Water Accountability 2021

Location	Reason	Consequence	Formula	Annual in Gallons
Launch Ramp LS	Odor Control/ H2S Reduction on Spit	Damage to SS down stream of the spit and customer complaints	24hr/day for4 months - 17gpm X 1440min/day(120 days) = **2.93 MG**	2,937,600
Larry's Ln	Freeze Protection	In ablity to deliver water to customers and damage to water	5.5 gpm X 1440min/day (180)days/yr	1,425,600
Deep Water Dock BR	Flush port for compliance sampling		10 gpm X 1440 min/day(365 days/yr)=	5,256,000
Airport	Flush port for compliance sampling	Violation of EPA/ADEC drinking water stantards. Continued violations will cause EPA to require additional and expensive treament.	10 gpm X 1440 min/day(365 days/yr)=	5,256,000
Spit Tank	Flush port for compliance sampling		30 gpm X 1440 min/day(365 days/yr)=	15,768,000
Canyon Trails	Flush port for compliance sampling		10 gpm X 30 min/day(365 days/yr)=	109,500
Distrbution System	Annual Maintenance	Decrease in water quality and increease in customer comlaints		1,657,266
STP Plant	Plant Ops	Cleaning, Chemical Batching	See STP WTP Tab	11,663,470
STP Shop	LS Cleaning	LS Cleaning	See STP WTP Tab	71,100
WTP	Plant Ops	Cleaning, Chemical Batching	See STP WTP Tab	1,530,300
2021 Metered Water			2021 Metered Water	139,297,800
Unmetered			Water Used for Water Quality Flushing and Treament Ops	45,674,836
WTP Treated Water			2021 Treated Water, from Operator Log	194,525,000
			Treated + Un Metered	184,972,636
			Unaccounted Water in gallons	9,552,364
			% Unaccounted Water	4.91%

Committee report: water accountability

Advances in technologies and expertise should make it possible to reduce lost and unaccounted-for water to less than 10 percent.

AWWA Leak Detection and Water Accountability Committee

Often, decision-makers in the water supply field are satisfied when they can account for 85 percent of the water they produce. Recognizing the problem of lost or nonrevenue-producing water and desiring to find solutions for member utilities, AWWA's Distribution and Plant Operations Division asked the Leak Detection and Water Accountability Committee to write this report, which recommends that because of increasing demand and higher operational costs, the goal for lost or nonrevenue-producing water should be less than 10 percent. The report also proposes that certain guidelines should be followed when the goal of 10 percent is not met.

Over the past several years, it has not been unusual to hear statements from water utilities throughout the country such as, "AWWA says that 15 percent unaccounted-for water is acceptable" or "Our water loss is pretty close to the AWWA guidelines of 15 percent." In fact, AWWA has never adopted a policy or issued guidelines to the effect that 15 percent unaccounted-for water is acceptable. AWWA's Distribution and Plant Operations Division asked the National Committee on Leak Detection and Water Accountability to deter-

Water lost through leaks, underregistering meters, or water theft takes a financial toll on utility operation.

mine how this impression arose, to research the issue of unaccounted-for water, and to issue guidelines and recommendations that specifically address unaccounted-for water and effective water loss management for water utilities.

1957 report identified as source of figure

Apparently, the source of the frequently heard statement that AWWA accepts a 15 percent rate of unaccounted-for water is a committee report presented at the 1957 AWWA annual conference in Atlantic City, N.J., and subsequently published in JOURNAL AWWA.[1] The committee report states that unaccounted-for water "may vary from 10 to 15 percent in a well operated system where the consumption is between 100 and 125 gpcd [379 and 473 L/d]. Good performance is generally indicated by a metered ratio of 85–90 percent (unaccounted-for water of 10–15 percent) where the use of water is between 100 and 125 gpcd [379 and 473 L/d]." Since that article was published 39 years ago, two areas of water loss management—operating costs and technological resources—have undergone dramatic changes.

Operating costs increase. Virtually all costs of producing and distributing potable water have increased dramatically over the past 30 to 40 years—treatment plant expansions and improvements, development of additional water supplies, distribution system construction, energy charges (pumping costs), labor at all staff levels, regulatory compliance, restoration expenses, and so on. As the total cost of operation rises, the cost of unaccounted-for water also rises at a corresponding rate.

