Presenter: Ted Bennett, P.E.

May 22, 2019

Connecting Waterville to Bowling Green Water Distribution

Maxi-Directional Drilling The River & The Switch

Jones & Henry
ENGINEERS, LTD.

Project Back Story

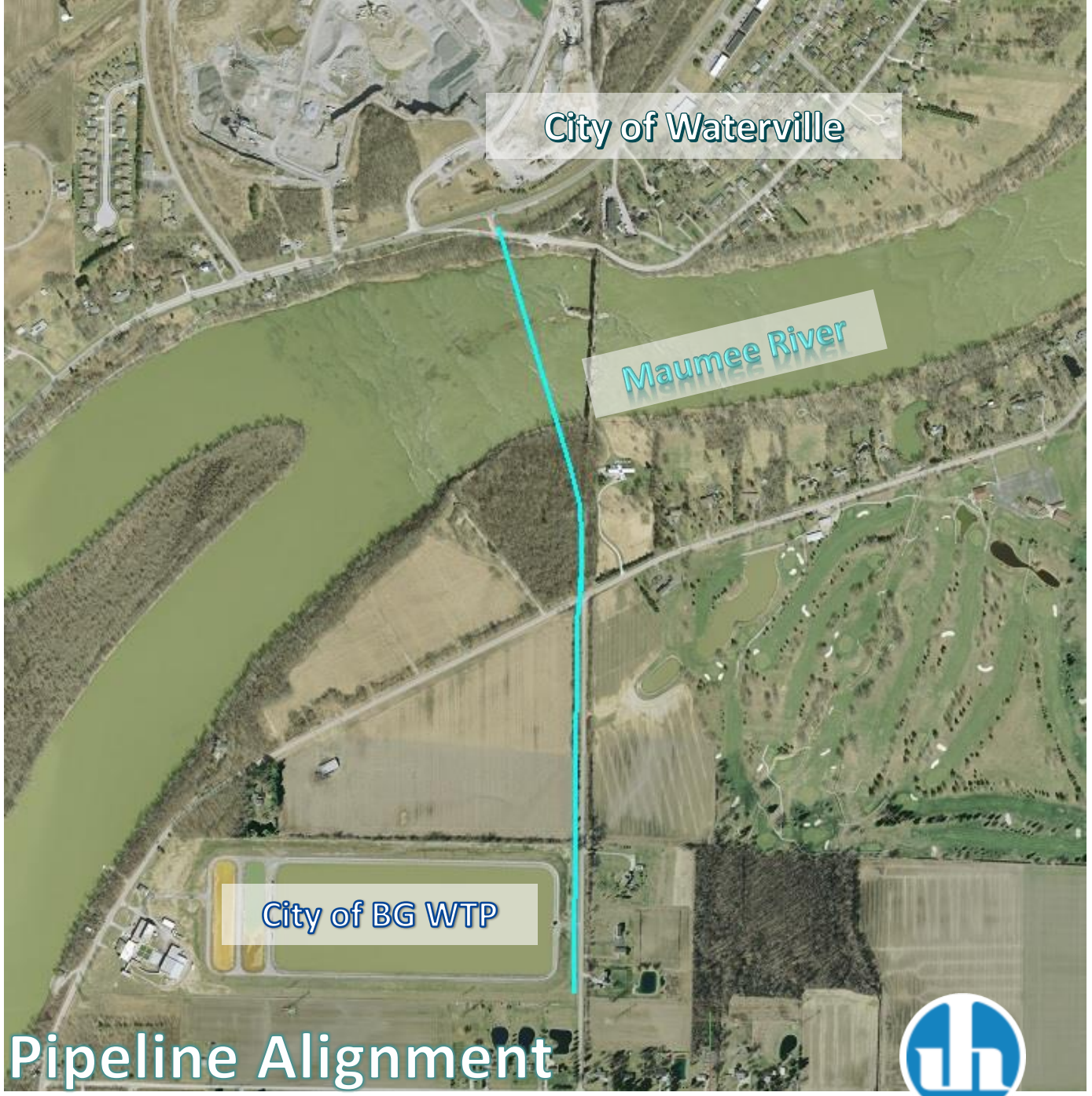
2014

Waterville's Contract for Toledo Water through Lucas County Sanitary Engineer set to expire in December 2016

Feasibility of A Contract with the City of Bowling Green Water System.

New Water Main would require

- 5000-feet of Water Main
- Maumee River is 1000' wide
- Metering
- Pressure Reducing Valve



Agreement Reached

WATERVILLE, OHIO
on the banks of history

THE GREAT SEAL OF THE CITY OF BOWLING GREEN, OHIO

2015

Agreement between Waterville and Bowling Green

Sentinel-Tribune

ednesday, April 6, 2016 www.sent-trib.com 75 Cents

Bike panel ives ideas for safer streets

PETER KUEBECK
nel-Tribune City Editor

e wheels continued to turn e city's Complete Streets ts Tuesday as Bowling n's Bicycle Safety mission met with City neer Jason Sisco.
m just interested to hear makes sense to folks that id bicyclists," Sisco said. mplete Streets is the con- hat road should be made nd accessible for all users, nly automobiles, and has a continuing discussion council members at City il and committee meet- nce 2014.
July of 2015, council a resolution in support of ete Streets.
rently there are 625 ete Streets legislative ationwide, eight of which Ohio, including Toledo, nd and Columbus. The Metropolitan Area l of Governments has Complete Streets as a olicy.
met with council's rtation and Safety tee on the subject last

uesday's meeting, dis- included where bicy- required to ride when vel on roads — it was d that the Ohio Revised quires bicyclists to ride ght as possible — and

Return to the garden

J.D. Pooley/Sentinel-Tribune

Employee Ariel Davenport moves hanging baskets at Bostdorff's Greenhouse. The Garden page returns today with a profile on the Bostdorff family and the latest at the greenhouse on Dixie Highway. More on Page 8.

EPA's OK of Waterville plan advances sale of BG water

Utilities director: H2O may flow to city by Sept.

By PETER KUEBECK
Sentinel-Tribune City Editor

Nearly a year since council

The matter has been ongoing since the spring of 2015, and was prompted by steep cost increases from Lucas County, from whom Waterville

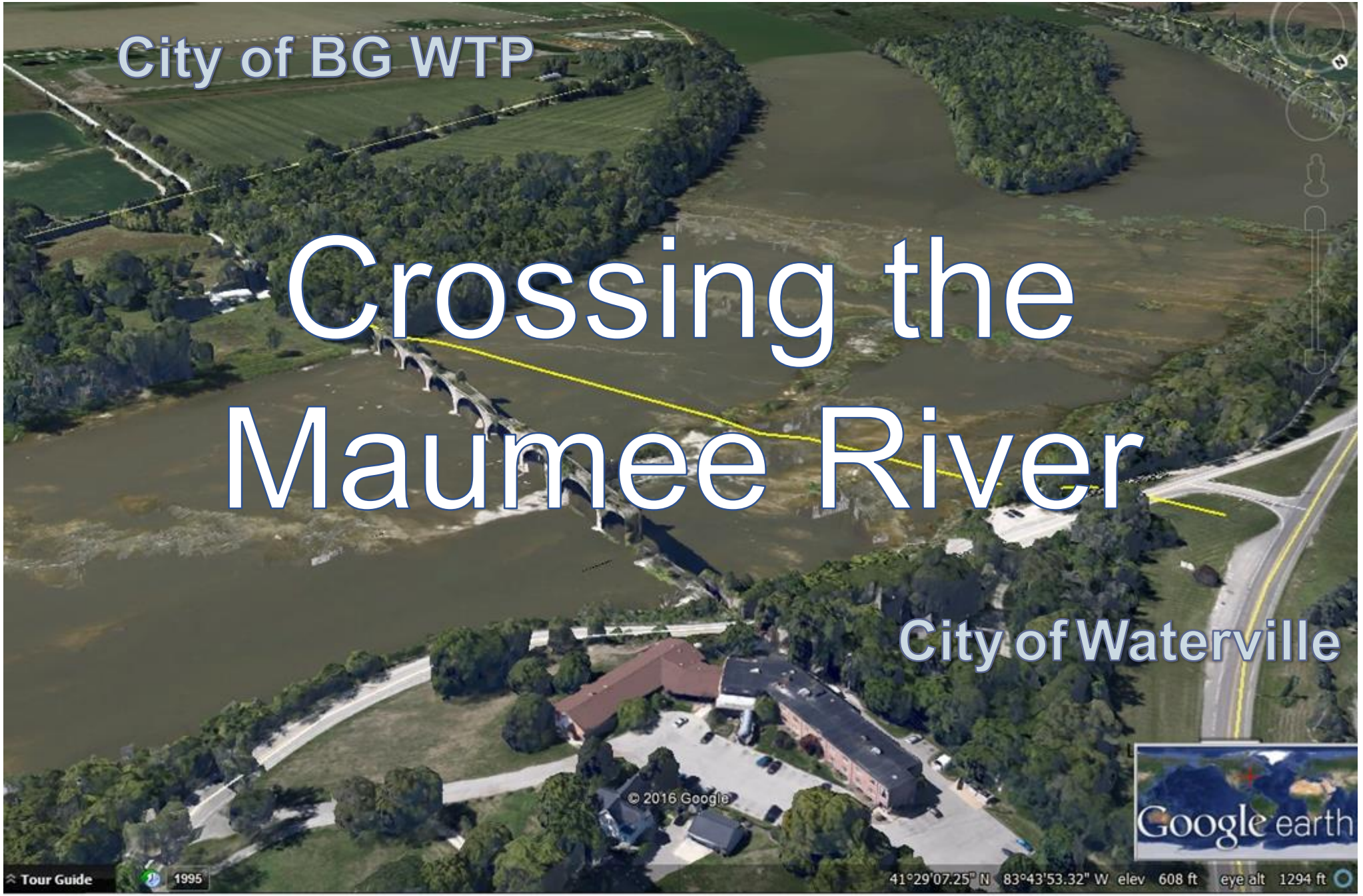
the algae issue.
Waterville has a population of about 5,500 people and uses about 504,000 gallons of water a day. Bowling Green has simi-

