Breathing New Life Into Old Pipes:

Real Time Optimization For The Next Generation

Timothy Ruggaber
Director of Operations
EmNet, LLC

Patrick Henthorn
Assistant City Engineer
City of South Bend

Real Time Analysis Elements

Model	Hydrologic & Hydraulic Standard Operating Procedures Alternative Operating Procedures
Profile/GIS	Trunk line Level Critical Hydraulic Elevations Basement Elevations
Real Time Data	Design Storms – Radar – Rain Gauge User dependent - Automatic Hydraulic Data: Critical – Extensive Level - Flow

Real Time Analysis Elements

Model

- Hydraulic & Hydrological Model
- Provides representation of hydraulics in collection system
- Model requires data to represent present and predicted status
- GIS tools can be used to streamline decision making
- Open source platform allows integration with real time data and GIS platforms
- Can include human interaction such as SOPs

Real Time Analysis Elements

Profile/GIS

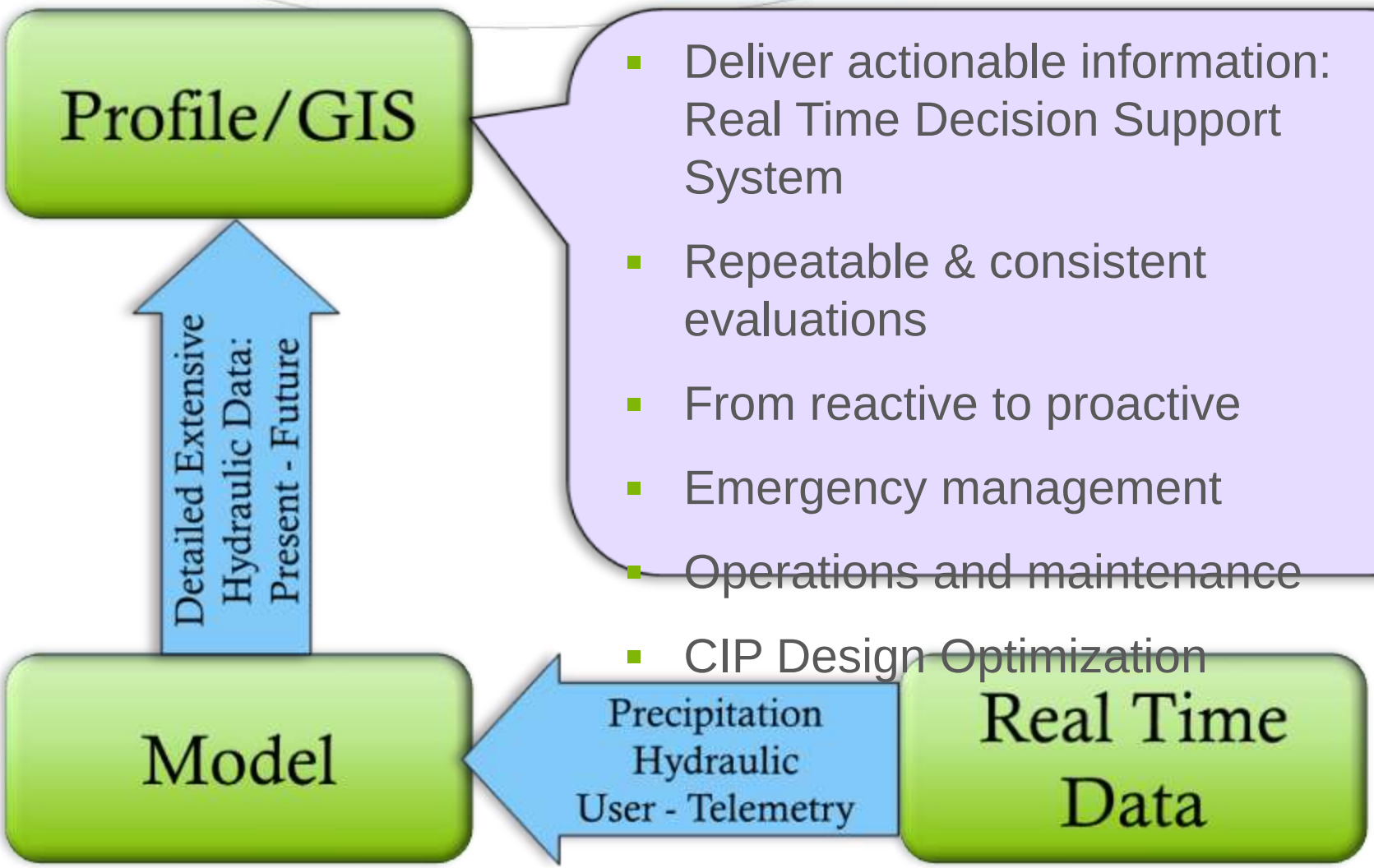
- Database of large amounts of infrastructure information
- Facilitates decision making process by making database data easy to consume
- Adoption of standards allows easy integration of modeled data to geographical databases
- Provides common platform for access to model and data

Real Time Analysis Elements

Real Time Data

- Data that can be modified at any time
- Meteorological: from user specified design storms to rain gauge to radar-based precipitation feed
- Time-line: from user specified profiles of intensity, direction, speed to automatic feed of predictive mean values and hybrids
- Hydraulic: From low cost level to advanced area-velocity
- Extensiveness: Definition of “hydraulically-critical” locations

