

# Integrated Water Quality Security System RiverSpill and PipelineNet

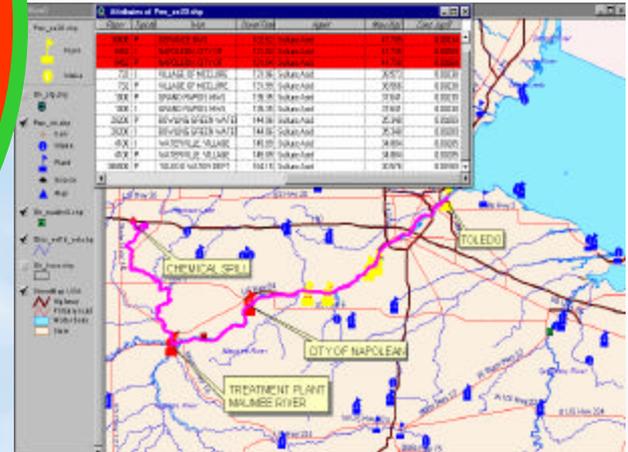
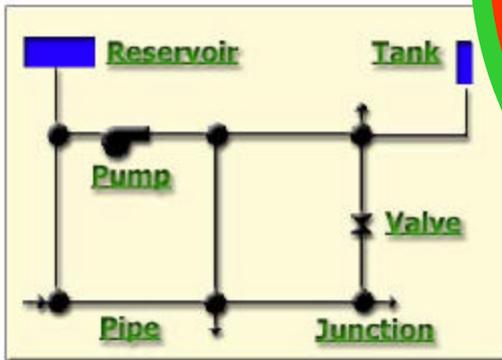
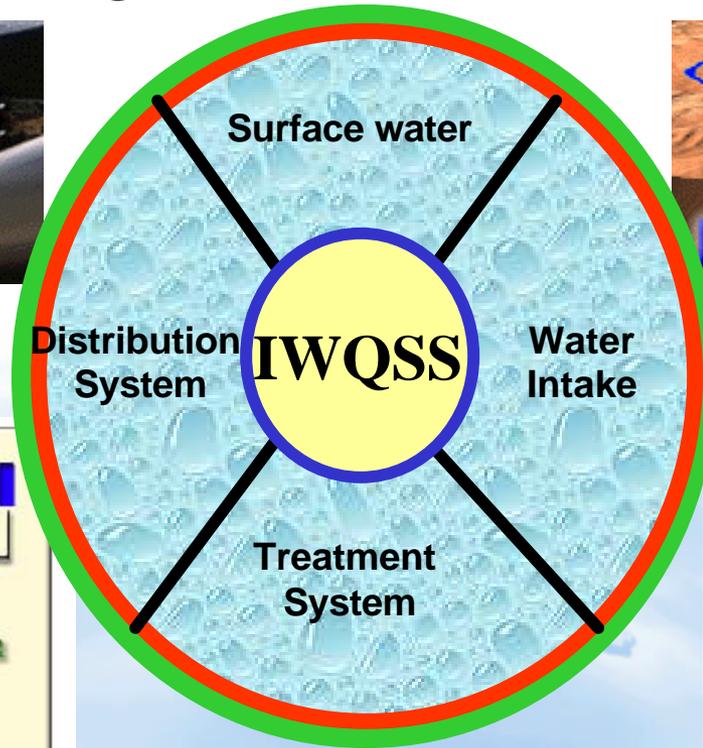


Source Water Protection and Homeland Security: Making the  
Connection at the Federal, State, and Local Level

Science Applications International Corporation

June 2, 2003

# Integrated Water Quality Security System (IWQSS)

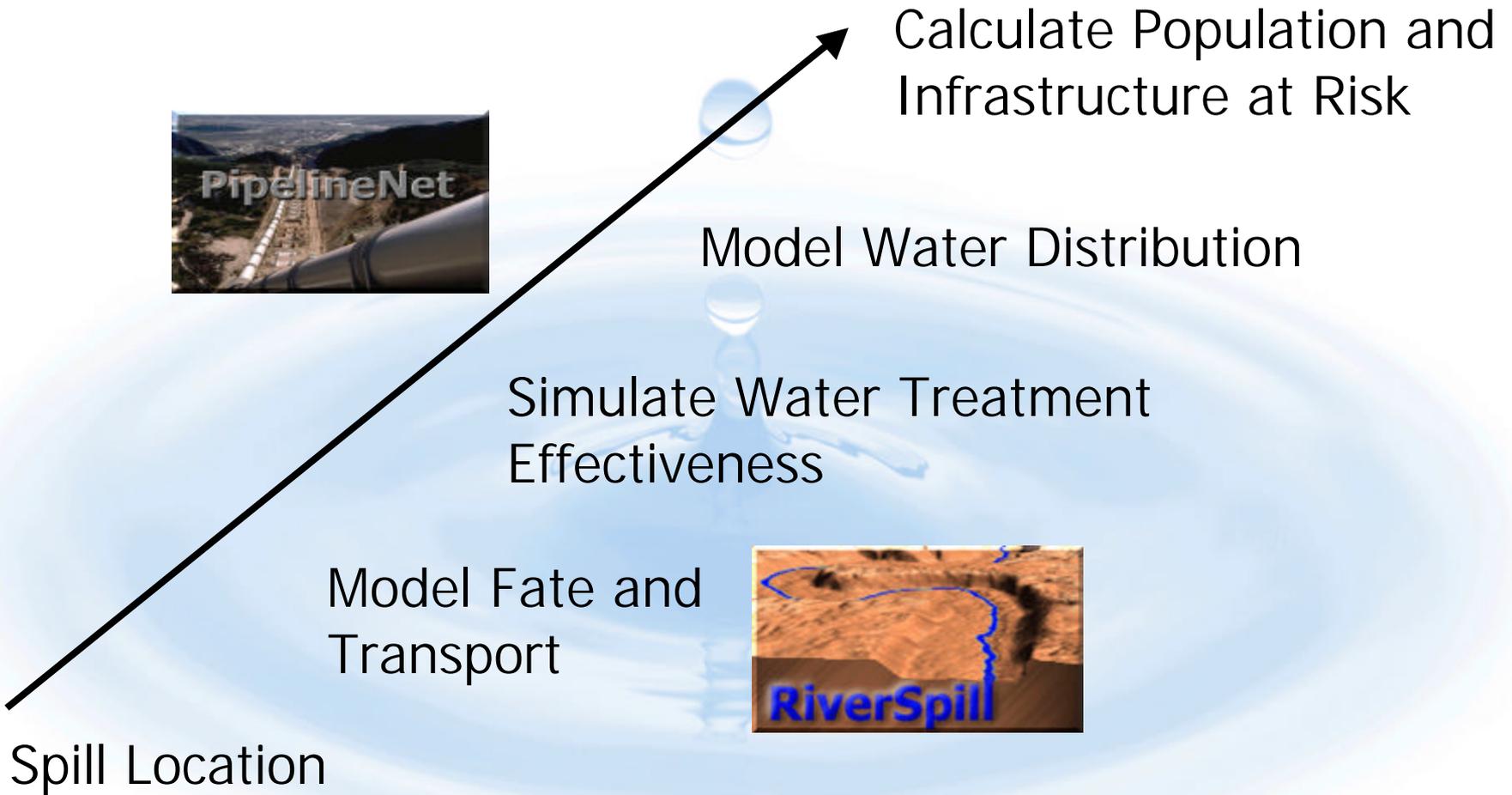


Water Treatment Process (WTP)

