

Surveillance and Response System At Greater Cincinnati Water Works

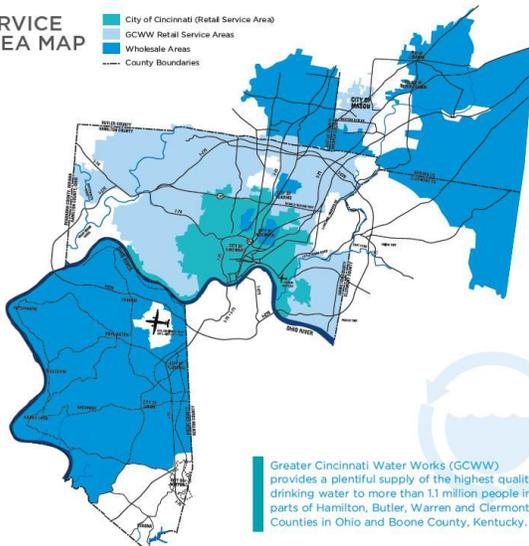
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Water Quality & Treatment



Greater Cincinnati Water Works: System Overview

SERVICE
AREA MAP

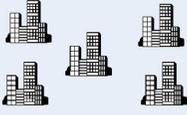
City of Cincinnati (Retail Service Area)
GCWW Retail Service Areas
Wholesale Areas
County Boundaries



- 2 Treatment plants:
 - Surface: 220 MGD
 - Ground: 40 MGD
- 3100 miles of Water main
- 11 Pressure zones
- 28 Storage tanks
- Avg. day pumpage: 120 MGD
- Customers
 - Retail
 - Wholesale

