Ice, Ice Baby! Ice Pigging of a Sanitary Sewer Force Main

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NC AWWA-WEA 2017
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Overview

- The Issues
- Force Main Evaluation

- The Proposed Solution
- The End Solution

- The Results
Solomons Island, Maryland
The Issue

Headworks Wastewater Pumping Station

• Conveys Flow to the WWTP
• Operating Below Design Capacity

Wet Weather

• Emergency Storage Basin
• Transport by Truck ($$)
• Overflow to the Bay
Pumping Station & Force Main Evaluation: Background

Solomons Island Headworks Pumping Station

- Constructed mid-1980’s
- Gravity Flow to WWPS 1
- De-gritting (recently replaced)
- Equalization Tank (wet well)
- Pumped to WWTF
- Force Main: 4.75 miles (7.64 km) 10-inch (250 mm)
The Issue

Headworks Capacity?

- Design: 700 gpm (44 l/s)
- Observed: 450 gpm (28 l/s)
  – OR

Wet Weather Flows?
Schematic
Pumping Station & Force Main Evaluation: Field Evaluation

- Drawdown Tests
- Continuous Pressure Monitoring
Pumping Station & Force Main Evaluation: Field Evaluation

- Design 1 Pump Operating
- Design 2 Pumps Operating
- Test Pump #1 Operating
- Test Pump #2 Operating
- Test 2 Pumps Operating
Pumping Station & Force Main Evaluation:
Field Evaluation
## Pumping Station & Force Main Evaluation: Field Evaluation

<table>
<thead>
<tr>
<th>Location</th>
<th>Calculated Hazen-Williams C-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headworks to Holiday Drive</td>
<td>90</td>
</tr>
<tr>
<td>Holiday Drive to Hilton</td>
<td>71</td>
</tr>
<tr>
<td>Hilton to Ace Hardware</td>
<td>82</td>
</tr>
<tr>
<td>Ace Hardware to Landfill</td>
<td>106</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>84</strong></td>
</tr>
</tbody>
</table>
Conclusion: Two steps

Two steps

1. Clean the force main
   – Assess post cleaning
2. Upgrade the headworks
   – Replace pumps
      • Restore capacity
      • Pump selection hinges on force main cleaning
      • Limited by pressure class of pipe
Two technologies
## Technology comparison

<table>
<thead>
<tr>
<th></th>
<th>Conventional Pigging</th>
<th>Ice Pigging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation Capabilities</td>
<td>Check Valves; Bends</td>
<td>None</td>
</tr>
<tr>
<td>Impact on Operations</td>
<td>Construction; supplemental water</td>
<td>Ice injection; supplemental water</td>
</tr>
<tr>
<td>Capital Improvements</td>
<td>Launching Stations</td>
<td>Ice Insertion points</td>
</tr>
<tr>
<td>Pumping</td>
<td>Supplemental</td>
<td>Existing pumps</td>
</tr>
<tr>
<td>Risk</td>
<td>Emergency Extraction</td>
<td>None</td>
</tr>
<tr>
<td>History</td>
<td>Well Established</td>
<td>New</td>
</tr>
<tr>
<td>Cost (estimated)</td>
<td>$400,000</td>
<td>$425,000</td>
</tr>
</tbody>
</table>
Design: First try

1. PIG LAUNCHING STATION

2. PIG RECEIVING STATION

NOTES:
1. PIGGING SUBCONTRACTOR TO ESTABLISH FINAL VAULT LENGTH AND WIDTH BASED ON PIG LAUNCHER REQUIREMENTS. MINIMUM CLEARANCES SHOWN.
2. PATCH ASPHALT PER DETAIL 6 - SHEET C003.
3. VAULT AND HATCH DESIGNED FOR H20 LOADING, HEAVY DUTY PER AASHTO M-306.
4. LOD SHALL NOT EXCEED 1.341 SF.
5. NEW BURIED VALVE AND PIPING SHALL HAVE RESTRAINED JOINTS.
6. RESTRAINED COUPLING MJ SHALL BE EBAA IRON 3800 MEGA-COUPLING OR EQUAL.
7. RESTRAIN FITTINGS WITH EBAA SERIES 1100 MECHANICAL J OINT RESTRAINTS OR EQUAL.
Revisiting Ice Pigging

Since 2013

• Completed sewer force cleaning
• References confirmed
• Modified plans
  – Added ice injection ports
  – Redirected material from cleaning
Field visit

Nearby Town

- Raw water main
  - High iron content
  - Demonstrated
    - Increased C-value (reduced roughness)
- Can move solids
Modify the plan

Doubled ice loads

- Two rigs
- No new injection ports
- Increased level of coordination
- Reduced number of work days
Results

**Completed cleaning**
- On schedule
- Immediate increase in flow from one pump
  - 350 gpm to 450 gpm
Next steps

- Complete full hydraulic evaluation
- Upgrade Headworks Pumping Station
Takeaways

- Ice pigging is viable option
- Limited contractors to complete work
- Less concerns during cleaning
- Need more quantitative results
Thank you

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