PUMPING STATION CONSOLIDATION AND TRENCHLESS INSTALLATION CASE STUDY

New River Street Pump Station - Bridgeport CT

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NEW RIVER STREET PUMP STATION – BRIDGEPORT, CT
Today’s Agenda

- Overview of Bridgeport CT System
- Project Background and Drivers
- Subsurface Investigation Overview
- Trenchless Sewer Installation Evaluation
- Approach to Risk Mitigation and Control
- Trenchless Installation Experience
- Lessons Learned
Overview of Bridgeport CT System

- East Side WWTP - 10 mgd (AA) Activated Sludge Facility
- West Side WWTP - 30 mgd (AA) Activated Sludge Facility
- 20 square mile service area
- 283 miles of sewers:
  - 160 miles of sanitary sewers
  - 123 miles of combined sewers
- 9 Pump Stations
- 66 Regulators
- 8 Inverted Siphons
- 33 CSO Outfalls
- Service Portions of Stratford, Fairfield, and Trumbull, CT
Overview of Bridgeport System
Project Background and Drivers

CSO Long Term Control Plan

Funding
- CT Clean Water Fund Set Asides
- CSO Reduction/Elimination

PS Rehab Program
- On-Going Upgrades of all Existing Pump Stations

Existing Conditions
- Upgrades Needed
- Not Operator Friendly
- Sites Landlocked
Project Background and Drivers

Island Brook Pump Station Site Constraints

No Room for Expansion or Construction
Project Background and Drivers

River Street Pump Station Site Constraints

No Room for Expansion or Construction
Project Background and Drivers

Consolidate the Pump Stations & Eliminate CSOs
Original Consolidation Plan - 2002

Use Pipe Jacking to Redirect Flow to a New River St PS
The Game Changer in 2008...

A Potential Alternative – Former Dog Kennel Site
New River Street Pump Station

- 2.4 MGD Wastewater PS
- Similar Design to other WPCA Pump Stations
- Wet Well/Dry Well Arrangement
- 3 Dry Pit Submersible Pumps
- Emergency Backup Generator
- Designed Utilizing 3D MEP
Subsurface Investigation Overview
Subsurface Profile from Island Brook to New Pump Station Site

Relocate PS Site and Go Trenchless to Reduce Cost

Credit: Haley and Aldrich, Inc.
Relocate PS to Avoid Contamination

Initial PS Site

Revised PS Site

Credit: Haley and Aldrich, Inc.
Trenchless Considerations

15” PVC Sewer – 540 LF
162 LF
193 LF

Revised PS Site

10” PVC 747 LF
250 LF

Credit: Haley and Aldrich, Inc.
Trenchless Evaluation

Credit: Haley and Aldrich, Inc.

Select Sustainable, Cost Efficient Method to Mitigate Risk
Trenchless Evaluation

Microtunneling

Horizontal Directional Drilling

Pipe Jacking

Microtunneling Offered Best Chance of Success
## Design Approach to Risk Mitigation and Control

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<th>Data Availability</th>
<th>Specify Parameters</th>
<th>Plan for the Unexpected</th>
<th>Monitor and Control</th>
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<td>• Supplemental Information to Bidders</td>
<td>• Prequalify Tunneling Contractors</td>
<td>• Discuss Risk and Develop a Mitigation Plan</td>
<td>• Document Existing Conditions</td>
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<td>• Define Limits of Reliance on Data</td>
<td>• Define Minimum MTBM Diameter</td>
<td>• Unit Price for Tunneling Crew Delay Time</td>
<td>• Install and Monitor Crack Gauges</td>
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<td>• Define “Boulders” and “Obstructions”</td>
<td>• Allowance Item for “Rescue Shafts”</td>
<td>• Monitor Site for Movement/Settlement</td>
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Trenchless Installation Experience

- **B to A:**
  - 44.5” OD Permalok Steel Casing Pipe
  - 15” PVC Sewer – 540 LF

- **C to D & C to B:**
  - 36” OD Permalok Steel Casing Pipe
  - 193 LF

- **D to PS:**
  - Pilot Tube MTBM
  - 15” No-Dig Clay Sewer Pipe (25 LF)

Credit: Haley and Aldrich, Inc.
MTBM Equipment
Herrenknecht AG, Germany
AVN600 for 36” OD (495 Tons Jacking Force)
AVN800A for 44.5” OD (765 Tons Jacking Force)
Estimated Jacking Force Required – 115 Tons

Typical Cutter Head Arrangement

Credit: Northeast Remsco, Inc.
Guided Bore/Pilot Tube MBTM Equipment

Akkerman PCH 22.5 with 308A/309A Jacking Frame

Pilot Tube MBTM Section

Cutter Head Arrangement – 15” OD
Typical MTBM Site Layout

NOTE:
This layout is only one of many possible layouts for the tunneling support equipment. Northeast Remsco reserves the right to revise this layout in the field if conditions require.

Credit: Northeast Remsco, Inc.
MTBM Site Layout

Island Brook

Shaft B
MTBM Site Layout – Slurry Plant
Typical MTBM Launch Shaft Setup

Entry Seal
Shaft Controls for Jacking System
Backstop Concrete
Laser
Access Ladder
Jacking Frame
Slurry/Shaft Pump

Credit: Northeast Remsco, Inc.
Tunneling Experience

B to A: 44.5” OD Permalok Steel Casing Pipe (540 LF)

Credit: Haley and Aldrich, Inc.
Murphy was an Optimist…

Credit: Haley and Aldrich, Inc.

Island Brook Ave

New PS Site

MBTM Lost Alignment (26mm right/78 mm down)
Investigating the Issue

• MTBM would need to be “Rescued” via Excavation of Rescue Shaft
• Obtain Inland Wetlands Permit
• Tunneling Logs Reviewed
• Material in front of MTBM observed and reviewed
• Discuss Potential Causes and Best Way to Proceed
• Utilized Unit Price and Allowance Items for Rescue Shaft

Work Collaboratively to Develop a Recovery Plan
Back to the Drawing Board…

Sonic Boring Investigation – 6” Core Barrels

Credit: Haley and Aldrich, Inc.
Planning for Completion

• Convert Rescue Shaft to Launch Shaft

• Upsize MTBM to 48” OD – AVN1200 with different Cutter Head Arrangement
  ▪ Use 48” OD RC Casing Pipe
  ▪ Sell off 44.5” OD Permalok Pipe
Meanwhile, Back at the Pump Station…
Murphy Didn’t Stick Around…
Lessons Learned

- Drill, Drill, Drill…Determine Subsurface Conditions
- Prequalify Tunneling Contractors
- Clearly Specify Tunneling Parameters
- Plan for Unexpected Delays and Conditions
- Collaborate and Work Together for Success
- Trenchless is a sustainable, cost effective solution to buried infrastructure challenges
Acknowledgements

- Bill Robinson and Ravi Keerthy, Bridgeport WPCA
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- Northeast Remsco Construction
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