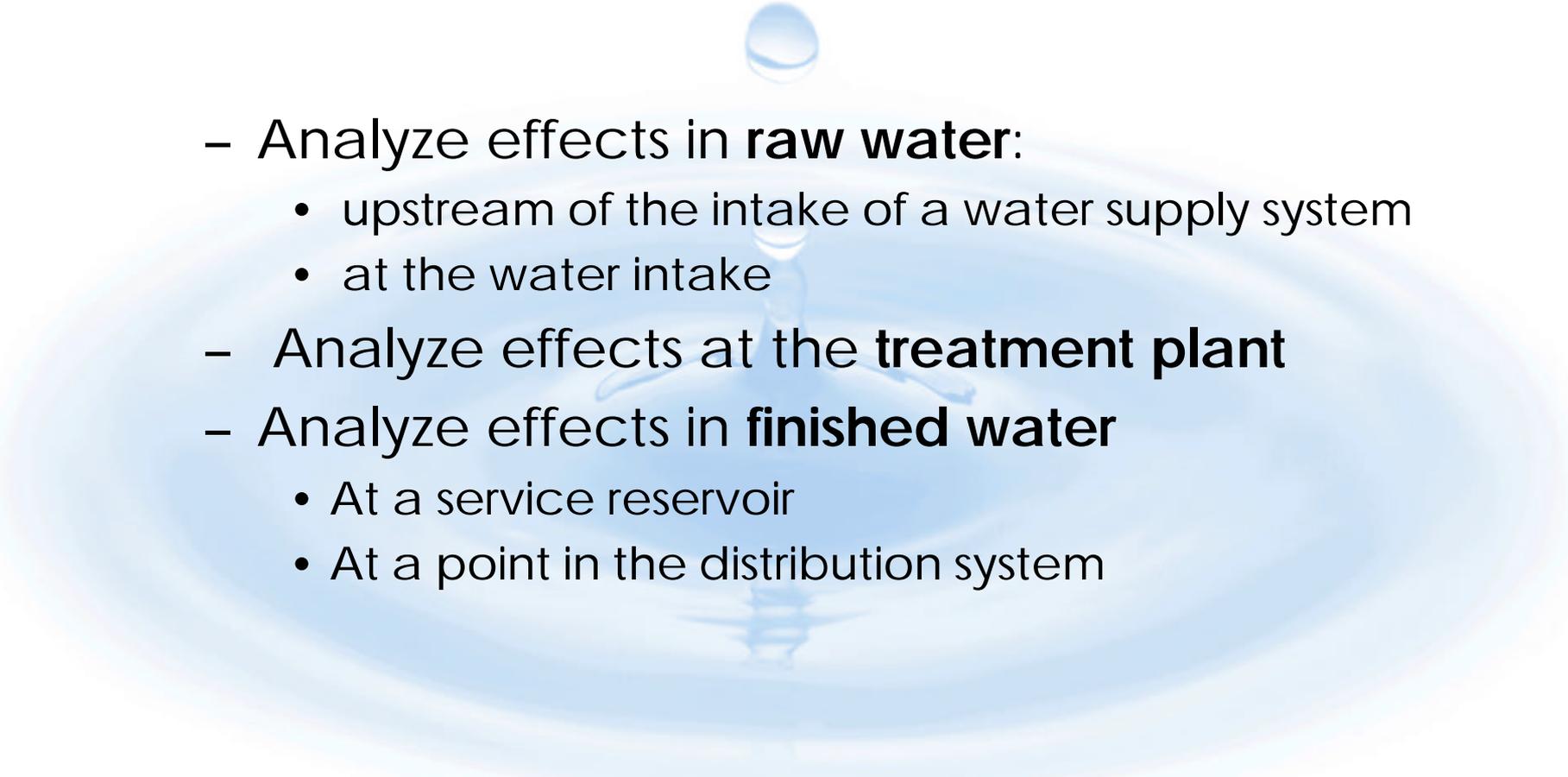
Agent	Processes				
	Screens	Coagulation Flocculation	Sand Filtration	Disinfection	Reverse Osmosis
Toxins	I	L	L	E	H
Bacteria	I	L	E	E	H
Viruses	I	I	I	E	H
Protozoa	I	L	E	E	H

I: Ineffective      L: Low effectiveness      E: Effective      H: High effectiveness

