# Just Add Water

## Leveraging Existing Water System Data to Launch Pilot District Metered Areas for Advanced Leakage Management

CAVANAUGH
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## OBJECTIVE:

**Develop a proactive leakage management approach**

**Utilize existing data that is already in place and being monitored through SCADA**

**Launch Pilot District Metered Areas to prioritize and focus Leak Detection resources**

## CASE STUDY: The Macon Water Authority
## Macon, Georgia

- Produces on average 9.5 billion gallons/year
- 7 elevated storage tanks
- 10 ground storage tanks
- A new elevated storage tank (Hartley) has been recently constructed
- 5 hydraulically-independent pressure zones
- A sixth one to be constructed
- Average pressures within zones currently range from 83 psi to 112 psi
- Average pressure for the entire system is approx. 93 psi

- Service area - 1,664 miles of distribution lines consisting of ductile iron pipe and cast iron pipe ranging from 1.5" to 64" in diameter.
- Customer base – 55,000 active Water connections
  Meter sizes ranging from 5/8" to 10"
- AS400, custom-built software for billing and financial management
- Some seasonal variation in consumption, highest in Mid-summer (900 mg/month), minimum consumption in late winter (500 mg/month).

## Methodology – Top Down Water Audit

**Phase 1**

Gather available financial and operational data and develop a Water Balance for the audit year

**Phase 2**

In-depth analysis and staff interviews pertaining to billing accounts and methods, customer metering database ad methods, distribution system management and SCADA system capabilities, with recommendations.

**Phase 3**

Implementation of the Water Efficiency Program, manifested through a series of monthly Water Efficiency Team Meetings, at which time we prioritize, execute and evaluate the improvement measures identified in Phase two, document and communicate results to the leadership, and recommend improvements.

## Establish Baseline Volumes of Real Loss

Macon Water Authority
WATER SYSTEM KEY PERFORMANCE INDICATORS
Audit Year (AY 11)
Jul-10_Jun-11

| | | | | |
|---|---|---|---|---|
| System Input Volume | 9,567 | MG / year | Data Validity: | 68 |
| Annual Operating Cost (Water Only) | 12,016,745 | $ / year | (out of 100) | |

Operational Indicators

| | | | | |
|---|---|---|---|---|
| Non-Revenue Water | 1,755 | MG / year | | 18.3% |
| Water Loss | 1,585 | MG / year | | 16.6% |
| Current Annual Apparent Loss (CAAL) | 321 | MG / year | 3.4% | |
| Current Annual Real Loss (CARL) | 1,264 | MG / year | 13.2% | |
| Apparent Losses per service connection per day | 14 | gal/conn/day | | |
| Real Losses per service connection per day | 54 | gal/conn/day | | |
| Real Losses per service connection per day per psi | 1 | gal/conn/day/psi | | |
| Unbilled Consumption | 171 | MG / year | | 1.8% |
| Unavoidable Annual Real Loss (UARL) | 570 | MG / year | | 6.0% |
| Infrastructure Leakage Index (ILI) : | 2.22 | (CARL / UARL) | | |

## Identification of DMA candidate zones

FORSYTH ZONE

BREEZY HILL ZONE

## SCADA Analysis

| Zone | length/mains (per GIS) (mi) | #/connections (per GIS) (ea) | average pressure (per model) (psi) | UARL (MG/yr) |
|---|---|---|---|---|
| Forsyth | 333 | 10,495 | 112 | 138 |
| Downtown | 4 | 864 | 91 | 5 |
| Breezy Hill | 14 | 1,365 | 85 | 9 |
| Airport | 19 | 441 | 83 | 5 |
| Amerson / Ruben | 957 | 50,405 | 93 | 432 |
| total | 1,328 | 63,570 | 93 | 567 |

| tank | t hr | nighttime drop ft | tank vol gal | est tank diameter ft | est gal/ft gal/ft | est rate of outflow gpm | est rate of outflow MG/year |
|---|---|---|---|---|---|---|---|
| forsyth | 1 | 1.0 | 300,000 | 41.26 | 8,000 | 133 | 70 |
| lizella | 1 | 2.0 | 1,000,000 | 75.33 | 26,667 | 889 | 467 |
| heath rd | 1 | 2.5 | 500,000 | 53.26 | 13,333 | 556 | 292 |
| | | | | | total estimated min-hour tank outflow | 1,578 | 829 |
| | | | | | | gpm | MG/year |
| | | | | | estimated demand: Prison | 50 | 26 |
| | | | | | estimated demand: Monroe County | 150 | 79 |
| | | | | | estimated demand: Barrington Golf Course | 30 | 16 |
| | | | | | estimated demand: Harrison Rd Hotels | 100 | 53 |
| | | | | | estimated demand: Macon State U | 100 | 53 |
| | | | | | estimated demand: Miscellaneous | 100 | 53 |

| | | | est % of total system leakage | cost/year |
|---|---|---|---|---|
| total estimated min-hour demand | 530 | 279 | | |
| total estimated leakage - Forsyth Zone | 1,048 | 551 | 44% | $ 572,190 |
| UARL - Forsyth Zone | 138 | | 11% | $ 143,313 |
| Recoverable Real Loss- Forsyth Zone | 413 | | 33% | $ 428,877 |

| tank | t hr | nighttime drop ft | tank vol gal | est tank diameter ft | est gal/ft gal/ft | est rate of outflow gpm | est rate of outflow MG/year | % of total system leakage |
|---|---|---|---|---|---|---|---|---|
| breezy hill | 3 | 5.0 | 500,000 | 53.26 | 16,667 | 463 | 243 | |
| | | | | | total estimated min-hour tank outflow | 463 | 243 | |
| | | | | | estimated demand: Miscellaneous | 50 | 26 | |
| | | | | | total estimated min-hour demand | 50 | 26 | cost/year |
| | | | | | total estimated leakage - Breezy Hill Zone | 413 | 217 | 17% $ 225,518 |
| | | | | | UARL - Breezy Hill Zone | 9 | | 1% $ 9,125 |
| | | | | | Recoverable Real Loss - Breezy Hill Zone | 208 | | 16% $ 216,393 |

**Results:**

**Pilot DMAs identified**

**Top-Down leakage and recovery potential quantified**

**No Capital Costs**

**Discovery and analysis of total leakage relationship to zone leakage**

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