

The Economic Impact of Oklahoma's Water Loss Auditing and Control Program

July 2021



“The impact of the water loss audit program on communities throughout the state has been tremendous. The completed audits have resulted in millions of dollars in savings, and considering many Oklahoma towns face budgetary challenges, the ability to identify financial savings is critical to continued growth and the protection of public health. The work done by the Alliance is crucial in helping Oklahoma on its path to becoming a Top Ten State.”

– Shellie Chard, DEQ Director of Water Quality

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“The success of the water loss audit program demonstrates just how important the Alliance with the Oklahoma Rural Water Association, the Oklahoma Municipal League, and the Governor and state agencies has become. I believe that we have only scratched the surface of the improvements and assistance we can provide across the entire state by helping these public water systems save energy, waste and money.”

– Ken Wagner, Oklahoma Secretary of Energy and Environment

About Water Losses

There are two categories of water losses – apparent water losses and real water losses.

Apparent water losses represent non-revenue water resulting from water theft, billing errors, and water meters registering inaccurate water usage. Usually, as water meters age, they become less accurate and favor the consumer rather than the water system. By minimizing the apparent water losses, a water system can generate more revenue, which can be utilized to repair leaks and improve the system. Among the 35.375 billion gallons of water supplied by the water systems audited by DEQ, 2.2% of that water (783 million gallons) is classified as apparent water loss.

Real water losses represent physical water losses through leaks. By repairing these leaks, the water system saves on water purchases, places less stress on its water supply, and reduces its operating costs including energy, water treatment, and maintenance costs. Real water losses represent a much larger percentage of the supplied water. More than one-in-five gallons (21.9% or 7.748 billion gallons) is lost to water leaks in the water systems that DEQ has audited.

While the cost to produce water is relatively cheap, with one dollar able to treat nearly 700 gallons of water, the costs add up. Total

variable production costs equal \$51.257 million to produce 35.376 billion gallons of water among the systems audited by DEQ. This means that water systems spend more than \$11.226 million to treat water that does not reach a water meter. These real losses also represent non-revenue water, and while the costs are not billed to any one customer, they are costs that end up being distributed across the whole system.

Water Loss and System Sustainability

Water system sustainability is directly tied to a water system's ability to plan for, achieve, and maintain the production of safe and affordable drinking water. Maintaining sustainable operations is crucial to supporting positive health and economic outcomes for water system customers and society at large. With the recent drought and ever tightening budgets significantly impacting the state's water systems, sustainability has become a primary concern. Water loss auditing is rapidly becoming one of the most effective tools in DEQ's capacity development toolkit for addressing this concern by promoting efficient use of water system resources.

Water systems that begin regular water loss auditing and start a program of addressing water loss can enhance their sustainability by:

Delaying or eliminating the need to develop additional sources of water – a water system may be able to delay the costly development of new water sources and can serve additional customers with the water sources at hand.

Increasing Revenue Collections – addressing water loss can help a system recover revenue lost through under-registering meters, theft, and by reducing operations and repair costs.

Improving System Operations – reducing water loss can also improve system operations by helping to increase operator knowledge of the distribution system, reducing service outages and the potential for cross-contamination.

Improving System Integrity – implementing a water loss program can improve system data accuracy and integrity by finding and correcting problems with metering, record keeping, and data management.

In making a water system aware of its water loss problems, giving it the information system personnel need to solve them, and demonstrating how to mitigate those problems to save water and money, DEQ is working to enhancing sustainability and helping to create water systems that are more resilient to natural disasters, climate change, and anything else that may impact them.

Sources of Water Demand

By using GIS as a tool, the system boundary maps from the Oklahoma Water Resources Board as an identifier, and the Quarterly Census of Employment & Wages (QCEW) from the Oklahoma Employment Security Commission as a data source, we can identify the employers located within the boundaries of the 165 unique water systems for which the Capacity Development Section has performed a water loss audit.

