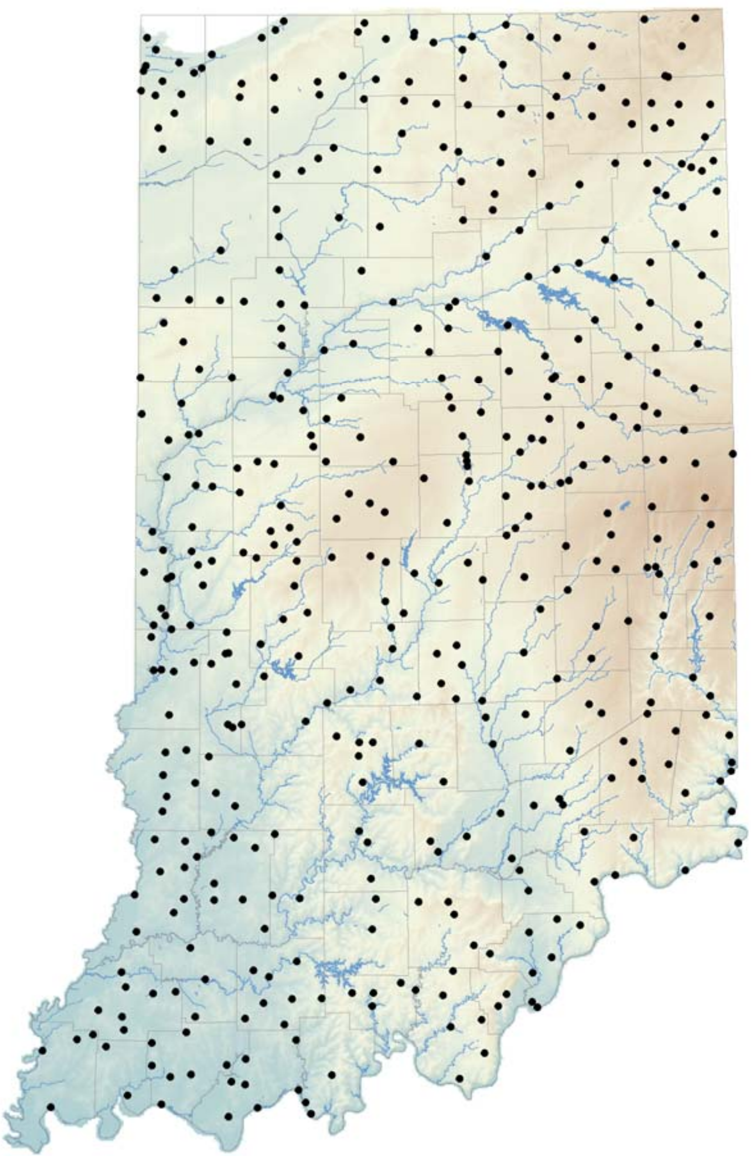
Evaluation of Indiana's Water Utilities

An analysis of the State's aging infrastructure



November 2016

Indiana Finance Authority

This report has been prepared pursuant to Senate Enrolled Act 347
for presentation to the Indiana State Legislature

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Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

Senate Enrolled Act 347 (SEA 347) was signed into law in March of 2016. The bill required the Indiana Finance Authority (IFA) to coordinate the distribution, collection, and compilation of a AWWA Water Audit (Audit) and an Infrastructure Survey (Survey) to Community Water Systems throughout Indiana (Appendix A). The process of distributing and collecting the Audit and Survey was a cooperative effort between the IFA, the Indiana Rural Water Association (IRWA), the Rural Community Assistance Program (RCAP), the Indiana Department of Environmental Management (IDEM), the American Water Works Association (AWWA), and the Alliance of Indiana Rural Water.

The IFA aided the water utilities in completing the Audits and Surveys, including on-site workshops, site visits, and numerous email and phone communications. There was 100 percent participation by the utilities completing the Audit and Survey.

The Audit and Survey were used to investigate the relationships between water loss, operational costs, and infrastructure conditions in the State of Indiana. This 2016 IFA Utility Evaluation Report represents the best available information compiled about the current status of water loss and infrastructure conditions for Indiana's Community Water Systems.

Conclusions from Data Analysis

The analysis of the Audits and Surveys revealed the following conclusions:

- Non-revenue water (NRW) amounts to over 50 billion gallons per year in Indiana.
- Too many pipes in Indiana are nearing or at the end of their useful life.
- Average NRW as a percent of the water supplied ranges from 19 to 24 percent of water supplied for each utility, and does not vary significantly with utility size.
- Some utilities reported having active and inactive connection lines that are comprised of lead.
- Customer retail unit costs (CRUC) decrease with increasing utility size.
- Costs per capita decrease sharply with increasing utility size.
- CRUC are higher in southern Indiana.