Owens faculty votes no confidence

New contract with wage cuts is OK'

By MARIE THOMAS BAIR
Sentinel-Tribune Education Editor

Owens Community Coll faculty has issued a vote of confidence in leadership, w agreeing to a contract that for wage cuts.
Paul Adams, president o Owens Faculty Associa read a prepared speech a board of trustees me Tuesday, stating members union have an overall la trust in President Mike E the board and senior ship.
He said 98 percent o voting approved the n but it is unknown how r the 242 union members pated in the vote tak 23-24.
Specific concerns in
• No confidence ership and its ability the college and effecti lem solve
• No confiden ership's fiscal mana the college or their manage organization
• No confider character, as you la age to take a positic know it may cost y support"
• No confi transparency of co
• No confi ability to "fos respectful labor


City of BG WTP
Crossing the Maumee River
City of Waterville
© 2016 Google
Google earth
Tour Guide
1995
41°29'07.25" N 83°43'53.32" W elev 608 ft eye alt 1294 ft

What is Maxi-HDD

- Trenchless Method
- Maxi-Horizontal Directional Drilling
  - Length Greater than 1,000’
  - Diameters Greater than 24”
- High Accuracy Needed

Designing a Maxi-HDD

Considerations for Success

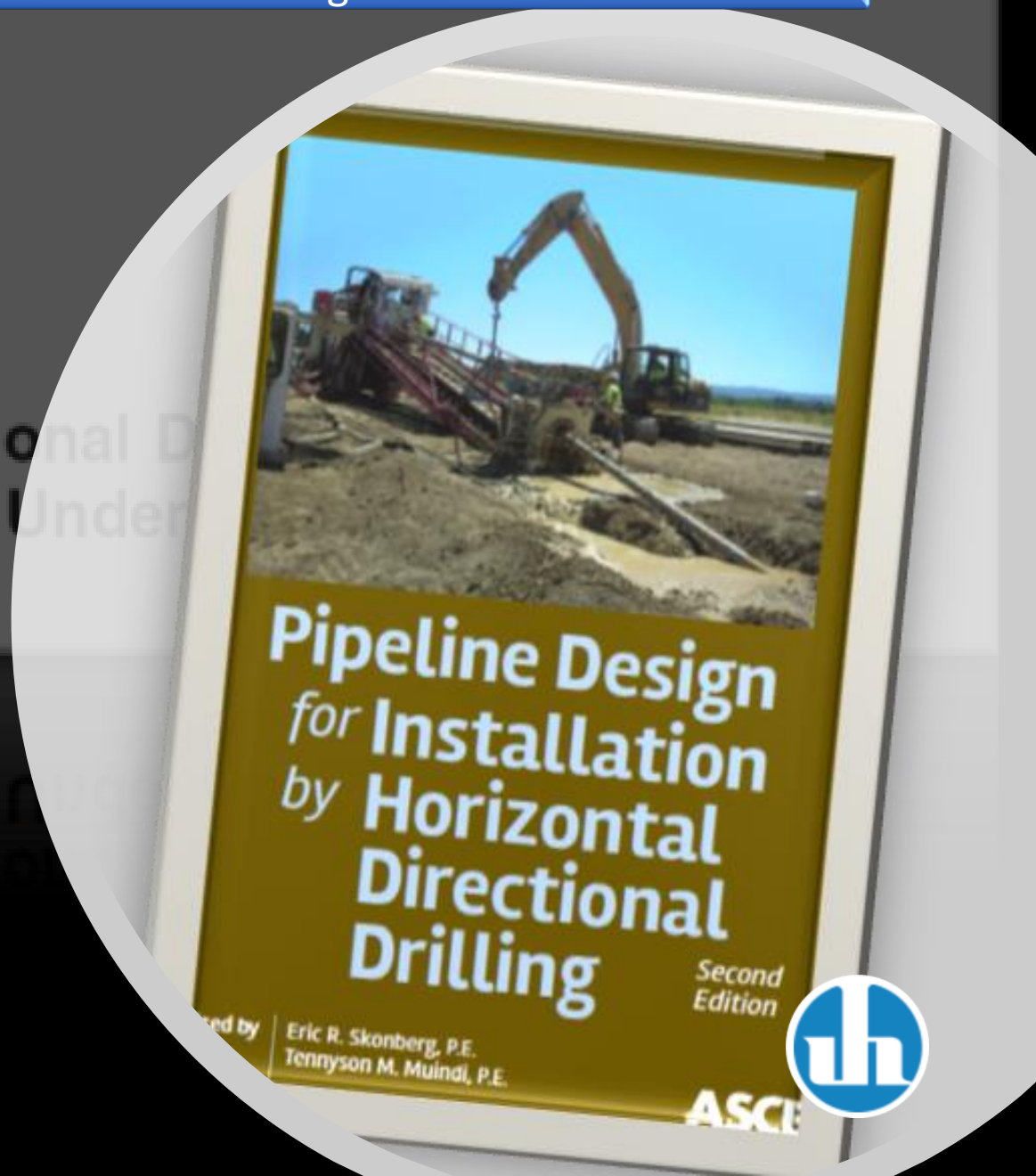
Right People (Consultant & Contractor)	Right Plan (Plans & Specs)
• Experienced • Qualified	• Functionality • Constructability

Right People

Right Plan

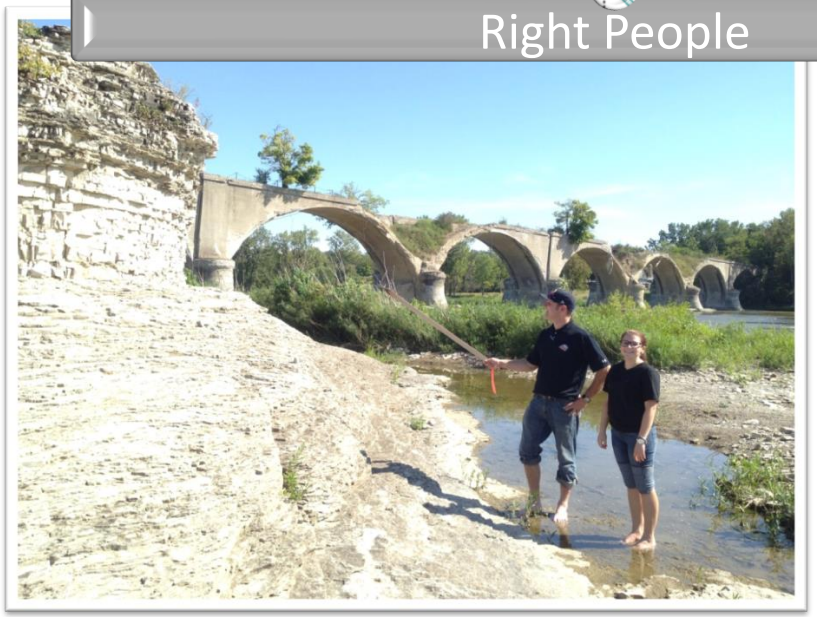
Designation: F1962 – 11

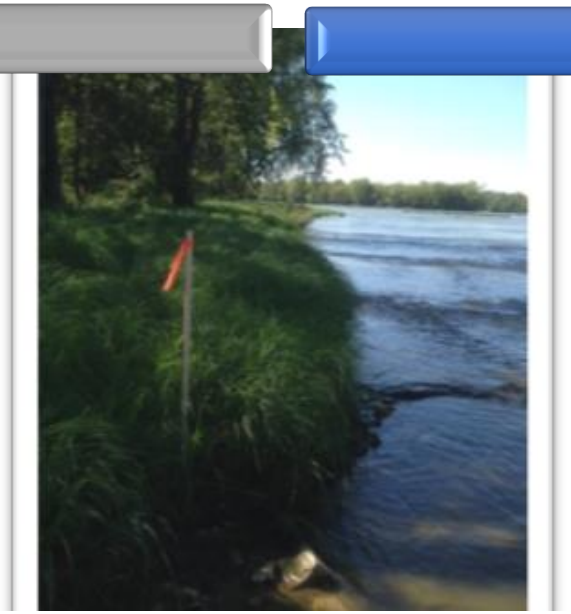
Standard Guide for
Use of Maxi-Horizontal Directional
Polyethylene Pipe or Conduit
River Crossings[1]