In total, there are 18,443 employing establishments operating in the 165 water districts. These employers include every major sector of the economy and represent private sector and government sector employers. These establishments employ 249,692 Oklahomans and have total payroll in excess of \$12.929 billion/year.

Table 1: Business Establishments, Jobs and Payroll by Region

Region	Water Systems	Number of Employers	Number of Jobs	Payroll (in billions)
Eastern Oklahoma	82	4,438	61,968	\$2.241
Central/OKC Region	14	5,434	64,338	\$2.912
Tulsa Region	26	5,254	60,439	\$2.666
Western Oklahoma	43	3,317	62,947	\$5.109
Grand Total	165	18,443	249,692	\$12.929

These 18,443 establishments represent commercial and industrial water users. Households also place demands on the water systems. Given that there are 368,967 active and inactive connections in total among these 165 water systems, there are 350,524 other connections for households and other users.

Unfortunately, information was not available regarding the number of these connections that are households, the number of duplicate meters serving the same customer, the number of meters for public parks, athletic fields, etc. It is also not known how many of the households in the geographic area utilize well water or other sources of water besides the water system for which they may happen to reside. To be conservative, assuming only two-thirds of the 350,524 connections are active connections associated with households, then there would be 584,000 Oklahomans depending on water from these systems.

There is an economic value of water when companies utilize it in their operations. Furthermore, water is a factor of production that contributes to the value-added activities of these companies. The number of business establishments and the estimated households demonstrate water usage for the systems that have had a water loss audit, and this information was used to apportion the cost savings for real water losses.

The Health Effects of Unsafe Drinking Water and Chronic Dehydration

The Environmental Protection Agency has reported that contamination of public water supplies via water main breaks is a significant source of risk for water system contamination. Issues such as pathogen contamination, harmful chemical intrusion, and exposure to excess disinfectant residual (from line repairs) can have negative health impacts on water system customers. The Center for Disease Control estimates that in the United States, 1 in 44 people get sick from waterborne disease each year, and calculated that in 2014, direct healthcare costs from illnesses associated with waterborne diseases were \$3.33 billion, nationally.

Having unreliable or sporadic access to safe drinking water can lead to chronic dehydration. The consequences of chronic dehydration can vary, causing symptoms anywhere from nausea and headaches to decreased kidney function, hypertension, intestinal failure, and dementia. When left untreated this condition requires emergency medical assistance for recovery.

Safe drinking water is compromised by leaks in water systems, and some systems that have had contamination related to real water losses have been required to instruct customers to boil water prior to consumption. Left unaddressed, this can lead to adverse health effects, which in turn, reduces economic productivity and increases consumer and business costs.

This loss in productivity and increased costs would have a negative economic impact. Hence, it is in the best interest of water systems to address the water losses identified by the Capacity Development Section.

Economic Impact Methodology

The two primary variables to measure the potential economic impact of the Capacity Development Section's water loss audits are the costs and forgone revenues of (1) apparent and (2) real losses of water.

Since apparent losses reflect forgone revenue, the retail value of the apparent water losses is used in the model. If these apparent water losses are reduced, then the water system would capture more of the revenue associated with the water it produces.

If this revenue were captured, it would improve the financial position of the water systems by recovering lost revenues from undercharged customers or by charging those customers that are using water, but are not paying for it. This increase in revenue then provides resources for fixing real losses, upgrading metering systems, and reduces the costs to existing customers.

The retail value of apparent water losses used in the model totals \$5,044,661/year across all systems and is entered as a revenue variable to water utilities.

Real water losses represent costs to the water systems, and ultimately, costs to the water systems become the costs to the rate payers. Water that is purchased or drawn from the water source is then treated, utilizes power and chemicals to treat and produce the water and also has system maintenance costs attributed to it. All of these costs are variable costs. By ensuring more of the produced water reaches meters, water systems can reduce their variable costs to the system and pass those reduced costs on to their rate payers.

