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AWWA Water Audits Coming to a Utility Near You

Neal Fujii, Commission on Water Resource Management

How much do you know about your water system's physical condition? Do you know what your water losses are? Have you done a water audit? Most public water systems keep track of their source production and customer sales, but does anyone have a really good idea of the volume of water entering their system and the volume of water leaving their system? I would bet that most operators have not taken the time to do a proper water audit of their system.

Since around 1991 the American Water Works Association has developed and improved a standardized method of water loss auditing. In fact, AWWA just released its latest version of publication M36, *Water Audits and Loss Control Programs, Fourth Edition*, in early 2016.

Commission on Water Resource Management (Commission) staff was introduced to the AWWA water audit methodology several years ago at an industry conference, where it was touted as an emerging best practice for water management. One of the fundamental responsibilities of the Commission is to plan and coordinate programs to conserve and protect Hawaii's water resources in cooperation with government agencies and private organizations. In February 2013, the Commission completed its *Hawaii Water Conservation Plan*, which recommended two priority actions for the near-term: (1) an irrigation metering demonstration project for agriculture; and (2) procedures for conducting and requiring annual water loss audit of public water systems. The Commission implemented its first priority action in 2013 through a partnership with the U.S. Geological Survey to conduct a diversion metering training workshop for large agricultural irrigation systems. To implement the second priority action, Commission staff worked with the Hawaii Fresh Water Initiative partners to develop legislation that would help to achieve statewide water audits.

This collaboration culminated in Act 169, Session Laws of Hawaii, 2016 (Act 169), which was signed into law by Governor David Ige in June 2016. The Act authorizes and requires the Commission to develop and implement a water audit program and provide technical assistance (training) to counties and other public water system owners, enabling them to complete an initial validated standardized water audit. Thereafter, utilities are required to complete and submit validated water audits to the Commission on an annual basis.

What's a Water Audit?

A water audit is simply a mass balance analysis starting with the volume of water entering the system (system input volume) and the volume of water leaving the system (authorized consumption + water losses). Key in the analysis is the source meter and customer meter data which form the foundation of the water balance. All of the water entering and leaving the system can be accounted for using meter data while making careful estimates and deductions regarding system variables. No more "unaccounted-for water." System losses can be categorized into real and apparent losses. Real losses are the physical leaks. Apparent losses can be attributed to many factors, but are commonly caused by inaccurate meters and data handling errors. AWWA has standardized the water balance in its M36 publication.

The AWWA method systematically breaks down the water balance into its fundamental elements. In order to simplify data inputs, AWWA also developed free water audit software based on Microsoft Excel to facilitate water audit completion. The software produces a suite of outputs which will help utility managers identify actions that can be taken to reduce system losses and improve data validity.

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Important outputs include system performance indicators, cost (in dollars) to the utility from real and apparent water losses, and prioritized action recommendations.

Water audit results are only as good as the data used in the audit – which should be validated by a qualified third-party validator. Validated water audits will allow a utility to design a cost-effective and data-driven water loss control program.

A Growing Trend Across the U.S.

You may have heard that in recent years water audits have become mandatory in several states across the U.S., under the authority of various regulatory agencies. These progressive states include California, Delaware, Georgia, Illinois, New Jersey, New York, Pennsylvania, Tennessee, Texas, Washington and Wisconsin – and now Hawaii. These states recognize the importance and benefits of water audits to utilities and their ratepayers through more efficient delivery of water. They also realize that the resulting loss control programs will lead to conserving water resources, thereby stretching available supplies. The Environmental Protection Agency has gotten behind water audits – most recently in California where their Drinking Water State Revolving Fund funded a statewide water audit training program. Another important aspect of water audit and loss control programs is the water-energy nexus. Electricity is one of the highest operating costs for a water utility. By repairing leaks a utility can save a lot of money by reducing the amount of water it has to pump. In some states, drought and water shortage or scarcity have been important drivers of states' water audit requirements and programs.