Design Guidance

Right People

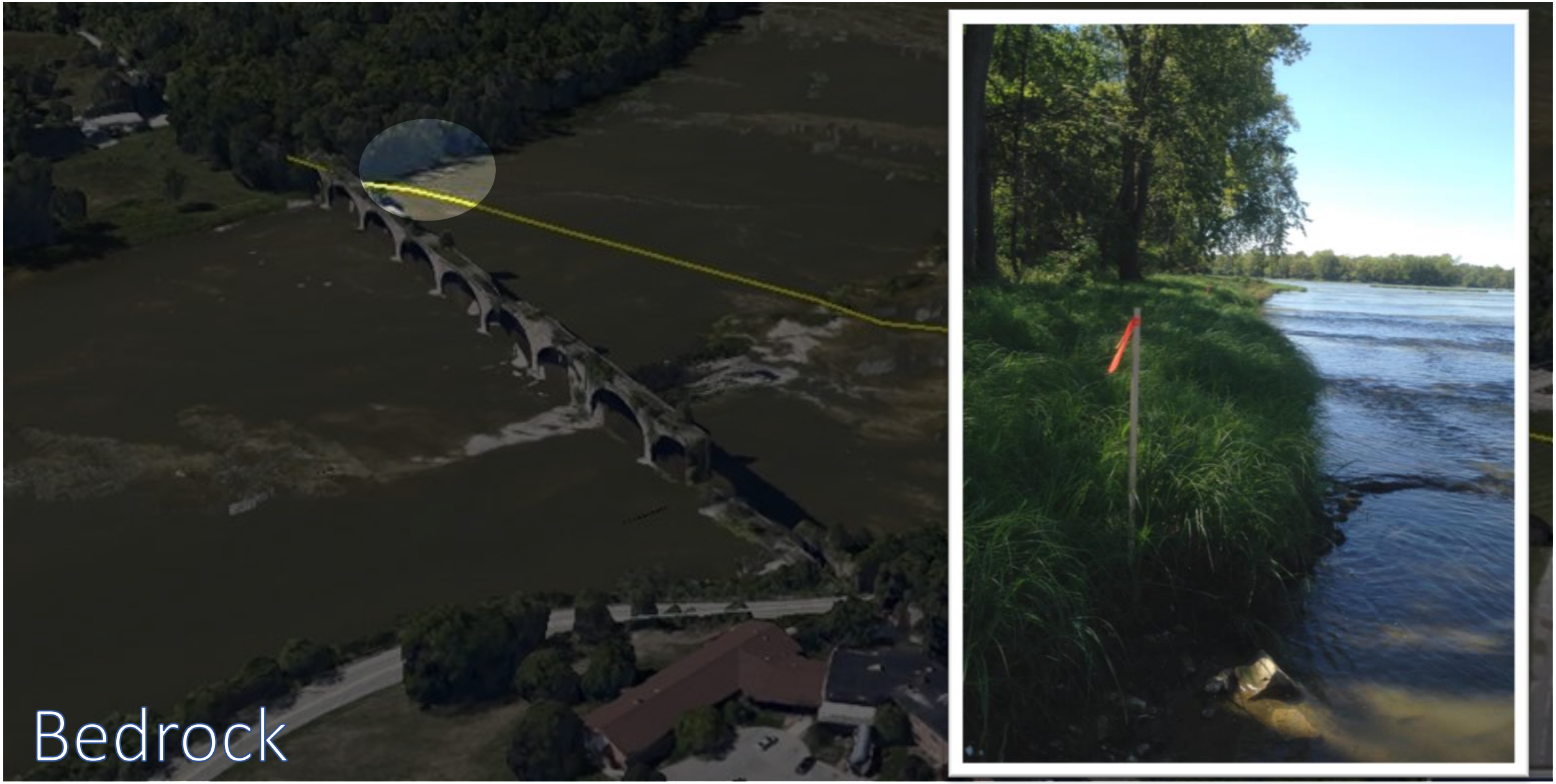




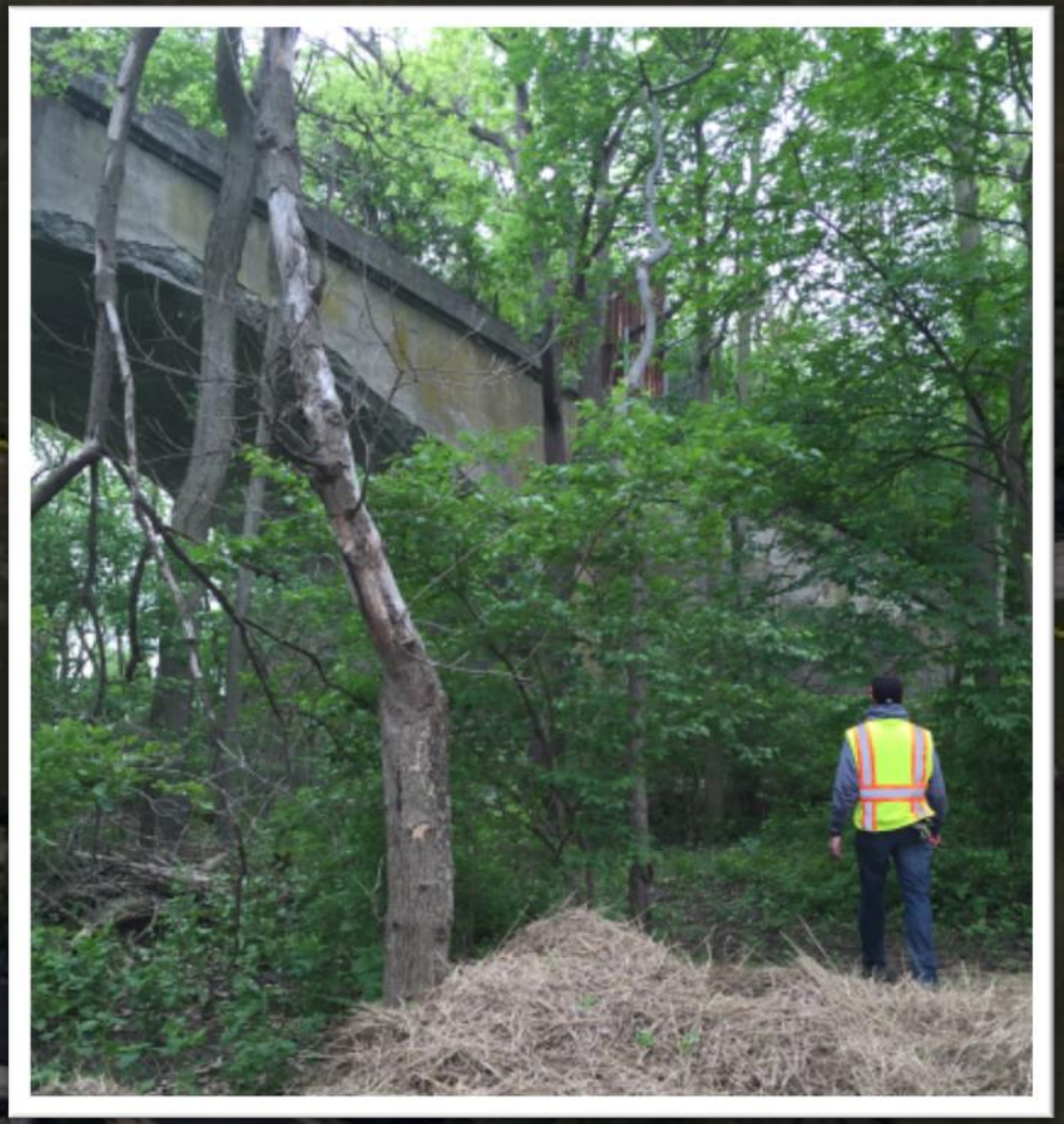
Right Plan

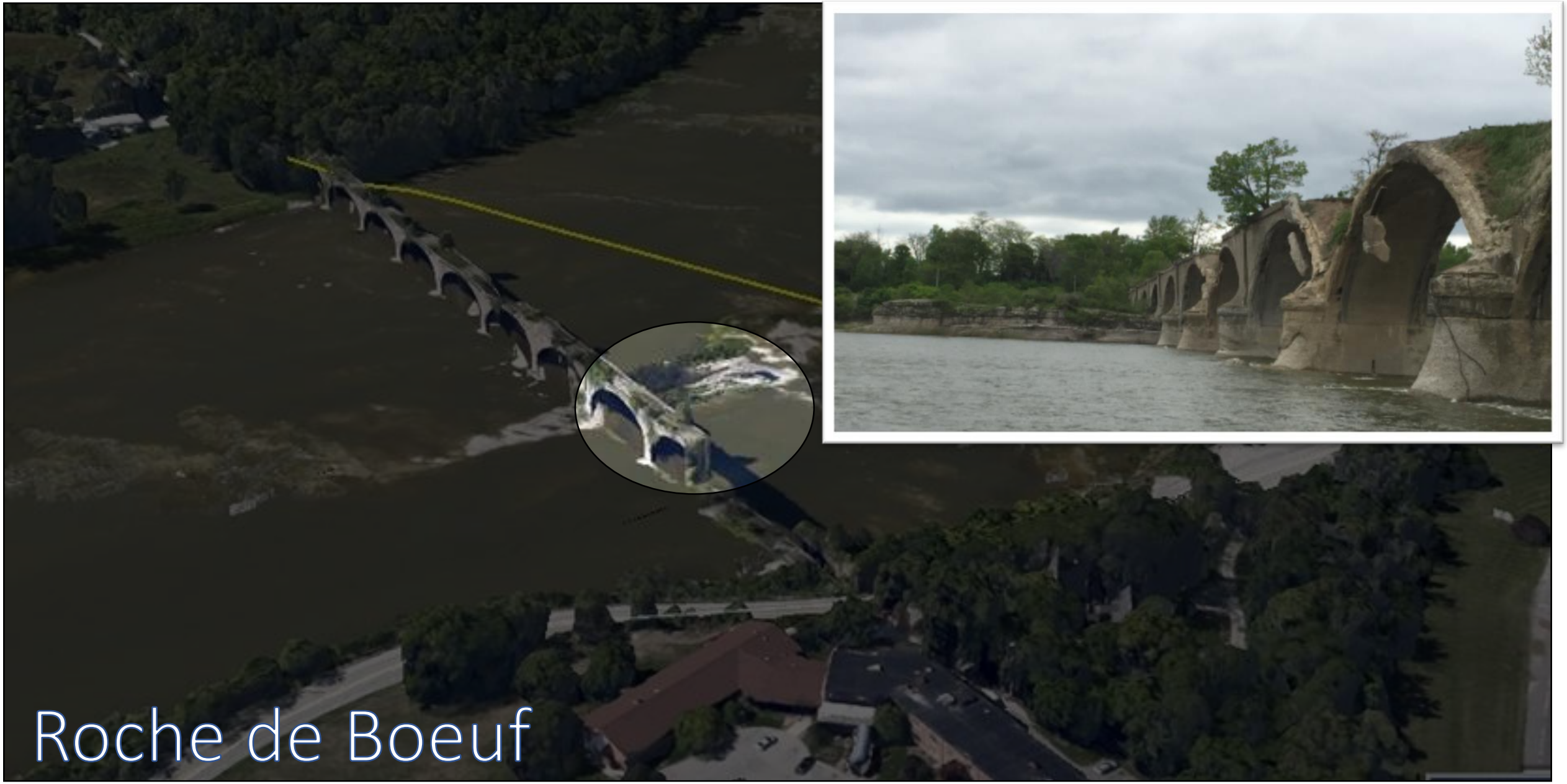
Field Reconnaissance

Railroad Roadbed


Bedrock

Bridge Ruin





Roche de Boeuf

Soils Investigation

Objectives

- Understand Rock Characteristics – Hardness / Fractures
- Depth Below Pipe
