HORIZONTAL DIRECTIONAL DRILLING A FORCE MAIN IN FRANKLIN, MA – CHALLENGES AND PITFALLS, BENEFITS AND SUCCESS

NEWEA Annual Conference

January 24, 2017

ARCADIS Design & Consultancy for natural and built assets

Agenda

- Project Overview & Background
- Design & Site Constraints
- Construction – Horizontal Direction Drill
- Project Successes and Challenges

Project Team

Brutus Cantoreggi, Franklin DPW Director

Laurie Ruszala, Franklin Water & Sewer Superintendent

Scott Haynes, Arcadis

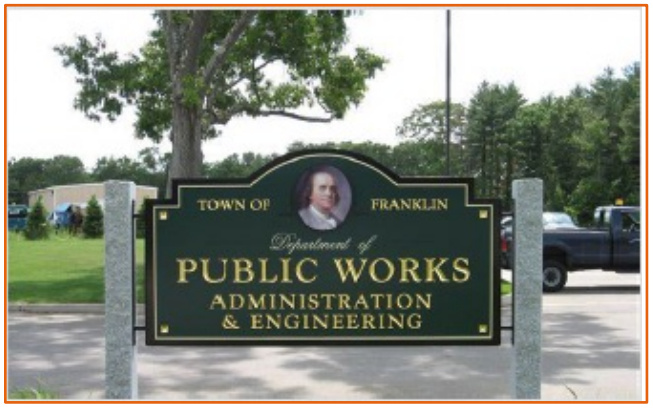
Amy Anderson, Arcadis

Aqua Line Utility, Inc, Contractor

Directional Technologies, Inc

Franklin, at a Glance

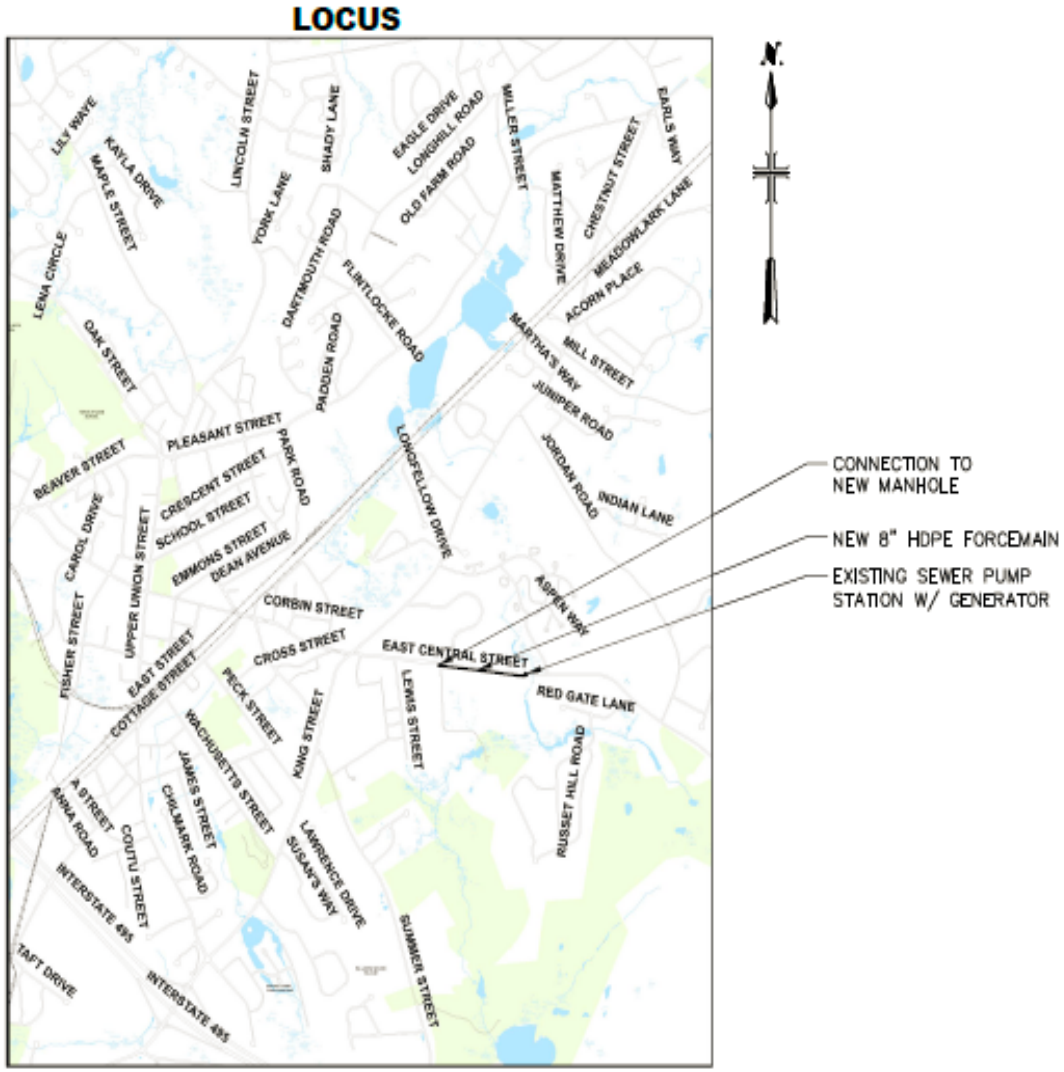
- Suburban, Bedroom Community
- Population: 33,400+
- Total Land: 27 Square Miles
- 148 miles of sewer works
- 23 Pump Stations
- Sewage treated at the Charles River Water Pollution Control District