# IWOSS Summary



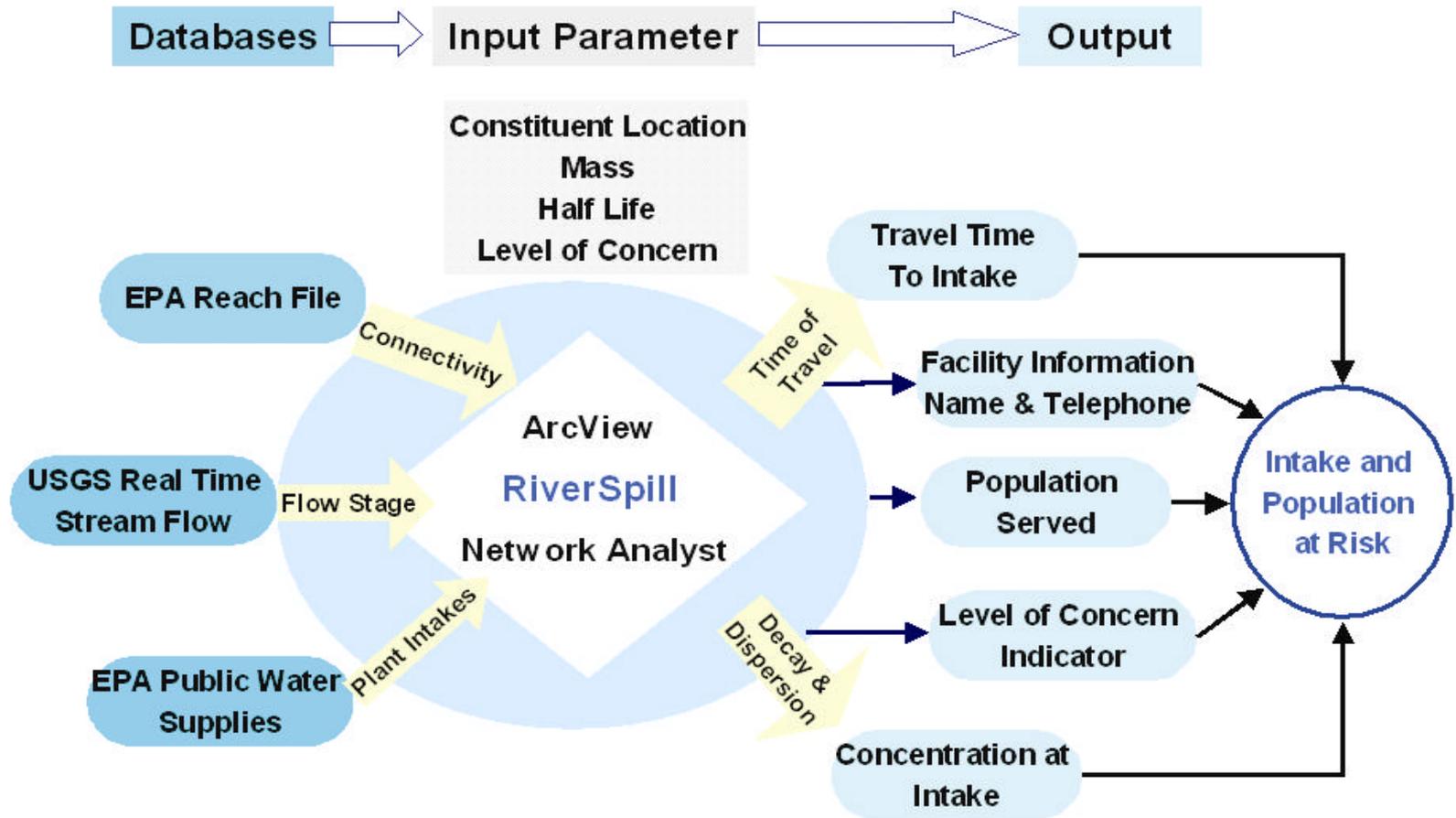
# Comprehensive Approach

- 
- Analyze effects in **raw water**:
    - upstream of the intake of a water supply system
    - at the water intake
  - Analyze effects at the **treatment plant**
  - Analyze effects in **finished water**
    - At a service reservoir
    - At a point in the distribution system

# RiverSpill Module

- 
- Emergency response tool for fate and transport of contaminants
  - Uses real-time stream flow data
  - Operational for US

# RiverSpill Architecture



## System Components

- ArcView 3.2
- Network Analyst 1.0
  
- Databases
- Enhanced Reach File (EPA, USGS)
- USGS Real Time Stream Flow
- Public Water Supplies (EPA)

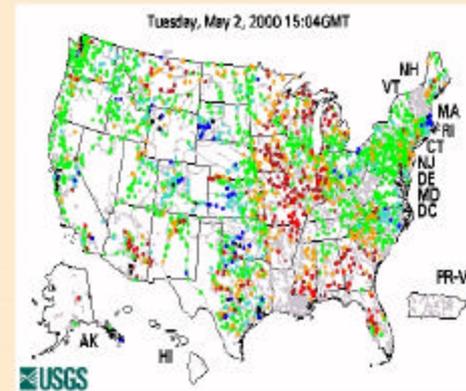


 Due to network problems, real-time data for New Hampshire and Vermont are temporarily unavailable. We apologize for any inconvenience.

## Real-Time Water Data

 Real-time hydrologic data are considered preliminary data. Please be aware of the limitations this imposes. We recommend reading U.S. Geological Survey Circular 1123: Stream-Gaging Program of the U.S. Geological Survey.

[Faster, Smaller Windows!](#)  
\*Place the page in your  
page!



## Additional Information

See more information on the 1000 drought!  
**Drought Watch**

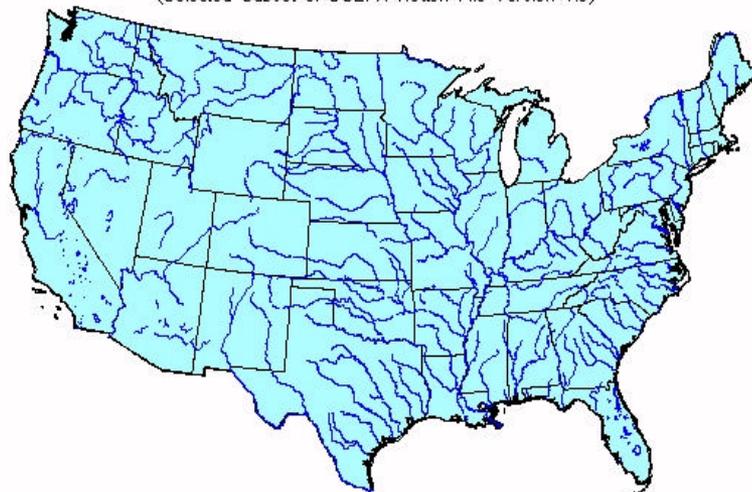
National Weather Service  
Interactive Weather Information Network



Visit the NWS Site to find active flood

## Rivers of the United States

(Selected Subset of USEPA Reach File Version 1.0)



**EPA** United States Environmental Protection Agency  
What's New | Overview | Data Update | Site Map | Feedback | EPA Home

# Envirofacts

Date Warehouse and Applications

A single point of access to select U.S. EPA

Queries, Maps, and Reports

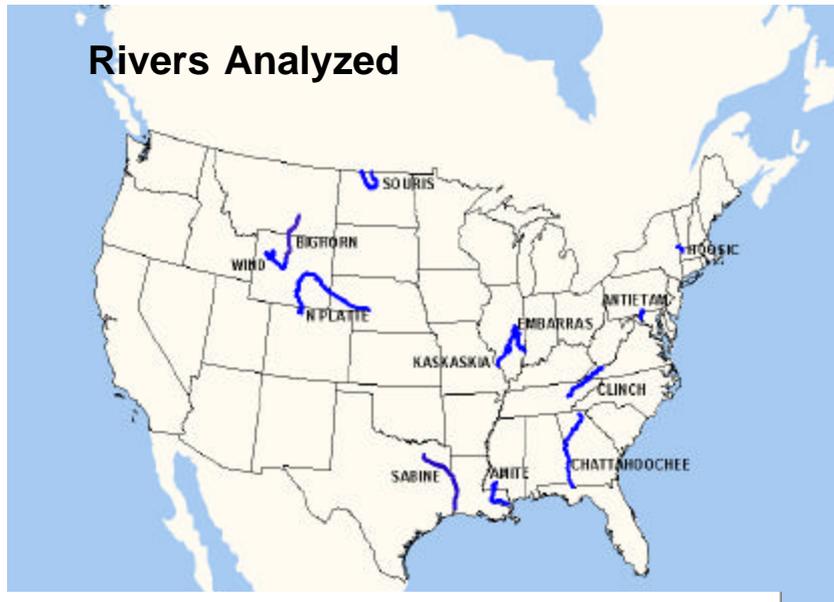
Read about Envirofacts [queries](#) and [mapping applications](#), or select one from the list below.

- [Envirofacts Multisystem Query](#)
- [EnviroMapper](#)
- [Superfund](#)
- [Safe Drinking Water Information](#)
- [Hazardous Waste \(RCRIS\)](#)
- [Biennial Reporting System](#)
- [Toxics Release Inventory](#)
- [Drinking Water Occurrence](#)
- [Risk Management Plans](#)
- [Facility Information](#)
- [Water Discharge Permits \(PCS\)](#)
- [Air Releases](#)
- [Brownfields](#)
- [Grants Information](#)
- [Chemicals](#)
- [Drinking Water Microbial and Disinfection Byproduct Info](#)

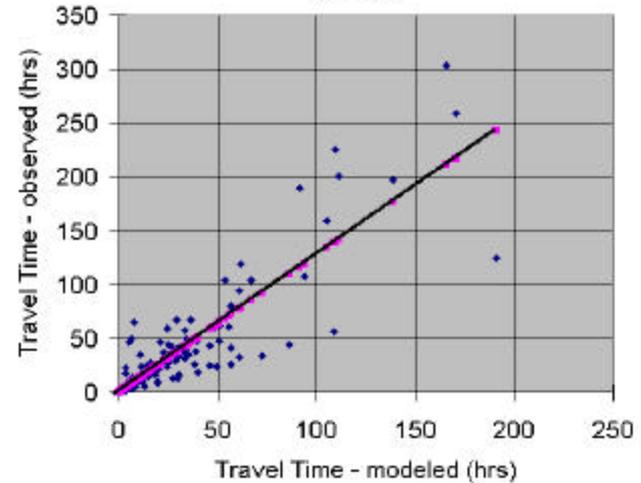
Envirofacts Data Warehouse and App...  
URL: <http://www.epa.gov/enviro>  
This page was updated on April 13, 2000.