- Construction Method Selection

Designing a Maxi-HDD

Developing the Plan and Profile

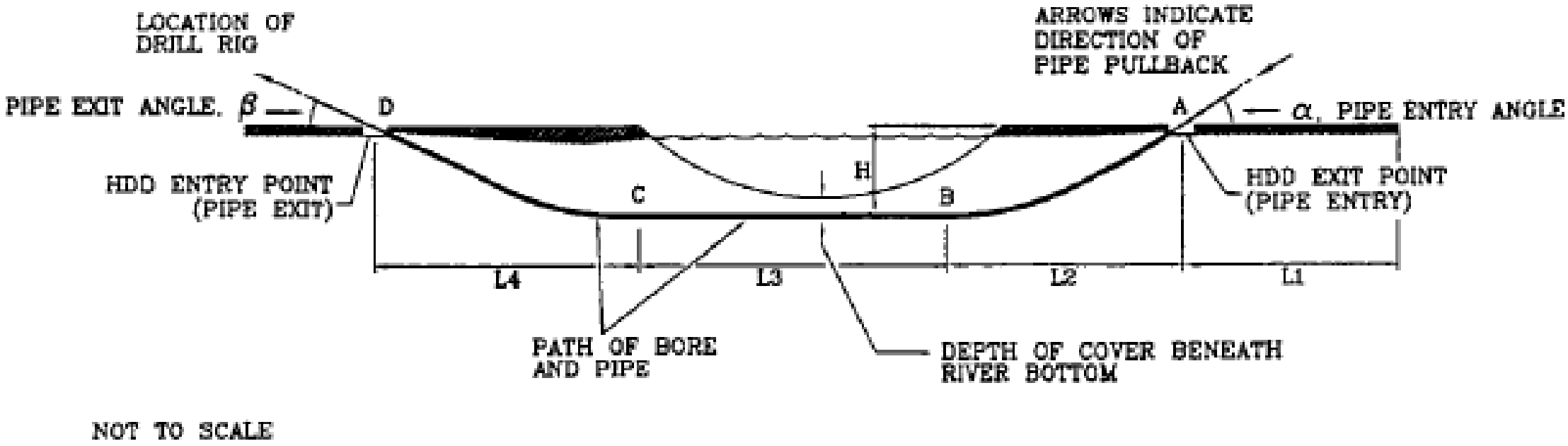


FIG. 1 Maxi-HDD for Obstacle (for example, River) Crossing

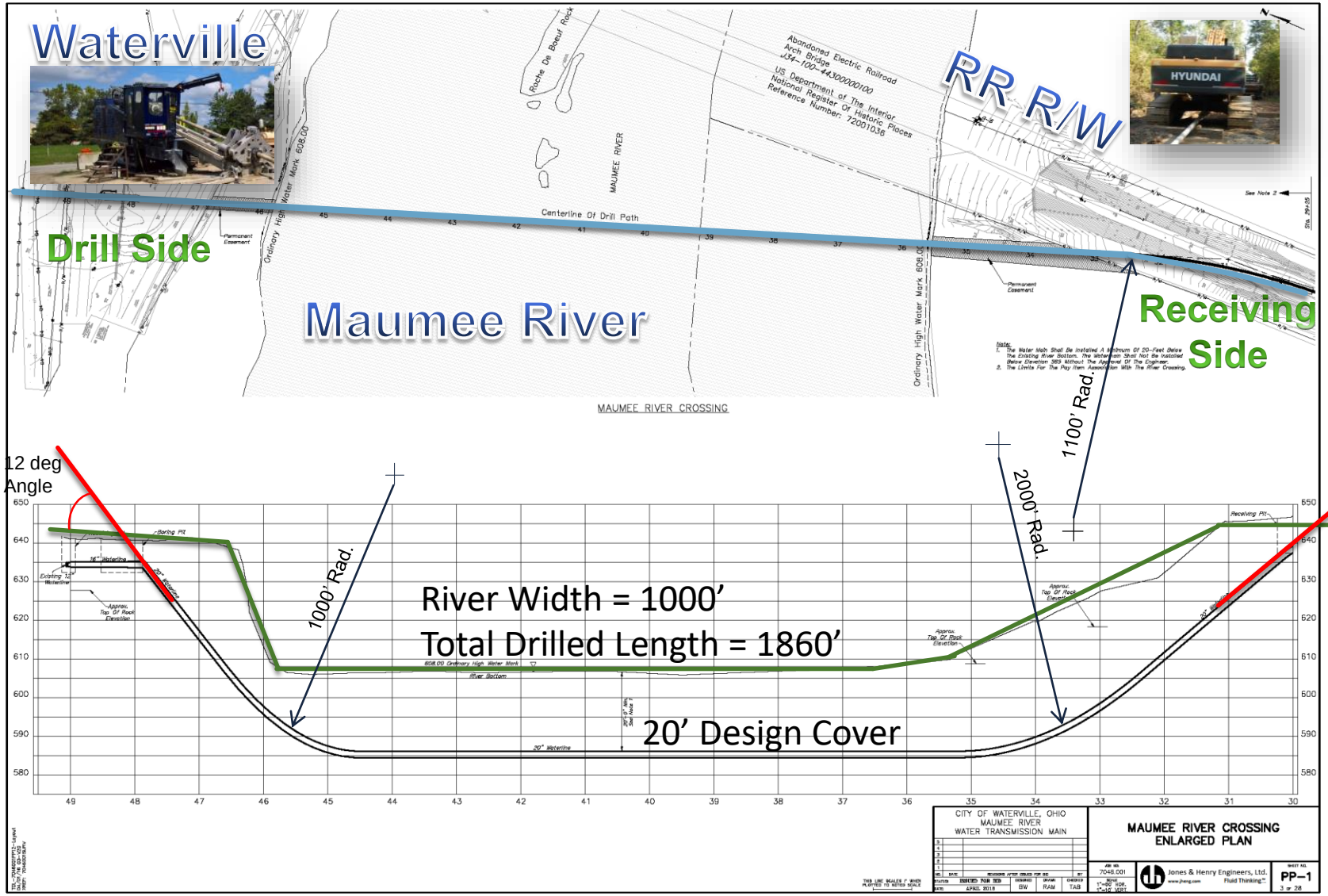
Source: ASTM F-1962 – Use of Maxi-Horizontal Directional Drilling for Placement of PE Pipe or Conduit Under Obstacles, Including River Crossings. (2011)

