Lowlands Pump Station and Force Main Upgrade

Nahant, MA

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Background: Nahant, MA

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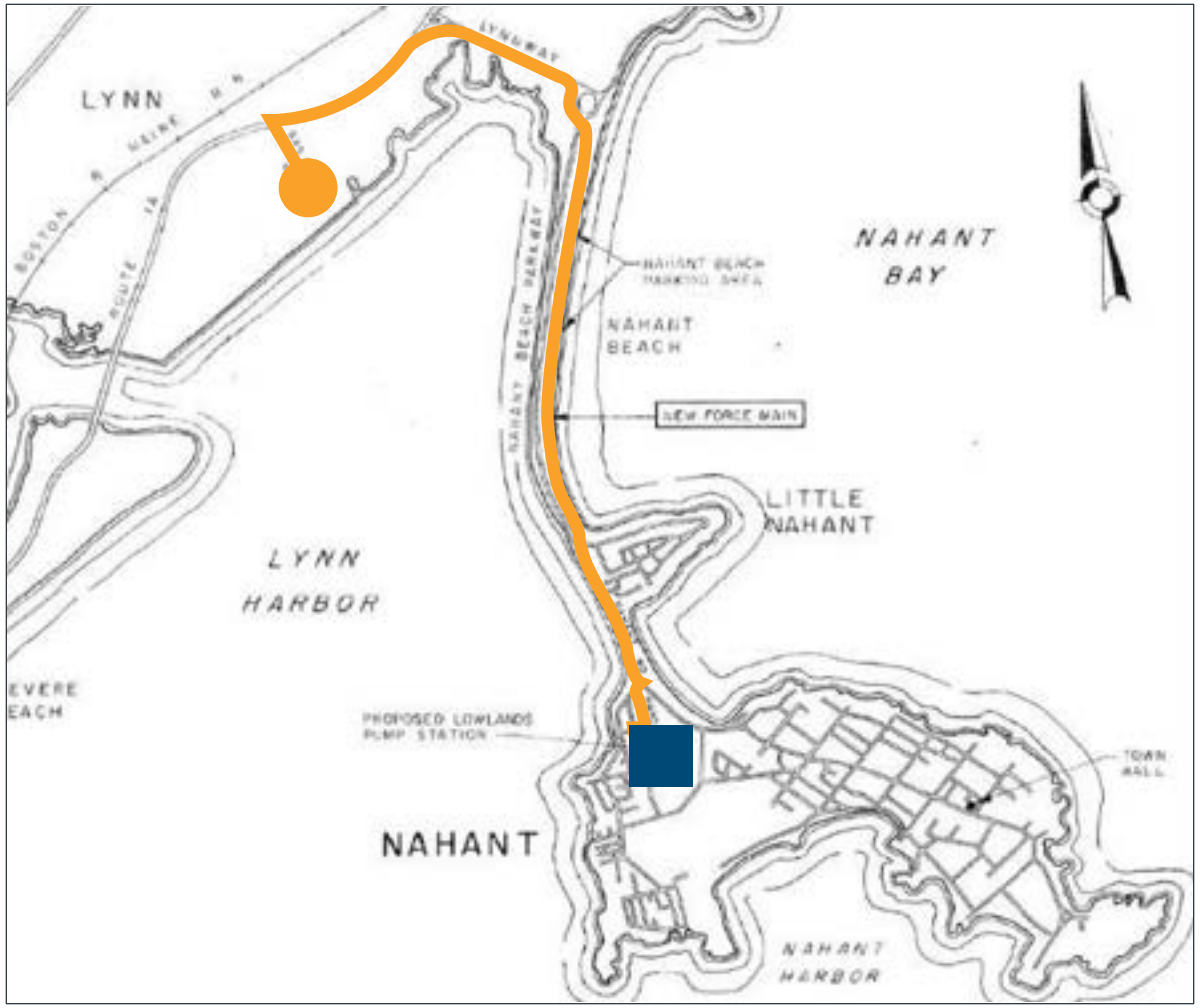
Project Overview: Lowlands Pump Station & Force Main