Existing Conditions

- East Central Street Pump Station & Force Main
  - Designed for 450 GPM, reduced capacity to 335 GPM
  - Anticipated flow increase due to new developments in Town
  - 1,400 LF 6-inch cast iron force main, built in 1940

Site Location



Franklin, MA

Located along Route 140 – State Highway

Road reconstructed in 2012 – existing moratorium

Busy commercial area

Project Location

East Central Street Pump Station

Project Background

- Capacity Assessment and FM condition assessment conducted in Spring 2014
- Force Main was determined to be heavily tuberculated and have considerable grease build-up
  - Estimated that force main was reduced in size to approximately 4 inches
  - Reducing the flow the pumps can convey

What to do next?

- Cleaning the force main - Pigging
  - Propelling a bullet-shaped “pig” made of foam through the pipe
- Hydraulic/mechanical cleaning
  - Jet the force main to remove any debris and tuberculation
  - Require bypassing the pump station

Cleaning was determined to be too great of a risk due to condition of the pipe and configuration of force main

Replacing the Force Main – 3 Options

Dig & Replace	••Trenching along existing state highway ••New 8” force main ••Extensive bypass pumping required (1,400 LF) ••Adjacent and crossing utilities
Pipe Bursting	••Hydraulic “bursting” head propelled through existing pipe, pulling new pipe into place ••Extensive bypass pumping required (1,400 LF) ••Entrance and exit pits – no trenching required ••Proximity to adjacent utilities would cause concerns
Horizontal Directional Drilling	••Horizontal Directional Drill bore hole, pull 8” force main into place ••No trenching required ••Minimized bypass pumping required ••Least expensive option ••Drill under all existing utilities

Horizontal Direction Drilling Design

- Drilled five geoprobes to determine soil conditions
- Mass Highway Permit – 5 month delay
- Bypass chamber at ECSPS
- 1,400 LF of 8” HDPE
- One continuous shot, 20 to 30 feet below grade, under all existing utilities

Site Constraints

Equipment Layout

- Large Space for Drilling Equipment
- Water access – hydrant across Rt 140, piped through existing catch basin

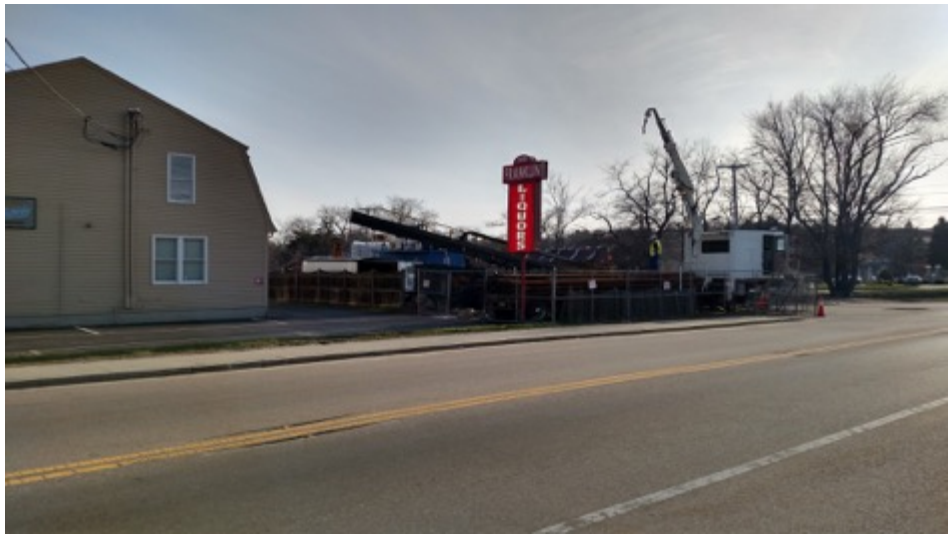
Restricting Traffic

- Maintain access to all driveways and buildings

Minimize trenching in state highway layout

- Test pits to identify existing force main
- Plans did not show force main accurately