Right People

Right Plan

BAD DESIGN

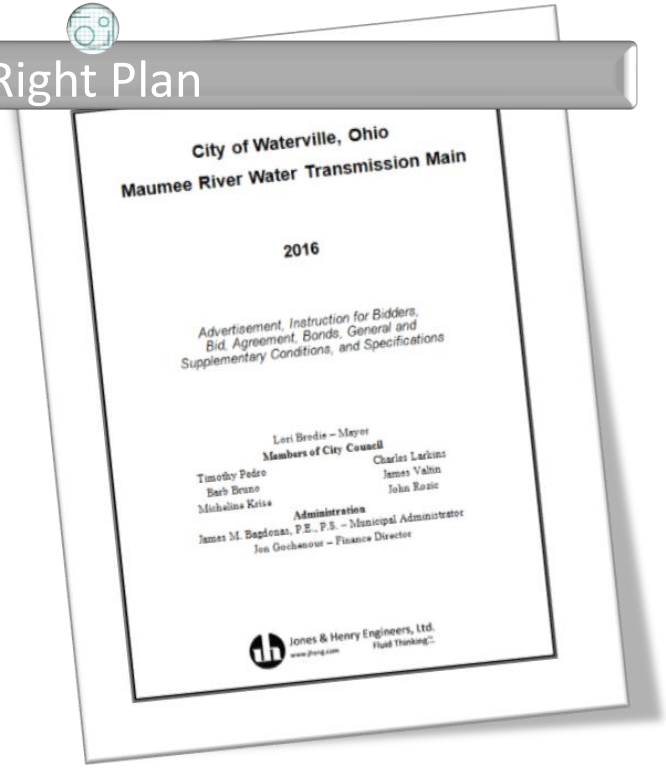
Final Design



Right People

Right Plan

Technical Specs



Typical Requirements

- Tracking & Accuracy
- Make Staging Area Big
- Plan for Bore Fluid Management
- What Happens if you Frac-out?
- Accuracy Expectations
- Identify the Failure Paths

Right People

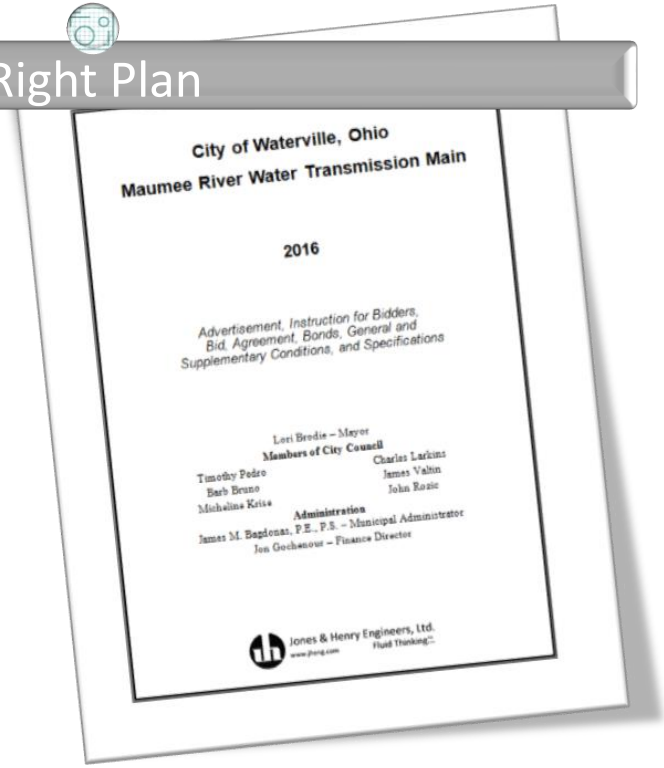
Right Plan

Contractor Selection

Contractor Qualifications

- Guidance and Tracking
- Personnel
- Past Performance
  - Size & Scope of Projects
  - Soil Conditions
  - Project Costs
- Equipment

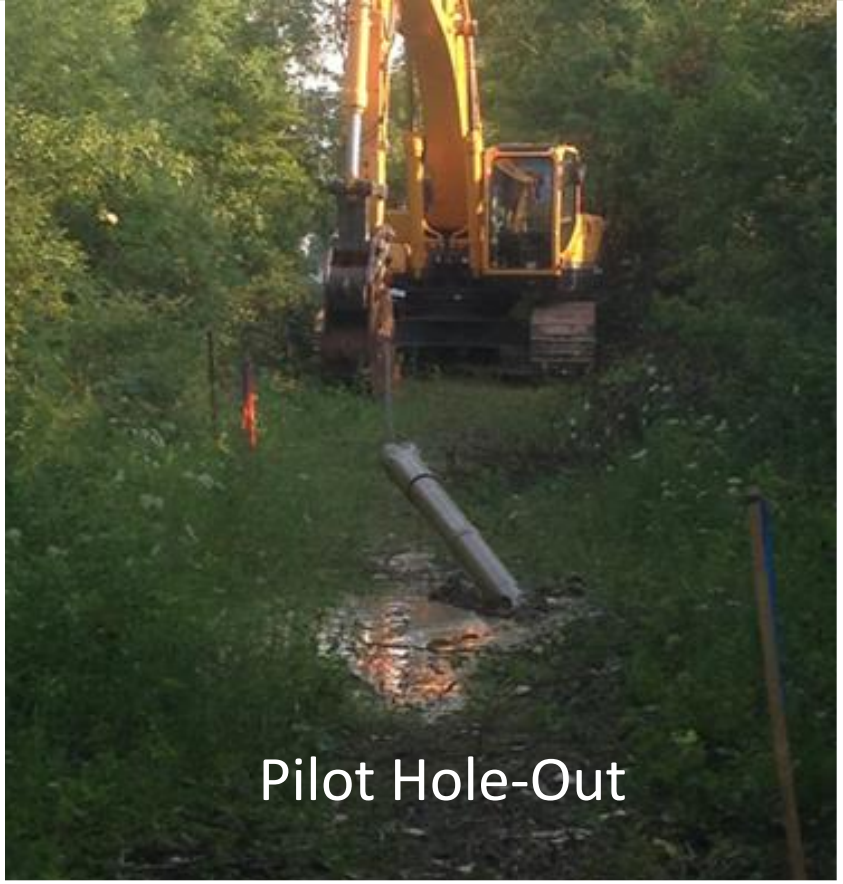
Drill Machine
250,000lb Thrust / Pullback