Infrastructure Costs

Infrastructure costs were estimated based upon current utility needs itemized by the IFA and from the utility responses to the Survey. The IFA used standard best practices to construct an idealized infrastructure replacement plan (Appendix D). The immediate infrastructure costs calculated by the IFA are estimated to be $2.3 billion. After the initial infrastructure upgrade to address the most critical needs, an additional $815 million is needed annually to maintain the utilities into the future. This 2016 IFA Utility Evaluation Report estimates future infrastructure costs to be much higher than previous estimates.

Recommendations

1. Fund a new infrastructure program

The funding gap identified by the Water Audit and Infrastructure Survey is much larger than previous estimates. Water utilities are doing their best to balance the growing need for pipe replacement and infrastructure repair against the need to provide safe and affordable water to their customers. In the past several decades, the federal government has had a historically minor role in financing many construction projects, as reported by the Congressional Budget Office (CBO, 2015). While the federal role could expand, it would take broad changes in the political will of the U.S. Congress. Recent work by the CBO and the Congressional Research Service (CRS, 2010) on this topic indicates that current trends and conditions make it more likely that the states need to be the primary support for utilities on this topic.

2. Prioritize replacement of old water services lines

The utilities reported they have drinking water mains that are aging and many are failing. The replacement of these water mains needs to be the focus of a special program to address their vulnerable condition.

3. Cultivate and standardize asset management

The recommended approach to managing large public assets is to develop a schedule of asset management that organizes the construction needed to maintain and extend the life of a utility system (GAO, 2013). This means that life-cycle cost becomes the basis for equipment replacement and maintenance is done prior to failure on a schedule that avoids increased risks. This is a starting point for a more comprehensive assessment of the data that can be used to map and locate the features of a system and some information about the age and condition of the pipes, valves and other components of the utility. This approach to managing assets is the modern way to maintain system value and financial integrity. Asset management needs to become the primary way that utilities operate, not doing so puts Indiana's water supply at risk and creates a competitive disadvantage.

4. Name a leader to coordinate water financing program

An important finding of the 2015 IFA Water Utility Planning Report (IFA, 2015) was that the State has many programs that are involved in water resources, water supply and the public health issues of water development, but there is no single point of contact responsible for planning or managing interagency coordination. Sustainable development can only be accomplished at a regional level. The management responsibility could be given to a water program or agency that can act as a coordinating and management board for each region. This would enable data and tools to be developed by the State, and allow regional priorities to be determined by local water users.

5. The IFA could evaluate regionalizing utilities to improve efficiency

Given the observable economies of scale in water utilities, the State of Indiana may want to consider system regionalization. Collaborative planning has already begun among neighboring utilities in some areas of the State. The data from this 2016 IFA Utility Evaluation Report suggests that larger systems improve the economic performance for customers. In spite of this, new small systems continue to be formed instead of combining assets with existing utilities where value could be added. With larger size and capacity, regional utilities add efficiencies while being more reliable and sustainable than individual community water systems. To understand the economic and practical challenges of regional systems, the Indiana Finance Authority could evaluate the technical and regulatory hurdles that may exist to regional water utility development and planning.

Next Steps

The gaps in infrastructure funding and water loss described in this 2016 IFA Utility Evaluation Report can be closed with the following actions:

State Funded Infrastructure Program - Identify a source of new funding to begin fixing the problem.

Agency Coordination - Additional Full-Time Equivalents are required in water and geology-related agencies. This work needs to be coordinated to address the most pressing problems and move towards immediate solutions.

Commission Water Availability and Demand Investigations in Priority Water Basins - Evaluate demand and availability of water resources to focus on the areas of greatest need.

State Data / Regional Authorities / Local Management - Educate the public, collect data, and create regional water authorities that use a common water resource. The State needs to support the framework for local planning and management.

1.0 INTRODUCTION

Around the country, drinking water utilities are struggling to maintain the quality of service as water mains, treatment plants, and storage tanks continue to age (GAO, 2013). One of the most difficult aspects of utility operation is investing in these long-lasting systems. Maintaining pipes and other underground assets needs to be balanced with the constant problems of improving treatment and maintaining adequate yield with new water users pumping from the same aquifers and rivers. While drinking water utility growth varies from community to community, the increase in all water uses, especially groundwater, is a national trend that is also evident in Indiana. Balancing the need for replacement of aging infrastructure against the need for new system improvements has become a serious dilemma for many utilities (ASCE, 2011). As more distribution mains in our utilities age, more treated water is lost through leakage and there may be new risks (and costs) that will be borne by the public.

