



## WESTPORT'S PUMP STATION NO. 2 FORCE MAIN REPLACEMENT PROJECT USING HDD: A CASE STUDY

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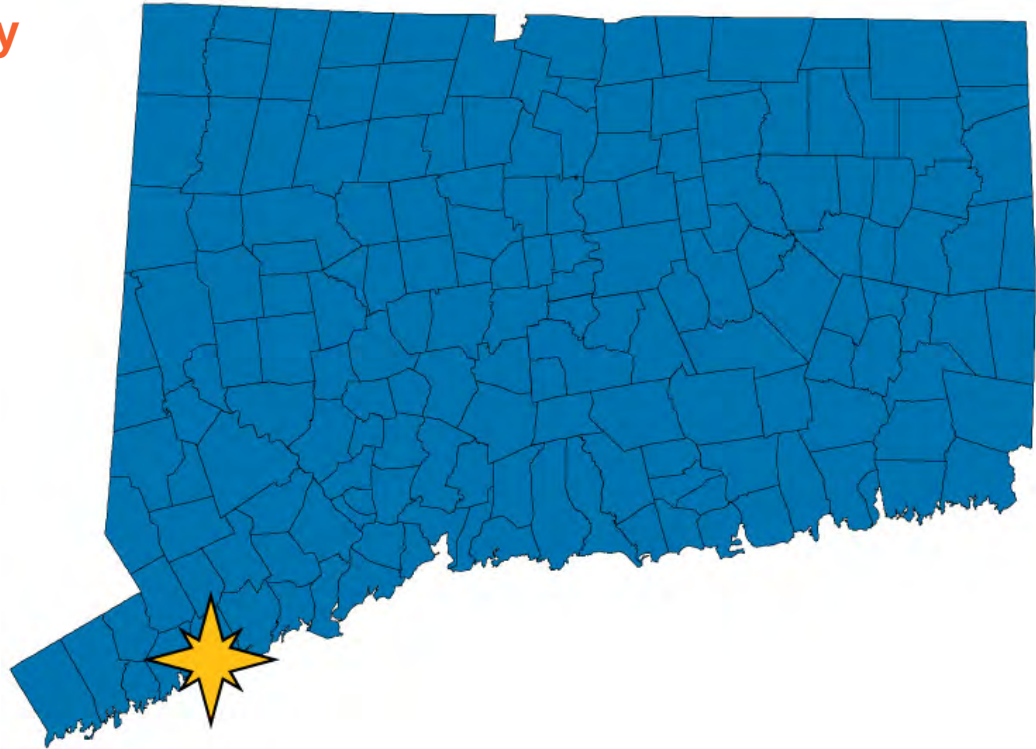
# PRESENTATION OUTLINE

- **Town of Westport**
- **Project Impetus**
- **Project Requirements**
- **Project Challenges**
  - Permitting
  - Bid Phase
  - Design
    - Technical
    - Logistical
  - Construction
- **Takeaways**



# TOWN OF WESTPORT

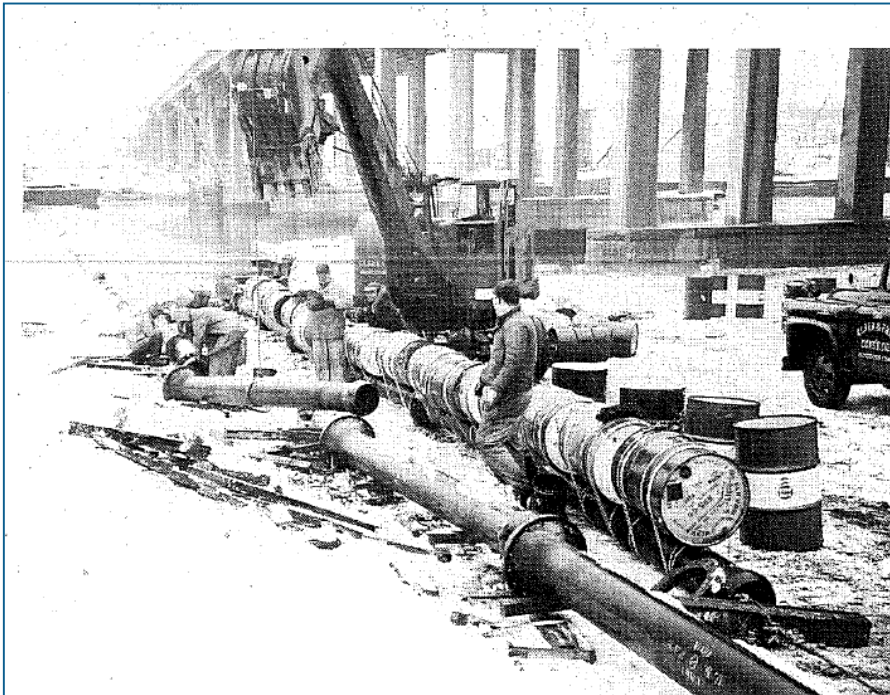
- Located southwest CT on Long Island Sound
- Population: 27,000, 40% connected to sewer
- Collection system: 128 miles of sewers and 18 pump stations
- 3.5 MGD Treatment Facility