Construction Phase

- **Total HDD Drill and Pullback - 35 days**

Directional Mud Motor



Pilot Hole-Out

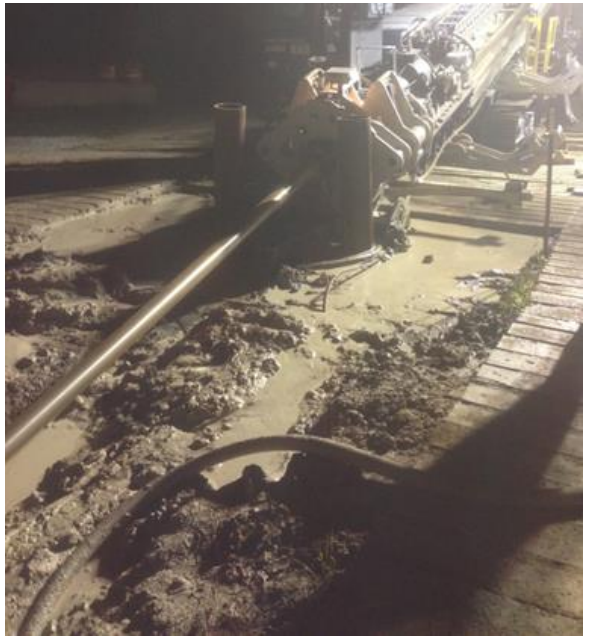
9” Pilot Hole Reaming Bit

Pipe Installation – Pilot Hole

9” Pilot Hole Reamer – 9 days

Pipe Installation – Reaming

24” Reamer – 16 days
30” Reamer – 10 days



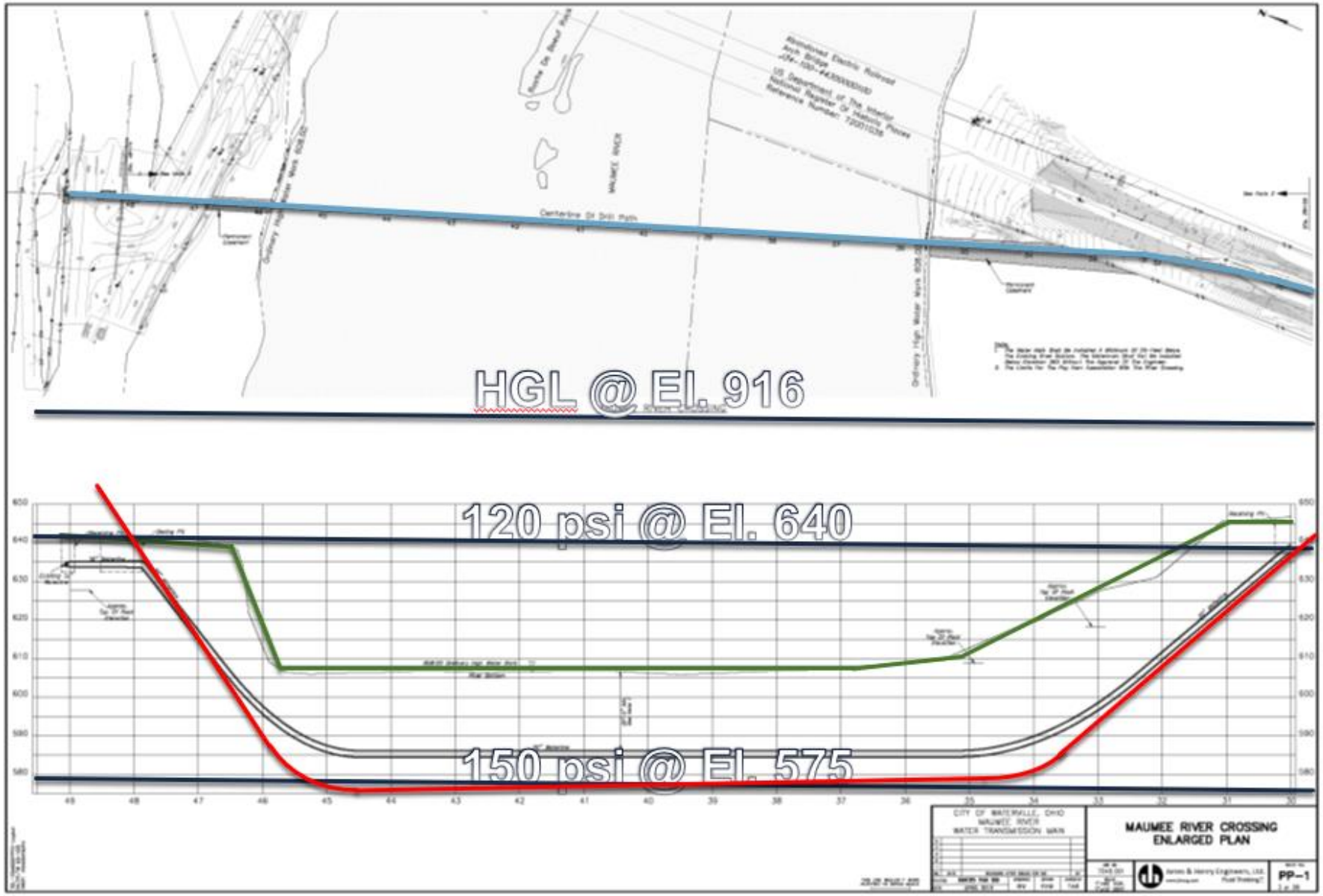
Pipe Pullback – 13 hours

Fusion Machine

- Pre-test with low air pressure prior to pullback
- Water Pressure test after pullback

Pressure Testing

Pressure Testing

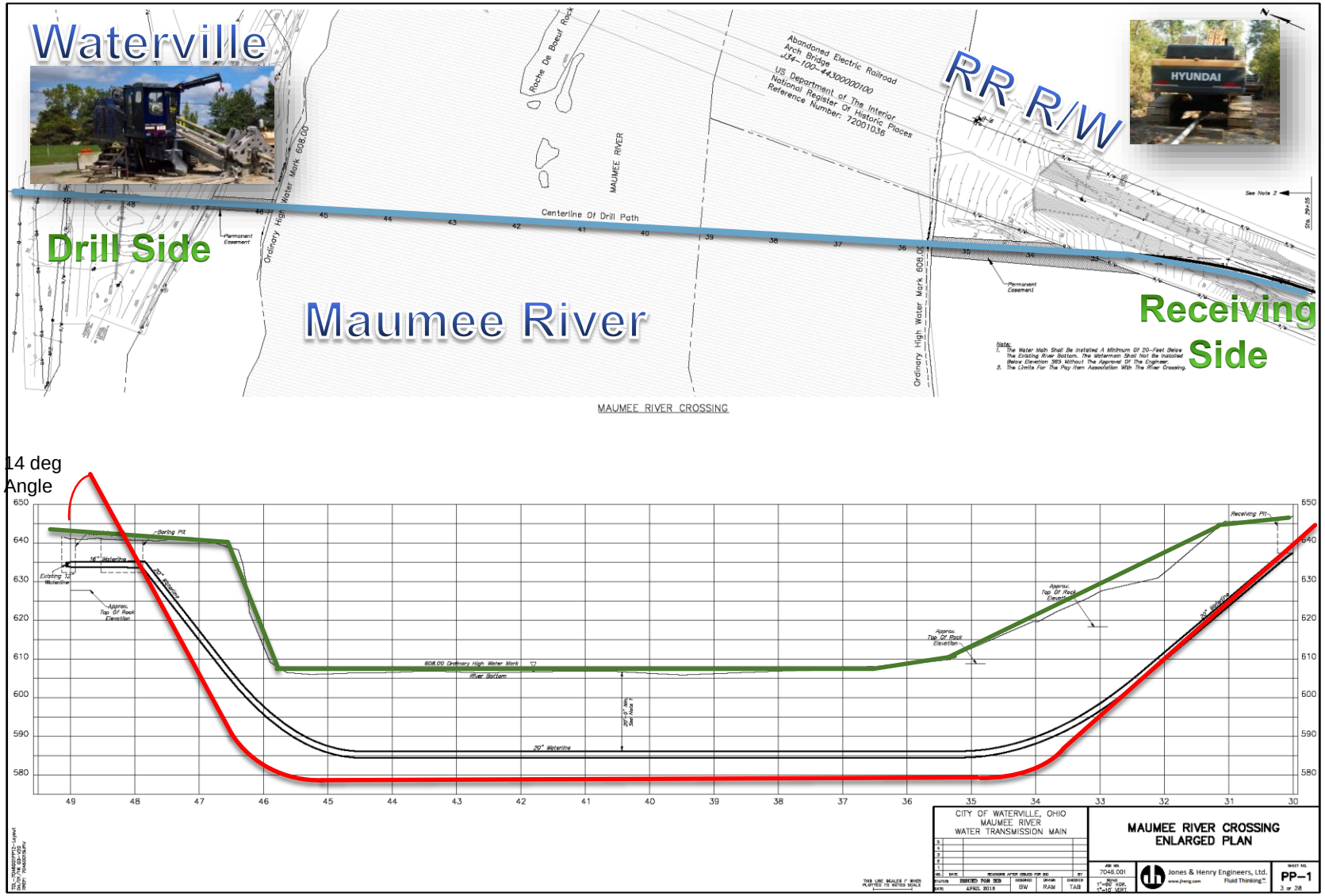


*Pipe Installed @ Elevation 575 – 30’ Depth Below River

Right People

Right Plan

As-Built



Design Vertical and Horizontal Curves Held Pipe Deepened to 30’ Cover

Construction Wrap Up

- Engineer's Estimate = $2.5
- Project Bid Price = $2.2 million
- Bore Price = $1.7 million (~$970 / ft)
- Final Project Cost = $2.2 million
- River Crossing Commence: July 18, 2016
- River Crossing Completion: September 1, 2016
- Project Substantial Completion: February 2017
- Project Final Completion: April 2017

