Utilizing a Risk Mitigation Strategy to Design and Construct a Water System Interconnection

Kristen VonderBrink, EI
Project Engineer
RA Consultants, LLC
kvonderbrink@raconsultantsllc.com
Welcome

- Project Overview
- Project Goals
- Project Risks
- Project Strategy
- Mother Nature’s Twist
- Construction and Results
- Questions
Project Overview

- Located in Greene County, OH
- 40,000 LF (7.5 miles) of water main
- Pipe sizes ranging from 12” to 24”
- 9 trenchless crossings
- Strict 18-month Design and Construction deadline
- Project configured into five separate contracts for cost and schedule efficiency
Project Goals

- Greene County’s agreement to purchase water was set to expire in May 2018
- Connect Greene County’s Northwest Region and Eastern Region Water Systems
  - Survey
  - Design
  - Easements
  - Permitting
  - Bidding and Construction Assistance
- Design and Construction completed within strict 18-month deadline
Project Risks

PERMITTING
WEATHER
EASEMENTS
Much of the project area falls within the 1,000 ft corridor of the Little Miami River (LMR)

Would require Water Quality Certification for Nationwide Permit 12

LMR is a National Scenic River
  - Jurisdiction of the National Park Service (NPS)
  - No articulated review period
  - Some can span as long as nine months
Weather

• Given the NTP was in December 2016, weather had most potential impact on survey operations

• Potential to affect construction operations as well
Easements

• Easement acquisition can be time consuming process
• Costs and other factors dictate when & where they may be required
Project Strategy

Risk Management Process

- Control Risks
- Plan Risk Management
- Plan Risk Response
- Risk Identification
- Quantitative Risk Analysis
- Qualitative Risk Analysis

PERMITTING
WEATHER
EASEMENTS
Mitigating the Permitting Risk - HDD under the LMR

- LMR = Highest Priority
- Install the crossing of the LMR with HDD → not impacting the river
  - Therefore, do not need a permit
- Grouped HDD crossings to the greatest extent possible

- Locating all connection pits outside of environmentally sensitive areas
- Cloud-based map used to collaborate in real-time
  - Tablets used in the field to collect data by designers, ecologists and surveyors
Mitigating the Permitting Risk - HDD under the LMR
Mitigating the Weather Risk

- 90 day milestone for survey/basemap
- Traditional field survey supplemented with aerial
- Multiple crews
- Included non-working days into schedule to account for weather
- Construction → multiple contracts & created schedule that included 25% non-productive days as a weather buffer
Mitigating the Easement Risk

- Establishing alignment within R/W
- Establishing a HIGH priority on property records research
- RA SMART Tool
- ArcGIS Online

- 50 foot R/W
- 30 foot R/W
Easement Pinch Points

Options:
• Main in the Pavement
• Easement Acquisition

22 +/- feet

< 4 feet

< 4 feet
Systematic Mitigation of Alignment Risk Tool
Alignment Planning

• Client’s original preference to utilize US 68 after the LMR HDD

• Corridor HIGHLY unfavorable
  • Tight corridors
  • Very limited probability for easement

• Modified alignment to utilize Little Miami River Scenic Bike Trail
Alignment Planning and Packaging

- DP 1 – HDD: 4 crossings
- DP 2 – Hilltop: 16”, 12,000 ft
- DP 3 – Ludlow: 12”, 8,700 ft
- DP 4 – Bike Path: 20”, 5,300 ft
- HDD: 1 crossing
- DP 5 – SR 235/68: 16”, 20”, 13,000 ft

<table>
<thead>
<tr>
<th>Contract</th>
<th>Diameter (in)</th>
<th>Length (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16, 20, 24</td>
<td>1,800</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>12,000</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>8,700</td>
</tr>
<tr>
<td>4</td>
<td>20, 24</td>
<td>5,200</td>
</tr>
<tr>
<td>5</td>
<td>16, 20</td>
<td>13,500</td>
</tr>
</tbody>
</table>
Innovation in the Alignment Planning

Cost Impact of Decisions in Each Phase

- Alignment Planning
- Preliminary Design
- Detailed Design
- Construction

Ability to save vs. Time
Little Miami River Scenic Bike Trail

• Revised alignment meant new stakeholders – ODNR
• Closing a popular multi-County bike path requires detailed coordination
Mother Nature’s Twist

- Design complete & time for bidding
- Hurricane Harvey
- Pipe Supply
- Pipe Prices
- Schedule
Mother Nature’s Twist

- Quick decisions made
- Allowed contractor to procure PVC pipe from alternate source
- Client accepted pressure class 250 pipe as an alternate to Class 52 D.I.P. and C-900/C-905
- All five contracts successfully bid and awarded
Figure 3

Electrical Resistivity Profile MC717L1

Electrical Resistivity

South

North

Elevation (ft)

Iteration = 6  RMS = 5.51%  L2 = 0.76  Electrode Spacing = 5 ft

Effects of bridge abutments
Approximate water level
Relatively coarse grained - possible gravel
20 feet below deepest extent of creek

Massie’s Creek
Construction

Massie’s Creek
Construction

Little Miami River Scenic Bike Trail
Success! Ahead of Schedule and Under Budget

“I can complete the project under budget and ahead of schedule, but you'll need to allocate additional time and money for that.”
Questions?
Sources

- https://www.google.com/search?q=connection&rlz=1C1CHZL_enUS765US766&source=lnms&tbm=isch&sa=X&ved=0ahUKEwi23e6JqfTcAhXKyoMKHSR4AeoQ_AUIChgB&biw=1680&bih=913#imgrc=bcCZEOAG8cDkFM
- http://svhs.ccs.k12.nc.us/2018/01/02/inclement-weather-notice
- https://www.shutterstock.com/image-vector/scale-weighing-money-time-199561439?src=STU5DRcmO2A2zVpJGJdMg-1-4
- http://www.surveyhistory.org/funny_bones_-).htm
- http://ohiodnr.gov/
- https://www.gcparkstrails.com/
Thank You!

kvonderbrink@raconsultantsllc.com