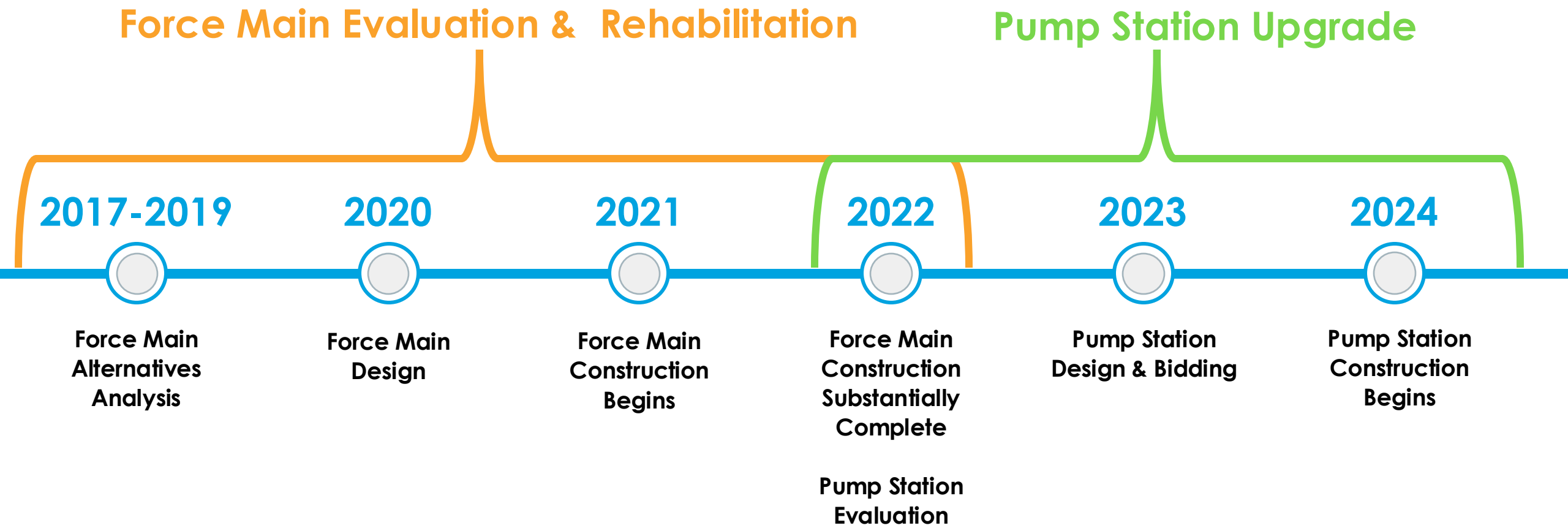
Lowlands Pump Station

- Size: 18” diameter force main
- Discharge to Lynn Regional WWTF
- Constructed in 1983
- 0.7 MGD avg daily flow
- 2.82 MGD peak flow