City of Waterville switches water sources today

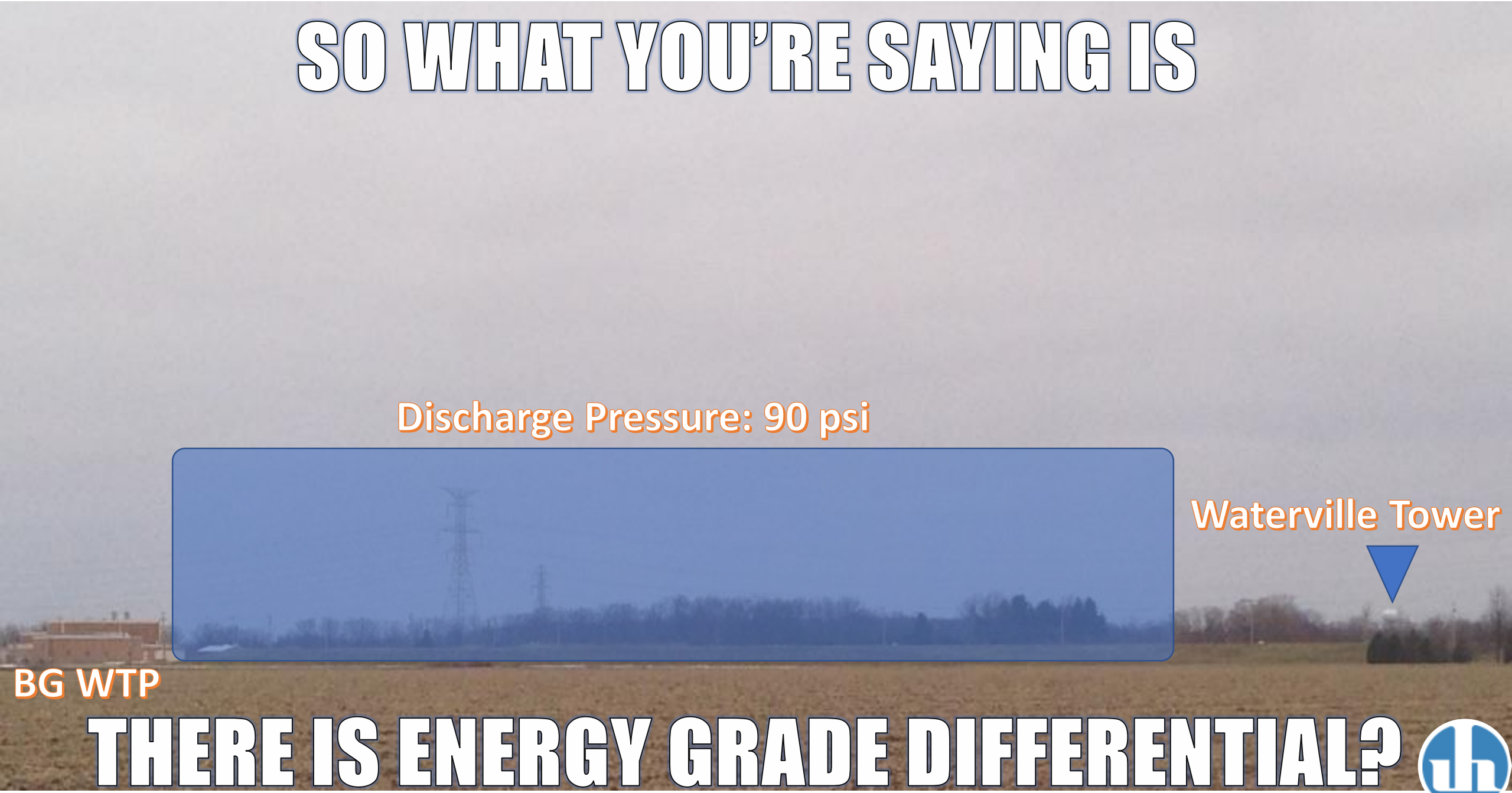
Starts to draw water from Bowling Green after shutting off Toledo connection

THE SWITCH

Regulatory Review

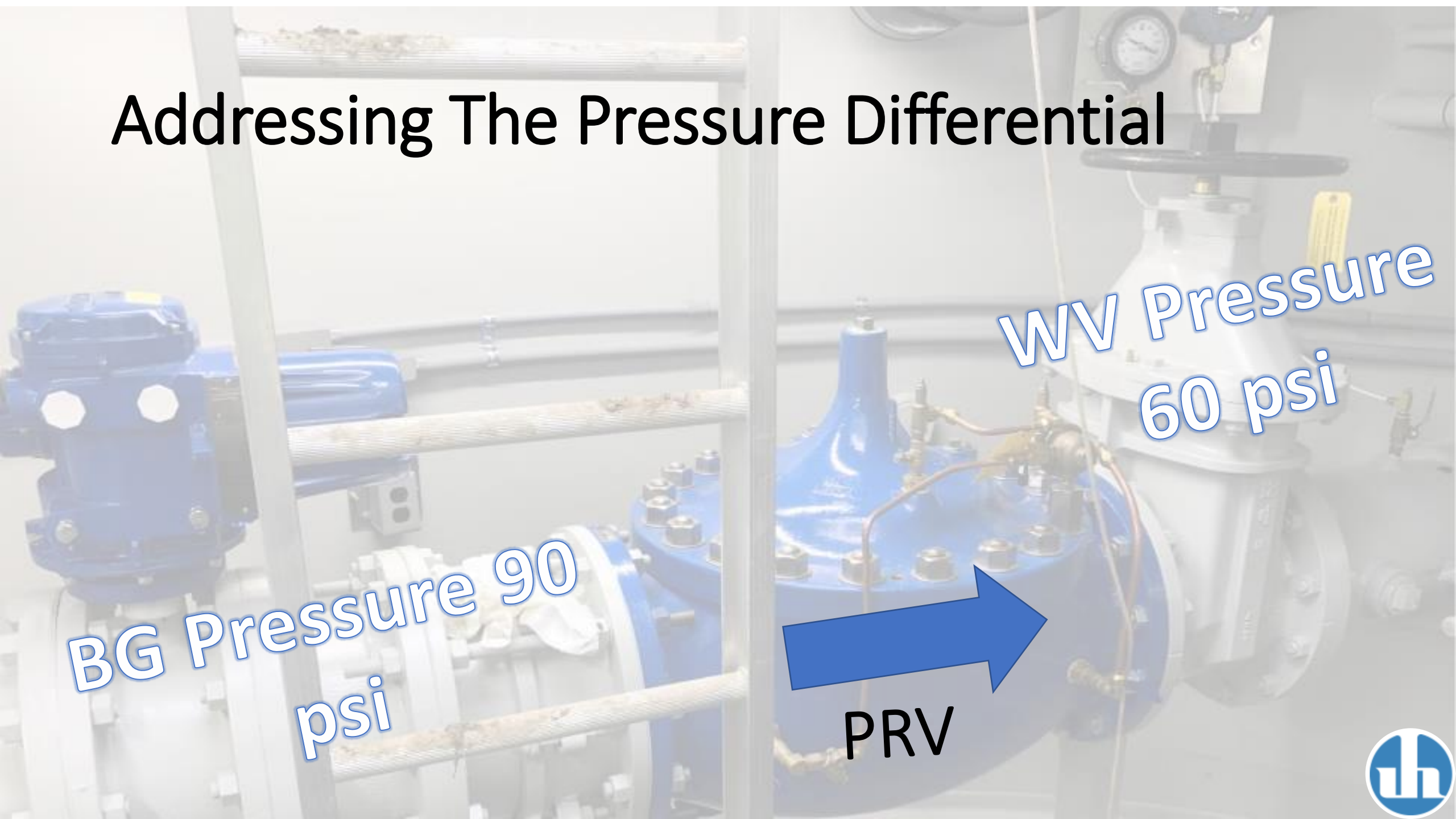
- Pressure Zone Changes
- Velocity Magnitude Change
- Velocity Direction Change
- Water Chemistry

SO WHAT YOU'RE SAYING IS



THERE IS ENERGY GRADE DIFFERENTIAL?