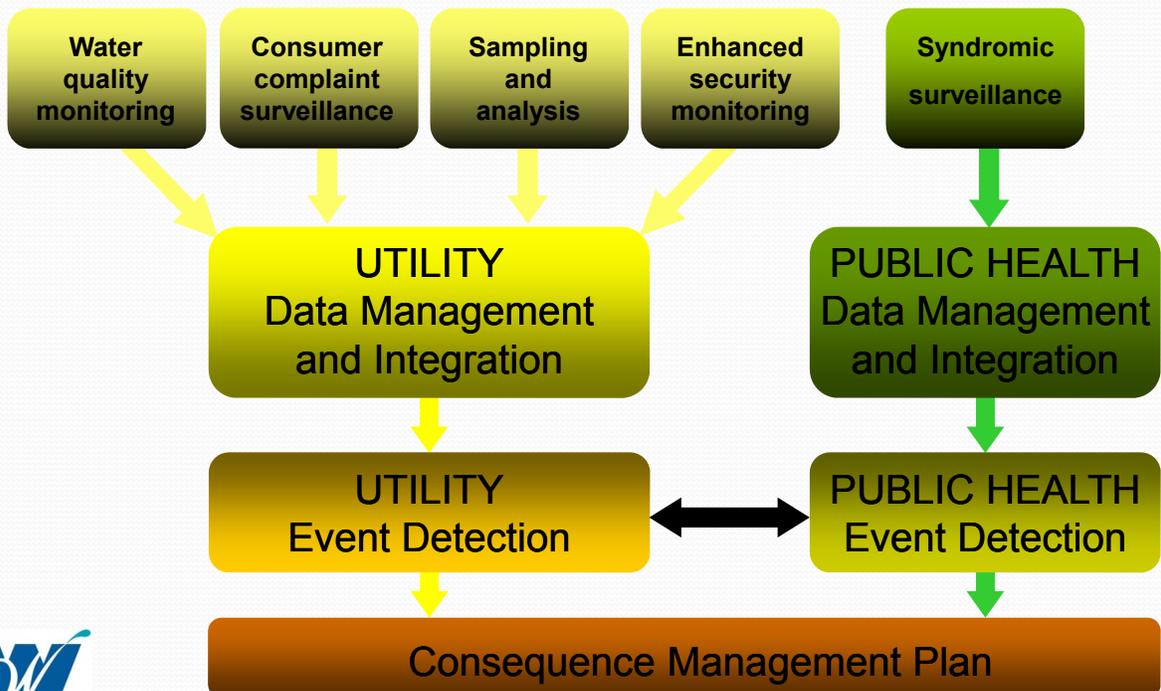


WaterSecurity Initiative Program

Phase	Design	Initial Pilot	Expansion	National Guidance
Approach	Conceptual design	Apply to <i>single</i> pilot utility Evaluate Refine and enhance	Applied by <i>multiple</i> utilities Evaluate Refine and enhance	Convert to guidance for <i>any</i> utility
Scope	Not applicable			
Design Specificity	Low	High - Applies to pilot utility only	High - Applies to each pilot utility	Medium - Applies to range of utilities



Contamination Warning System

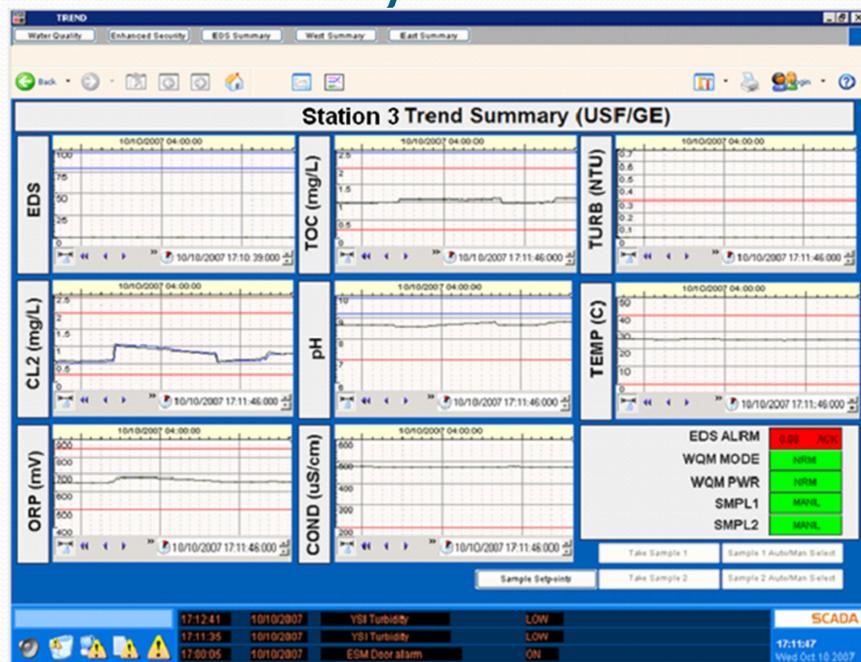


Water Quality Monitoring (WQM)

