

## THE NEW REALITIES OF WATER MANAGEMENT: The Non-Revenue Water Solution

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Water utilities are under game-changing pressures today from internal and external forces. Just ask any water utility in California. Where, once, water was plentiful, there are serious droughts and unprecedented dramatic usage restrictions. Where, once, regulations were voluntary and without restrictions, they are getting stricter, with mandatory conservation measures. Where, once, consumers didn't worry about water consumption, conservation is now becoming more of a habit. Where, once, cheap water was considered the goal, real value pricing is now a hot topic of conversation. Where, once, utilities were not expected to operate under the same best practices of competitive businesses, water-saving strategies and efficiencies in utility business cases are now expected. Due to the confluence of these pressures, water utilities, today, cannot continue to operate as they have in the past. New questions about water management must be asked, and new solutions must be offered to shore up the future.

One of those questions should and must involve non-revenue water – managing and minimizing lost water and recovering lost revenue. Studies show that non-revenue water totals in the trillions of gallons every year, taking billions of dollars out of the potential revenue stream. Here are the key facts:

- Nationally, over 2 trillion gallons per year are classified as non-revenue water, costing water utilities billions of dollars.
- Up to 75% of current water losses in systems are recoverable.<sup>1</sup>
- The average utility has more than 33,000 gallons of water per year and \$35 per connection per year in non-revenue water, costing utilities millions of dollars, according to the American Water Works Association (AWWA) Water Audit Data Initiative. For example, a 50,000-connection water utility could be losing \$1.8 million in non-revenue water every year.<sup>2</sup>

From both financial and environmental viewpoints, we simply cannot afford to ignore non-revenue water any longer. Inefficient systems, inaccurate methods of measurement and substandard policies, as well as inaccurate data, must be relegated to the past, and a new era of openness, accuracy and economics must take its rightful place.

### MAKING THE TRANSITION

One of the easiest, most important places to start on a non-revenue water initiative is by asking the right questions. In this case, let's start with just one question: How are you measuring your non-revenue water? For years, the answer was nearly universal – water that was unaccounted for was based on a percentage of total system input volume. But this measurement is highly inaccurate when overall volume increases or decreases based on demand.

In the example in **Figure 1**, water losses in 2001 are around 3 mgd and show steady increases since the utility has no water loss control program. In 2008, a major industry moves to the area and begins using more water. Water losses are still on the rise as new leaks begin and existing meters degrade. Fast forward to today, and after 13 years of unmanaged water loss, that number has doubled from 3 mgd to 6 mgd, yet the percentage of system input volume lost tells a more positive but misleading total.

In fact, measuring non-revenue water using this metric is no longer considered the correct method. More than a decade ago, in 2003, the AWWA abandoned this practice, yet many water utilities continue to use it, perhaps unaware that there are now preferred optimized and accurate data validation tools that yield precise measurements and lead to actionable results.

***The first question water utility leaders should ask is, “How am I measuring Non-Revenue Water?” If the answer is by percent of system input volume, it's time to abandon that inaccurate metric and utilize more meaningful metrics from the M36 water audit.***

A second step is to take a look back at past actions to minimize and manage non-revenue water. Many utilities assume that most non-revenue water comes from leaks and inaccurate metering. Naturally, the default solutions have been to replace pipes and meters. But all too often, after investing in expensive repairs and new equipment, the end result is missed expectations.