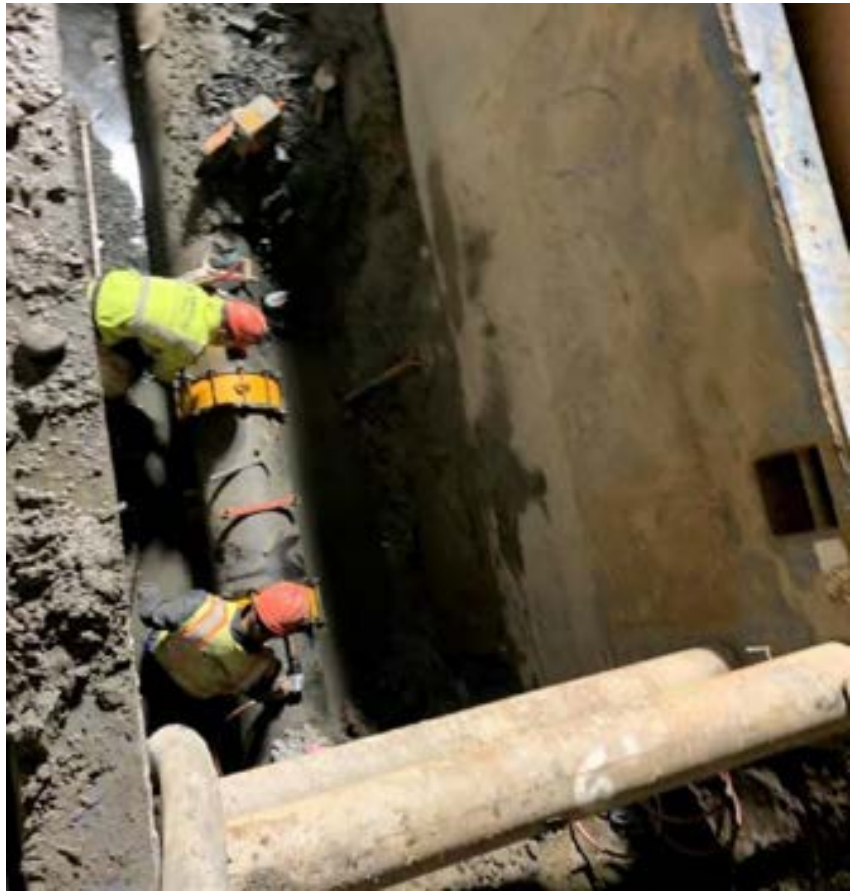
Two Major Construction Projects

- Lynnway Force Main Rehabilitation
- Comprehensive Pump Station Upgrade

Project Overview: Timeline



Background: Force Main Breaks



- April 7, 2017, break 282 Lynnway
- April 25, 2017, break 330 Lynnway
- June 3, 2019, break 260 Lynnway
- June 11, 2020, break 260 Lynnway
- September 29, 2020, break Lynnway
- June 2, 2021, break Lynnway

Force Main Evaluation: Methods of Corrosion

Break due to Hydrogen Sulfide

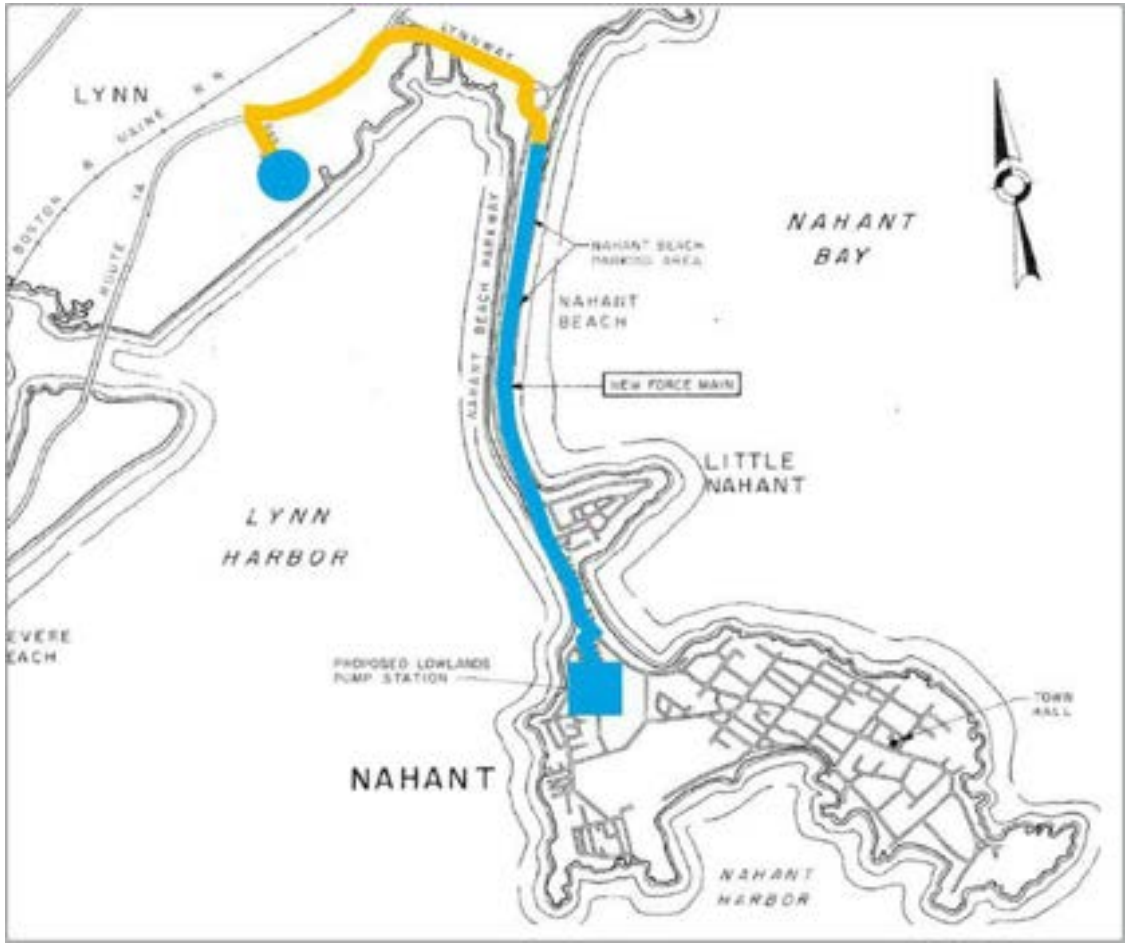
Break caused by Electrolic (Stray Current)