Real Time Analysis Elements



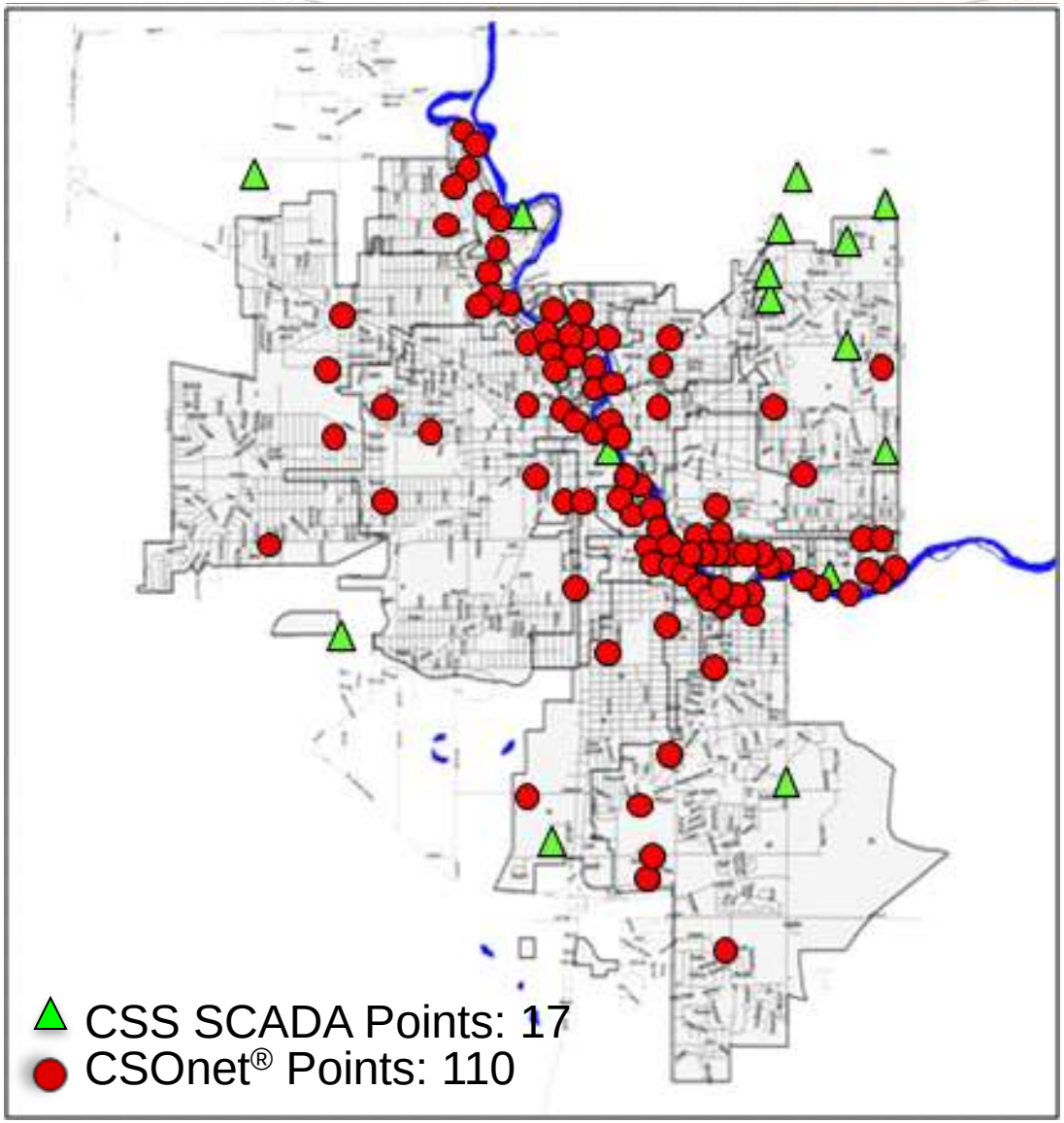
Similar applications

Profile/
GIS

Model

Real Time
Data

Real Time Data

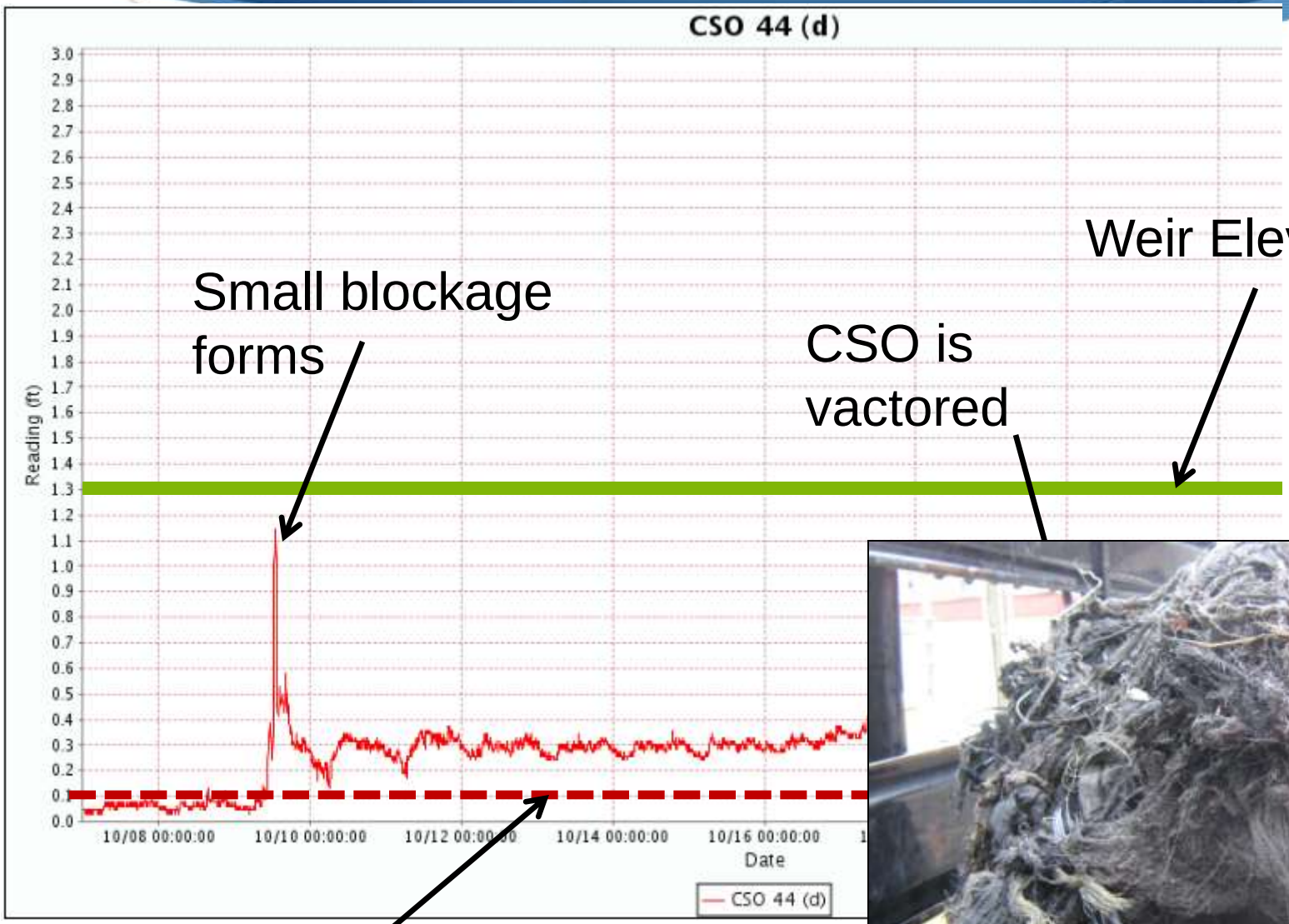


SCADA System:
Rockwell – RSView
SCADA Monitored locations:
17 (mostly lift stations)

CSOnet® Monitoring:
CSO outfalls: 36 sites
Interceptor: 27 sites
Trunk lines: 42 sites
Retention basins: 5 sites
Cost: $3M

"Before CSOnet®, it was like we had an artist's rendering of our collection system. Now, it is like we have a high definition video feed."
Jack Dillon,
Director of Environmental Services,
South Bend