HDPE Pipe Layout



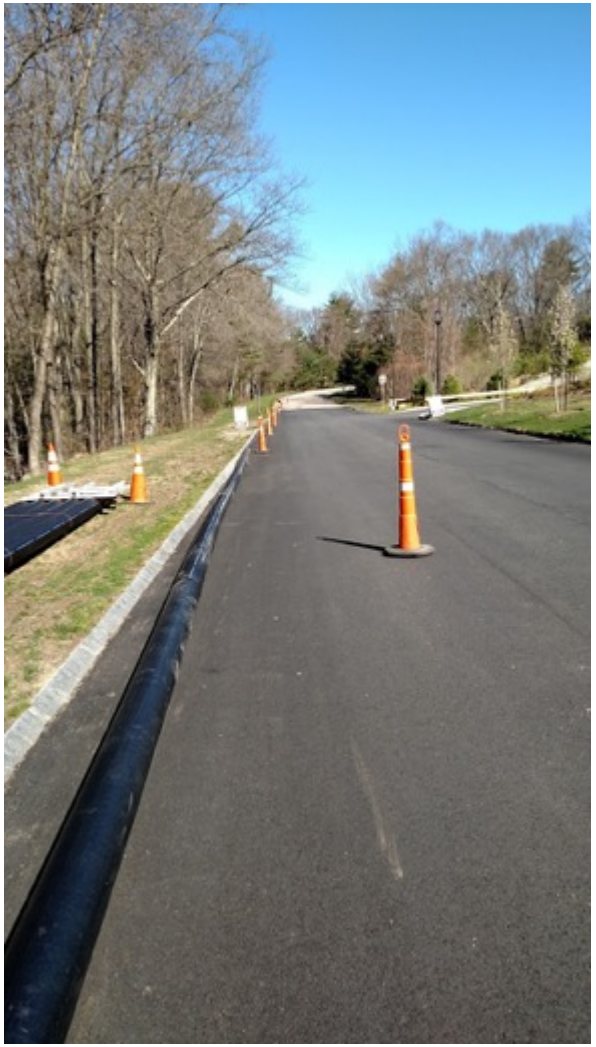
Horizontal Direction Drill Process

1. Dig Entrance and Exit Pits
2. Drill bore hole to exit pit – Install reamer
3. Ream back to entrance pit – Install pipe pull bit
4. Push drill back to exit pit
5. Attach HDPE pipe to pull bit
6. Pull HDPE into place

Horizontal Directional Drilling Process

Horizontal Directional Drilling Process

HDPE Pipe Fusing and Layout



- *Nearby private property owner that allowed the Contractor to fuse and store fused pipe until ready for pipe pull.*
- *Two 700 LF pipe lengths that were fused together the night of the pull*

Hitting Rock!

- Drill bit hit boulders 1,200 LF into bore path
- Attempted to navigate around boulders with drilling bit
- Attempted to drill through with a rock bit
- Resulted in contractor digging a trench to assist drill bit through the boulders
- Schedule delays
- Change Order

Hitting Rock!

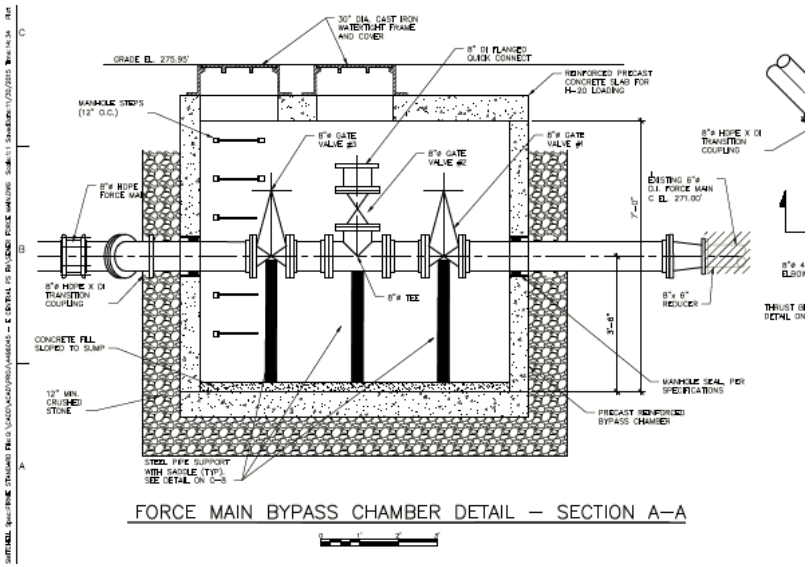
Pipe Pull

- Conducted overnight to minimize impacts to residents and driveway access
- Pipe pull completed in approximately 4 hours