Force Main Evaluation: Ultrasonic Thickness Testing

Pipe Wall Thickness

Location	Pipe Thickness (inches)	Thickness Loss (Percent)
Causeway	0.51	Minimal
Causeway	0.38	7%
Rotary	0.32	22%
Lynnway	0.48	Minimal
Lynnway	0.21	50%
Lynnway	0.10	76%
Lynnway	0.10	76%
Lynnway	0.13	69%

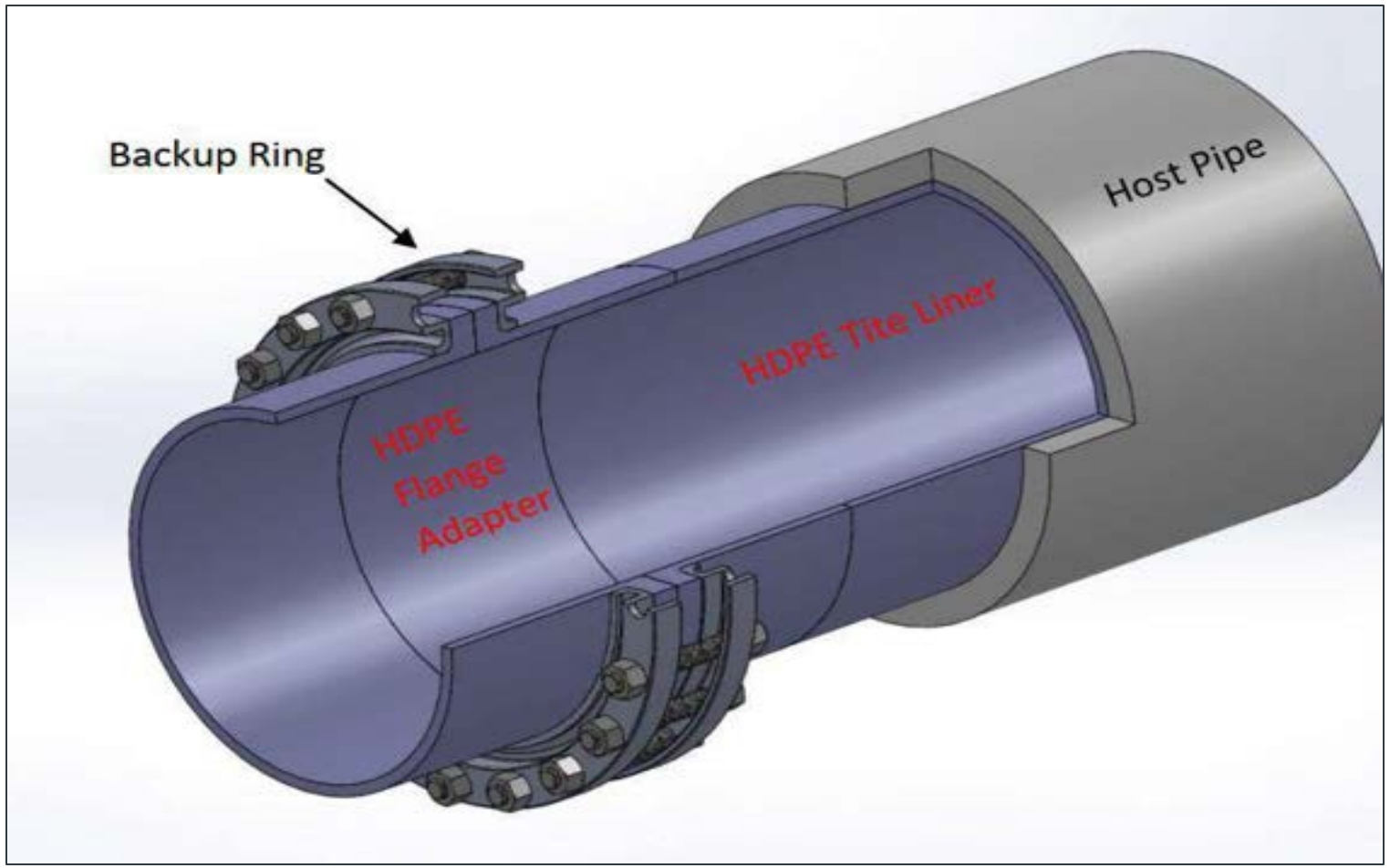
Force Main Evaluation: Recommendation



- **Lynnway section is identified for immediate design and repair.**
- **Repair & Replacement methods considered**
  - **Repair as Required**
  - **Traditional Dig & Replace**
  - **Cross-Harbor Directional Drill**
  - **Trenchless Technologies**

Force Main Evaluation: Compressed Fit HDPE Liner Pipe

Benefits



- Aegion Tite Liner System
- AWWA Class IV Product
- Custom pipe size
- 18-inch DR17 HDPE
- Pull length up to 1,000 LF
- Pull through 11-degree bends
- Minimize number of access pits

Force Main Construction: Compressed Fit HDPE Liner Pipe

Close up of roller box