Deviations from Model



Small blockage forms

Weir Elevation

CSO is vactored

Average Dry Weather Flow

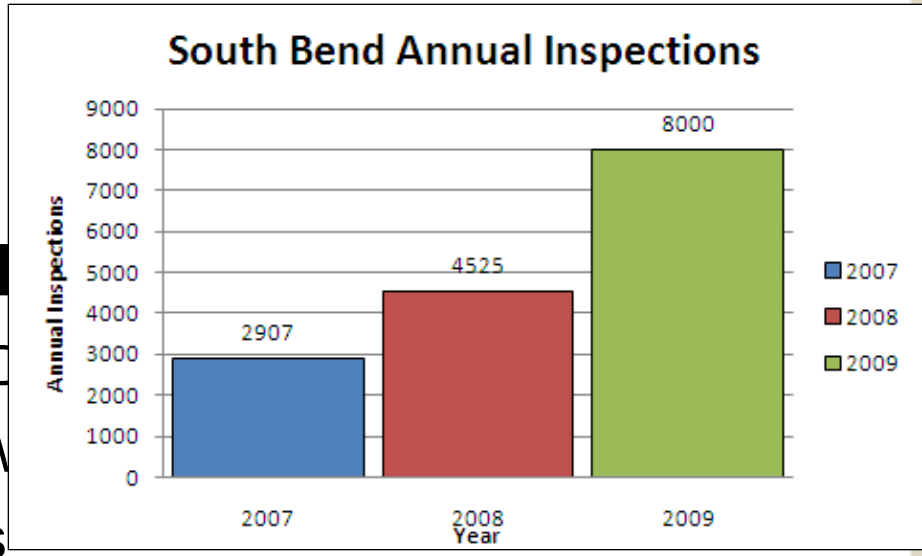
Increased O&M Benefits

- Use of vactor trucks 50 additional days annually
  - = **$133K**
- Clean 2000 additional catchbasins annually
  - = **$40K**
- Increase number of sewer inspections at non-routine locations by 175%
  - = **$29K**
- All this with **Same Staff**
- **Total Dynamic Maintenance Savings**

= **$202,000**

Before RTI

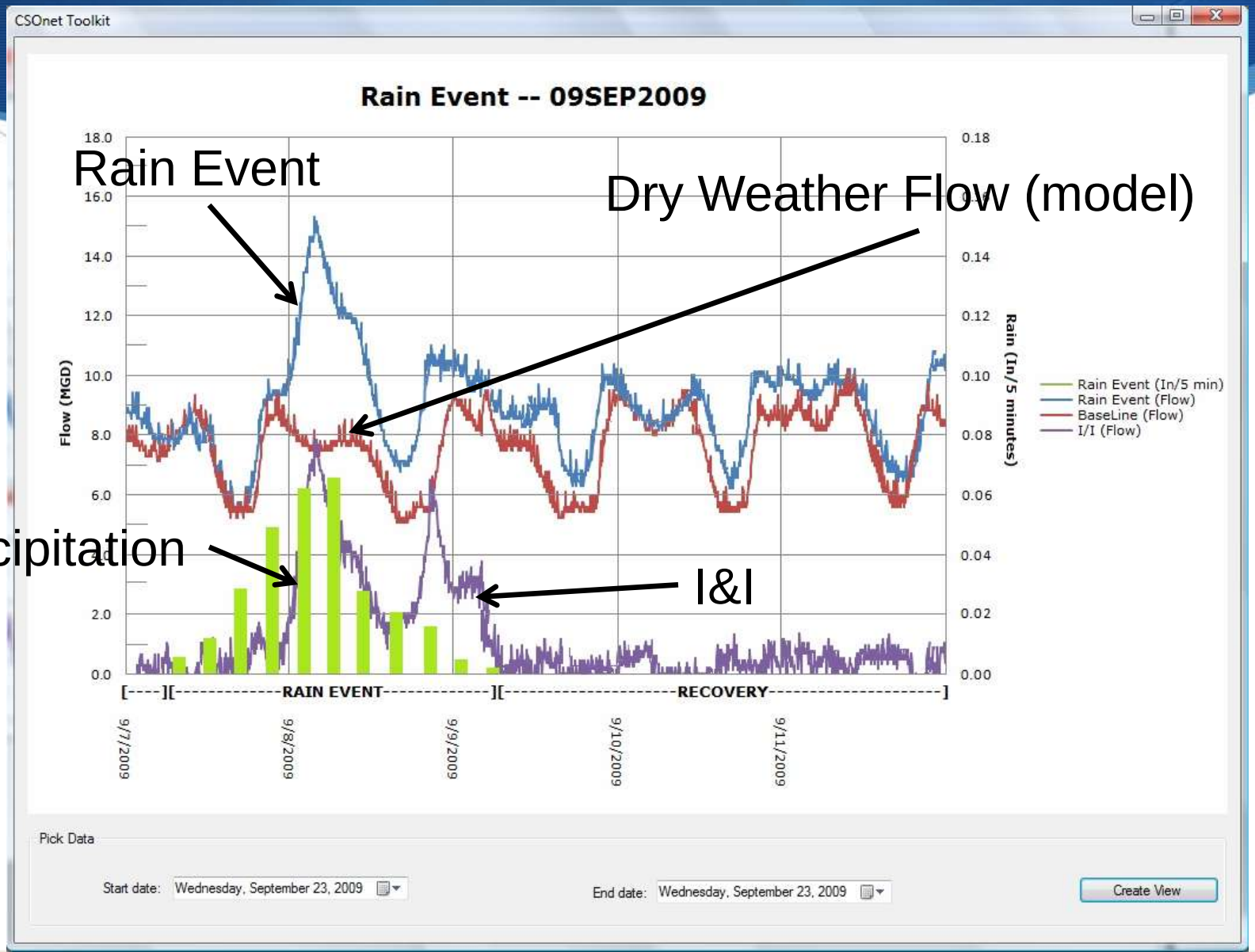
- Search for D
- Resolve DW
- Misc. duties



"It's like hiring more personnel, but without the cost."

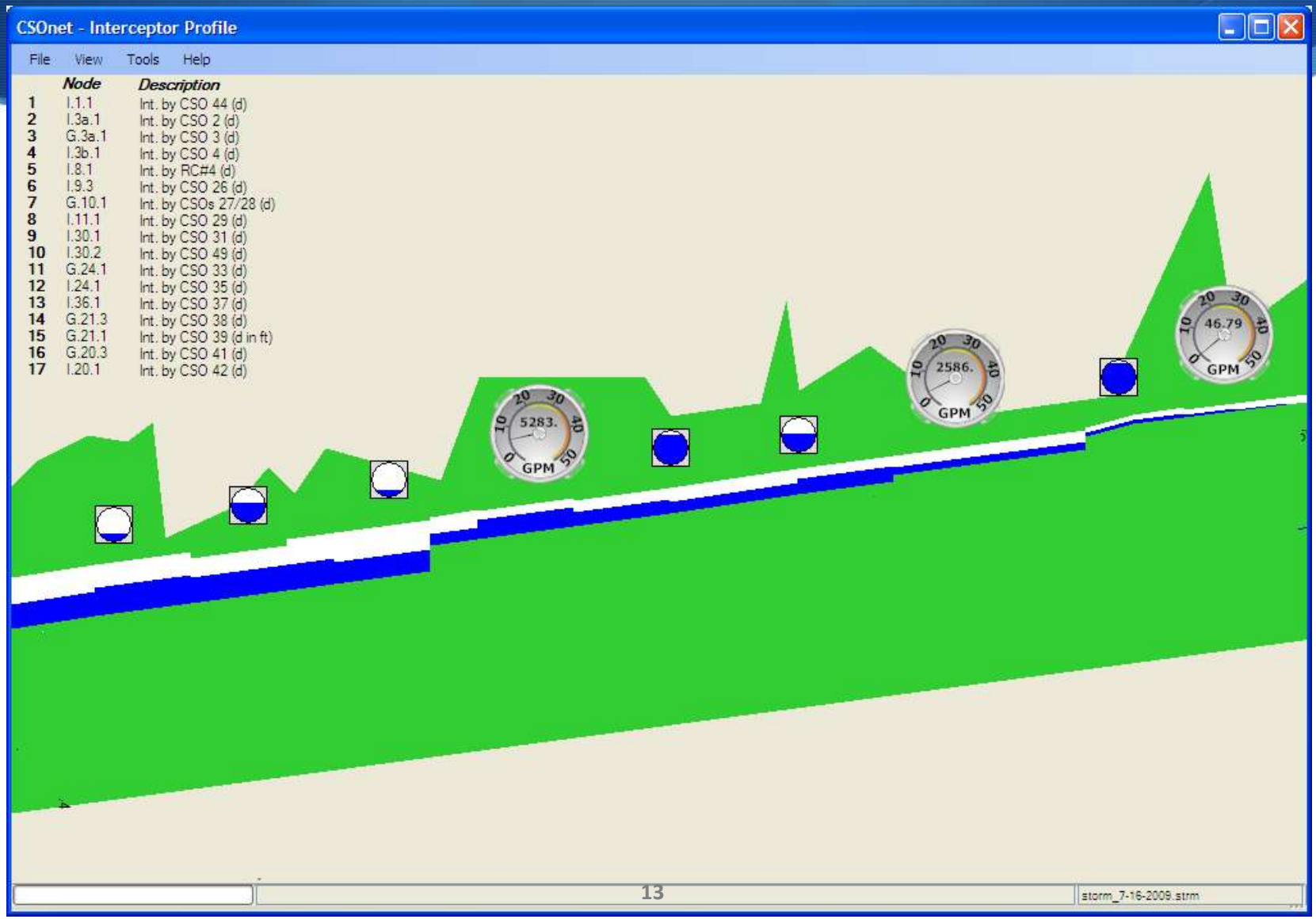
Gary Gilot,
Director of Public Works,
City of South Bend, IN