The variable cost of produced water that has been leaked out of the audited water system totals \$11,226,208. If water systems repair leaks, these are costs that the rate payers would not have to bear. These are potential savings distributed across all 374,572 customers and represents the second input to enter the model.



Analyzing apparent and real water loss data is the most direct route to measuring the potential economic impact of the Capacity Development Section's water loss auditing work. However, there are other benefits to water loss audits, and they could have been utilized in an economic impact analysis if monetary values could have been placed on them. For example:

- Water loss audits improve water resource utilization. With improved utilization of existing resources, water systems are saved the costs resulting from acquiring additional water rights, constructing reservoirs, adding additional infrastructure, etc. These are all avoided or deferred costs. These costs are highly variable and can range from a few million dollars to hundreds of millions of dollars depending on the size, location and source of water.
- Water loss audits reduce impacts on the environment and recreation industries. There are other uses for water besides consumption. When water systems repair leaks, more water is left at the source for use by wildlife and migratory animals, and there is an environmental benefit for doing so. Additionally, when water systems repair leaks, more water is left at the source for the recreational enjoyment of our fellow citizens who fish, hunt, boat and swim on or near bodies of water. These alternative uses for water can have an economic impact as well if a value were associated with alternative uses of water in these activities.
- Water loss audits improve data integrity and revenues. Water systems that are efficient and can account for the water used in their systems have data integrity. This ensures the accuracy of water usage, which leads to better resource management and permits better long-term planning. This in turn could impact the borrowing rates available to a water system.
- Water loss audits improve system knowledge. By knowing which areas are prone to leaks and the water system's producing and distribution assets, a system's operators can more quickly fix water leaks, which reduces disruption to customers, prevents damage to property and safeguards public health. These are all avoided costs or system reliability factors that could be utilized in an economic impact analysis with more data.

This economic impact report limits the measurement of economic impacts to utilizing real and apparent water losses. It is the most straight-forward approach to measuring the economic impact of the Capacity Development Section's water loss auditing work. And while the previously mentioned benefits to water loss audits could have been utilized, this direct approach avoids associating monetary values to variables that can fluctuate greatly, are highly dependent on the unique circumstances of a water system, and may not be rational when scaling to 165 water systems. Ultimately, the resulting economic impacts will be more conservative when limiting the model's inputs to real and apparent water losses.

A four-region REMI economic impact model for Oklahoma was used to estimate the economic impacts of this program. As previously mentioned, there are two primary variables. They were (1) apparent water losses totaling \$5,044,661/year, and (2) real water losses totaling \$11,226,208/year. These values were proportionally distributed and entered into the model based on region of the water system, and the distribution accounted for the household, commercial or industrial demand sources for the water. So that, when accounting for these specific geographies and demand sources, the actual number of variables in the model totaled 272 variables.

The real and apparent water losses were distributed among the four regions as illustrated in the below table using the Capacity Development Section's measurements for each of the systems. The apparent water losses were then allocated to utility revenue in each of the regions, and the real water losses were then allocated to household, commercial and industrial sectors as reduced costs in each of the regions.

Table 2: Real and Apparent Losses by Region

Region	Annual Real Loss Variable Production Costs	Annual Apparent Loss Cost (retail cost/yr.)	Total Loss Costs
Eastern Oklahoma	\$4,720,974	\$1,887,277	\$6,608,251
Central/OKC Region	\$3,528,374	\$944,300	\$4,472,674
Tulsa Region	\$2,087,493	\$1,323,824	\$3,411,317
Western Oklahoma	\$889,367	\$889,261	\$1,778,628
Grand Total	\$11,226,208	\$5,044,661	\$16,270,869

Economic Impact Results

The first step in realizing the full economic impact of this program is to measure the size and scope of water losses. This has been accomplished in many of the water systems across the state. When fully addressed, reducing the size of apparent and real water losses has a sizeable impact upon the economy.