# Travel Time Skill Assessment - observations<sup>1</sup> vs. model calculations

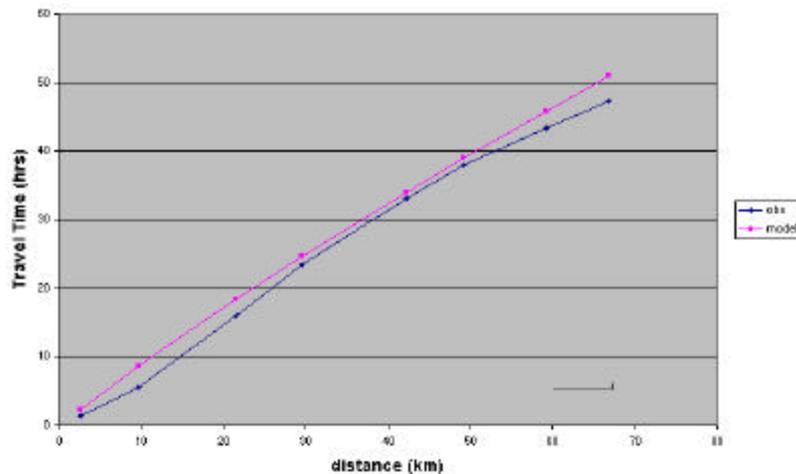
## Rivers Analyzed



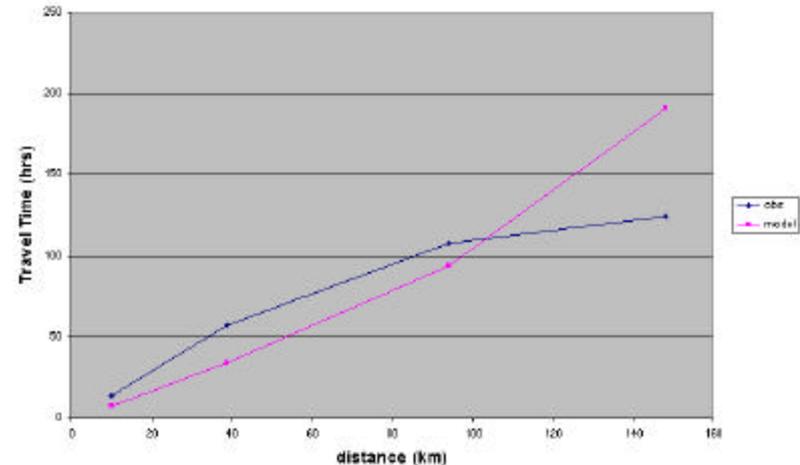
Travel Time (All Rivers)  
Regression - obs. vs model (hours)  
 $r = 0.87$



Antietam River



Anite River



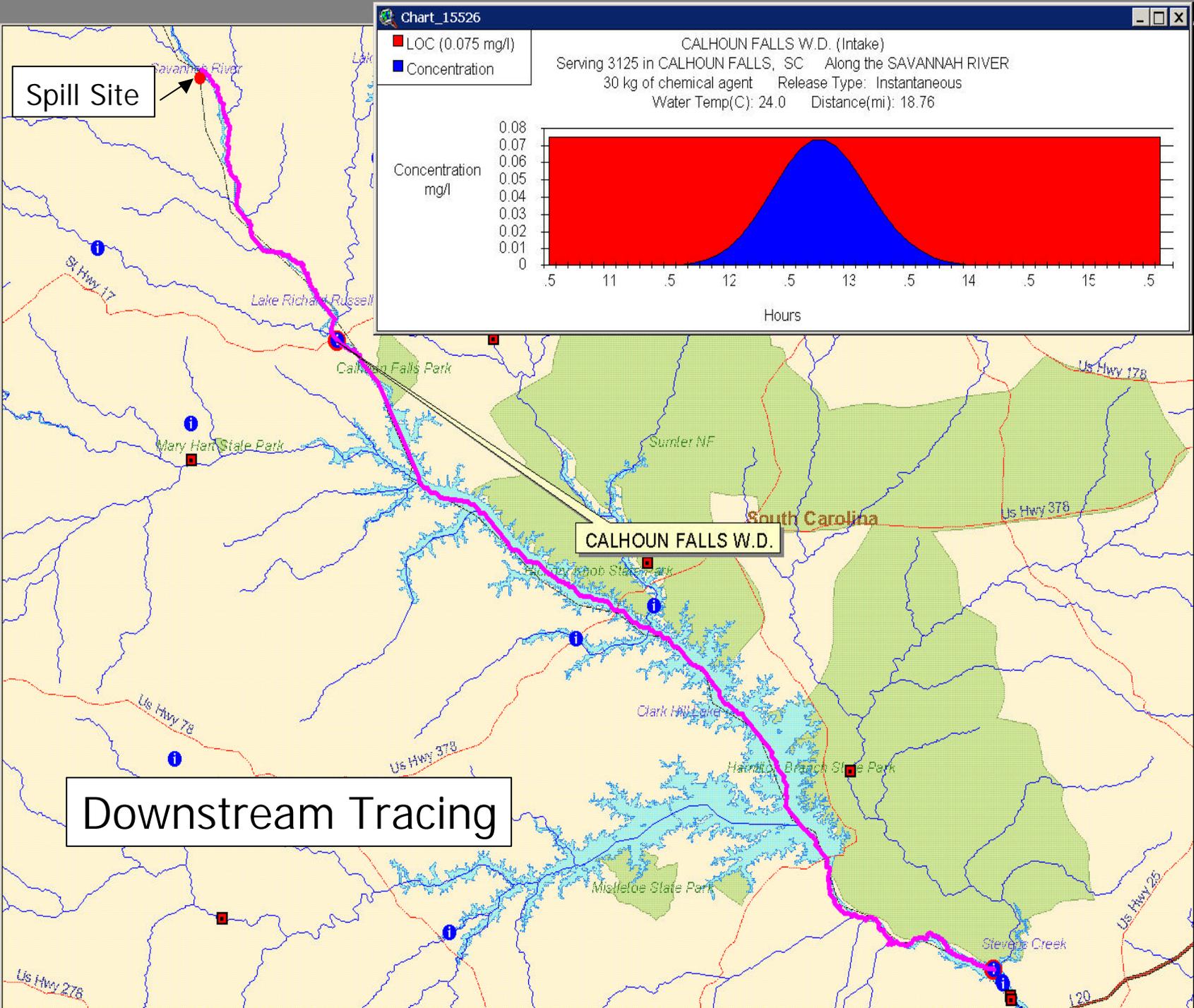
<sup>1</sup> Jobson, 1996, Prediction of Travel time and Longitudinal Dispersion in Rivers and Streams, USGS Report 96-4013

