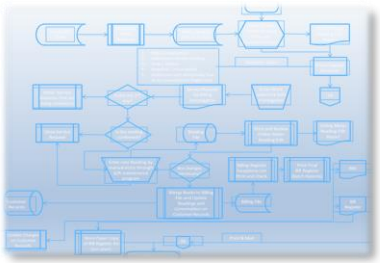
Advanced Water Audit Validation: Ensuring NRW Program Efficacy

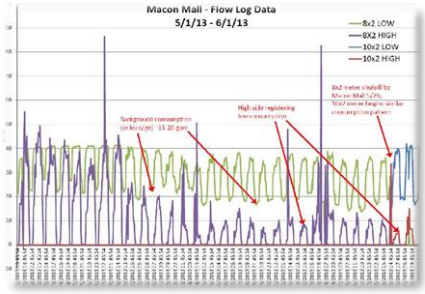
CAVANAUGH
Stewardship Through Innovation

"Give me six hours to chop down a tree, and I will spend the first four sharpening the axe." - Abraham Lincoln

Non-revenue water is complicated. Make sure your NRW program is focused on the right things.

The AWWA Level 1 top-down water audit provides an initial assessment of the volume, value and validity of your utility's non-revenue water components – leakage, apparent loss and unbilled authorized consumption. Inherently each of the systems that generate the data needed for the water audit were designed for its specific purpose (billing, metering, etc) and is *fully functional* in its own right. However **these systems were not designed** specifically for the purpose of extracting data to develop a precise, spatially and temporally bound water balance for conducting detailed water loss analysis. And when they are called upon to provide such precise information, there are many challenges that can arise with regards to data accuracy. Some data systems are more accommodating than others, but none of them were designed specifically for this purpose. Level 1 Validation is an important first step, but it is essential that advanced validation be conducted to eliminate any assumptions that were made in the top-down water audit – before the NRW program is designed and implemented.





Advanced water audit validation involves deep mining of the data in the utility's existing data systems – the supply metering, SCADA systems, customer metering systems, customer billing systems, and work order systems. The highest levels of validation include conducting field tests to collect new data, such as hydraulic flow verification of supply volumes, accuracy testing of customer meters and leakage and pressure measurements for night flow and DMA analysis.

nput Component Ranking for Output Improvement	Volume MG/Yr	Rank
Billed Metered (MG/Yr) 5/8"	17,526.920	1
White River (MG/Yr)	17,898.651	2
Billed Metered (MG/Yr) 2"	5,807.108	3
Billed Metered (MG/Yr) 1 1/2"	5,000.801	4
Riverside (MG/Yr)	7,330.770	5
Unbilled Unmetered (Mg/Yr)	559.519	6
White River North (MG/Yr)	5,907.123	7
Fall Creek (MG/Yr)	5,298.257	8
South Wellfield (MG/Yr)	4,106.898	9
Billed Metered (MG/Yr) 1"	2,476.144	10

The essential outcomes from advanced water audit validation are:

- Full confirmation and cleansing of missing or duplicated supply or consumption volumes in the water balance
- 95% statistical confidence limits assigned to those non-revenue water components to quantify uncertainty

Performance Indicators and 95% confidence intervals

Component	Best estimate	95% Conf. Int.	Lower Range	Upper Range
Non-Revenue Water (gal/conn/yr)	24,327	9.2%	22,093	26,562

Component values $

Component	Best estimate	95% Conf. Int.	Lower Range	Upper Range
Real Loss Value (annual $)	$ 1,643,813	9.1%	$ 1,494,127	$ 1,793,498
Apparent Loss Value (annual $)	$ 5,470,718	6.2%	$ 5,129,932	$ 5,811,505
Unbilled Value (annual $)	$ 153,174	25.5%	$ 114,122	$ 192,226
NRW Value (annual $)	$ 7,267,705	5.1%	$ 6,893,451	$ 7,641,959
NRW Value ($/conn/yr)	$ 21.84	5.5%	$ 21	$ 23

- Assurance that the right problems are being prioritized in the NRW program

Non-revenue water is complicated. Make sure your NRW program is focused on the right things.

Contact us today to learn more.

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