Planning and Implementing Water System Interconnections

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Presentation Outline

• Discuss interconnection planning process using models
• Review lessons learned from implementing interconnections
• Discuss the value of testing interconnections
Planning Interconnections Usually Involves Modeling

- Models predict available flows and test operating procedures
- Models can account for worst case conditions without affecting customers
- Modeling identifies limitations on flow between systems
  - Sources
  - Pumps
  - Pipes
Identifying Interconnection Flow Limitations

Supplying System

Production Capacity

Pressure Zone Pumps or PRVs

Pipe Capacity

Control Valve or Pumps

Receiving System

Interconnect
Modeling Approach: Extended Period Simulations

Steady state not good enough for sustainability and full impacts
Extended period simulations show pump & tank performance over time
Multiple connections analyzed simultaneously to evaluate interactions
Important to Agree on Model Demands: Demand Impact Flows for Interconnects

AUGUST - 2002

Graph showing MGD (Million Gallons per Day) with lines for Winston-Salem and Greensboro. The graph also highlights the previous year's add.
EPS Models Verify Flows are Sustainable
Example: Predicted Interconnection Flows
Check Against Actual Flows When Implemented

Cary/Apex WTP
38.1 mgd

Cary WPZ
5.8 mgd

Davis Drive Pump Station

NC 54 Connection

Cary CPZ
SPZ/Apex/RDU
22.3 mgd

Cary

Trinity Rd Pump St

DURHAM

Cary/Apex WTP
38.1 mgd

Durham

Raleigh

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Cary
Hydraulic Models Test Operating Procedures

- Performance is predicted on both sides of each interconnection
  - Tanks
  - Pumps

- No surprises: operators know what to expect
Bringing Interconnects Online ASAP Is Critical To Avoid Empty Tanks and Low Pressures

- Models can identify which tank empties first during outages
- Models predict how long tanks last before interconnects must start
Two Methods of Reducing Time to Bring Interconnections on Line

Use interconnects during normal operation, alternating flow direction if possible

Integrate interconnection piping into distribution system instead of dedicated piping
Integrating an Interconnection: 10-mile Long 16” Pipe Connecting OWASA & Hillsborough

• Installed in 1980s to pump to and from main pressure zones in both systems

• Originally designed as dedicated interconnection that was not pressurized except during emergencies

• Activation took several days for flushing and chlorination
Integrating Parts of 16” Pipe into Both Systems Cuts Flushing Time by 40%

- OWASA now using south end of 16” pipe to increase fire flows in their 740 Pressure Zone
- Hillsborough plans to use north end of 16” pipe in their 831 Zone which soon will have sufficient pump capacity to supply OWASA
- 40% of 16” pipeline will be used for normal operation and won’t need flushing or valving to isolate
- Connections for portable pump near midpoint of 16” pipe would facilitate flushing and boost gravity flow
Lesson Learned: Flexible Flow Control
Greensboro Interconnect with Winston-Salem

• Interconnect links Winston’s 1140 Zone to Greensboro’s 1120 Zone

• Original plan: pump 3 mgd to get maximum flow into Greensboro
Lesson Learned: Flexible Flow Control
Greensboro Interconnect with Winston-Salem

- Now supply is limited to 1120 Zone to avoid mixing disinfectants
- 1 mgd gravity flow exceeds demand in 1120 Zone – tank fills up
- Operators force flow through pump to limit gravity flow to 0.8 mgd
- Need PRV for flexible control of gravity flow
Implementation Lessons Learned

- **Shared SOPs Are a Must**
  
  Shared understanding between jurisdictions regarding responsibilities and action items during emergency transfers.

- **Communication is Key**
  
  Open conference call or command center communication system is essential for testing or using interconnections.

- **Practice Transfers Periodically**
  
  Identify challenges that will occur during emergencies. Builds working relationships between different staffs.
Another Lesson Learned: Defining Responsibilities
Importance of Testing Interconnections

Confirms that pump and tank performance, flows and pressures are consistent with model predictions

Prompts development of operating plans (SOPs)

Rehearses implementation without the stress and time constraints of emergency conditions

Determines if water quality will be a concern

Tests integrity of piping near interconnects
Testing Subjects Pipes to Higher Pressures Reduces Failure Risk During an Emergency

HGL WITH INTERCONNECTION ON AND OFF

- Normal
- Historical Max
- Interconnect

Distance from Tank - Feet

HGL - Feet

0 2,000 4,000 6,000 8,000 10,000

87 psi
74 psi
56 psi
Testing also can check for closed valves by comparing measured and predicted HGLs.
Durham/Raleigh Interconnection on US 70: Lessons Learned During Initial Testing

Maintaining water quality can be challenging

- Initial turbidity at high flow rates were above 20 NTU
- Velocities when flushing must be similar to transfer velocities

Three days for flushing

- High velocities for scouring required 2.3 MG
Be Proactive – Don’t Put Interconnections On Back Burner Until Droughts or Main Breaks
AWWA and PWS Support Interconnections

Regionalization of Water Utilities

Policy Statement

AWWA encourages water utilities to support regional solutions to resource management, water supply, and utility services needs. AWWA values the protection and efficient use of natural resources. Regional water supplies planning may increase water use efficiency, promote water conservation, minimize capital investment, and enhance source protection. Where a regional program is necessary or desirable, water utilities should work with the appropriate governmental and other entities to develop regional solutions to promote effective water resource and water supply management practices, coupled with sound provision of utility services. Furthermore, AWWA encourages state, provincial, territorial, and federal agencies to support local efforts to develop appropriate regional programs and to ensure equitable benefits to all participating water utilities.
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Questions

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