# RiverSpill Demonstration

- Downstream Tracing
  - Time-of-Travel
  - Concentration profile (leading edge, peak and trailing edge)
  - Intakes affected (population served)
- Upstream Tracing
  - Delineation of area of concern based on distance or time
  - Assist in determining deliberate or accidental release
  - Locate potential sites for contaminant release

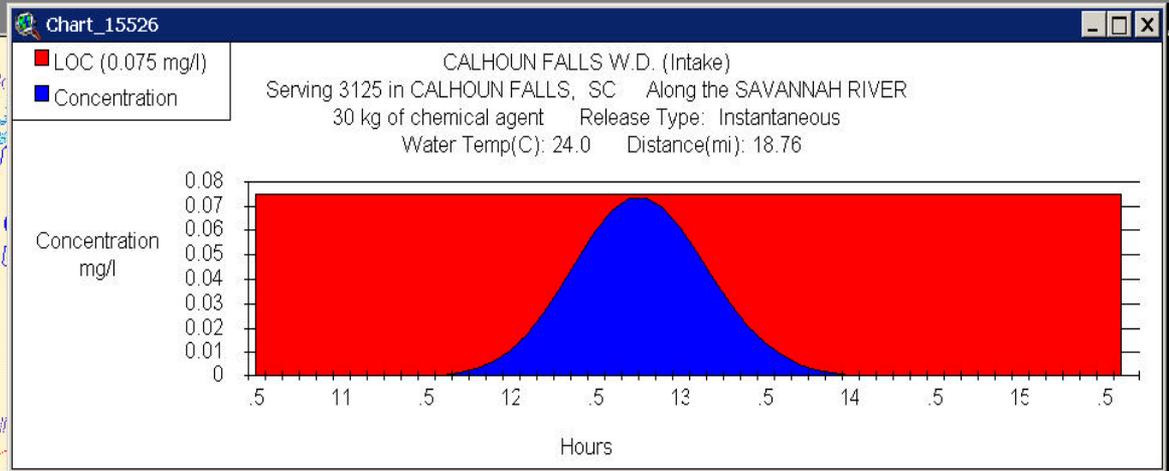


- Cfl\_dist.shp
- StreetMap USA Top
  - Airport
  - Highway
  - Primary road
- Wa-chem.shp
- Sc-bio.shp
- Ind\_up.shp
- Dams
- Water Treatment Plan
- Hazard Material Sites
- Sewage Treatment Plk
- USGS Gages
- Public Water Supply It
- Railroads
- Reach File (Up Stream
- Reach File
- Cfl\_time.shp
- Assessed PWS
  - Plant
  - Intake
- RiverSpill Above
- HUC Boundary
- State Borders
- StreetMap USA
  - Airport
  - Highway
  - Primary road