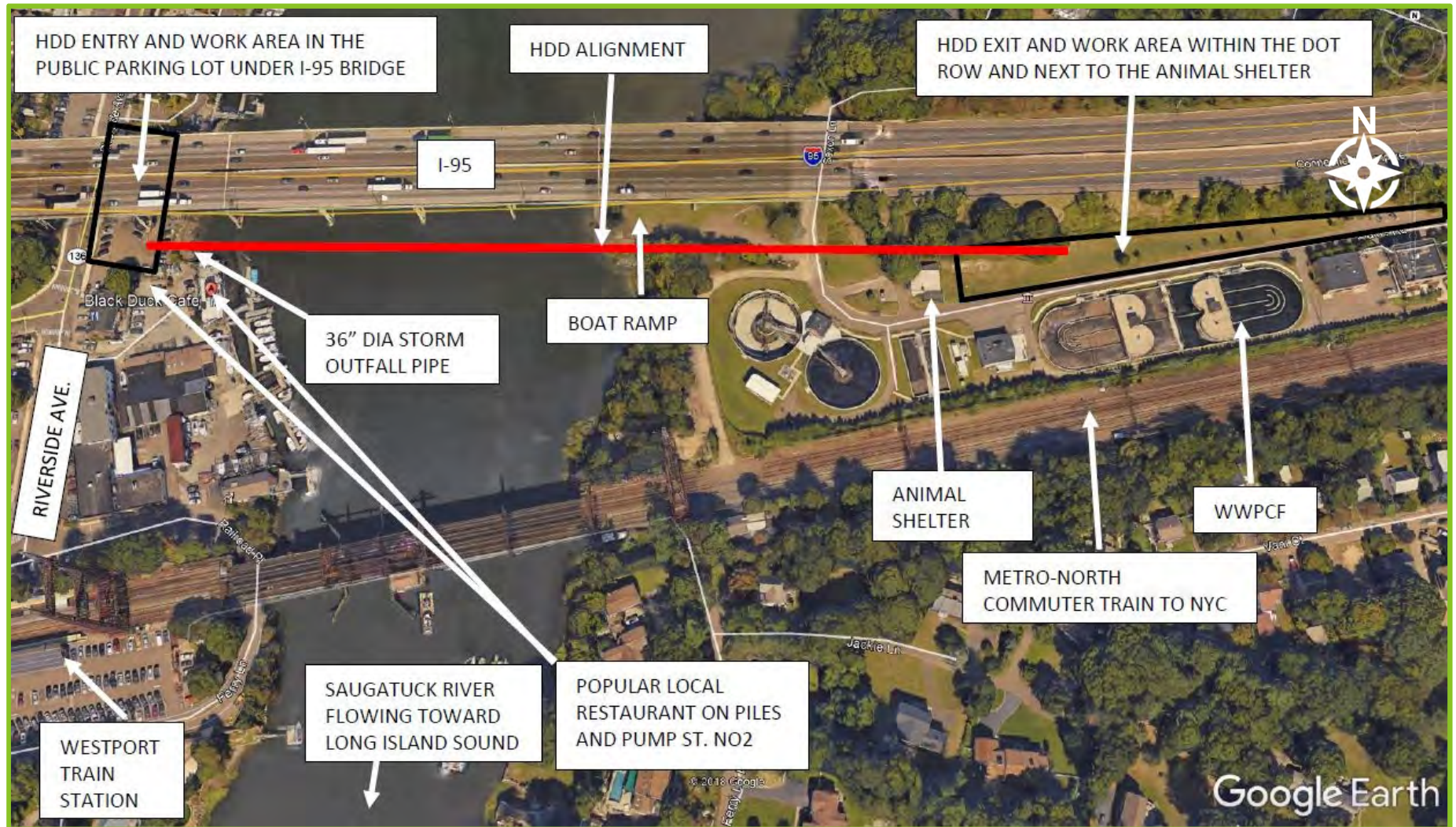
# PROJECT IMPETUS

- **Existing force main**
  - 10" dia. cast iron force main installed in 1959
  - Connects Pump Station No. 2 to WWPCF
  - Services 25% of the Town's sewer customers
- **Why replace?**
  - Town experienced cast iron force main failures on pipes of similar age
  - Proactively maintain and replace critical infrastructure





# PROJECT SITE





# HDD ALIGNMENT



Looking west to east along the HDD alignment

Looking east to west along the HDD alignment



# PROJECT REQUIREMENTS

- **Hydraulic requirements**
  - Shared force main
  - Adequate velocity for existing/future pump rates
  - Suitable thickness for HDD
- **Installation requirements**
  - 14" DIPS DR 9 HDPE
  - Approx. 1,300'
  - Trenchless installation
    - Tidal fluctuations in the river
    - Permitting difficulties
    - Logistical reasons

# PROJECT CHALLENGES

- **Permitting**
- **Bid phase**
- **Design**
  - Technical
  - Logistical
- **Construction**





# PERMITTING CHALLENGES





# BID PHASE CHALLENGES

- **Try #1**

- Drilling Work plus piping connections
- Summer Construction
- One bidder

- **Try #2**

- Drilling Work only
- Contractor selects timeframe (meeting permit requirements)
- 3 bidders
- Low bidder: Carson Corporation with bid of \$1.4M



# DESIGN CHALLENGES

- **Technical**

- Subsurface conditions
- HDD Alignment geometry in bedrock
- Designing to manage the risk