Force Main Construction: Pipe Cleaning

Force Main Construction: Pipe Fusing

Force Main Construction: Pipe Insertion

Force Main Construction: Pipe Insertion

Construction: Pipe Receiving

Construction: Equipment Change

Construction: Pipe Receiving

Construction: Challenges

Contaminated groundwater and soils uncovered during excavation

Custom trenching required due to large quantity of utilities in the Lynnway

Construction: Challenges

Large concrete thrust blocks discovered in field

A Swampscott manhole installed on top of Nahant's force main

Construction: Challenges

Daytime Construction

Nighttime Construction

Question Break

Evaluation: Lowlands Pump Station

Issues identified:

- Pumps system aged and not reliable
- HVAC/air handling systems not functional
- Aged electrical system
- Unreliable standby generator
- Wet well isolation gates not functional

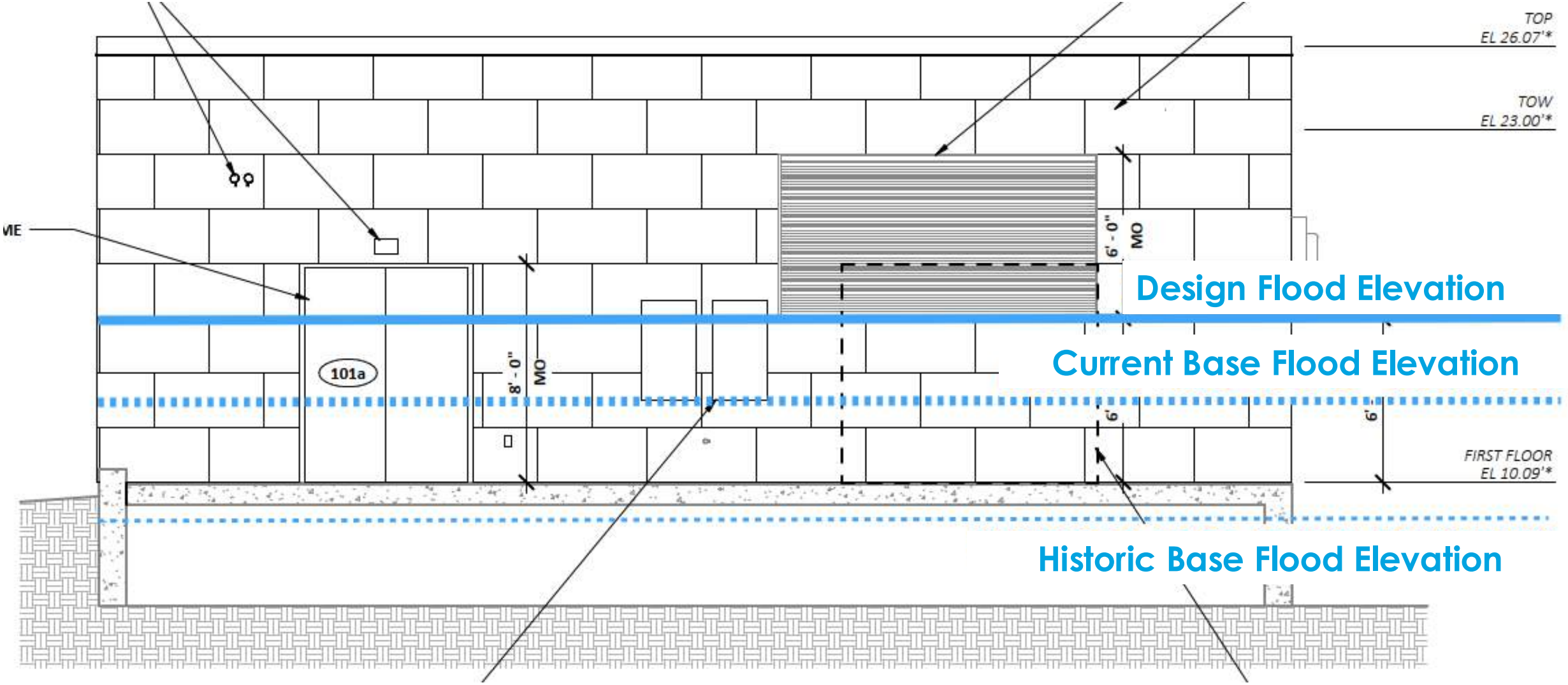
Conclusion:

- Replace everything except the building!

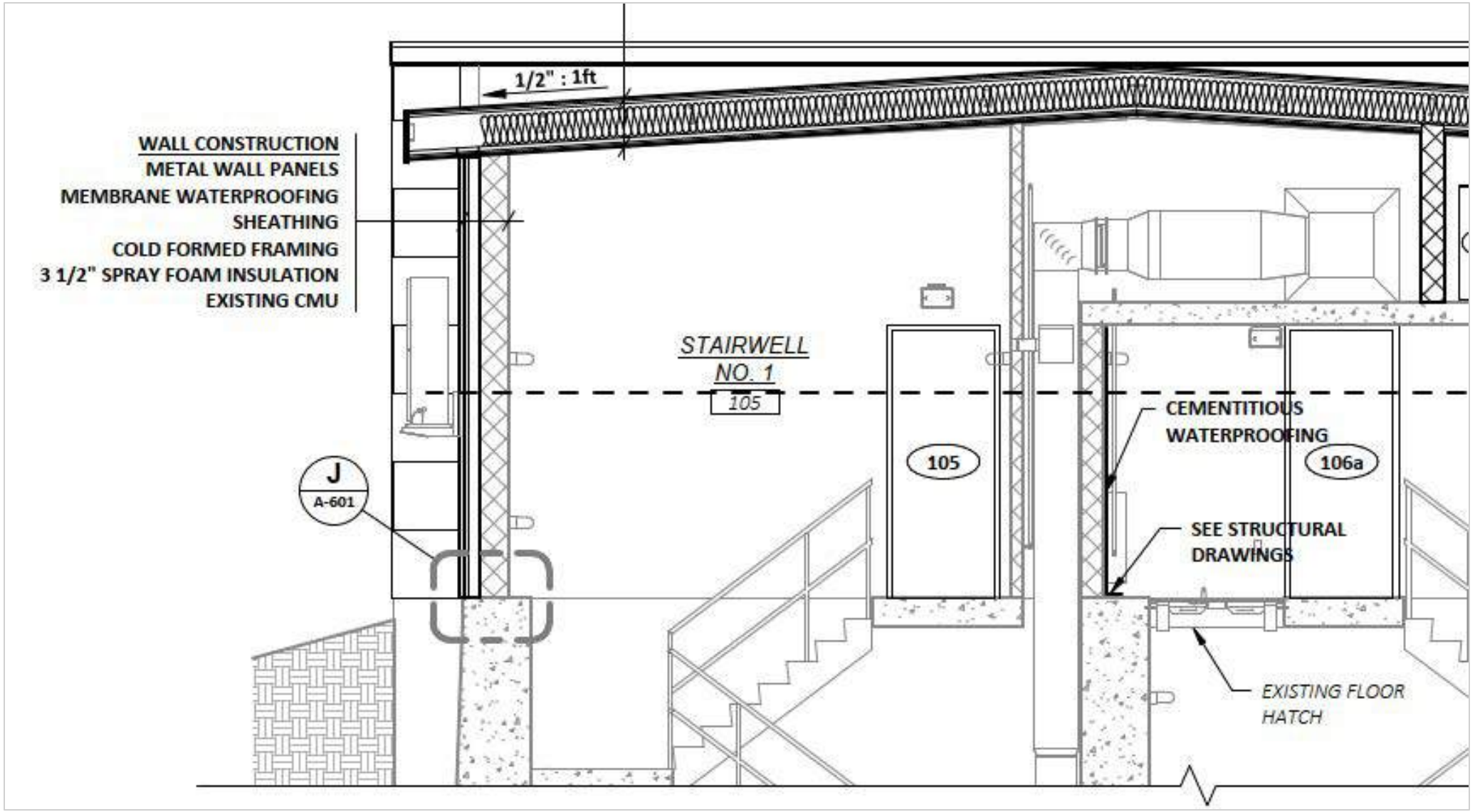
Design: Comprehensive Upgrade

- Wastewater equipment
  - Dry-pit submersible pumps
  - Channel grinder and bar rack
  - Gates, valves, and pipes
- HVAC
- Plumbing
- Electrical
  - MCC, VFDs, power systems, lighting
  - Standby generator
- Site improvements
- Building improvements
- Flood hardening

Design: Flood Hardening



Design: Flood Hardening



Construction: Demolition Begins

- Building deficiencies found
- CMU block wall missing bond beam
- Grout reinforcement missing at wall openings
- Grout reinforcement missing below monorail
- Corroded structural steel and roof purlins

Redesign Approach: Knock It Down!

Original Design	Re-design
Renovate and retrofit	Build new from the floor up
Keep existing CMU block structure	New cast-in-place structure
Retrofit waterproof membrane/structure	Waterproofing admixture, retrofit waterstop
Keep existing flat roof structure	New gable roof supported by wood trusses
Architectural metal siding	Vinyl siding
Building layout	No change
Process, electrical, mechanical design	No change

Construction Take 2: Demolition

Demolishing the pump station to the first-floor slab

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Construction Take 2: Protect Existing Equipment