Infiltration and Inflow

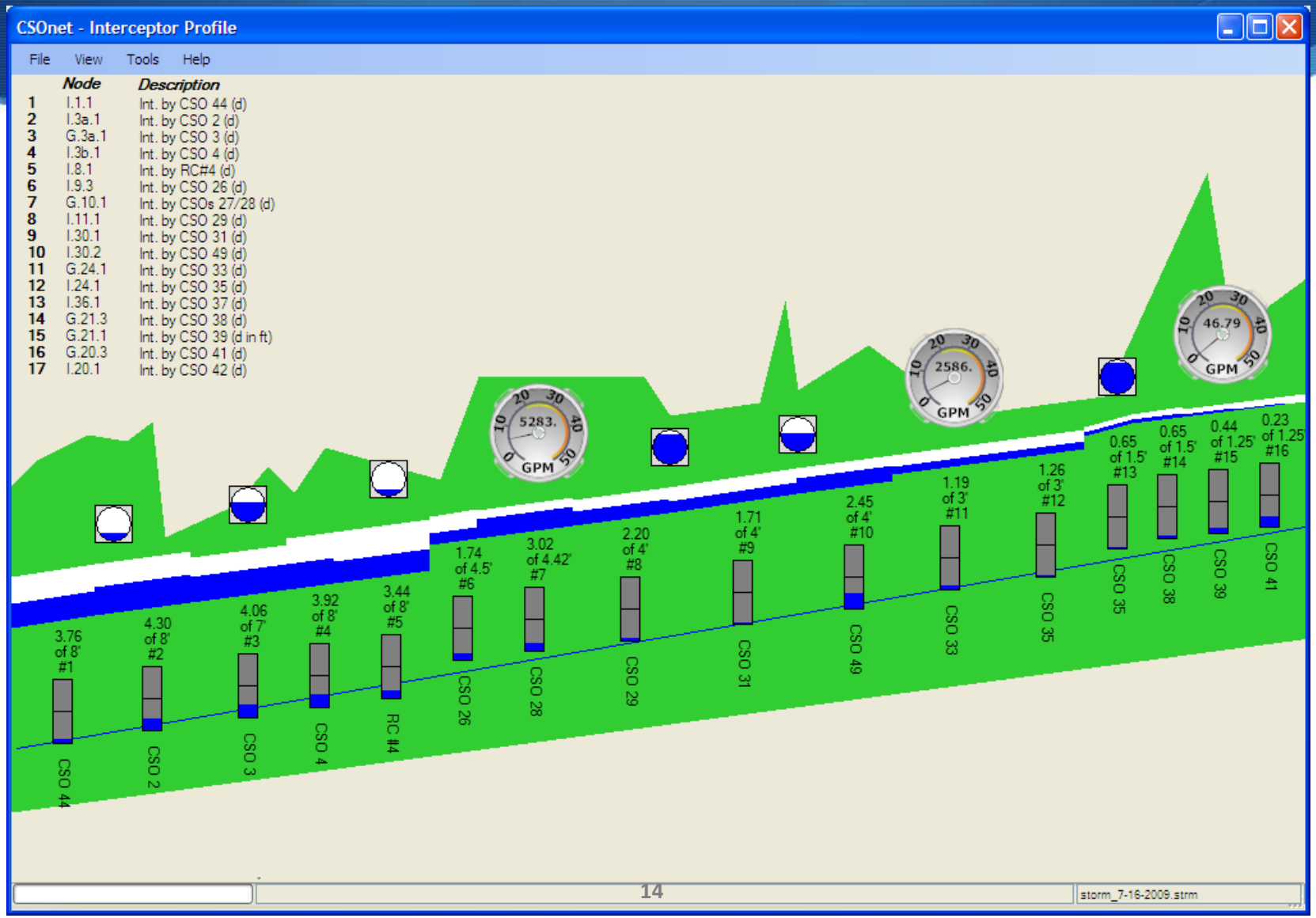


Visualization (Profiler/GIS)