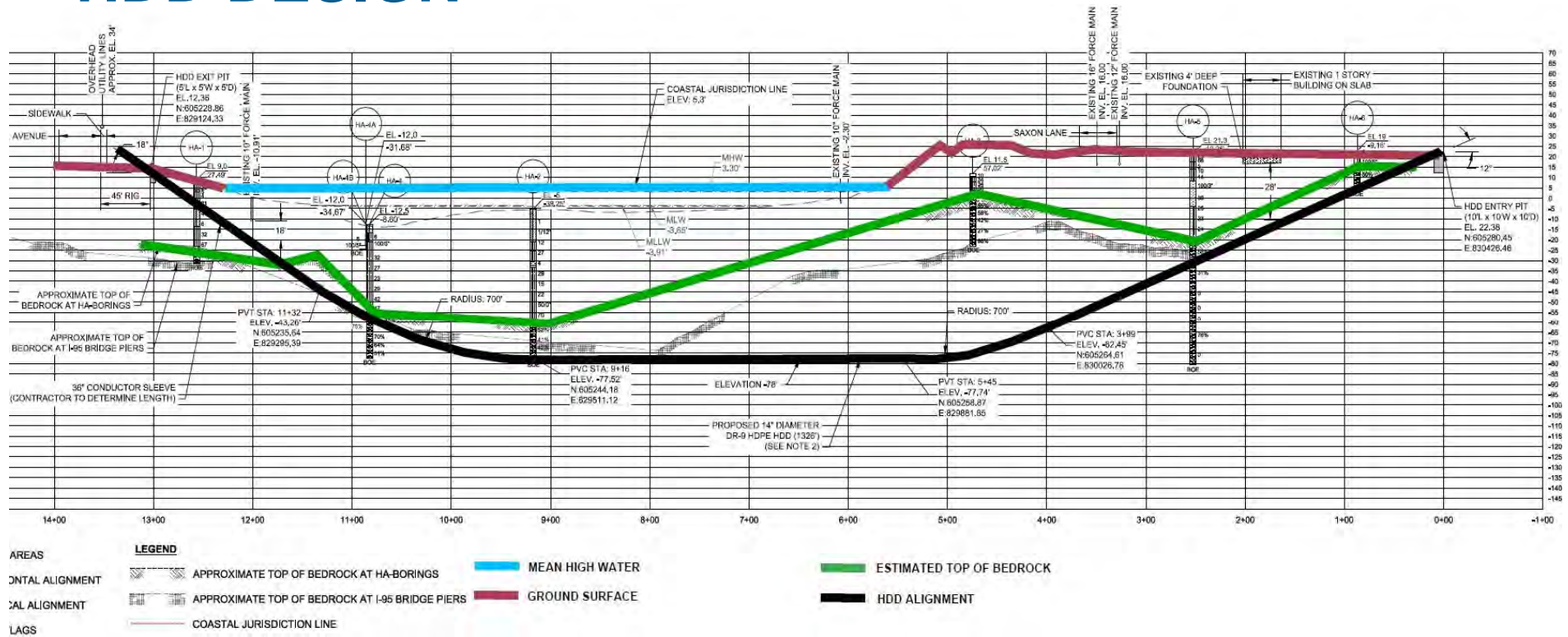
- **Logistical**

- Limited work area
- I-95 bridge
- Public and vehicular traffic
- Overhead and underground utilities
- Commercial establishments
- Restaurant on piles





# HDD DESIGN



## Subsurface exploration plan and findings

- Fill soils, organic deposits, granular Glaciofluvial deposits overlying Gneissic bedrock
- Bedrock
  - Hard, coarse grained Gneiss
  - Extremely abrasive
  - Unconfined compressive strength of 34,000 psi

# SUBSURFACE CONDITIONS





# DESIGNING TO MANAGE RISK

- **Extensive subsurface exploration program**

- Performed adequate test borings offset from the design alignment
- Performed appropriate rock tests
- Grouted the test borings to avoid inadvertent returns

- **Engineering**

- Higher entry and exit angles, so as to drill in conducive subsurface conditions
- Conductor sleeves
- Instrumentation program
- Extensive inadvertent return contingency plan
- Abrasivity of rock was considered while selecting pipe wall thickness
- Active construction management program