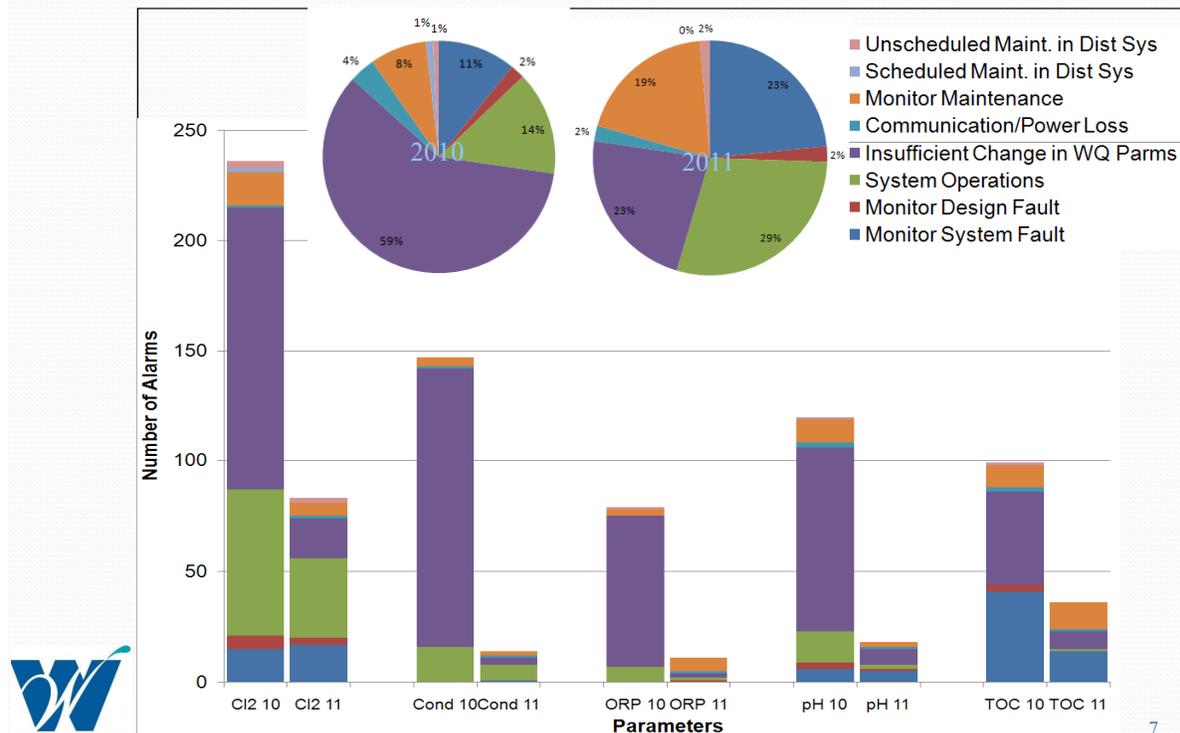
- 17 Monitoring stations – 3 designs
- TOC, Cl₂, pH, Conductivity, Temperature, ORP, Turbidity
- Monitored through SCADA system
- Event detection system
 - CANARY – Sandia



Station Summary



Event Detection Alarms by Parameter



Consumer Complaint Surveillance (CCS)

- Capturing data from > 1 million sensors
- Filter funnel approach
- Triggers
 - IVR
 - Work Orders
- System monitors
 - 1 day
 - 2 day



Consumer Complaint Surveillance

- Work Order alert - e-mail with complaint details

ID: 09-038794-000

Datetime: 3/30/2009 1:39:41 PM EDT

Location: xxxx Carmel Ter & Everett Av (WESTWO)

