A Collection System Wet Weather Case Study:
The Village of Menomonee Falls Automated Emergency Operations System

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Topics Covered

1. Village of Menomonee Falls Background Information
2. Background and Problem
3. Alternatives Considered
4. Concept of Automated Emergency Operations System (AEOS)
5. Components of AEOS
6. Results
7. Conclusions
Village of Menomonee Falls

• Northeast Waukesha County
• 33 square miles
• Population of 33,000
• Wisconsin’s largest Village
• Sewer system tributary to:
  – Brookfield WPCF
  – Sussex WWTF
  – Milwaukee Metropolitan Sewage District (MMSD)
Background and Problem

- June 1997 flood event
- Sanitary Sewerage System Plan – July 2000
  - Existing system adequate for full build-out of sewershed, 10 year storm
  - Study criteria – system to be adequate to convey flow from extreme events while protecting basements from sewer backups
Sanitary sewer bypassing from trunk sewer in Menomonee Avenue to eliminate basement flooding

- Old sewer (1960’s)
- Poor soils
- High groundwater
- Reactive groundwater
- Road Flooding

- Similar problem in other areas of Village

\[
\frac{\text{Peak hour}}{\text{Average day}} = 14:1; \, \text{Typical 3:1 or 4:1}
\]
Alternatives Considered

- Sewer relay
- Relief sewer
- AEOS

I/I reduction part of all alternatives
Alternatives Considered

• 2000 Sanitary Sewer System Study
• AEOS chosen
  – Cost competitive
  – Flexibility
    • Definable start and stop points
    • Amount of sewage diverted, metered and recordable
    • Future cap on flow to MMSD
      – Space available for future storage at end of force main
Alternatives Considered, contd.
Concept of AEOS

With excess rainfall, sanitary sewage flows are conveyed past local collection system restrictions, via a pump station, to a downstream location where more capacity exists.
AEOS Components

- Diversion MH
- Pump station
- Force main
- Outlet diversion MH
- Outlet MH
Concept of AEOS
Concept of AEOS
Concept of AEOS

Approximate Hydraulic Grade Line
Trunk 6 Sanitary Sewer

Pipe Capacity HGL  Manhole Rim Elevation

Manhole Number

Elevation

5/4/2010

Menomonee Falls Village 1192117 Menomonee Avenue Sanitary Sewer Diversion System > Design Pump Station 201 > Design > Adjusted Hydraulic Profile with Lift Stations - HGL Graph

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Concept of AEOS

Approximate Hydraulic Grade Line
Trunk 6 Sanitary Sewer

Pipe Capacity HGL
1997 Storm Event HGL
Manhole Rim Elevation

Manhole Number

Elevation

5/4/2010
Menomonee Falls Village 1192117 Menomonee Avenue Sanitary Sewer Diversion System > Design Pump Station 201 > Design > Adjusted Hydraulic Profile with Lift Stations - HGL Graph
Concept of AEOS
Components of AEOS

- Diversion MH
  - Provide means to reduce HGL
  - Direct sewage to wet well
  - Adjustable weir
Components of AEOS

• Pump station
  – Submersible type
  – Separate valve MH
  – Flow meter
  – Stand-by power
  – Sunset Ridge Drive: 2.3 MGD
  – Lloyd Avenue: 2.0 MGD
  – Pumps designed for shared force main with 2 other lift stations
  – Cost: $1.25 M
Components of AEOS – Pump Station
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Components of AEOS

• Force Main
  – PVC and PE
  – 16-inch diameter, 2,000 ft.
  – 20-inch diameter, 7,400 ft.
  – Future upstream – 14-inch diameter
  – Air valves
  – Cost: $1.5 M
Components of AEOS

• Outlet diversion MH
  – Normal route to outlet MH
  – Emergency route to Menomonee River
  – Automatically controlled plug valve
Components of AEOS
Components of AEOS
Components of AEOS

• Outlet MH
  – Force main discharge to gravity system
  – Monitor level in 42-inch gravity sewer
  – Control position of plug valve with floats
Results

• Similar system put in place in 2003
  – No bypassing to date under extreme events
  – July 22, 2010 storm
    • No basement backups
    • Diverted 2.3 million gallons

• No bypassing in areas improvements made
  – Parallel sewer
  – Relay with larger pipe
Conclusions

• AEOS allows greater flexibility
  – Collection system
  – Future reduction in flow to MMSD
• AEOS cost effective way to eliminate bypassing
  – 10 year storm to 50 year storm
• AEOS allows greatest use of existing collection system
• I/I efforts still critical
  – MH rehabilitation
  – Sewer lining
  – Televising
  – $10.7 M spend in last 10 years