Addressing The Pressure Differential



The Velocity Concern

- Changes in Magnitude and Direction could cause:
  - Biofilm Stripping
  - Sediment Fluidization
  - Protective Coating Shearing

Literature Review
Water Main Velocity

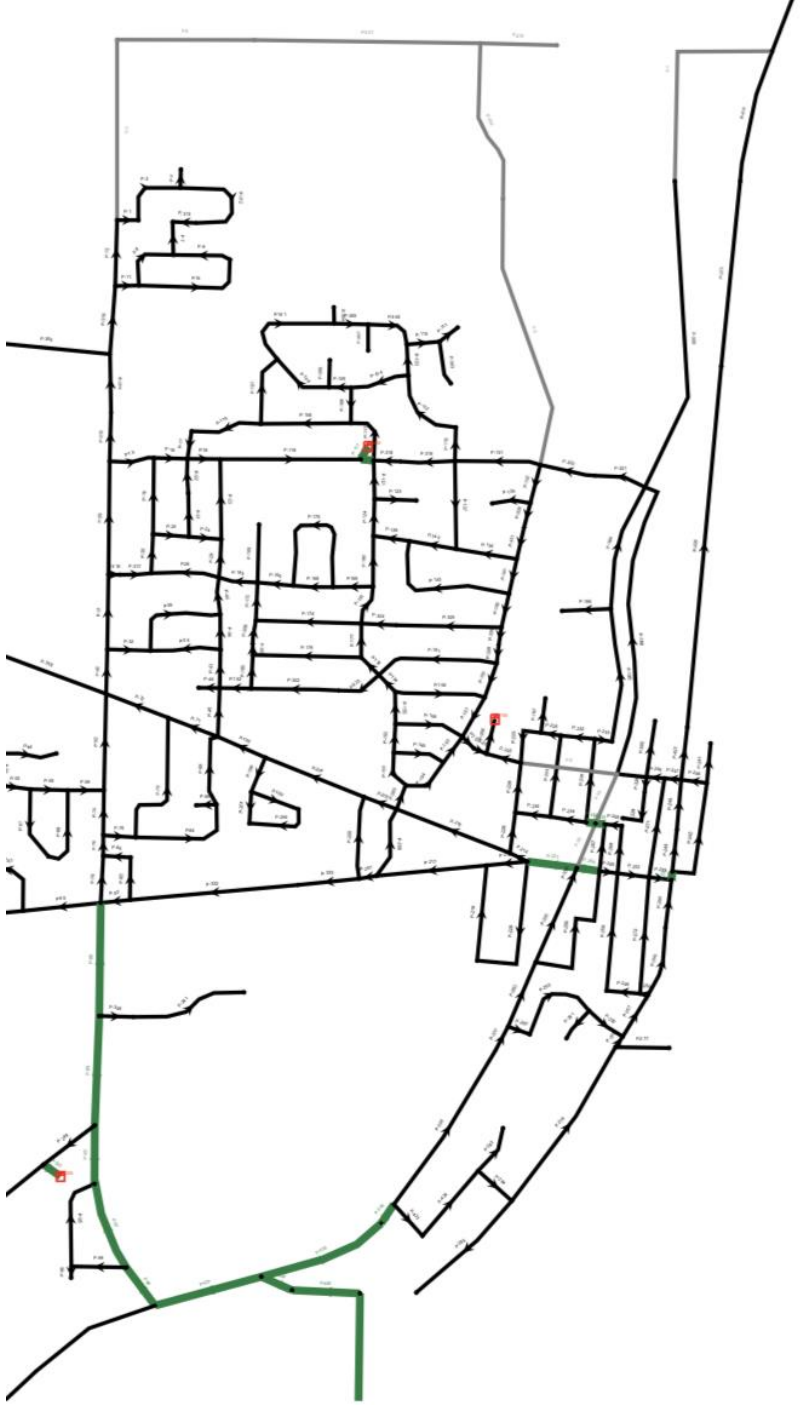
- Consensus
  - Sediment Particle sizes vs velocity
  - AWWA & 10 States – 2.5 fps for scouring (new pipe)
  - Velocity must be greater than 5 – 6 fps to scour (ex pipe)
  - Not much information about directional switch

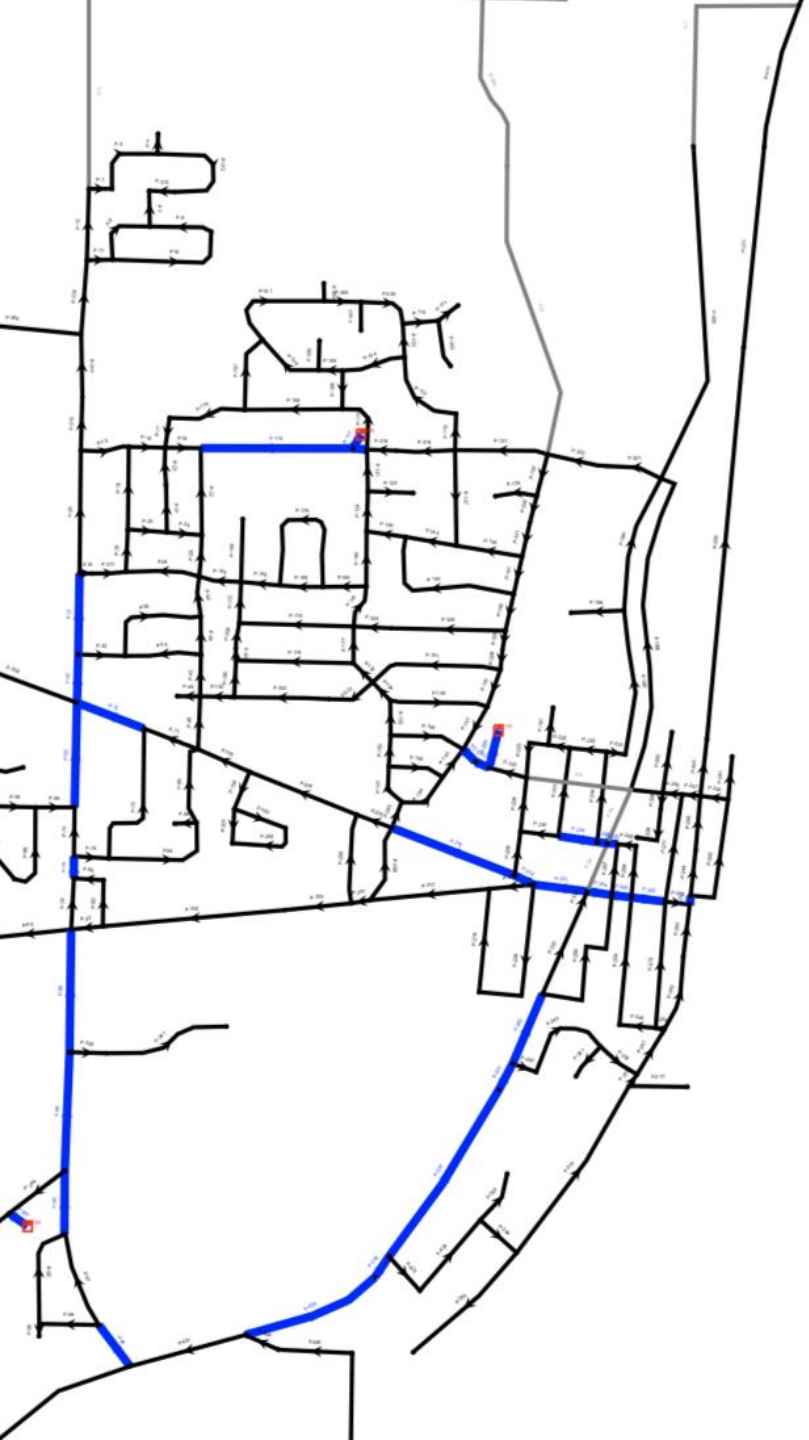
Velocity Magnitude Evaluation WaterCAD

- Existing System
- Pipes with Velocity >2.5fps
- Maximum velocities near Lucas Co. connection and existing tanks.
- Only two pipes predicted to have a maximum velocity exceeding 5 fps. .

Velocity Magnitude Evaluation WaterCAD

- Proposed System
- Pipes with Velocity > 2.5fps
- Maximum velocities near Bowling Green connection and existing tanks.
- Only one pipe predicted to have a maximum velocity exceeding 5 fps. .





Velocity Direction Switch Evaluation Water CAD

- Pipes with 5 fps of direction change
- Locations near Bowling Green
- Locations near removed feed from the Lucas County
- Locations feeding towers experience greater than 5 fps switch feed towers
- Pipes with directional changes experience daily flow switching.

Velocity Direction Switch Evaluation (Permanent) - Water CAD

- All permanent switches below 5 fps
- Impacts minimal

Water Chemistry Concerns

- Water Chemistry Similar
- Alkalinity of BG slightly higher than Toledo
- OEPA required a reduction in Alkalinity by BG prior to switch
- Waterville resumed Lead & Copper

Right People

Right Plan

Final Points – “Mission Accomplished”

Construction

- Background Investigations and Analysis Critical
- Project Specific Technical Specifications and Drawings
- Constructible Pipe Geometry

Supply Switch

- Water Chemistry Evaluation
- Water Flow Study
- Seamless Switch

Questions?

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