“A reliable water source is the first step to providing and promoting economic growth. Together the partners of the Oklahoma Strategic Alliance are working to create a more sustainable water and wastewater system across Oklahoma, allowing for more growth statewide. Throughout the past year, we’ve seen that for every \$1 invested into the water and wastewater industry provides an even greater return on that investment, which is directly correlated to conducting water loss audits on Oklahoma systems, conserving resources, and therefore allowing economic growth.”

– Jimmy Seago, ORWA Deputy CEO

Realizing additional revenues and saving costs enables the water systems to be more efficient, which enables them to reinvest in their systems and lower operational costs. With lower operational costs, rate payers will benefit and households and businesses will retain income. Retaining more income allows households and businesses to spend and/or save it for use in operations and consequently invest more in the economy. These impacts may be seen in Gross Domestic Product and Real Disposable Income.

Gross Domestic Product (GDP) impacts average \$16.7 million/year through 2025 in the state’s economy. The impacts are distributed by region based on the relative composition of the regional economies and the water loss audit measurements from the Capacity Development Section. GDP represents value added economic activity and measures the value of new activity in the regional and state economies.

Table 3: Gross Domestic Product (GDP) Impacts by Region

Region	2021	2022	2023	2024	2025
Eastern Oklahoma	\$5,256,900	\$5,426,100	\$5,440,900	\$5,402,900	\$5,345,700
Central/OKC Region	\$5,034,000	\$5,202,500	\$5,202,700	\$5,150,800	\$5,081,500
Tulsa Region	\$4,702,000	\$4,751,700	\$4,653,800	\$4,518,000	\$4,370,800
Western Oklahoma	\$1,631,200	\$1,649,000	\$1,635,700	\$1,612,000	\$1,586,400
Grand Total	\$16,624,100	\$17,029,300	\$16,933,100	\$16,683,700	\$16,384,400

Total output, which is the value of sales in the economy, is generally about 80% higher than GDP and averages \$30.6 million per year. Since GDP reflects value-added activity occurring within the region, it is more reflective of the impacts of new economic activity in the region.

Disposable Personal Income represents income that can be saved or spent in the economy. It averages \$12.1 million per year through 2025.

Table 4: Disposable Personal Income Impacts by Region

Region	2021	2022	2023	2024	2025
Eastern Oklahoma	\$2,781,400	\$3,171,100	\$3,471,500	\$3,729,000	\$3,990,400
Central/OKC Region	\$3,124,500	\$3,461,900	\$3,669,900	\$3,825,800	\$3,977,400
Tulsa Region	\$3,609,200	\$4,011,900	\$4,250,600	\$4,420,000	\$4,569,800
Western Oklahoma	\$763,800	\$842,500	\$894,100	\$934,100	\$976,700
Grand Total	\$10,278,900	\$11,487,400	\$12,286,100	\$12,908,900	\$13,514,300

Western Oklahoma, with 43 systems, may have smaller impacts, but the size of their losses are lower as well. It may be that the relative scarcity of water in western Oklahoma compared to the other regions has encouraged them to implement more water savings measures.

Return on Investment

“I am proud of the many accomplishments of the water loss audit program. Through the partnerships formed by the Oklahoma Strategic Alliance, it has been possible to not only identify water loss issues in many Oklahoma communities but also find ways to fix those problems resulting in significant financial and water savings. These efforts positively affect Oklahoma’s environment, economy, and growth potential.”

– Scott Thompson, DEQ Executive Director

The state invests \$491,417/year in the Capacity Development Section’s work to perform water loss audits (\$116,417/year, or 11% of the budget) and provide funds for leak detection (\$375,000/year, or 89% of the budget) for water systems across the state. This budget allows DEQ to offer the water loss audits at no cost to Oklahoma’s water systems and to provide resources identifying the sources of the leaks. Water systems could hire a company to perform the audits, but there would be sizeable costs to the water system, which places an additional burden on their resources.