Benefits to a Water Utility

Why would a utility manager want to do these water audits? He or she is probably thinking “Everything is fine with my system. I do some leak detection, most customers pay their bills and water quality is good. I have a lot of other stuff to do besides these water audits.” Well, sometimes you don't really know how your system is running until you drill down and take a closer look. Do you have a meter testing program? How about leak detection? Do you know how much water is lost in hydrant testing or main breaks? Doing an AWWA water audit will help a manager better understand all of these things and more. You may be surprised at what you find and that you suddenly have the data and information to justify programs that will reduce your leaks and increase revenue. Water audits are the first step in developing a comprehensive water loss control program that will yield multiple benefits over time. Here are a few benefits to implementing a water audits loss control program:

- Save water and energy. Water audits can guide leak detection and repair. Utilities pump less water when they reduce leaks resulting in energy and money savings.
- Recover lost revenue. Water audits can inform meter testing and replacement programs. Inaccurate meters usually run slower resulting in undercharging your customer. By replacing or repairing faulty customer meters, a utility can recover revenue that was previously lost.
- Defer new source development. Successful leak detection and repair can recover a large volume of leakage and reduce overall water demand. This may help to delay new source development until a later time.
- Become a steward of a precious resource. Utilities that proactively manage their system demonstrate leadership in the community and responsibility for protecting our most precious natural resource.

Why is Commission Doing This?

Public water systems (PWS) statewide deliver an estimated 250+ million gallons per day of potable water, about 90% of which is supplied by wells. It is an established fact that all drinking water systems have leaks, many of which go undetected. We estimate that very few drinking water utilities in Hawaii conduct AWWA water audits.

In 2015 the Commission began a targeted pilot program to train 15 Public Utilities Commission-regulated PWS on the AWWA methodology of water loss audits (at no cost to the PWS). This voluntary pilot program was comprised of three phases including an on-site system assessment by an expert contractor. This program was well received and successful in training on the concepts of water loss audits, use of the AWWA free water audit software, and making recommendations for the utilities to improve their data validity scores and to address water losses. A post-program survey of the participants showed that most of them had a positive learning experience and all respondents would recommend the program to other utilities. This pilot program demonstrated great potential for utilities to reduce real (and apparent) losses, which would realize immediate water savings and energy savings. There is a huge opportunity statewide for utilities to begin to assess the condition of their water systems based on input and output volumes using a standardized and industry accepted methodology.

The Commission's pilot program yielded very interesting results and I would like to share just a couple of important discoveries regarding potential costs that could be recovered by utilities. Figure 1 shows the annual cost of apparent losses per connection for the 10 PWS (labeled A through J) covered under the Commission's pilot water audit program. Note that this is mainly caused by customer meter error (under-registration) where water is valued at the retail rate. There is quite a large range of annual cost, but this is something that every utility should evaluate for themselves.