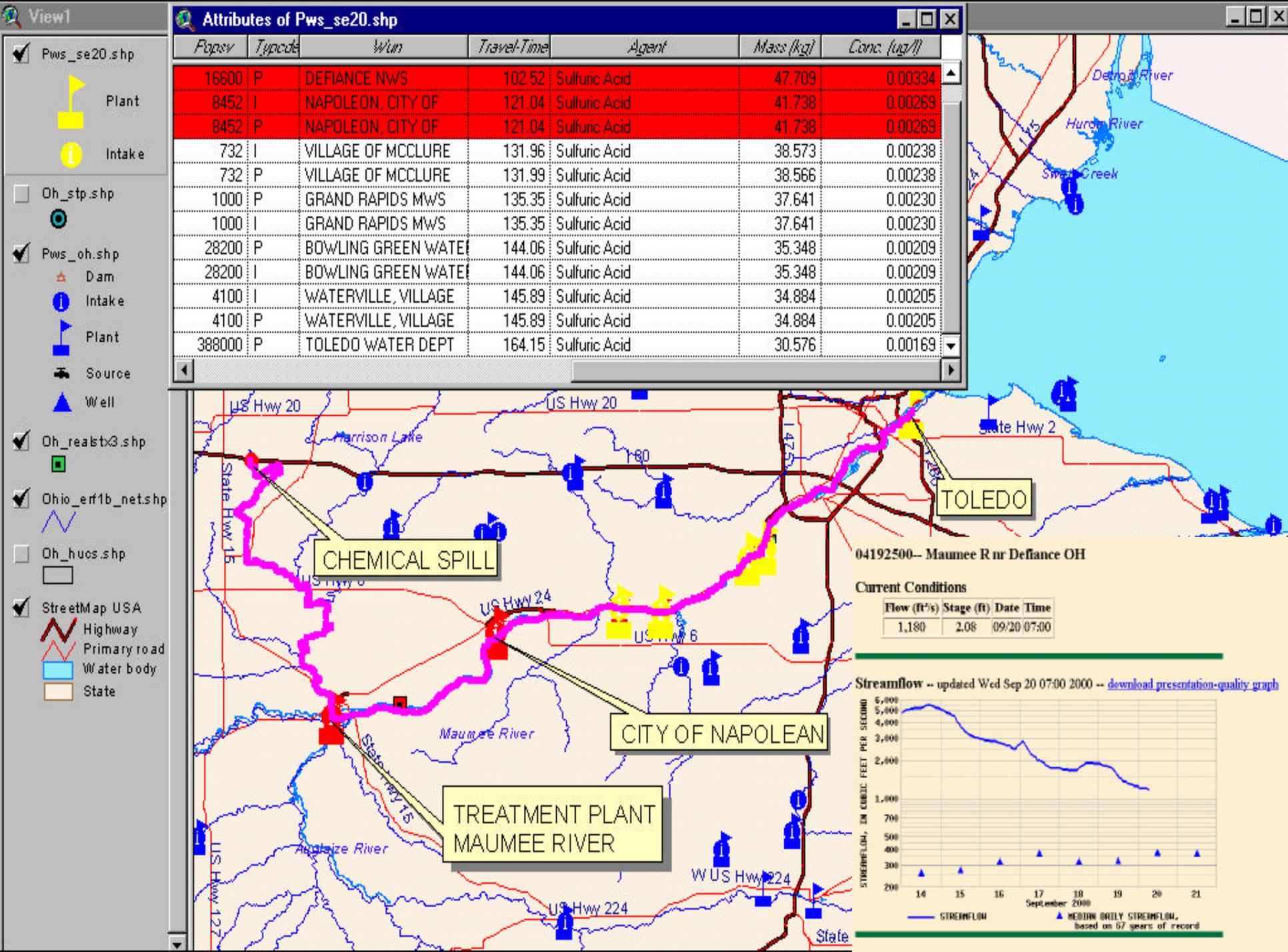


Spill Site

Downstream Tracing



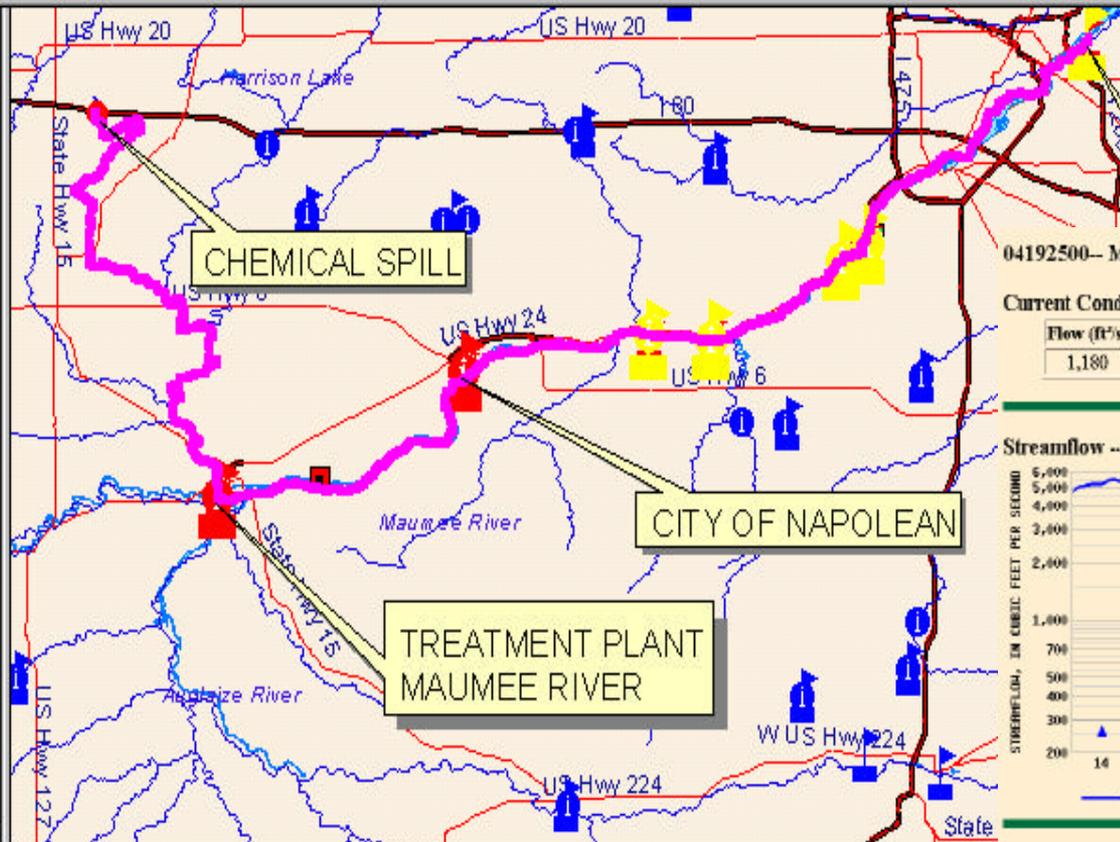
CALHOUN FALLS W.D.



Attributes of Pws\_se20.shp

Popsz	Typede	Wun	Travel-Time	Agent	Mass (kg)	Conc. (ug/l)
16600	P	DEFIANCE NWS	102.52	Sulfuric Acid	47.709	0.00334
8452	I	NAPOLEON, CITY OF	121.04	Sulfuric Acid	41.738	0.00269
8452	P	NAPOLEON, CITY OF	121.04	Sulfuric Acid	41.738	0.00269
732	I	VILLAGE OF MCCLURE	131.96	Sulfuric Acid	38.573	0.00238
732	P	VILLAGE OF MCCLURE	131.99	Sulfuric Acid	38.566	0.00238
1000	P	GRAND RAPIDS MWS	135.35	Sulfuric Acid	37.641	0.00230
1000	I	GRAND RAPIDS MWS	135.35	Sulfuric Acid	37.641	0.00230
28200	P	BOWLING GREEN WATER	144.06	Sulfuric Acid	35.348	0.00209
28200	I	BOWLING GREEN WATER	144.06	Sulfuric Acid	35.348	0.00209
4100	I	WATERVILLE, VILLAGE	145.89	Sulfuric Acid	34.884	0.00205
4100	P	WATERVILLE, VILLAGE	145.89	Sulfuric Acid	34.884	0.00205
388000	P	TOLEDO WATER DEPT	164.15	Sulfuric Acid	30.576	0.00169

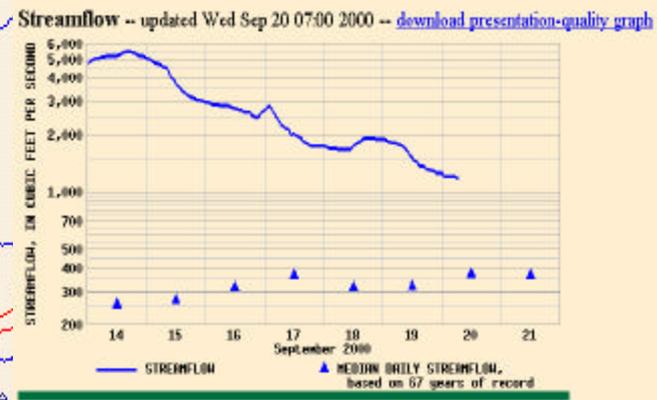
- Pws\_se20.shp
  - Plant
  - Intake
- Dh\_stp.shp
  -
- Pws\_oh.shp
  - Dam
  - Intake
  - Plant
  - Source
  - Well
- Dh\_realstx3.shp
  -
- Ohio\_erf1b\_net.shp
  -
- Dh\_huocs.shp
  -
- StreetMap USA
  - Highway
  - Primary road
  - Water body
  - State