Technology developed to reduce water loss. Because of increasing costs of production, distribution, and unaccounted-for water, many technological advances aimed at reducing water loss have been developed. These include leak detection and pinpointing instruments, more accurate metering devices, instrumentation to test meter accuracy, rate-of-flow recording for meter sizing and typing, and data collection. In addition, a wide range of techniques and methodologies provide practical application of these advanced technologies to identify losses within a water system and to implement cost-effective corrective action.

Because of these significant advances, AWWA's Leak Detection and Water Accountability Committee recommends the goal for unaccounted-for water should be less than 10 percent.

Regardless of the water system's size, water loss should be expressed in terms of actual volume, not as a percentage.

Method given to determine "true" unaccounted-for water

The basic steps for quantifying the amount of water loss within a water system are as follows:

(1) Accurately determine the amount of water being produced or purchased and delivered to the distribution system for a 13-month period of operation. The production quantities are used to establish the base number against which all other calculations in the water accountability process will be made. It is therefore imperative that the production quantities be accurate. This requires annual accuracy testing of source meters.

(2) Determine the total amount of water sales for the same period of operation as measured by all meters in the system. This includes estimated accounts.

(3) Subtract the total amount of water sold from the total amount of water produced or purchased.

(4) Identify and quantify all other categories of water use in the system. It is recommended that all water use in the various categories be metered, so the

water can be accurately accounted for instead of ending up in the unaccounted-for water category where it does not belong. If actual metering is not possible, every effort should be made to accurately estimate each type of water use to determine realistic usage quantities for each category.

The various categories of water use in a water system include bulk water sales (including construction), known leakage, tank (storage facility) drainage, storage tank overflows, line flushing, fire protection, bleeding or blowoff done during the winter or for taste and odor episodes, and municipal uses (sewer cleaning, street cleaning, golf course, parks and recreation facilities, hydrant flow tests, unknown miscellaneous uses, and all other nonrevenue uses).

(5) Subtract the total quantity of water use for the same period of operation for all of the identified categories in step 4 from the quantity of water remaining after step 3.

(6) The quantity of water that remains is the water system's true amount of unaccounted-for water. True unaccounted-for water consists of the following: unidentified leakage, meter inaccuracies, theft, underestimated accounts, improperly typed and sized meters, meter-reading errors, and accounting errors.

Additional Information

For additional information about leak detection and repair, consult the following AWWA or AWWA Research Foundation publications. Catalog numbers are in parentheses. To purchase copies, call the AWWA Bookstore at (303) 795-2449.

Leaks in Water Distribution Systems (20236)

Leak Detection and Water Loss Reduction (20194)

Leak Repair: After You Locate It (20022)

Introduction to Water Distribution: Vol. 3—Principals and Practices of Water Supply Operations Series (1951)

Water Audits and Leak Detection: M36 (30036)

Water and Revenue Losses: Unaccounted-for Water (90531)

Express water loss in terms of volume

Regardless of the water system's size, water loss should be expressed in terms of actual volume, not as a percentage. This is necessary for the utility to be able to determine the true annual cost of unaccounted-for water. Consider the following example.

A water utility produces 2 mgd (7.6 ML/d) and has a true unaccounted-for water rate of 20 percent. The utility adds a large-volume user that uses 0.5 mgd (1.9 ML/d), which increases production to 2.5 mgd (9.5 ML/d). What happens to the 20 percent unaccounted-for water? It becomes 16 percent. Has the utility actually reduced its water loss and the associated costs of the loss?

Don't be misled by percentages. Measure performance with respect to unaccounted-for water strictly by comparing the volume of water lost with the volume that was lost in prior years. The "percentage unaccounted" so often used, although it is a convenient yardstick of comparison, can be misleading.

Convert water loss to dollar loss

The amount of water loss is more meaningful than the percentage of unaccounted-for water. When the total volume of unsold water is known, the utility can place a value on that water and determine the cost-effectiveness of implementing corrective action.

The simplest way to estimate the potential financial loss is to make two assumptions:

- All water loss results from underground pipe leakage.
- All water loss results from underregistering water meters.

Usually the least amount of financial loss would be related to underground leakage, because that amount of the loss depends on the direct production costs associated with producing that amount of water. Three components make up direct production costs: costs of raw water, energy costs (electricity), and treatment costs (chemicals). Therefore, the total volume of underground lost water is multiplied by the unit production rate (excluding labor) to determine the approximate financial loss to the utility.

