Challenges and Rewards of Sewer Interceptor Assessment and Rehabilitation

THE CITY OF FAIRBORN EXPERIENCE -
THE CITY OF FAIRBORN, OHIO

- Located in Southwest Ohio in Greene County
- Population approx. 33,000
- Owns and Operates 6 MGD Water Reclamation Center
The Issue

- Peak Wet Weather Flow of 14 MGD
- Surcharging in Trunk Sewers across the Wright Patterson Air Force Base (WPAFB) property
- Long recovery times at the WRC after heavy rain
- Potential for redevelopment with high water users
The Study

- In 2010 City began that Sanitary Sewer Interceptor Study which included:
  - Capacity Evaluation
  - Flow monitoring (13 meters)
  - Manhole Inspections along Interceptors
  - Desktop Capacity Analysis
  - Sanitary Calculations vs. Observed Flow
Interesting Findings

Flow monitoring indicated a significant increase in Dry Weather Flow across (WPAFB).

Table 1:
North Interceptor Dry Weather Flow per Sanitary Sewer Interceptor Study

<table>
<thead>
<tr>
<th>DWF Dates</th>
<th>Average DWF Upstream WPAFB (FM #5a&amp;b)</th>
<th>Average DWF Downstream WPAFB (FM #4)</th>
<th>Change in Average DWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 15 – March 22, 2010</td>
<td>0.355 mgd</td>
<td>0.889 mgd</td>
<td>0.535 mgd</td>
</tr>
<tr>
<td>April 17 – April 24, 2010</td>
<td>0.361 mgd</td>
<td>0.873 mgd</td>
<td>0.512 mgd</td>
</tr>
<tr>
<td>June 30 – July 7, 2010</td>
<td>0.425 mgd</td>
<td>0.761 mgd</td>
<td>0.336 mgd</td>
</tr>
</tbody>
</table>

Table 2:
South Interceptor Dry Weather Flow per Sanitary Sewer Interceptor Study

<table>
<thead>
<tr>
<th>DWF Dates</th>
<th>Average DWF Upstream WPAFB (FM #8)</th>
<th>Average DWF Downstream WPAFB (FM #7)</th>
<th>Change in Average DWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 15 – March 22, 2010</td>
<td>2.751 mgd</td>
<td>3.433 mgd</td>
<td>0.682 mgd</td>
</tr>
<tr>
<td>May 22 – May 29, 2010</td>
<td>2.181 mgd</td>
<td>2.772 mgd</td>
<td>0.590 mgd</td>
</tr>
<tr>
<td>June 30 – July 7, 2010</td>
<td>2.085 mgd</td>
<td>2.858 mgd</td>
<td>0.774 mgd</td>
</tr>
</tbody>
</table>
What’s the Problem?

• WPAFB was being billed on an estimated discharge rate
• Significantly less than what the flow monitoring indicated
• Significant revenue loss for the City
Next Steps

• Verify Findings
  • Was this Inflow and Infiltration?
  • Was it heavy water usage?

• CCTV inspection was completed to evaluate the condition of the existing sewers and to verify existing connection from WPAFB

• Additional flow monitoring was conducted to determine how much flow WPAFB was utilizing

• This all took Coordination and Cooperation with WPAFB
CCTV Findings

Structural Defects

Inflow and Infiltration
## Flow Monitoring Results

### Dry Weather Flow by Interceptor

<table>
<thead>
<tr>
<th></th>
<th>Avg. Daily Flow (mgd)</th>
<th>Peak Observed DWF (mgd)</th>
<th>Min. Observed DWF (mgd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Interceptor</td>
<td>0.176</td>
<td>0.282</td>
<td>0.128</td>
</tr>
<tr>
<td>South Interceptor</td>
<td>0.002</td>
<td>0.011</td>
<td>0.001</td>
</tr>
</tbody>
</table>
## Summary of Findings

### Estimated Groundwater Infiltration

<table>
<thead>
<tr>
<th></th>
<th>Average change in DWF across WPAFB as observed by the Interceptor Flow Monitoring</th>
<th>Observed DWF from WPAFB service connections located between the Interceptor Flow Meters</th>
<th>Estimated groundwater infiltration in the Interceptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Interceptor</td>
<td>0.451 mgd</td>
<td>0.157 mgd</td>
<td>0.294 mgd</td>
</tr>
<tr>
<td>South Interceptor</td>
<td>0.690 mgd</td>
<td>0.002 mgd</td>
<td>0.688 mgd</td>
</tr>
</tbody>
</table>
FINDINGS

• WPAFB was using more than expected
• WPAFB wasn’t contributing all the flow
• Where was the rest coming from?
FINDINGS

• South Interceptor invert elevation 781 to 808
• North Interceptor invert elevation 794 to 813
FINDINGS/RECOMMENDATIONS

• FINDING:
  WPAFB was being significantly undercharged for their actual water usage.

• RECOMMENDATION:
  Increase monthly estimated discharge rate

• FINDING:
  • Due to high ground water table significant I/I was entering the system through defects

• RECOMMENDATION:
  Rehabilitate the South and North Interceptor as they cross WPAFB
IMPLEMENTATION

- Project included rehabilitation of 15,256 linear feet of 21-inch to 36-inch Sewer Main
- The entire project was within WPAFB
- Portions of the sewer were located in restricted areas
- Some of the worst structural defective sewers were located under a runway
PRE-CONSTRUCTION CHALLENGES

Coordination with WPAFB

- Special training
- Schedule coordination
- Limited height due to runways
- Fence penetrations
- Waived specifications to accommodate schedule

Access due to saturated conditions
Coordination with WPAFB

- Restoration specifications
- Difficult to gain access for post-construction inspections
BENEFITS

- Reduced storm impact on Northwest Lift Station
- Identified WPAFB connections that were not documented.
- Quantification of flow allowed for more appropriate billing of the base.
- Renewed lines with high risk of failure
- Reduced impact on Water Reclamation Center
- Reduced dry weather flow
- No surcharges on base property since rehabilitation
- One year televising showed no indications of I&I in the lined areas.
QUESTIONS?