There are different methods to measure Return on Investment (ROI) of the state’s investment in the Capacity Development Section’s water loss auditing work. Two methods relate economic activity per budgeted dollar when water systems address water losses. These economic measures of ROI include the amount of value-added activity generated per budgeted dollar, and economic output per budgeted dollar. An alternative, and more direct ROI, relates the state tax dollars anticipated to be generated per budgeted dollar.

Addressing economic ROI measures first, the Capacity Development Section 2021 ROI for this program would be \$5.64 returned in value-added GDP for every budgeted dollar assuming the water systems address water losses. This utilizes the Water Quality Division cumulative six-year budget from 2015-2021. Every subsequent year results in higher economic ROIs assuming a static budget and similar annual activity, and by 2023, the ROI increases to \$12.87 in value-added GDP for every \$1 spent. These cumulative ROI measures indicate the economic activity that can be generated from performing the water loss audits, leak detections and then acting on the information.

As a fiscal ROI, anticipated State Taxes generated from economic activity is presented in the table below and increase from \$458,000 in 2021 to \$599,000 in 2025. The annual ROI comparing state tax revenue generated per dollar of budget starts low at 0.93 but for every year that water systems utilize the Water Quality Division it increases to show positive returns to \$1.22 in in 2025.

Table 5: Anticipated State Tax Generated

Region	2021	2022	2023	2024	2025
Eastern Oklahoma	\$124,686	\$141,724	\$154,951	\$166,177	\$177,518
Central/OKC Region	\$139,017	\$153,727	\$162,865	\$169,609	\$176,128
Tulsa Region	\$160,553	\$178,108	\$188,581	\$195,880	\$202,279
Western Oklahoma	\$34,058	\$37,476	\$39,735	\$41,457	\$43,284
Grand Total	\$458,313	\$511,035	\$546,131	\$573,122	\$599,208

When including local taxes, the fiscal ROI is even greater. Anticipated local taxes generated from economic activity increase from \$231,000 in 2021 to \$304,000 in 2025. If combined with anticipated state taxes, the ROI is \$1.4 in 2021 and \$1.84 in 2025.

Success Stories

- Across the state, many water districts have addressed water loss, resulting in significant savings for these communities both in terms of produced water and overall budget.

Creek RWD #2

Creek County Rural Water District (RWD) #2 is a small water system near Jenks that serves around 5,213 connections. In October of 2018, Creek County RWD #2 contacted ODEQ, expressing interest in having a water loss audit conducted and in participating in the associated leak detection technical assistance program that is offered by ORWA. ODEQ conducted the water loss audit in October 2018, auditing each of the four systems that form the water system. The audits indicated that real loss levels were at an average of 16.8%, with a yearly loss of 109.7 MG/yr., valued at \$194,917 (at production cost).

To address this, Creek County RWD #2 met with ORWA in early 2019 and received technical assistance and training focused on leak detection. Over several weeks, 25 leaks were identified and plans were made for their repair.

During the course of the training, Creek County RWD#2 adopted a proactive approach to reducing water loss, using several tools and methods simultaneously. They have

coupled active leak detection with their GIS mapping software, which presents leakage and infrastructure data in a way that contributes to successful and effective asset management. They have likewise installed a data logger system with telemetry that provides precise information on distribution system performance and leakage location to the system office, and have invested in an advanced ground microphone to locate leaks in the field.

Combining telemetry and remote sensing with boots-on-the-ground leak detection has proven to be a potent combination for reducing water loss. Looking forward, they have recently approved the installation of in-line flow meters that will make this combined approach to water loss control even more effective.

Using the tools and techniques mentioned above, Creek County RWD #2 has worked steadily to repair the leaks. Fifteen major leaks have been pinpointed and repaired so far, with plans made to address the remaining 10. The latest water loss audit results showed that the system had a real loss level of around 5.7%, indicating that over 25 million gallons of treated, potable water



had been saved in five months, at a savings of \$137,000 for the water system's budget (based on retail cost).