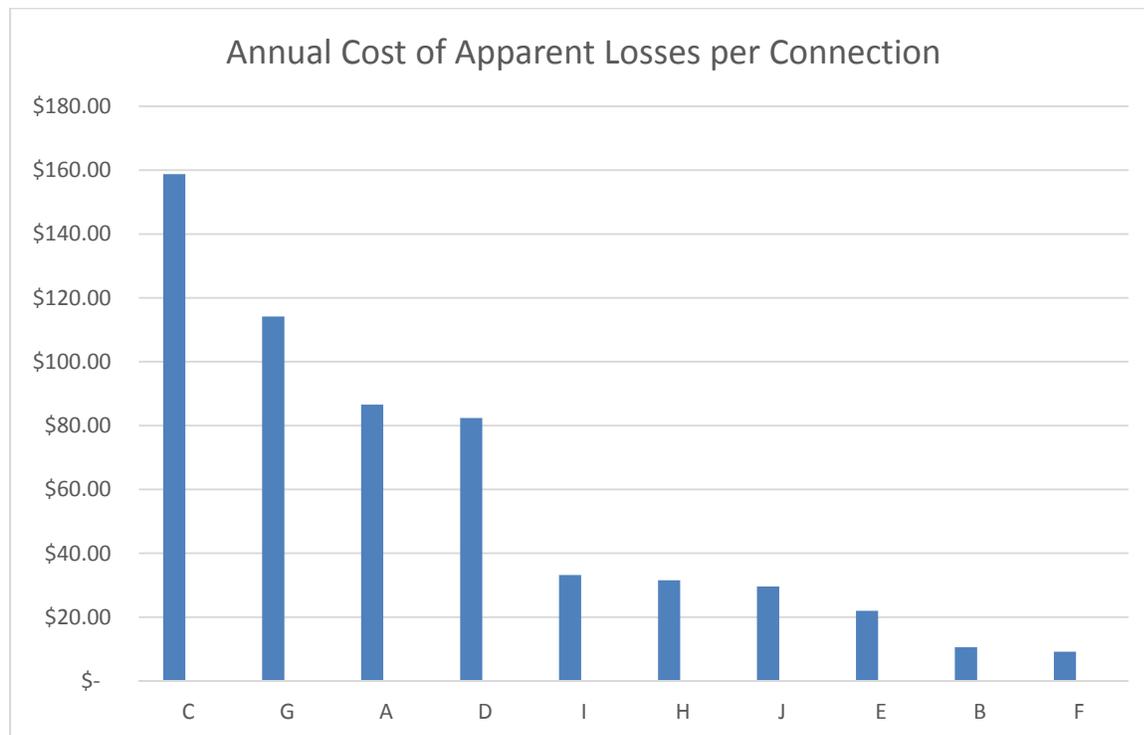


Figure 1. Source: *Training Workshop and Technical Assistance Program on AWWA Water Audit Methodology and Loss Control for PUC-Regulated Public Water Systems, Summary Report, 2016, CWRM*

Figure 2 shows the annual cost of real losses per mile of main. These are mainly a result of physical leaks and the water lost is valued at the wholesale or variable production cost of producing the water. Once again there is a large range of potential savings if leaks are addressed (note that the lighter colored bars indicate that these utilities [A and B] are classified as urban, while the others are rural).