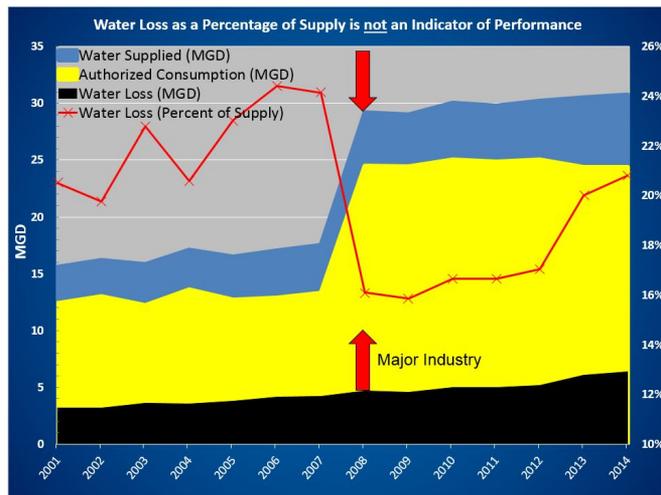


FIGURE 1



That is because those same utilities skipped a critical phase – the diagnosis phase – and jumped straight into implementation despite the fact they have no clear and definitive understanding of the problem’s source. It is an understandable situation – there are numerous sophisticated technologies available to address leaks and metering – and the inclination is to get straight to the fix. But here’s the problem: when the prescribed solution doesn’t address the real issue, the result is disappointment and frustration, and in extreme cases, changes in utility leadership and personnel when improvement is not realized.

**The second question is this: Do I truly have a clear understanding of the cause of non-revenue water at my utility? If the answer is no, it is time to find out.**

Both AWWA and EPA recommend water utilities follow a three-step process to minimize and manage non-revenue water: auditing, intervention and evaluation. This process ensures utilities can determine their baseline water use and loss, prioritize the most important water efficiency projects and define operational changes to implement, and then measure the results with an eye on continuous improvement.

Figure 2 illustrates the three-step process outlined for the State of Georgia, a leader in water loss control. As accurate information is gathered and acted on, verifiable long-term reductions are realized. Audit, validation, and real improvement take time.

Because of the proactive measures it has taken to control its water loss, the State of Georgia is now recognized as a leader in water resources management. In the recent Statewide Water Audit Training Program, this three-step process provided the roadmap, ensuring accurate information was gathered, analyzed, and acted on. Water utilities there anticipate long-term reductions, and should realize measurable improvements, saving two-thirds of lost water within seven years.

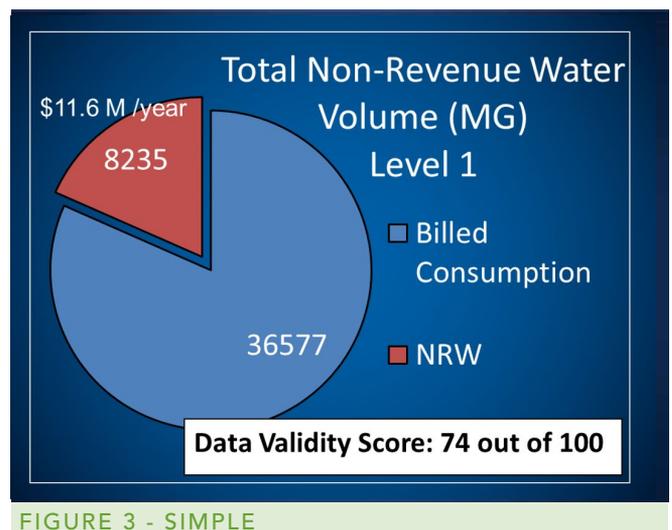
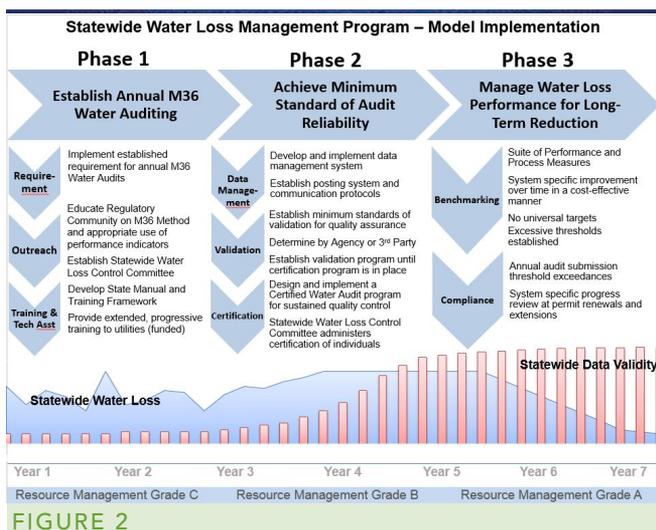
### TAKING ACTION

Today, there are highly accurate tools that measure all three categories of non-revenue water to provide a much more actionable perspective than simply a percentage of total volume. A good place to start is with free audit software developed by AWWA. By utilizing this powerful tool, water utility managers will finally have clear data on billed authorized consumption, unbilled authorized consumption, and apparent losses.