In the older cities in the Midwest, the need to repair aging systems is becoming a larger issue that can have public health consequences. At the same time that many utilities are being forced to upgrade their sewer systems to improve water quality, drinking water utilities are becoming aware of the scale of the funding gap that exists to maintain their own distribution and treatment assets.

The cities in the Midwest grew rapidly in the early part of the last century so the age of pipes and the distribution of supplies reflect that history. Many utilities have reported 50 percent water loss between their wells and their customers. Leakage from these old mains has recently become urgent (IURC, 2014).

Western states have also struggled with this problem for years, but they are also battling increasingly frequent and severe drought that has threatened their water supply and severe water shortages have forced states to react. Many western states have poured millions of dollars into elaborate planning and management systems to provide some predictability for utilities and other water users.

The experience in the West can serve as a useful guide and some Midwestern states are recognizing that early planning may prevent the occurrence of similar events as those that occurred in the West.

If Indiana addresses the problem now, the cost of maintaining the system will not cause societal or economic disruption. However, even here in Indiana, some sectors of water use are growing. Over the last 10 years, irrigation has become a normal practice for row-crop agriculture in the Corn Belt. In Indiana, new irrigation systems have become the fastest growing water users that often pump from the same aquifers as the water utilities. Unfortunately, we do not know how much water these aquifers can provide or for how long.

Indiana is behind some of our neighboring states, but with action now, we could prevent problems and target our resources to the most critical areas of the State. This 2016 IFA Utility Evaluation Report summarizes data collected from Indiana's Community Water Systems, to determine: 1) the total costs of infrastructure needed within these utilities, and 2) the amount of non-revenue water produced by each system, including the amount leaking from their water mains in the distribution network. The estimate of infrastructure needs was produced with a custom survey developed by the engineering team at the Indiana Finance Authority (IFA). This group is also responsible for providing the U.S. EPA with an estimate of Indiana's infrastructure needs as part of the State Revolving Fund (SRF) loan program. The non-revenue water estimate was produced with an audit tool developed by the AWWA for Community Water Systems.

This 2016 IFA Utility Evaluation Report summarizes the results by describing how the average water losses and infrastructure needs varied by several factors, including:

- size of the utility;
- regulatory status of water rates (some have rates that are regulated by the IURC, others manage rates through their town councils and Water Board of Directors); and,
- the location of the utility within the State (North, Central and Southern Indiana).

The results are rolled up into a statewide summary that can provide legislators and utilities a sense of the dimensions of this need relative to other fiscal priorities. Unlike other infrastructure, water utility systems can fail in ways that are both harmful to public health and the long-term economic identity of a community. This Report is designed to help focus on the infrastructure problems that need immediate action.

This document is organized into the following sections:

- an executive summary that gives context to the work;
- a description of infrastructure needs in the State and how that varies across the State;
- a summary of non-revenue water losses and what factors may explain its variability; and finally,
- a set of recommendations and funding options that consider how other states have improved the long-term stability of their community water systems.

This work reflects an ongoing commitment to utility stability that may require new state programs and funding.

Previous investigations

Over the last several years, multiple reports have been commissioned to determine if Indiana utilities are properly maintaining their infrastructure and whether utilities are prepared for water shortages. The most recent studies by the State and reports by public interest groups have provided a consistent call for a more comprehensive approach to managing water resources and water supplies. These assessments all conclude with a similar consensus of recommendations.

Some of the key findings:

1. Replacement of aging infrastructure needs immediate attention and presents a major challenge and few utilities are adequately investing in new water mains for their systems.

2. The State needs to identify a lead program/agency for the coordination of state agencies to assist Indiana's utilities and the management and planning of the use of the State's water resources.

3. Diminishing water quality often limits aquifer and surface water yield.

4. Conservation needs to become a standard practice of water utilities.

In the 2016 Legislative Session, the General Assembly passed Senate Enrolled Act 347 (SEA 347) to address the first of these findings, requiring the Indiana Finance Authority (IFA) to survey a total of 554 water systems that provide drinking water to the public (Appendix A). The investigation used a water-loss audit tool developed by the American Water Works Association (AWWA) to estimate the amount of water lost from utilities, to understand the cost of non-revenue water, and the efficiencies that might be gained from conservation and improvements in infrastructure. In addition, each utility was asked for an estimate of their particular infrastructure needs. The findings, as summarized in this 2016 IFA Utility Evaluation Report, both confirm the work that has been done by others (including the U.S. EPA) and provide a better estimate of the actual infrastructure needs and costs throughout the State.