Problem Description: cloudy water with black specks sample 3/31 10 am to 12

ID: 09-039533-000

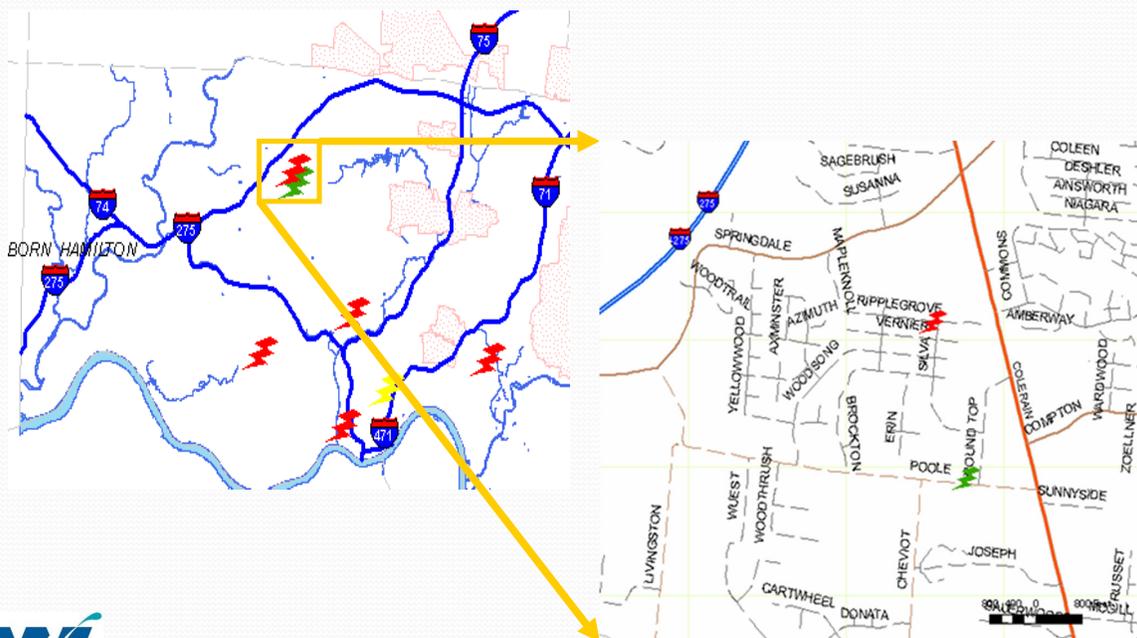
Datetime: 3/31/2009 4:00:10 PM EDT

Location: xxxx Elkhorn Dr & Loralinda Dr (COLETP)

Problem Description: Customer says the water tastes like a garden hose. Please sample and flush on 4/1/09 between 12:00 and 4:00



CCS Alarm on GIS Map



Sampling and Analysis

- Field and lab program
- Additional parameters and methods
- Monitoring to establish baseline
- No detections out of ordinary
- Integrating with routine water quality sampling



Enhanced Security Monitoring

- 13 facilities
- Entry alarms, motion sensors and cameras
- Hatches and vents
- Alarms tied into SCADA system

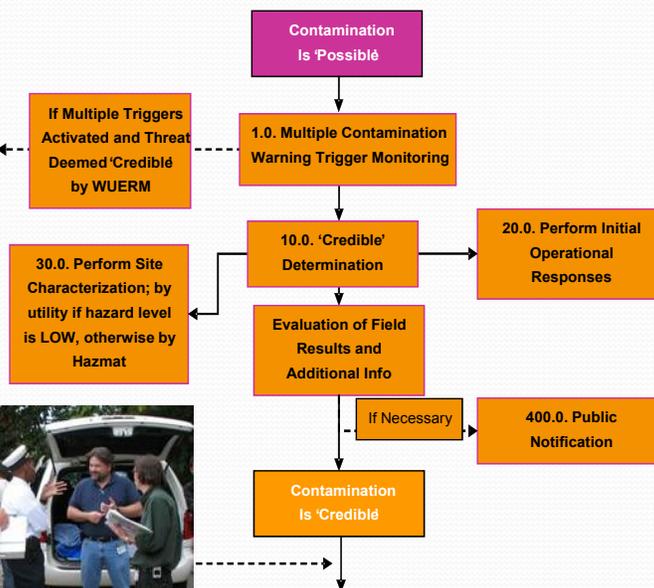
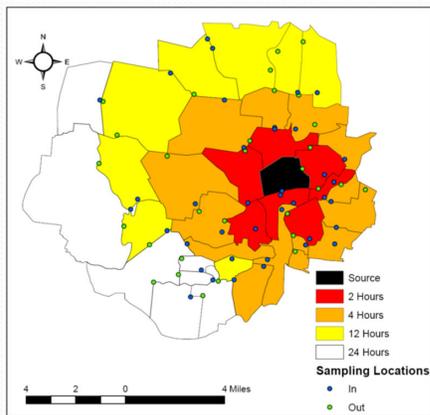


Public Health Surveillance

DATA SOURCE	SPATIAL COVERAGE	DATA LOCATION	TIMELINES OF COLLECTION	INITIAL CONTAMINANT DETECTED
 EMS	City and/or County	Fire Department	Near Real-Time	Fast-Acting Chemicals (Classes 1-9)
911	City and/or County	Fire Department	Near Real-Time	Fast-Acting Chemicals (Classes 1-9)
 Poison	Regional	Poison Control Center	Near Real-Time	Fast-Acting Chemicals (Classes 1-9)
	City/County/Regional	NRDM	Daily	Pathogens (Classes 10-11)
 Hospitals	City/County/Regional	LPH	Days or Weeks	Pathogens (Classes 10-11)



Possible to Credible



Total System Costs

- **Deployment Costs:** total cost to design and install the CWS

Total deployment cost	\$11,951,805
> Labor	\$ 8,870,852
> Equipment and services	\$ 3,080,953