# WEST SIDE LOGISTICAL CHALLENGES





# WEST SIDE OVERHEAD UTILITIES





# WEST SIDE UNDERGROUND UTILITIES AND WORK AREAS





# EAST SIDE LOGISTICAL CHALLENGES





# EAST SIDE PIPE ASSEMBLY AND WORK AREA





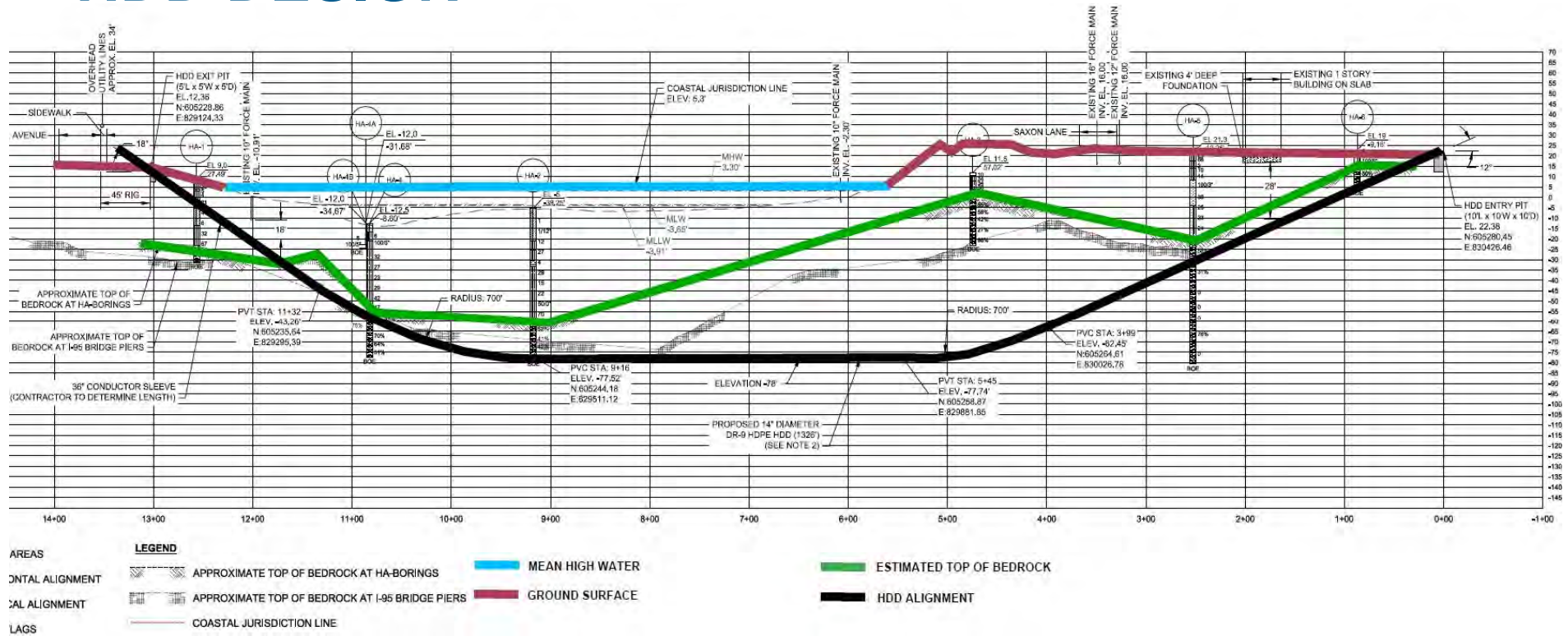
# CONSTRUCTION

- **Stages of construction**

- Drill direction – West to east; pipe pull back – East to west
- East side - Install 36" dia. Steel conductor sleeve; West side - Fuse product pipe
- HDD Rig - American Augers D210 ; Pilot hole – 9.625" dia pilot head
- 1<sup>st</sup> partial ream – 20" dia reamer
- 2<sup>nd</sup> complete ream – 22" reamer
- Swab – 22" reamer
- Pipe pullback



# HDD DESIGN



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# PIPE FUSED AND READY ON ROLLERS FOR PULLBACK





# FINAL REAM AND PIPE PULLBACK





# PULLBACK COMPLETED SUCCESSFULLY

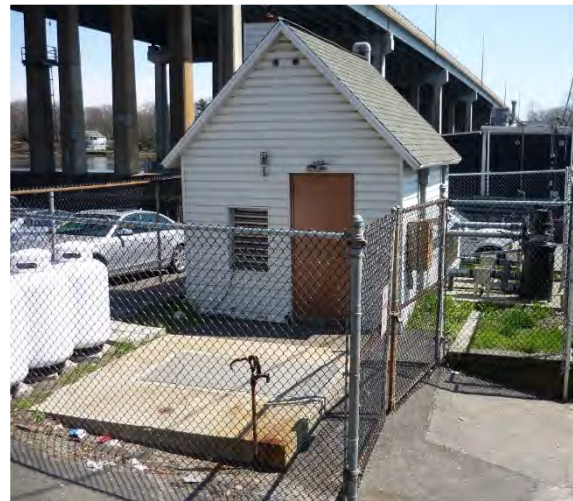


# TAKEAWAYS

- **Separate HDD work into separate contract**
  - Avoids overhead charges and increases potential bidders
- **Drilling Contractors are busy**
  - Keeping schedule flexible may increase bidders
- **Let Municipalities take charge of certain permits**
  - Ongoing relationships can help speed up approvals
- **Designing to manage risk**
  - Detailed evaluation of project specific challenges and risks is crucial during the design phase
- **Active coordination between the owner, construction management team and the contractor**
  - Results in better overall communication and therefore, project success







THANK YOU

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# HYDRAULIC DESIGN

- Shared force main
- Adequate velocity for existing/future pump rates
- Suitable pipe thickness for HDD
- 14" DIPS DR9 HDPE