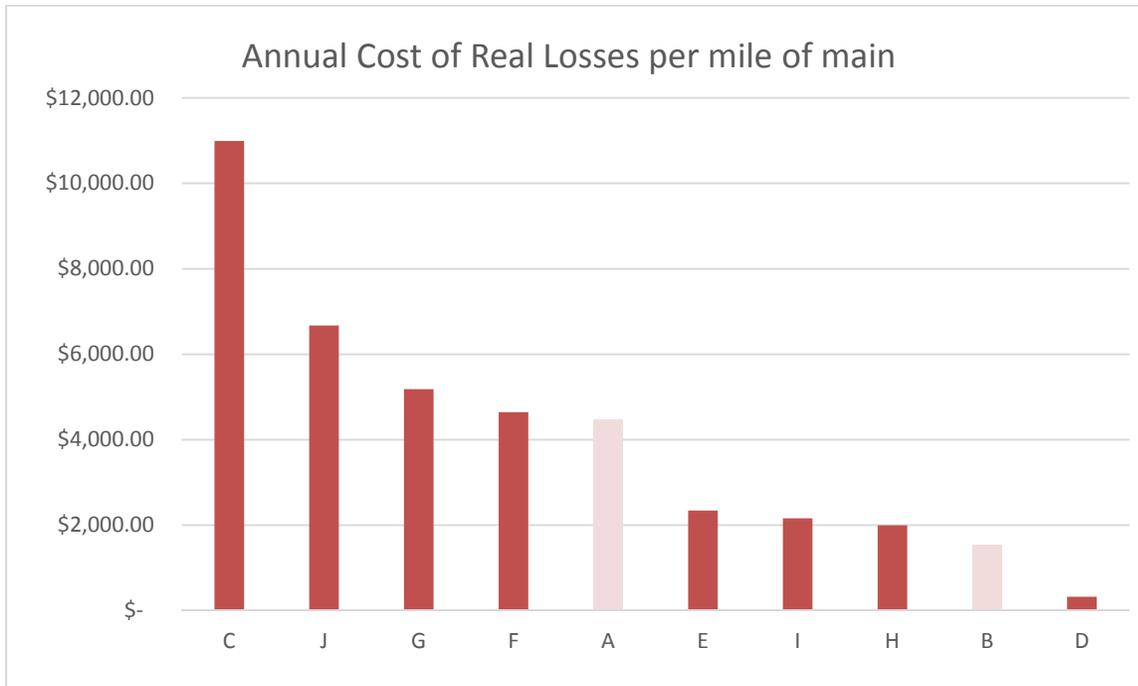


Figure 2. Source: *Training Workshop and Technical Assistance Program on AWWA Water Audit Methodology and Loss Control for PUC-Regulated Public Water Systems, Summary Report, 2016, CWRM*

As mentioned above, Act 169 requires the Commission to develop and implement a water audit program while providing technical assistance to the affected utilities. The county-owned public water systems are required to submit annual water audits to the Commission beginning July 1, 2018. The remaining public water systems serving a population of 1000 or more and public water systems in water management areas are required to submit annual water audits to the Commission beginning July 1, 2020. Hawaii Legislature authorized federal and private funding for this program, so the technical assistance and training will be provided free of charge to the utilities. Please visit the Hawaii State Legislature website to download and read the entire Act (http://www.capitol.hawaii.gov/session2016/bills/GM1271_.PDF).

How Will the Commission Implement This Program?

The Commission aims to partner with the Hawaii Department of Health and other organizations to form a collaborative water loss control committee to help guide the program. These organizations may include federal, state and county agencies, water supply utilities, water utility professionals, water loss control experts, Hawaii Rural Water Association, Rural Community Assistance Corporation and the American Water Works Association-Hawaii Section.

The Commission will hire a consultant to assist us with the water audit technical assistance and training program/project. We envision the project would be done in two phases. The first phase will focus on the county-owned utilities and the second phase will cover the remaining utilities. The Commission will

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host hands-on water audit workshops on each island followed by individual web meetings with each utility. A second workshop will address data validation, which will be again followed by a web meeting. By the end of this training, each utility will be able to complete an AWWA water audit for each of their public water systems and submit them to the Commission on an annual basis. We plan to start on this project in early 2017 and complete it by July 2020, when the second phase of water audits is due to the Commission.

In the upcoming months the Commission will continue to perform outreach and education on this new program leading up to the first water audit workshops in early 2017. Affected utilities will receive timely invitations to the workshops with detailed program information and schedule.

FAQ

How many PWS are affected by Act 169?

Approximately 103 PWS on all islands will need to complete water audits. This is 76% of the PWS delivering 90% of the state's drinking water.

Who needs to submit AWWA water audits to the Commission?

All county-owned PWS, PWS serving a population of 1000 or more, and PWS operating in a designated water management area are required to submit annual validated water audits to the Commission. County-owned PWS water audits are due July 1, 2018. Water audits from PWS serving a population of 1000 or more and PWS operating in a water management area are due July 1, 2020.

What is a water management area?

The Commission has designated ground and surface water management areas where the water resources are threatened or where there are serious disputes. Additional management measures are required in these areas to protect the water resources. Current ground water management areas include all of Oahu except Waianae aquifer sector, all of Molokai and the Iao aquifer system system on Maui. Only Maui has surface water management areas, which encompass the Na Wai Eha region. This includes the Waihee, Waiehu, Iao and Waikapu surface water hydrologic units. Water use permits are required in all water management areas.

Who should attend the free training?

Suggested organizational units that should be represented include administration, operations, and finance/billing. Water system administrators and program managers responsible for source metering programs and customer metering/billing programs should attend in particular.

We sincerely hope that this brief program summary will help utilities begin to understand the importance and usefulness of AWWA water audits. We also hope that this will give you an idea of the legislative requirements, program elements and timing of the program delivery. Please contact Neal Fujii at 808-587-0264 if you have any questions.