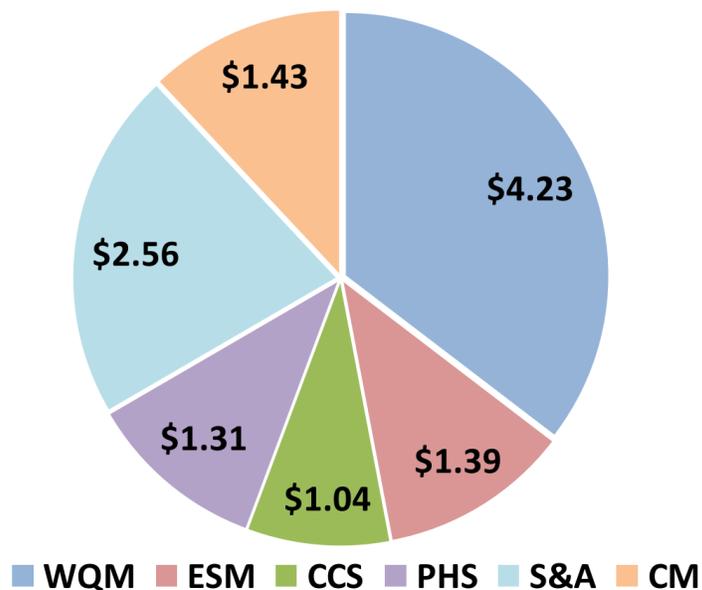
- **O&M Costs:** annual cost to operate and maintain the CWS

Total O&M cost per year	\$ 308,328
> Labor	\$ 155,641
> Consumables and services	\$ 152,687