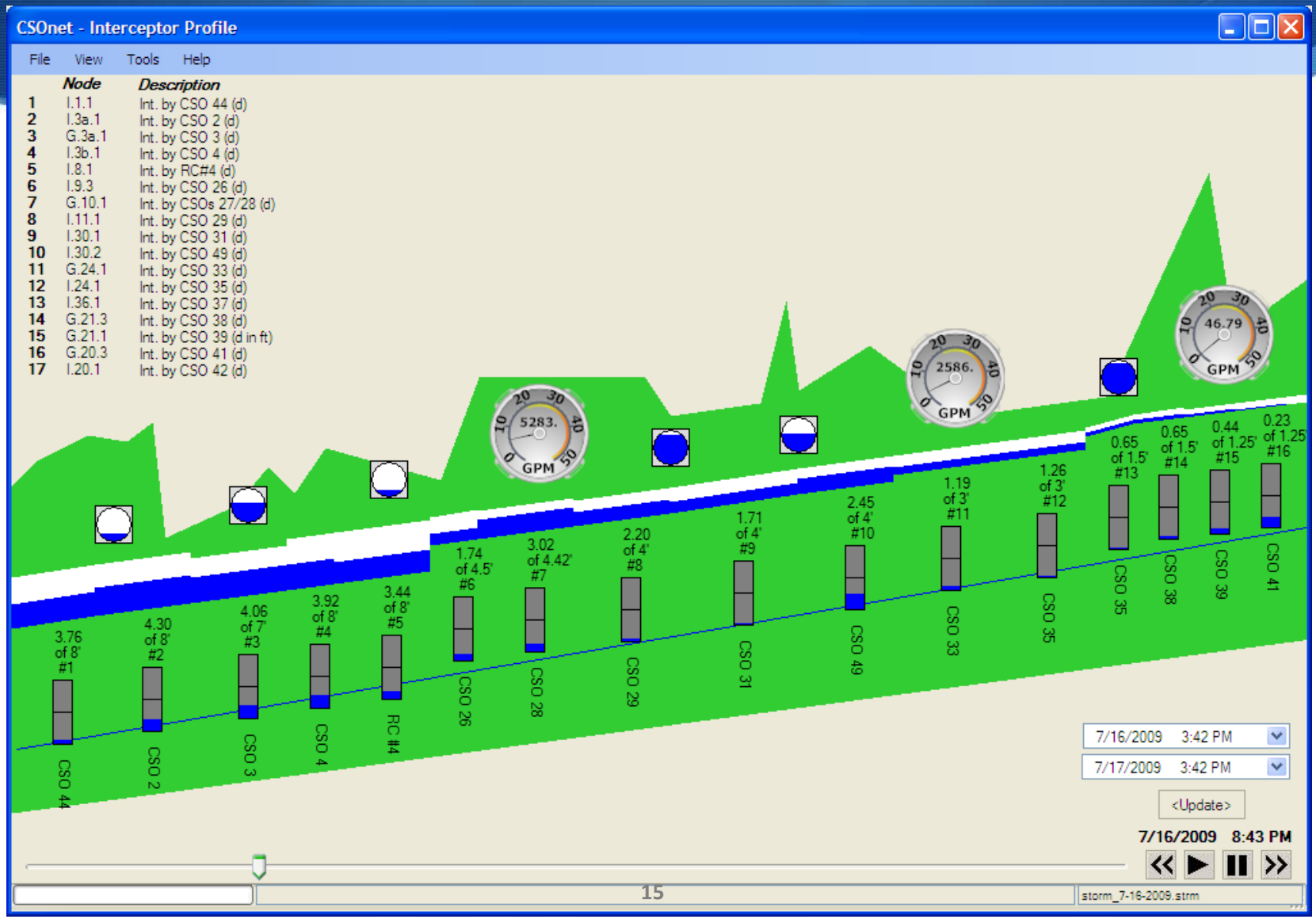
Visualization (Profiler/GIS)



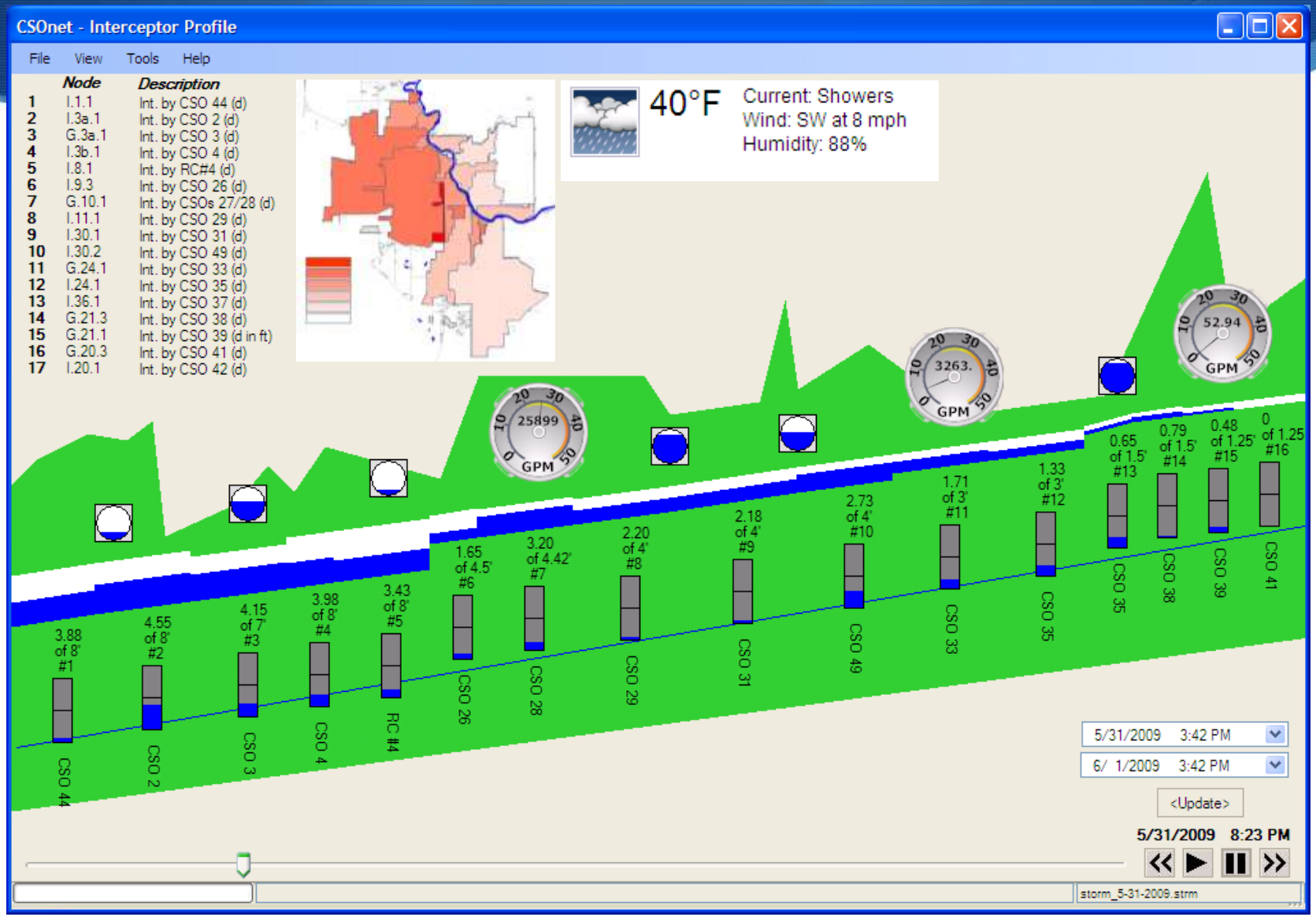
Visualization (Profiler/GIS)