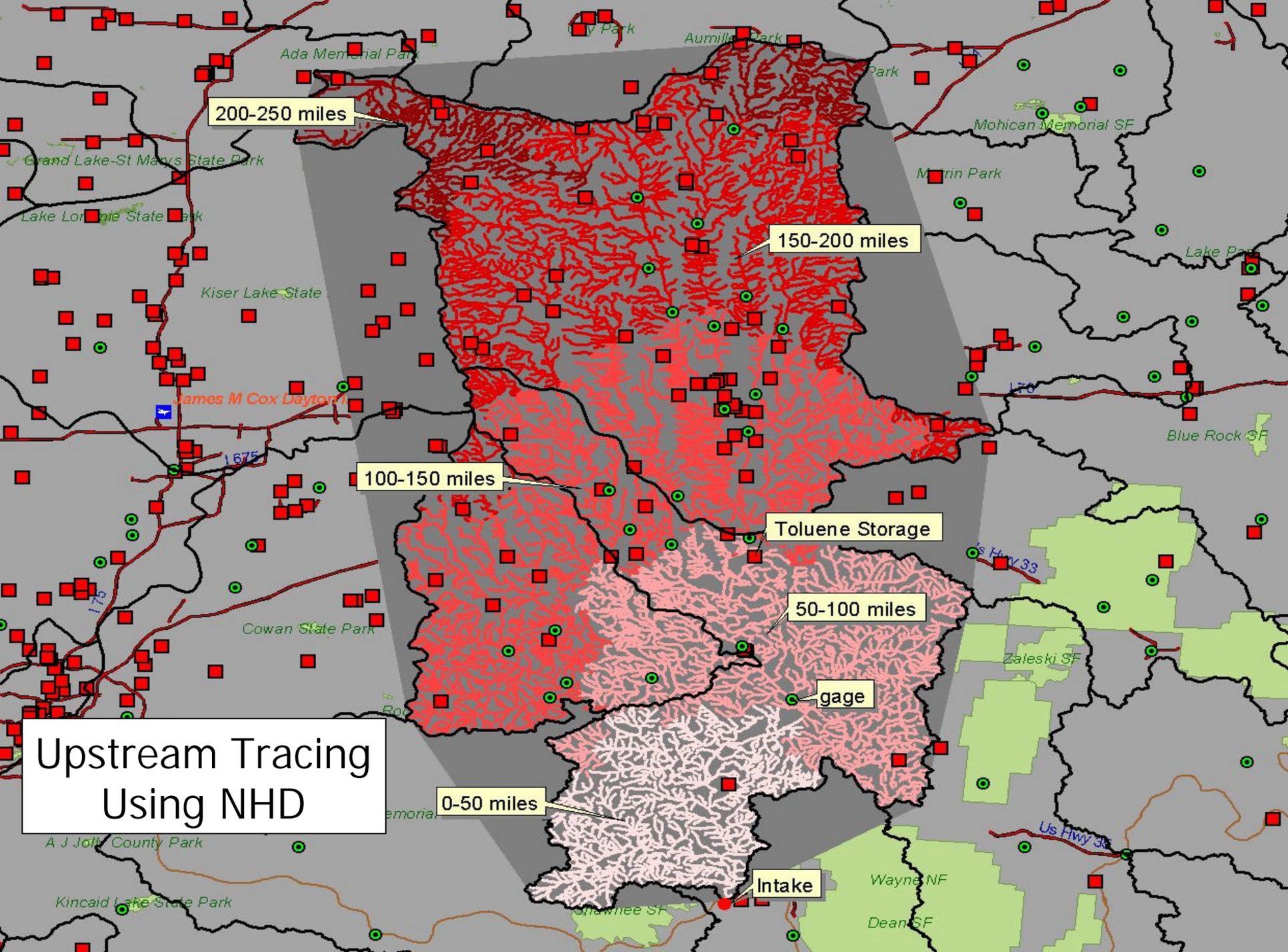


04192500-- Maumee R nr Defiance OH

Current Conditions

Flow (ft³/s)	Stage (ft)	Date Time
1,180	2.08	09/20 07:00





200-250 miles

150-200 miles

100-150 miles

Toluene Storage

50-100 miles

gage

Upstream Tracing  
Using NHD

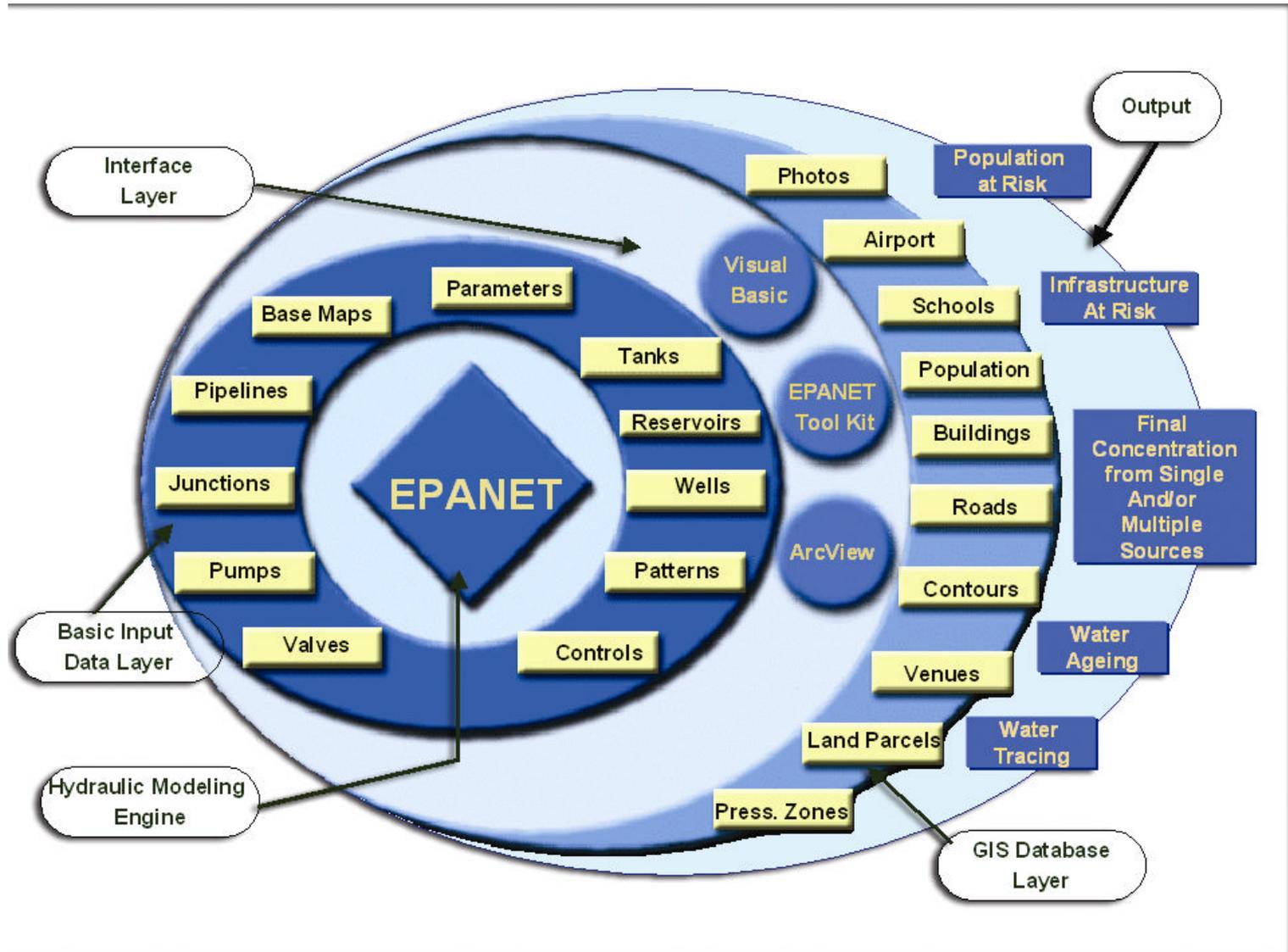
0-50 miles

Intake

# PipelineNet Module

- Module components
  - EPANET hydraulic model
  - EPANET Toolkit
  - ArcView GIS

# PipelineNet Architecture



# PipelineNet Users and Applications

- Current Users
    - Utah Olympic Public Safety Command
    - Salt Lake City, Murray City, Provo, Park City
    - EBMUD (Oakland, CA)
    - CDC
  - Planned Users
    - San Francisco
    - Las Vegas
    - Seattle
    - Washington, DC
    - New York City
- 
- A decorative graphic of a water splash is centered in the background of the slide. It features a single water droplet falling from the top, creating a series of concentric ripples that spread outwards. The splash is rendered in various shades of light blue and white, giving it a soft, ethereal appearance. The background of the slide is a light, solid blue color.