A memorable way to think about it is the three Vs: Validity, Volume, and Value. Until the three have been determined, the right tools or solutions cannot be chosen.

Validity refers to the AWWA audit system’s rating scale, from 1 to 100, to correctly assess a utility’s performance. The objective is to accurately reflect the utility’s current state to provide a valid baseline. Many utilities have found that additional training on using AWWA audit software results in more accurate data as well as a better user experience for utility employees. So this step should be considered an important one.

**“BOTH AWWA AND EPA RECOMMEND WATER UTILITIES FOLLOW A THREE-STEP PROCESS TO MINIMIZE AND MANAGE NON-REVENUE WATER: AUDITING, INTERVENTION AND EVALUATION.”**



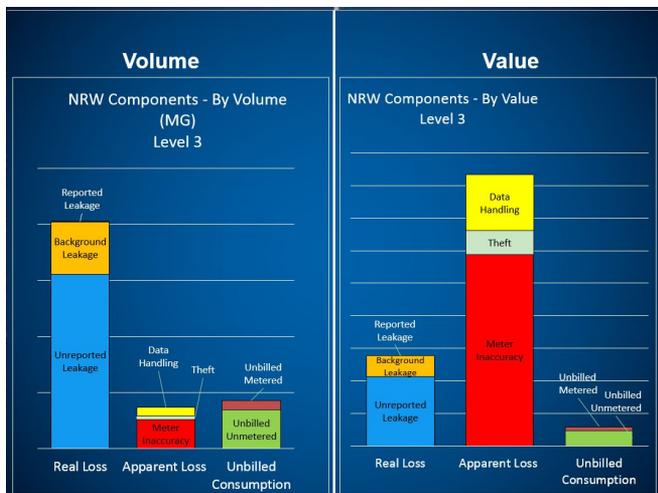


FIGURE 4 – COMPLEX

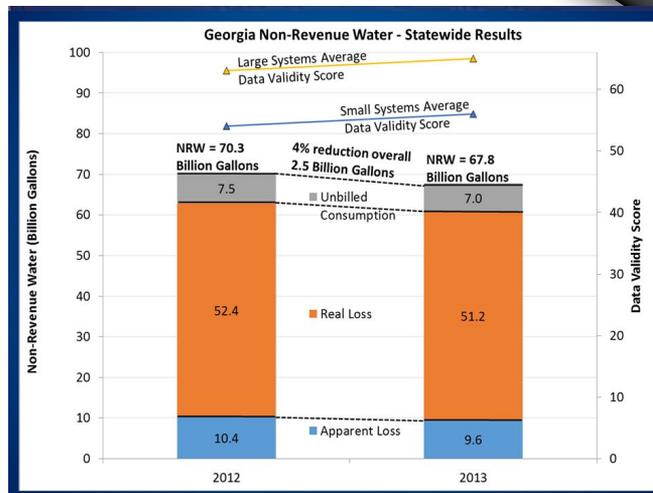


FIGURE 5

## “IN THE GEORGIA PROGRAM, IMPROVEMENTS WERE EVIDENT IN ALL THREE NON-REVENUE WATER CATEGORIES.”

Volume is no longer a generic measurement of percentage of total volume. Instead, each category of non-revenue water is quantified by class, providing utility managers specific data they have never had before. With an accurate picture, utility managers can then make more informed decisions and achieve greater results.

Figure 3 illustrates how many utilities currently measure non-revenue water as simply a percentage of system input volume. Figure 4 illustrates new levels of detail by NRW category volume and value utilizing AWWA’s M36 free audit software. By using an audit, utility managers can see non-revenue water data with new clarity to inform better decisions and create a more effective plan.

Finally, the value of non-revenue water can be calculated with greater precision to determine market worth. Often total non-revenue water can add up to significant dollars.