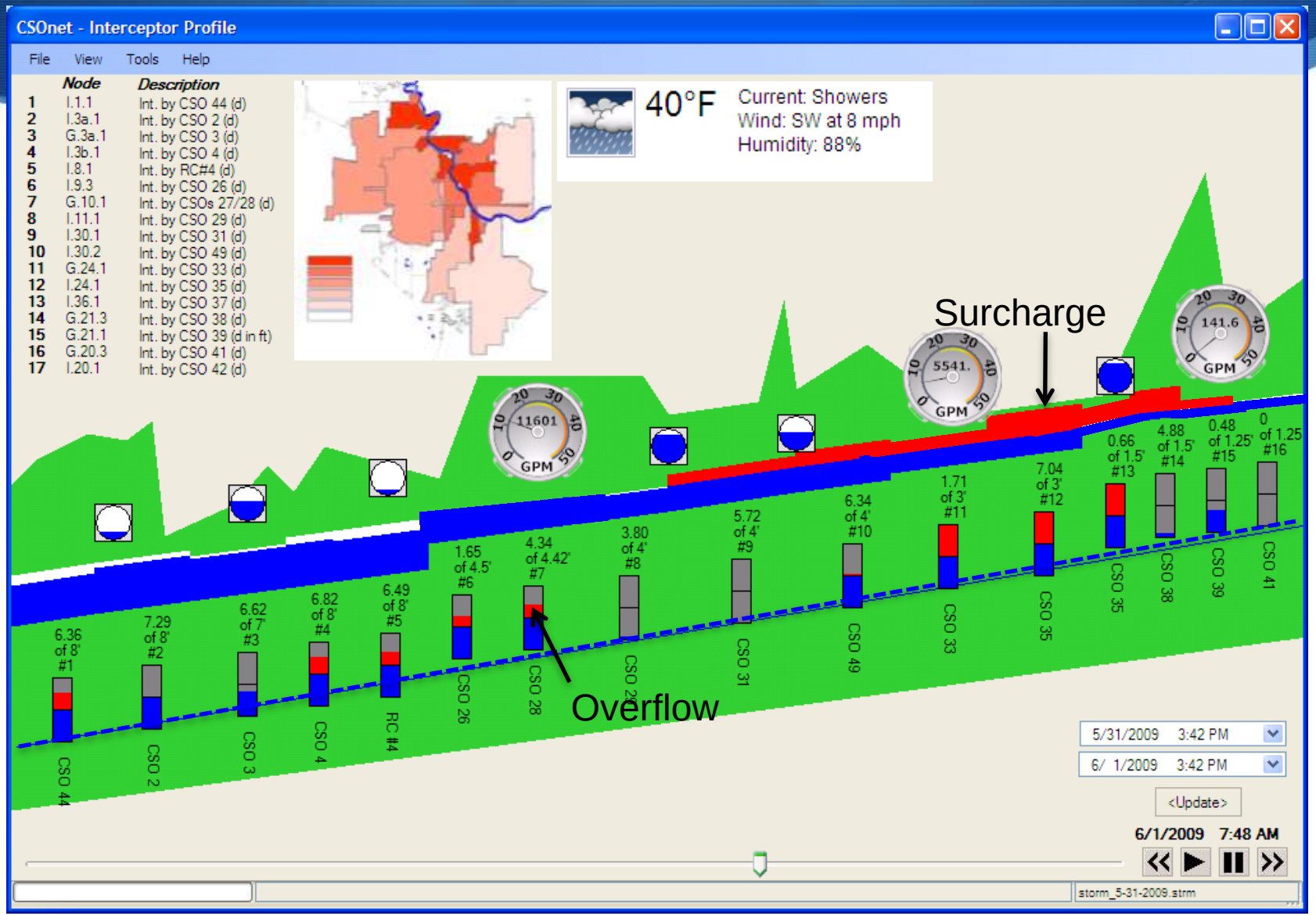
Visualization (Profiler/GIS)



Visualization (Profiler/GIS)

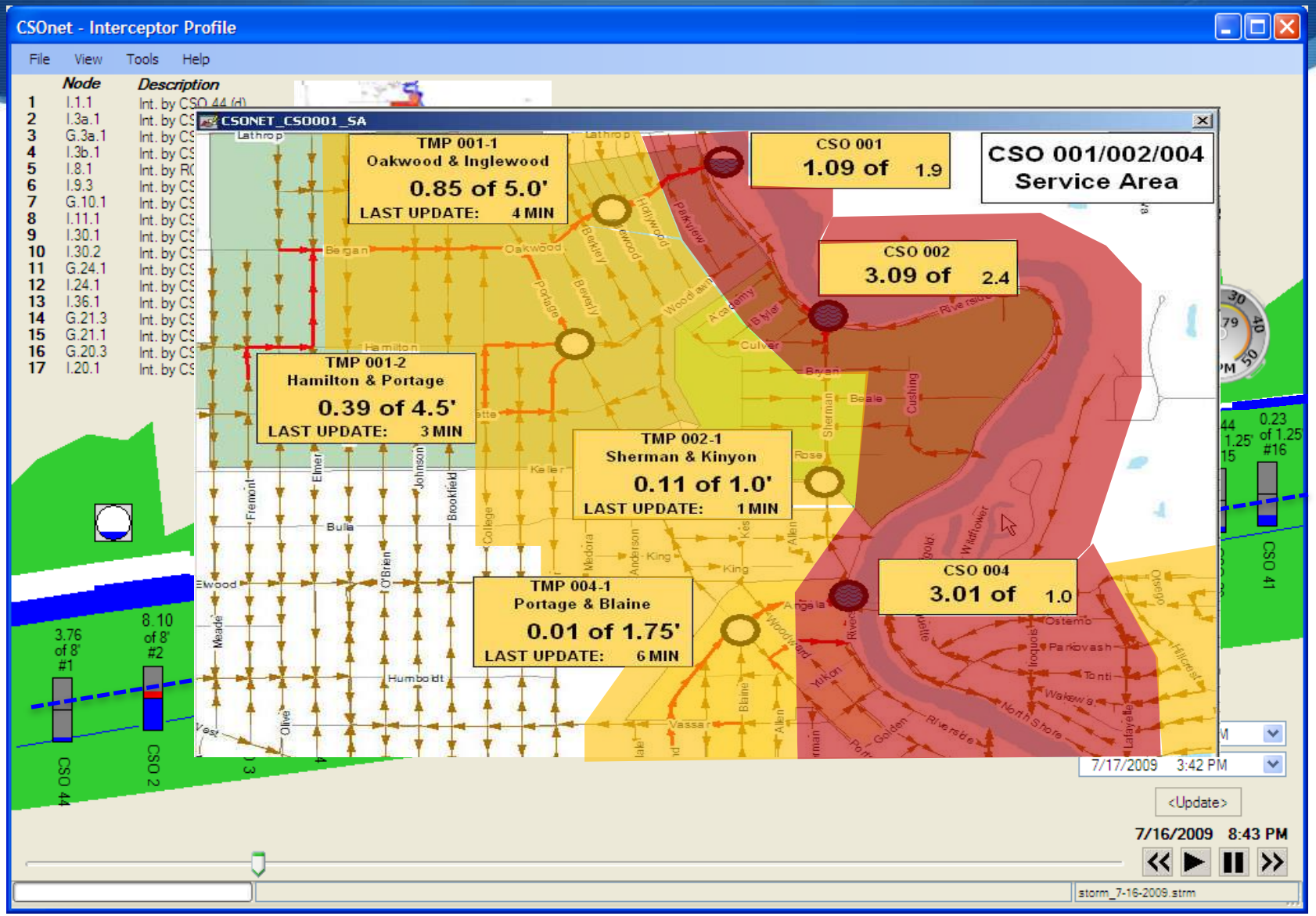


Visualization (Profiler/GIS)