# PipelineNet Demonstration

- Input data conversion tool
- Water quality graphical user interface
- Display interface
- Consequence assessment tool
- Isolation tool
- Spatial database display tool
- Ranking system display tool



SELECT AN ANALYSIS TYPE

Analysis Type:

Concentration

Tracing

Ageing

Head - Pressure

Concentration Source Location(s)

ARCHIVE NEW

ADD RECORD 

Total Records:

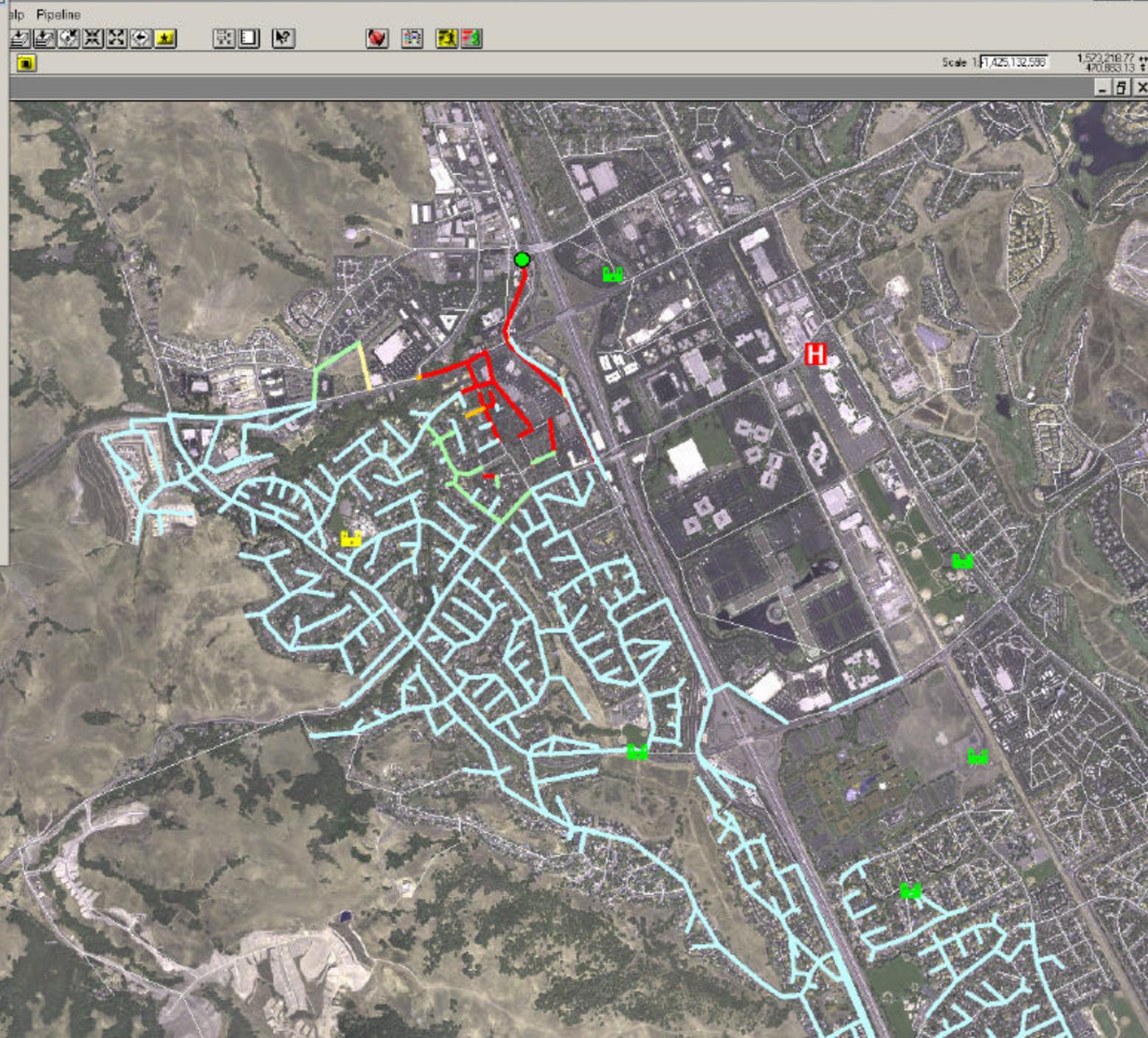
Tracing Node ID:  

Simulation Duration (Hrs)

INITIALIZE SYSTEM PARAMETERS

CANCEL EXECUTE

- Conc013 .shp
- Conc012 .shp
- Conc011 .shp
- Conc010 .shp
- Conc09 .shp
- Conc08 .shp
- Conc07 .shp
- Conc06 .shp
- Conc05 .shp
- Conc04 .shp
- Conc03 .shp
- Conc02 .shp
- Conc01 .shp
- EPANET Pipelines
- EPANET Above
- EPANET Nodes
  - Junction
  - Reservoir
  - Tanks
  - Well
- Roads

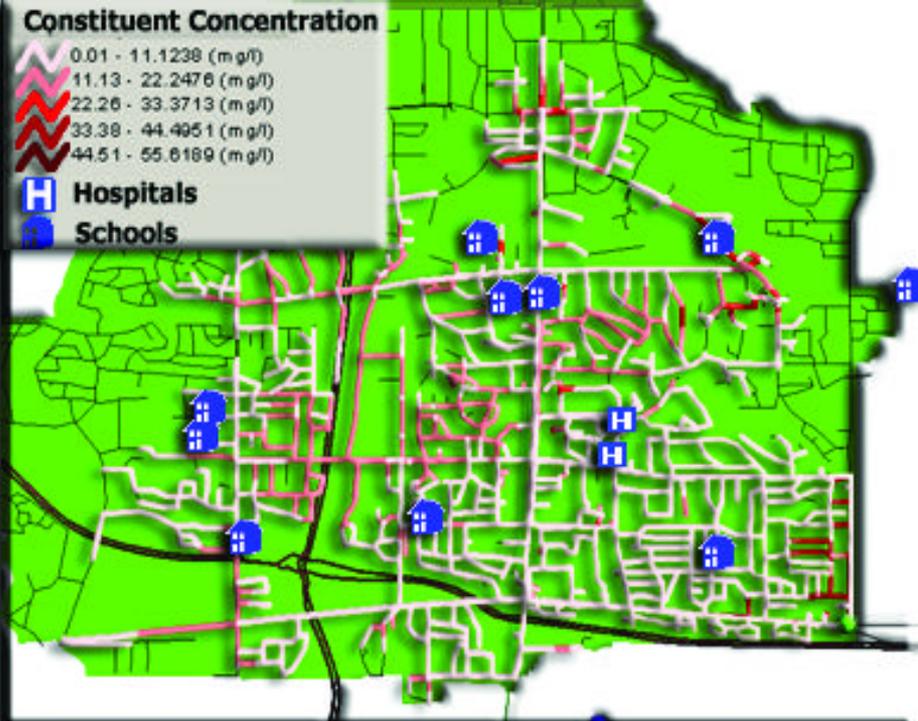


# Putting It All Together

**Constituent Concentration**

- 0.01 - 11.1238 (mg/l)
- 11.13 - 22.2476 (mg/l)
- 22.26 - 33.3713 (mg/l)
- 33.38 - 44.4951 (mg/l)
- 44.51 - 55.6189 (mg/l)

**H** Hospitals  
**S** Schools



**PipelineNet Output**

**Pipeline Network**

**Intake**

**Spill Source**

**RiverSpill Output**