Reducing loss from 16.8% to 5.7%, and saving 25 million gallons of drinking water, is substantial. Over the five-month timeframe, the 25 million gallons of water saved would have been enough to supply 625 three-bedroom homes. That water formerly lost to leaks is now remaining in either Creek County RWD #2's distribution system for use by their customers, with the wholesale systems that sell water to Creek County RWD #2, or remains in the original source waters to the benefit of everyone.

Part of Creek County RWD#2's success in controlling loss is in realizing that water loss must be regularly tracked in order to determine the effectiveness of leak control solutions. Consistent tracking of water loss leads to faster response to leaks, more effective system management, and an improved financial condition.

Wagoner RWD #5

Wagoner County RWD #5 is a small water system near Coweta that serves around 4,200 connections. In January of 2019, Wagoner County RWD #5 contacted ODEQ, expressing interest in having a water loss audit conducted and participating in the associated leak detection technical assistance program offered by ORWA. ODEQ conducted the water loss audit in early February.

The audits indicated that real loss levels were at an average of 16.0%, with a yearly loss of 45.213 MG/year, valued at \$70,260 (at production cost). To address the loss identified in the Water Loss Audit, Wagoner County RWD #5 met with ORWA and conducted technical assistance and training focused on leak detection in December of 2020. Over several weeks, 25 leaks were identified. Wagoner County RWD #5 worked with ORWA to repair these leaks as they were discovered and had equipment and crews standing by to repair the leaks as ORWA identified them.

For the leaks that could not be repaired right away, Wagoner County RWD #5 took a proactive

approach. Using the tools and techniques provided by ORWA, Wagoner County RWD #5 has worked steadily to repair these difficult-to-locate leaks. Twelve major leaks have been pinpointed and repaired so far, with plans to address the remaining 13.

The 12 leaks repaired have saved Wagoner County RWD #5 134.7872 MG/yr. and \$748,088/year (valued at production cost). The work that Wagoner County RWD #5 has done is the equivalent of saving almost a month of water usage for the entire system from being lost. That water, formerly lost to leaks, is now remaining in either Wagoner County RWD #5's distribution system for use by their customers, with the purchase systems that buy water from Wagoner County RWD #5, or remains in the original source waters to the benefit of everyone.

This project's success was primarily due to the staff of Wagoner County RWD #5 and their positive attitude and behaviors towards addressing loss. The water system regularly addresses water loss issues, and they have assigned a staff member whose primary duty is locating and repairing leaks. Additionally, the system is also working to install more isolation valves and in-line meters. These actions will help the staff target and repair leaks more effectively in the future.

Eufaula

The Eufaula Public Water Supply is a small municipal water system serving approximately 4,617 residents in McIntosh County that treats and supplies water drawn from Lake Eufaula. Eufaula joined the water loss auditing and control program in 2018, and had an audit performed during January of that year. That first audit found real loss levels of 127.7 MG/year, at an annual cost of \$64,271. This level of loss represented 11.2% of all water supplied to the system.

Eufaula entered into the ODEQ/ORWA leak detection program in March of 2018, and 12 were discovered; one of which was buried in the middle of the embankment of a large, four-lane highway overpass. Two of the leaks were immediately repaired, with plans made to address the other 10.

A follow-up water loss audit was conducted in November of 2018 as part of a comprehensive performance evaluation. The follow-up audit indicated that real loss had dropped to 77.8 MG/yr., a 39% reduction from the January value. The new real loss level was 9.6% of total water supplied to the system, and was valued at \$76,593. Of particular note is that the value of real loss found by the follow-up audit was 16% higher than the value determined earlier, primarily due to a substantial increase in the variable production cost of water. Without successful leak detection and repair, the financial impact to the town would have been much higher.