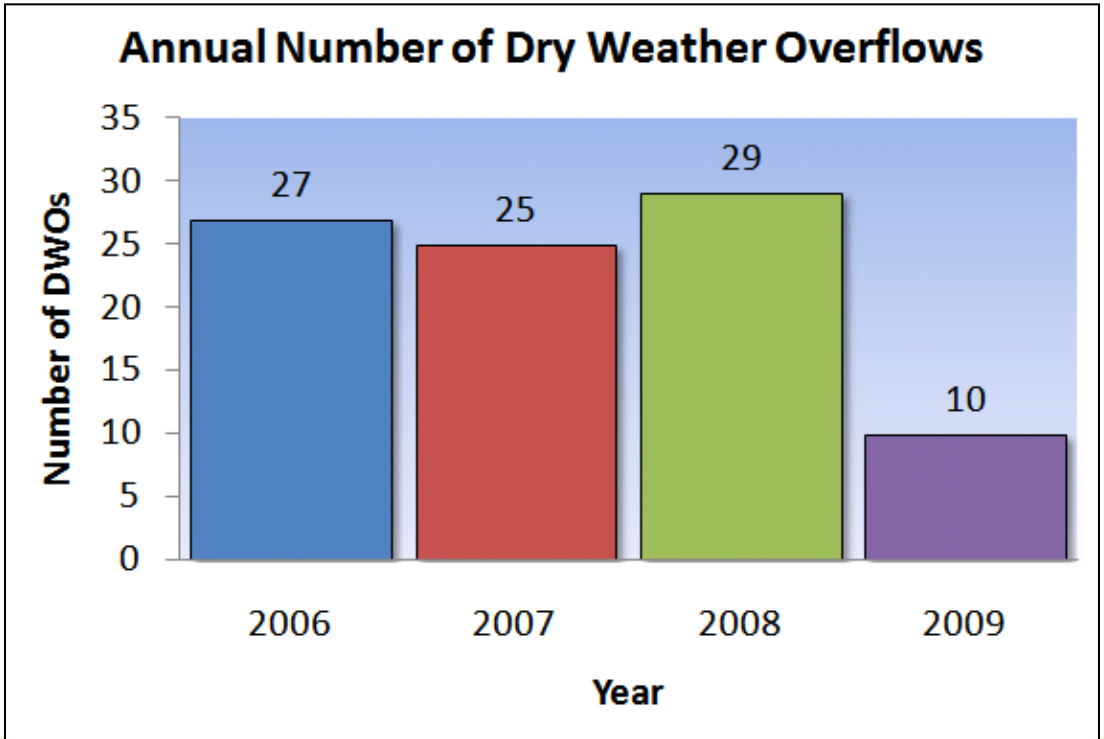
alization (Profiler/GIS)

Visualization (Profiler/GIS)