Pipe Pull

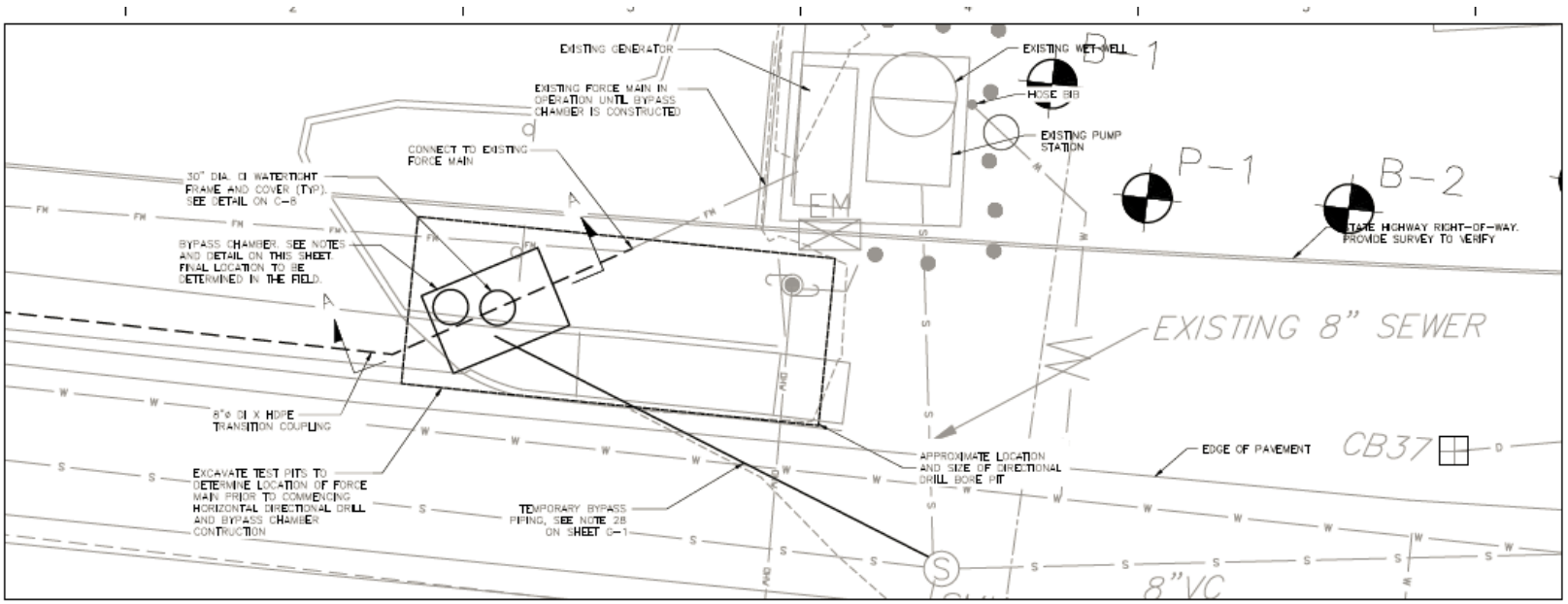
Installation of Bypass Chamber

- Designed a bypass chamber to allow the Town to bypass the ESCPS in the future if necessary



Installation of Bypass Chamber

- Used bypass chamber to bypass flow when making final force main connection to the station



New Manhole for FM Discharge

- Installed a new force main discharge manhole to connect to new HDPE force main
- Installed new PVC pipe section to existing manhole in Rte 140

Project Completion

Things to Consider

- Mass Highway Permit – horizontal directional drill requires an extensive permit process. Plan ahead!
- Conduct extensive borings prior to design – New England soil conditions can be unpredictable!
- Staging areas, size of equipment, and noise – Drills are loud!
- Consider laydown area for new pipe. The more that can be fused ahead of time drastically decreases the pipe pull time.

Project Success!

- Minimized impacts to traffic patterns and residents – No residential or commercial complaints
- Minimized trenching in state highway layout
- New force main configuration and size has reduced energy consumption at the ESCPS
- No pump station backups or failures since the installation of the new force main
- Less stress on existing pumps despite increased flows to the station from newly constructed developments

Questions?

CONTACT INFORMATION

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