Grady RWD #6

Grady County RWD #6 is a public water supply system in Amber, Oklahoma serving about 2,000 connections with 475 miles of water main lines. In 2016 they completed a water loss audit with DEQ. The audit found real loss levels of 42 MG/year at an annual cost of \$334,529 per year (valued at variable production cost). This level of loss represented 29% of all water supplied to the system.

One year later, Grady County RWD #6 began leak detection work with ORWA to address the water loss identified by the audit. The leak detection process took about two months to complete as everyone worked together to identify the leaks.

During the leak detection training, the water system staff adopted a proactive approach to reducing water loss. It was realized that there were many small leaks scattered throughout the system making it difficult to isolate leaks. They decided to create zones that are tracked with in-line meters to monitor the amount of water supplied to each zone. Where line meters could not be used a bypass meter was installed to check water flow into an area after a loop was shut off. Line meters are read daily and the values calculated to determine the amount of loss in each zone. To help create zones in the system, they used the systems map to color code different areas to better differentiate sections of the water system.

A follow up water loss audit was completed in

2020 with DEQ and showed real loss levels down to 23MG/year and water loss percentage down to 17% at an annual cost of \$21,748. Leak detection work has saved the system \$312,781 per year. With the money saved from leak detection work, the system was able to recently upgrade their meters to an AMR system, providing more accurate meter readings.

Roger Mills RWD #2 (Red Star)

The Red Star Water District (Roger Mills RWD #2) is a small water system that serves around 1,100 connects near the community of Leedey, Oklahoma. The district had a water loss audit completed with the DEQ in March of 2019, which found real loss levels of 28.9 MG/yr., valued at \$71,962 and representing 25.2% of total water supplied to the system. Red Star was losing revenue quickly and decided to take advantage of ORWA's leak detection program.

Red Star decided to work with ORWA for leak detection work in late September of 2019. The system staff worked with ORWA and located 29 leaks throughout the system. The water system adopted an aggressive program of leak repair, and was able to repair all 29 leaks. Repairing the leaks saved the system 26 million gallons of water per year at a value of \$71,000 annually.

In addition, the water system made further changes based on the suggestions of the leak detection crew, including eliminating the existing policy of customers self-reading meters on a yearly basis and allowing non-metered pasture taps. The system has now metered every connection and is in the process of installing an AMR system to eliminate meter reading discrepancies and failures and is creating a more accurate map to document every line and connection.

After repairing all leaks, Red Star also became a participant in the Long Range Sustainability Plan with ORWA and DEQ. They had many analyses performed including a rate analysis, leak detection, a hydraulic analysis and an asset management study to help ensure the economic sustainability of the system.



Atoka RWD #3

Atoka RWD #3 is a small public water supply serving around 1,500 people near Caddo, Oklahoma. The small system knew it had problems with high levels of water loss which were draining the system of both water and revenue. In 2015, the system agreed to become a volunteer in DEQ's water loss auditing pilot project, receiving a water loss audit in August of that year.

The initial audit indicated that the system was laboring under a real loss level of 18.637 MG/yr., which was 35.7% of the total water supplied. The water system had borne the cost of this loss for so long that the system had exhausted its financial reserves and was contemplating a significant rate hike just to survive. The results of the audit indicated that active leak detection would be beneficial, and the system agreed to work with ORWA to receive technical assistance and training in that regard. The leak detection training was provided to the system free-of-charge via a contract funded by the 10% set-aside from the DWSRF co-managed by DEQ and OWRB.

Atoka RWD #3 began active leak detection work with ORWA in early 2017. The system staff worked with the ORWA leak detection staff for three weeks, locating (and replacing when necessary) isolation valves, installing in-line meters to conduct zone metering, and acoustically/physically locating

leaks. At the completion of the leak detection work, 10 leaks were located and 2 were immediately repaired, saving the system 13.14 MG/yr. at a value of \$26,280 per year. This repair work will delay the need for the water system to drill new wells or seek other sources of water and will allow it to serve more customers using existing infrastructure and capacity.