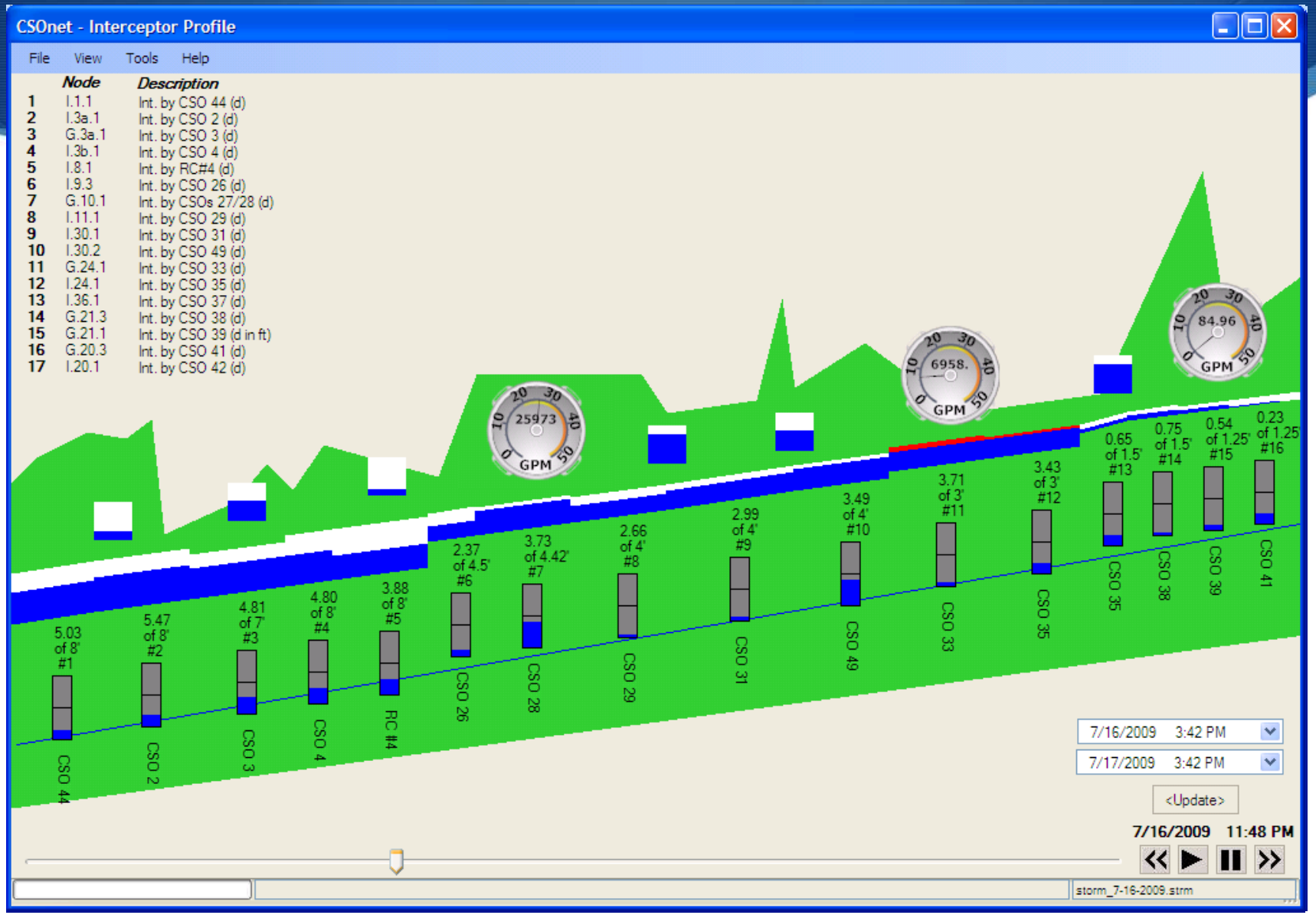


Dry Weather Overflow Elimination

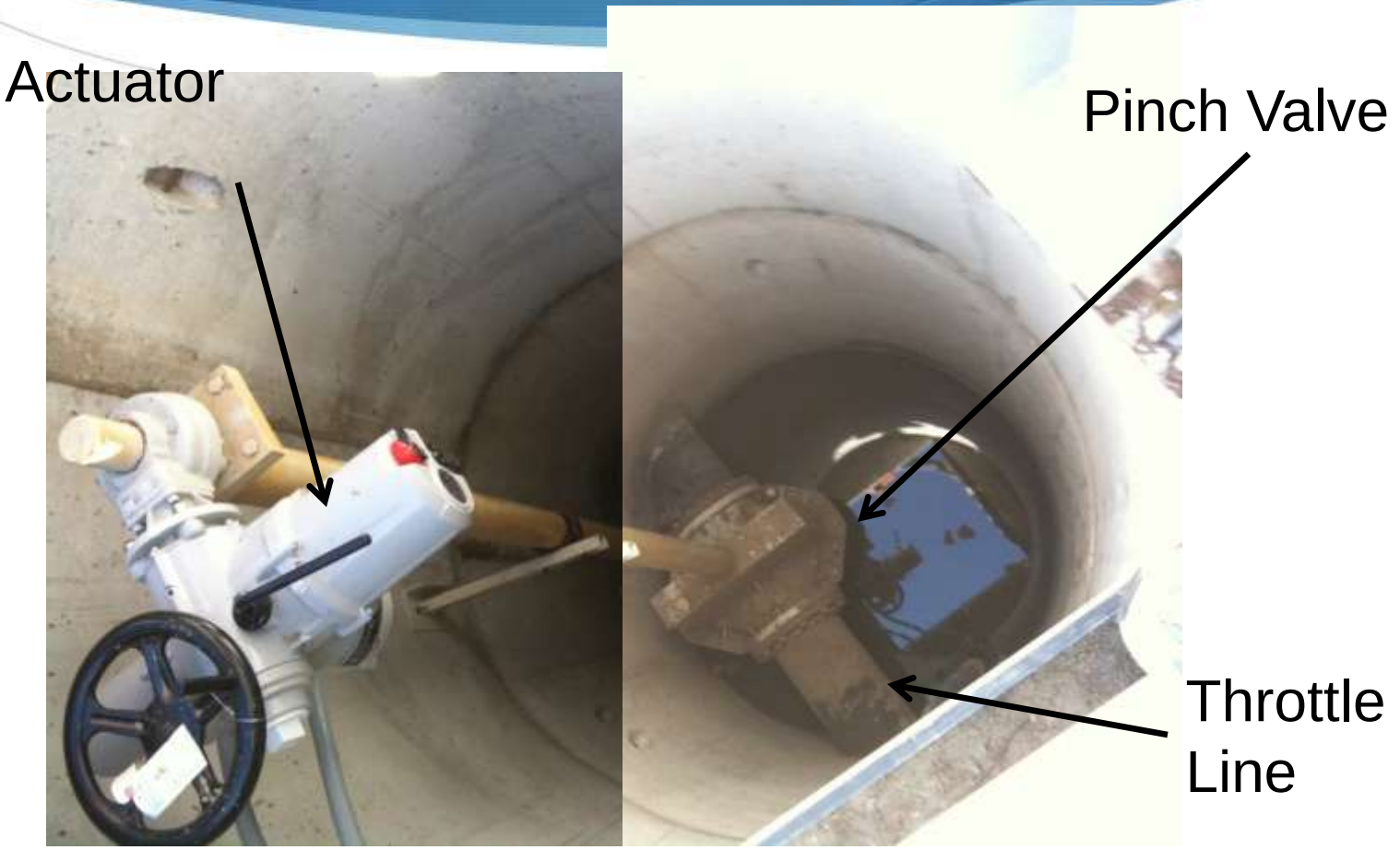
- 66% DWO reduction from 2008 to 2009
  - 2008 = $797,500 fines
  - 2009 = $275,000 in 2009 fines
  - 2010 YDT = $27,500



Automatic Control Strategy



Optimization In South Bend, IN



Optimization In South Bend, IN

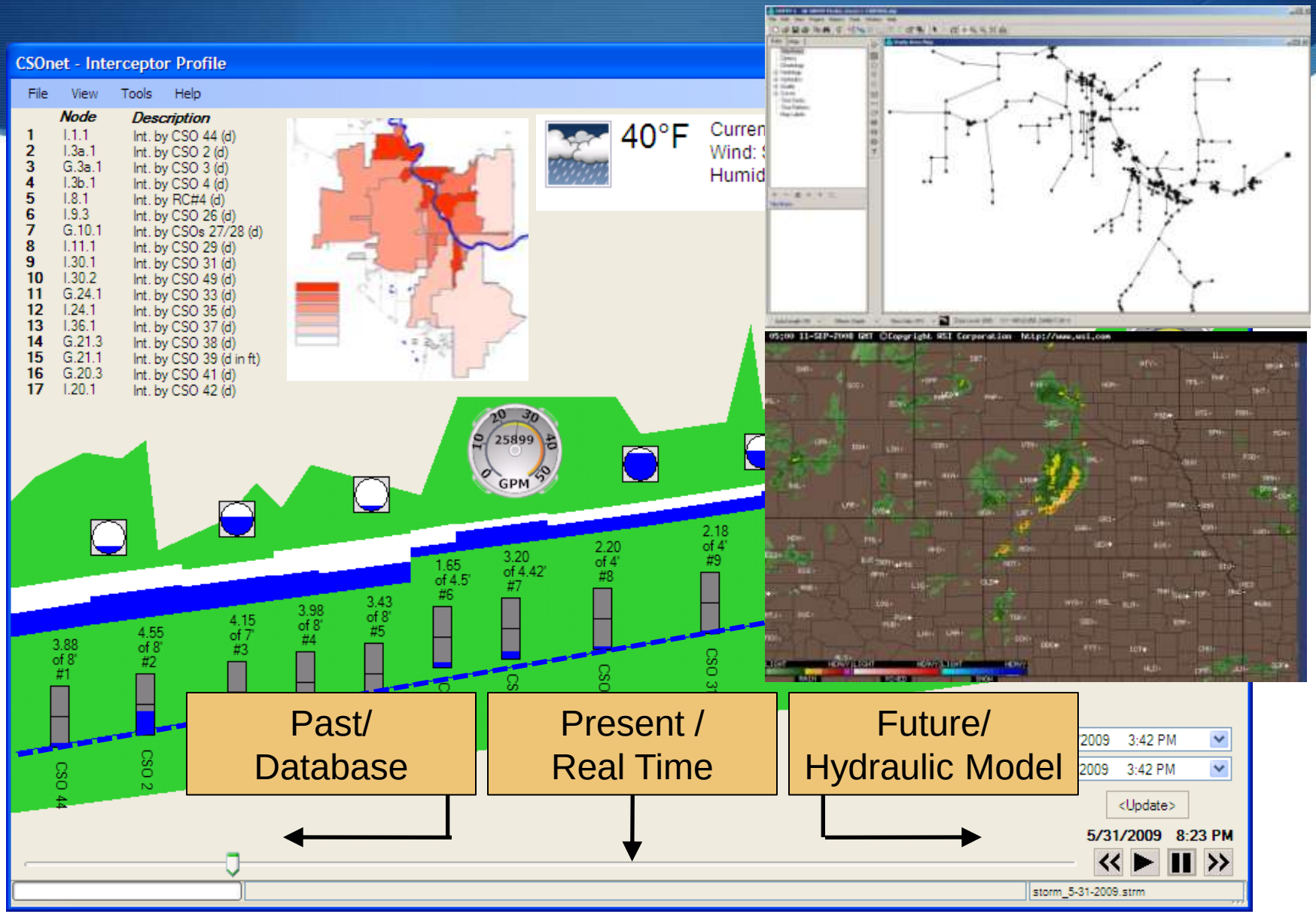
- Reduce CSO volume by balancing flows to WWTP

Annual Overflow Volume Existing System (MG)	Annual Overflow Volume CSOnet System (MG)	Percentage Reduction (%)
918.2	702.8	**23%**

- Increase inline storage opportunities
- Increase storage ability in retention basins by up to 150%

Optimize CIP saving $120 Million

Real Time Decision Support



Summary

- Advances in information processing lead to new ways of performing maintenance, operations, and design
- Integration of real time data, model, and visualization tools provides new insight
- Future systems will further enhance capabilities by providing forecasting of hydraulic conditions before they happen