Assuming annual losses per connection of \$35:

- A 15,000-connection water utility could recover \$525,000 each year.
- A 30,000-connection water utility could recover \$1.05 million each year.
- A 55,000-connection water utility could recover \$1.925 million each year.

In today’s economic climate, utilities are faced with operating budget cuts, fewer resources, rising performance expectations, and resistance to consumer rate increases. These non-revenue water figures translate to thousands of dollars of welcome savings to help ease some of the strain.

### SEEING POSITIVE RESULTS

When water utilities follow this simple prescription of measuring and understanding validity, volume and value to tackle their non-revenue

water challenges, the results can be dramatic, as shown in Figure 5.

In the State of Georgia, in 2012, water utilities serving a population of greater than 3,300 embarked upon a Non-Revenue Water Program. Within one year, they saw a 4% statewide reduction, or a validated 2.5 billion gallons, with an economic value of nearly \$2 million.

In the Georgia program, improvements were evident in all three non-revenue water categories, reducing total non-revenue water loss to 67 billion gallons, down from 70 billion. For small utilities, average water validity scores ranged from 31 to 81, with an average of 52.1. Larger systems tended to score a little better, with performance rankings from 38 to 81, with an average of 62.9.<sup>3</sup>

Take Asheville, NC as another example. This 56,000-connection water utility began battling non-revenue water in 2012 when it realized losses were mounting and something had to be done. “We were still using percentages, which is an inaccurate benchmark,” said Ivan Thomas, the Asheville Water Department Operations Manager. “We reported our water loss at around 30%. We needed a water audit to break our non-revenue water down in terms of validity, volumes and values. When we did this, we really started to see where we were and what needed immediate attention.”

Using AWWA water audit software, the utility learned its water and related revenue loss ranked 68 on the validity scale. Then, with valid data in hand, the utility began a full-scale assault on its non-revenue water problem, including leak detection, valve exercising, meter testing, unbilled customers, pressure reduction and zone metering. Today, Asheville has seen a 1 mgd reduction and recovered nearly \$100,000 a year from its water management measures.

## THE TIME TO ACT IS NOW

Unfortunately, many water utilities do not see the value in pursuing non-revenue water initiatives. But the truth is, there are costs associated with not addressing non-revenue water, and that cost will do nothing but escalate with every delay. For those who continue to ignore the signs or postpone programs, those costs include natural resource depletion, increased regulatory mandates (both funded and unfunded), and, eventually, public pressure from concerned consumers. The old business model simply doesn't work in the face of today's business, environmental, and regulatory climate.

One way to begin charting a better future for water utilities is to accurately assess non-revenue water and implement interventional programs. The Georgia and Asheville systems prove the case: when you are armed with the right data upfront, you can make more informed, responsible decisions. You can benchmark progress and improve the bottom line. You can actually improve the performance of your water utility.

So, if your water utility is not actively pursuing non-revenue water, it is time to consider it, before you are forced to do so by outside parties, thereby losing control of the process. Take the first steps forward toward stewardship of your water resources, and you can begin to see what is possible.

## ABOUT THE AUTHOR

For almost three decades **Steve Cavanaugh** ([steve.cavanaugh@cavanaugholutions.com](mailto:steve.cavanaugh@cavanaugholutions.com)) has worked with public and private sector clients to develop intelligent environmental stewardship solutions to some of today's most challenging issues. In addition to his agricultural expertise on waste-to-energy and biomass facilities, Steve is known in the industry as an expert in the field of water loss and revenue recovery, and has dedicated his life to teaching utilities how to discover and embrace efficient business practices. Steve is a member of International Water Association – Water Loss Specialist Group and Chair of AWWA WLCC Outreach Subcommittee.

## NOTES

- <sup>1</sup> Thornton, J. et al., *Water Loss Control Manual* (2nd Edition), McGraw-Hill, 2008.
- <sup>2</sup> AWWA Water Audit Data Initiative: [www.awwa.org/waterlosscontrol](http://www.awwa.org/waterlosscontrol)
- <sup>3</sup> Based on 226 water utilities in Georgia 

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