A follow-up water loss audit conducted in 2017 indicated that real loss levels two years after the leak detection technical assistance were significantly lower what they were in 2014, at 23% of production. Furthermore, the system staff began self-monitoring water loss and conducting active leak detection using the methods learned from DEQ and ORWA, and by mid-2018, were reporting real loss levels that were down to an astounding 2% of supply. This represents a savings of over 18.2 million gallons of water and \$36,528 in revenue per year, every year, from 2015, as measured by AWWA M36 water loss audits.

The water system's financial position has significantly improved since 2015, going from virtual bankruptcy to having a well-funding budget and contingency fund. All of these things contribute to increasing the water system's sustainability, ensuring that the customers of Atoka RWD #3 will have a safe and affordable supply of water from now into the future.

Summary

- Since 2015, the Capacity Development Section of the Oklahoma Department of Environmental Quality (DEQ) has:

Performed 211 free water loss audits for 165 unique water systems across the state

Identified 9.9 billion gallons of water loss in total from the water loss audits

The combined water loss could supply a population of over 286,000 people per year – a population equivalent to the size of Cleveland County.

\$11.23M Water systems spend more than \$11.23 million to treat water that does not reach a water meter.

TYPES OF WATER LOSS

Apparent water loss

Represents non-revenue water resulting from water theft, billing errors and water meters registering inaccurate water usage. Among the water supplied by the water systems audited by DEQ, 783 million gallons (2.2%) is classified as apparent water loss.

Real water losses

Represents physical water losses through leaks and are a much larger percentage of the supplied water. More than one-in-five gallons (21.9% or 7.748 billion gallons) is lost to water leaks in the water systems that DEQ has audited.

THE COSTS OF WATER LOSS

If two-thirds of the connections in the audited area are active household connections, there would be 584,000 Oklahomans depending on water from these systems.

WATER IS A BUSINESS COST

165 WATER DISTRICTS There are 18,443 business establishments in these districts employing 249,692 people with annual payroll totaling \$12.929 billion.

When water districts address water losses identified through the Water Loss Audits, there is a substantial economic impact on businesses operating in the region

- Gross Domestic Product (GDP) impact: \$16.7 million average/year through 2025
- Total output (value of sales in the economy): \$30.6 million (about 80% higher than GDP)
- Disposable personal income impact: \$12.1 million/year through 2025

Conclusion



Across the state of Oklahoma, there are 1,392 water systems.



The Capacity Development Section, working within the Water Quality Division at the Department of Environmental Quality has performed water loss audits for 11.9% of them



DEQ found water losses totaling 8.564 billion gallons of water.

If addressed, the apparent water losses would provide \$5.044 million/year in additional revenue to these 165 water systems, and the \$11.226 million/year in real water losses represent cost savings by fixing leaks in the systems.

The impacts from addressing these water losses are meaningful and average \$16.730 million in value-added activity per year between 2021 and 2025. As a cumulative impact, the total value-added economic activity sums to \$83.654 million for all of the years between 2021 and 2025 when water losses are addressed.

RETURN ON INVESTMENT

Further, the ROI measures are positive. For every dollar spent on the Capacity Development Section's water loss auditing program between 2015 and 2021, there is expected to have been an increase in state GDP of \$5.64 when water losses are addressed. These GDP impacts result from improved operational efficiencies and cost savings distributed to water customers in each of the 165 water systems across the state.

The annual tax impacts are positive. Total anticipated state taxes generated from increased economic activity is expected to grow from \$458,000 in 2021 to \$599,000 in 2025, and are estimated to sum to \$2.688 million for the 2021-2025 time period. Anticipated local taxes grow from \$231,000 in 2021 to \$304,000 in 2025. When combined, the annual tax ROI grows from \$1.40 in 2021 to \$1.84 in 2025 when water losses are addressed.



\$9.78/\$1

ROI INCREASES BY 2022



\$12.87/\$1

ROI INCREASES BY 2023



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