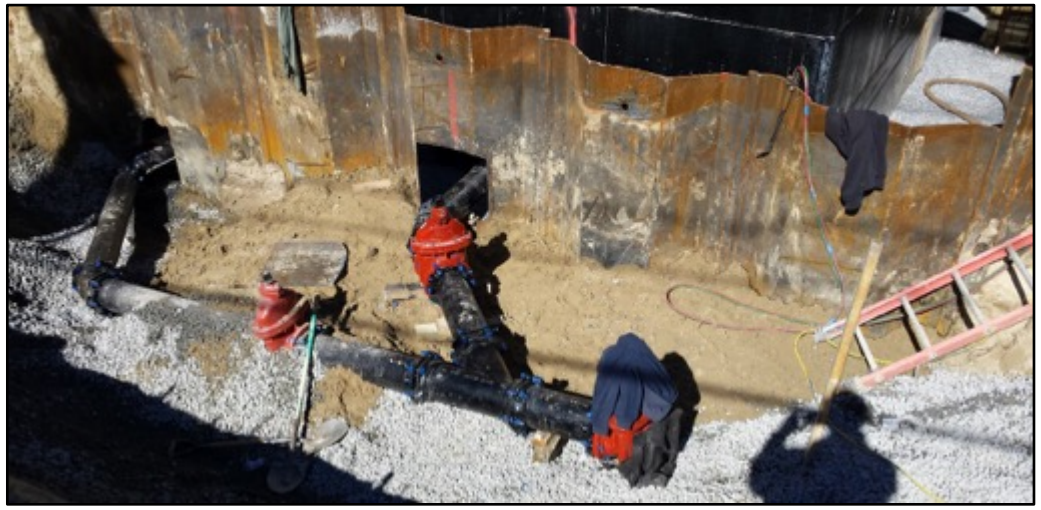
Construction

Pump Station

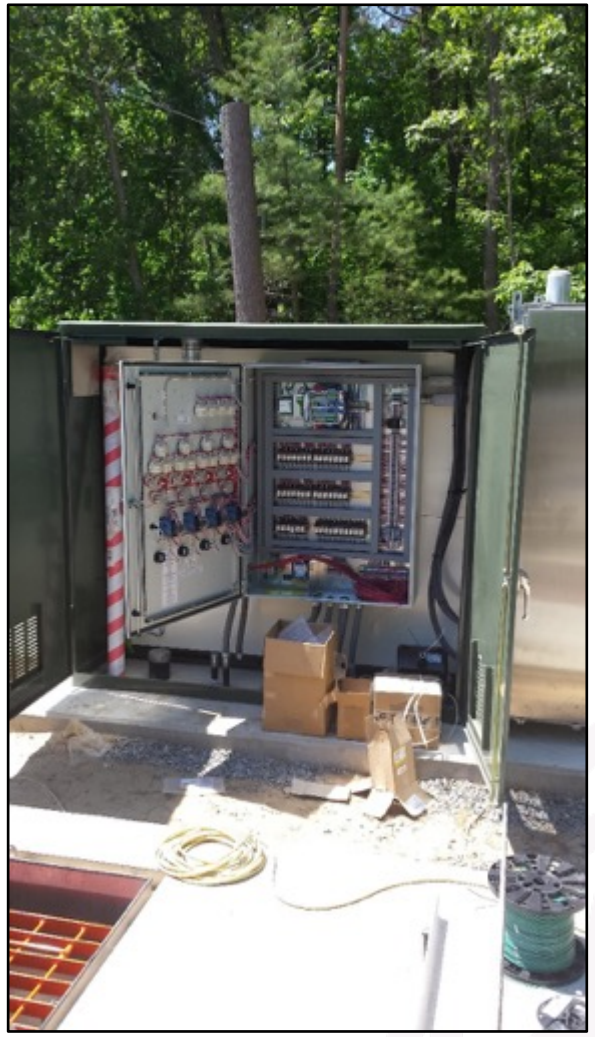
- Stainless Clips/Brackets
- Doweled Anti-Floatation Slab Installation
- New FM Connection to Existing
  - Allow Quick Transition Between Stations for Testing
  - Bypass Risers



Site Work



Construction

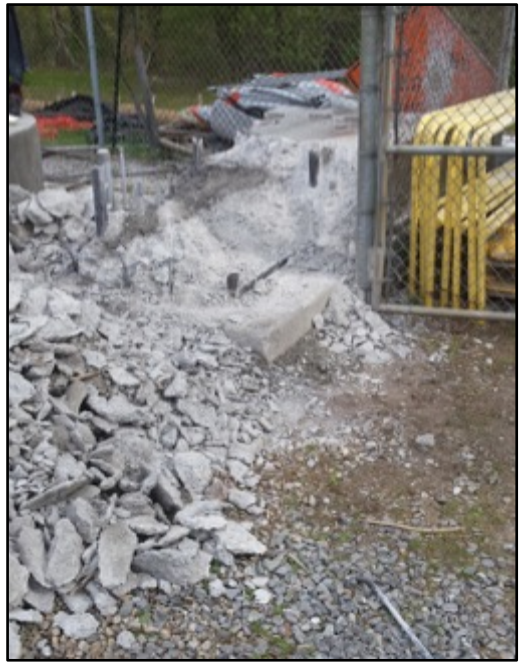


Electric Utility Connection

- Multiple Delays on Site Power
- Two Easements Required for New Poles for PS Service and New Support Pole
- 10-week Delay, June – August 2016
- Transformer Installation and Connection to Primary
- At Last, Removal of “Tree”

Construction

- Demolition – About 3 Weeks
  - Removed All Equipment
  - Wet Well, Auxiliary Storage Wet Well and Dry Pit Cut off 4 Feet Below Ground Surface, and Backfilled
  - Gravity Sewer and Forcemain to Existing Station Removed, Capped and Secured
  - Manhole Connections Plugged



Stormwater Management System Installation

- Stormceptor
- Stormwater Infiltration Basins

Pump Testing / Acceptance

- Pumps Performed Above Design Criteria
- Design C-Value = Conservative
- Station Entered Operation October 2016
  - Small Pump Operation, Large Pumps Exercised.
  - Panel Heater

Completed Station

Completed Station

Completed Station

Final Completion – Spring 2017

- Outstanding Items
  - Warranty Inspection
  - Seeding and Final Cleanup of Parking Area

Acknowledgements

- Town of North Andover
  - Glen Alt, Water Treatment Plant Superintendent, Pump Station O&M
  - Dan Concessi, Assistant Operations Manager, Resident Inspector
  - Jennifer Hughes, Conservation Administrator
  - Heidi Gaffney, Conservation Field Inspector
- Jack Troidl, Woodard & Curran, Project Manager
- Kate Roosa, Woodard & Curran, Engineer
- Maureen Herald/Steve Eriksen, Norse Environmental Services, Environmental Monitors
- Dan Maurano, Bryant Associates, Resident Inspector
- Mike Girard, Waterline Industries, Project Manager
- Jan Vastl, Waterline Industries, Superintendent

Acknowledgements

A Special Acknowledgement to Bruce Thibodeau, Town of North Andover Director of Public Works, for Participation in this Presentation.

Bruce Retired on January 20, 2017.

Best Wishes Bruce!

Questions?