Of course, the cost of underground leakage would be of greater value if leakage repairs eliminated the need for plant expansion.

Usually the most expensive water loss in the distribution system is caused by both underregistration of water meters and theft of water. This water loss has the highest potential value because it is "sellable" at the retail water rate. The total water loss volume related to underregistration and theft should be multiplied by the retail rate to determine the approximate lost revenue.

Experience dictates that total water loss in a system does not result from one cause but from several. Generally, a utility can split the difference between financial loss from leakage and from metering. The utility could then estimate how much money is being lost because of unaccounted-for water. The actual split will vary from one utility to another and will be determined by the age of meters, water quality, system pressure, age of pipe, and pipe material. For instance, if a utility has excellent water quality (e.g., minimal buildup of sand or minerals) and an aggressive meter-maintenance program, it will tend to weigh the cost factors toward production costs rather than retail rate. An example of determining the dollar value of unaccounted-for water is:

Total daily production: 1 mgd (3.8 ML/d)

Total known usage: 0.8 mgd (3 ML/d)

Difference: 0.2 mgd (0.8 ML/d)

Production costs: $0.30/1,000 gal ($0.08/1,000 L)

Average retail rate: $2.50/1,000 gal ($0.70/1,000 L)

To determine the minimum lost revenue, multiply 0.2 mgd (0.8 ML/d) of unmetered water by the production cost. If all unmetered water was lost through leakage, the direct cost to the utility would be $21,900.

To determine the maximum amount of financial loss to the water system, multiply the 0.2 mgd (0.8 ML/d) by the retail rate; the result is $182,500 per year. If all unmetered losses occurred in the area of underregistering water meters, the financial loss attributable to that condition would be nearly nine times that of the loss attributable to leakage.

As the total cost of operation rises, the cost of unaccounted-for water also rises at a corresponding rate.

If the utility knows what is causing distribution system water losses, it may want to weigh the cost factors toward either leakage or metering. For instance, it may be determined that metering is a greater problem than leakage by a factor of 2:1. The approximate cost of lost water in the system would then be $130,000 per year. When wastewater revenue loss is added to this example, the effect on the system is amplified. For many systems, this could be a significant loss.

Weigh the costs

After the utility has determined the annual cost (or cost range) of unaccounted-for water, management can make a more informed decision concerning the cost-effectiveness of corrective action. For example, if a utility is losing $100,000 per year because of unaccounted-for water and it has an aggressive meter accuracy testing and repair program, it can be reasonably sure most of the loss is attributable to leakage. If a leak detection and pinpointing survey of the distribution system will cost about $10,000, it is likely that such a survey will be cost-effective.

Likewise, if a utility is losing $100,000 per year in unaccounted-for water and it has recently conducted a comprehensive leakage detection and pinpointing survey, it can reasonably conclude that most of the loss is attributable to meter inaccuracies or underregistration. If a testing and repair program to determine meter accuracy will cost about $20,000, it would be cost-effective.

Regardless of the size of the water utility, determining the cost of loss should be conducted on a case-by-case basis. Each water system has unique characteristics and variables that must be considered when the cost of water loss is calculated for any given system—e.g., the quantity and the quality of the raw water, the number and size of commercial and industrial meters, the extent of pumping required (energy costs), and treatment costs.

Today's water system managers are faced with a variety of challenges to be met and problems to be solved. Drought, contamination, lack of available funding sources, increased regulations for water quality and monitoring, and aging distribution systems are among some of the issues that confront water utilities.

As the cost of producing and distributing potable water continues to escalate, it will be important for water system managers to implement effective water loss management programs. Excessive amounts of water loss or unaccounted-for water will not be tolerated by regulatory agencies or the general public as water rates continue to increase.

It is fortunate that the necessary technologies, expertise, and methodologies are available to identify and substantially reduce lost water and to reduce unaccounted-for water to a more acceptable and realistic level. As the twenty-first century approaches, the goal for unaccounted-for water should be less than 10 percent.

Reference

1. Revenue-Producing Versus Unaccounted-For Water. *Jour. AWWA*, 49:12:1587 (Dec. 1957).

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