Protect electrical gear and pumps during demolition

Construction Take 2: Rebuild

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Construction Take 2: Rebuild

Construction Take 2: Flood Hardening

Retrofit waterstop

Equipment access platform

Construction Take 2: New Aesthetics

New pump station

Nahant life saving station

Construction Take 2: MEP Construction as Planned

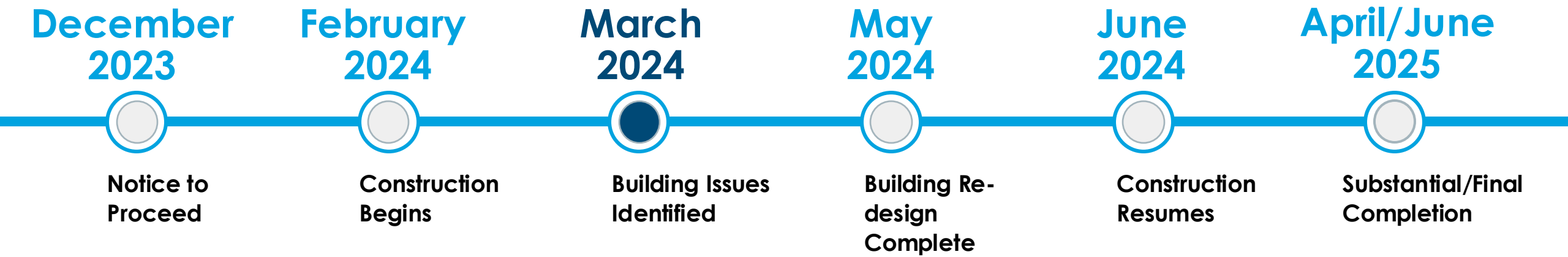
Project Status

Project Cost

Contract price	$5,997,677
Building re-design/national grid changes	$135,788
New fire alarm system	$75,694
Owner initiated CO	$39,153
Unforeseen conditions CO	$170,713
Estimated cost to complete	$6,419,324

Total Re-design Cost = $211,482
3.5% increase in bid price

Project Timeline



Project projected to be complete two months ahead of contract times.

Project Takeaways

1. Use a team approach with contractor and owner to overcome construction challenges.

2. Expect the worst during construction. Be proactive managing change.

3. Consider the benefits of new construction during preliminary design.

Acknowledgements

Town of Nahant

P. Gioioso & Sons, Inc.
Force Main General Contractor

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Pump Station General Contractor

THANK YOU

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