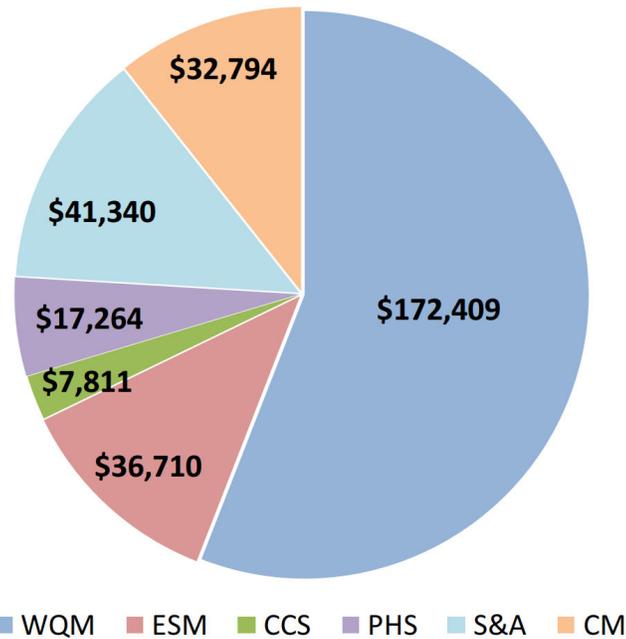


System Deployment Costs

Cost in Million Dollars

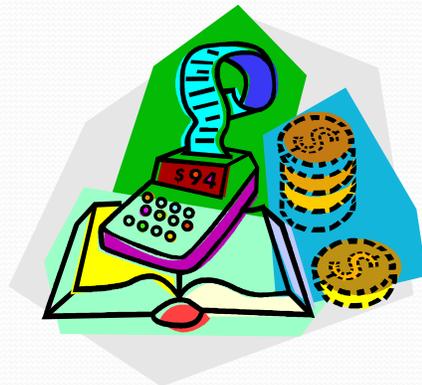


System O&M Costs



Costs of WQM Station

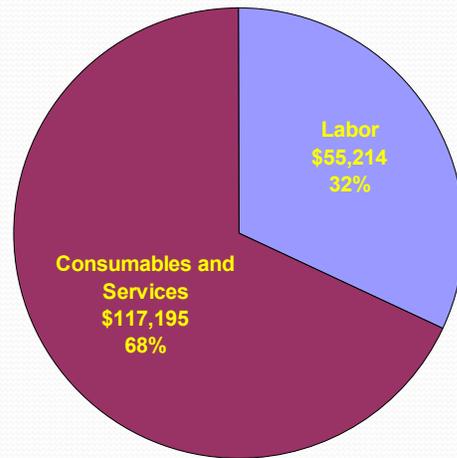
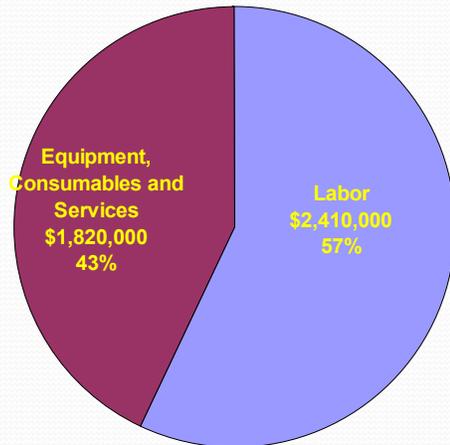
- \$7,600 per station per year (\$4,800 for TOC) – O&M
- 3 hours per month per station – O&M
 - 50 hours/month typical for 17 stations
 - Includes significant travel time
- Plus investigation time
- EDDIES/Canary
 - minimal maintenance cost



WQ Monitoring System Cost

■ Deployment
(\$4.23 mil)

■ O&M
(\$172K)



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- **O&M Costs:** annual cost to operate and maintain the CWS

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- **Equipment Replacement Costs:** total cost for equipment replacement every 7-10 years

Total replacement cost	\$ 1,000,000 + ?
> Hardware	\$ 1,000,000
> Software	\$?



Benefits of CWS

- Reduced fatalities
- Reduced cost of medical treatment
- Reduced loss in wages and business revenue
- Reduced cost of remediation
- Reduced cost of bottled water
- Reduced loss in drinking water and wastewater revenue



Dual Use Benefits of SRS

- Improved knowledge of distribution system water quality
- Potential cost savings in operations and capital improvements
- Ability to detect and respond to a wide range of distribution system water quality issues
- Information to support activities related to regulatory compliance (GWR, SDWA, DBPR, AMR)
- Increased public confidence in the water supply
- Improved coordination and communication among agencies and within the drinking water utility
- “All emergencies” preparedness

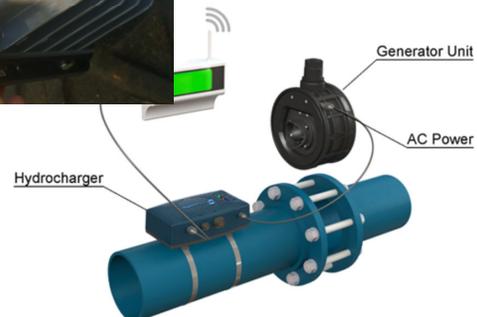


Sustainable SRS

- Reduce O&M Cost using equipment with less field work
 - Optical sensors
 - Adaptive measurement frequency
 - Remote diagnosis



Remote Monitoring with Energy Harvest



Sustainable SRS

- Reduce O&M Cost using equipment with less field work
 - Optical sensors
 - Adaptive measurement frequency
 - Remote diagnosis
- Generate Revenue by selling services
 - Lab analysis
 - Monitoring equipment
 - Water quality data
- Utilize What is Available from others
 - Public health
 - Police video surveillance system
- Develop More Dual Uses
 - Site characterization tools like radios, drones



Additional Dual Uses



Sustainable SRS

- Reduce O&M Cost using equipment with less field work
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 - Adaptive measurement frequency
 - Remote diagnosis
- Generate Revenue by selling services
 - Lab analysis
 - Monitoring equipment
 - Water quality data
- Utilize What is Available from others
 - Public health
 - Police video surveillance system
- Develop More Dual Uses
 - Site characterization tools like radios, drones
 - UV/Vis probe
 - Real-time model calibration/validation



Questions?

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