2.0 DATA COLLECTION AND ANALYSIS

After SEA 347 was signed into law in March of 2016, the Indiana Finance Authority (IFA) coordinated the distribution, collection, and compilation of 1) the AWWA Water Audit (Audit) and 2) an Infrastructure Survey (Survey) to 554 Community Water Systems throughout Indiana (Appendix A).

The process of distributing and collecting the Audit/Survey was a cooperative effort between the IFA, the Indiana Rural Water Association, the Alliance of Indiana Rural Water, the Indiana Department of Environmental Management (IDEM), the American Water Works Association (AWWA), and the Rural Community Assistance Program (RCAP). The IFA provided assistance to the water utilities in completing the Audits and Surveys, including on-site workshops, site visits, and numerous email and phone communications. There was 100 percent participation by the utilities included in the Audit and Survey.

The IFA asked each utility to use the American Water Works Association (AWWA) Water Audit Software (2014). This software is free and is the industry standard to identify water losses. The software was used to collect, compile, and score water loss data for each Community Water System. An example of the information collected by the Audit Software is presented in Appendix B.

The Infrastructure Survey (Survey) was developed by the IFA in consultation with engineers, data analysts and utility operators. The Survey requests an inventory of water supply infrastructure for each Community Water System. The Survey formed the basis for a model of infrastructure needs and related costs for the State of Indiana, developed by the IFA. An example Infrastructure Survey is presented in Appendix C, and details of the infrastructure cost model are presented in Appendix D.

The Water Audit and Infrastructure Survey results were merged into a single data set for the purposes of this 2016 IFA Utility Evaluation Report. The combined data was analyzed to better understand the relationships between water loss, operational costs, and infrastructure conditions of utilities in the State of Indiana. Additional information was added to the data set including regulatory status, region of the State, and population served (U.S. EPA SDWIS) for each utility. This 2016 IFA Utility Evaluation Report represents the best available information compiled about the current status of water loss and infrastructure conditions for Indiana's Public Water Supplies. The merged data set includes 520 Community Water Systems, representing 531 individual Public Water Supply IDs (PWSIDs). The data reported by the utilities and included in this Report represent the year 2015.

2.1 Most utilities are small, but larger systems serve 75 percent of the population

The U.S. EPA divides Community Water Systems into sizes, according to the population served, from very small to very large, as presented in *Table 1*. Column 3 of *Table 1* presents the distribution of utility sizes among the Community Water Systems in Indiana, and Column 4 presents the population served by each size.

More than 4.76 million people in the State, or 72 percent of the population, are served by a Community Water System. 73 percent of the Community Water Systems in Indiana are very small to small, serving 10 percent of the population; 1 percent of the systems are large to very large, serving 75 percent of the population. Columns 5 and 6 of *Table 1* present the size distribution and population served for the merged data set.

- The data set includes 520 systems representing 97 percent of the State population served by Community Water Systems.

Table 1. Size and population served of utilities surveyed in the IFA Water Audit and Infrastructure Survey.

U.S. EPA Utility Size	Population Served Range	Indiana Community Water Systems	Population Served	Survey Water Systems	Population Served
Very Small	0 to 500	275	45,151	45	14,437
Small	501 to 3,300	302	432,863	269	390,453
Medium	3,301 to 10,000	126	729,577	121*	703,912
Large	10,001 to 100,000	81	2,095,023	80*	2,045,821
Very Large	> 100,000	5	1,462,621	5	1,467,192
	TOTAL	789	**4,765,235**	520	**4,621,815**

Note- does not include universities and correctional facilities.

Utility size was the most significant factor affecting the retail cost of water and the annual operating cost of producing and distributing water across the State. In the following subsections, we present average cost and water loss data by utility size. Distributions of data within each size category are informative, but the ranges are large with many outliers, and are not presented here. The outliers can be explained only by investigating the circumstances of each individual utility. Our results present aggregate values of average cost and water loss data, for each utility size.

2.2 Economies of scale are evident as utilities increase in size

Utility size, based upon the U.S. EPA population served designations, was found to have a significant impact on water utility costs. Cost information for each water system was provided in the AWWA Water Audit, including customer retail unit cost (CRUC) and the total annual cost of operating the water system. The CRUC reported in the Audit represents the average charge that customers pay for water service. *Figure 1* shows the relationship between the average CRUC in dollars per 1,000 gallons of water and utility size.

The economies of scale fade when utilities get larger for several reasons. Very large utilities have other problems that smaller systems don't encounter. For example, large systems need to have diverse water supply portfolios to be resilient to drought. They also must maintain pressures in a larger service area that creates engineering and design problems. In general, however, the customer retail unit cost (CRUC) for water is more than 1/3 lower for large systems than for smaller utilities.

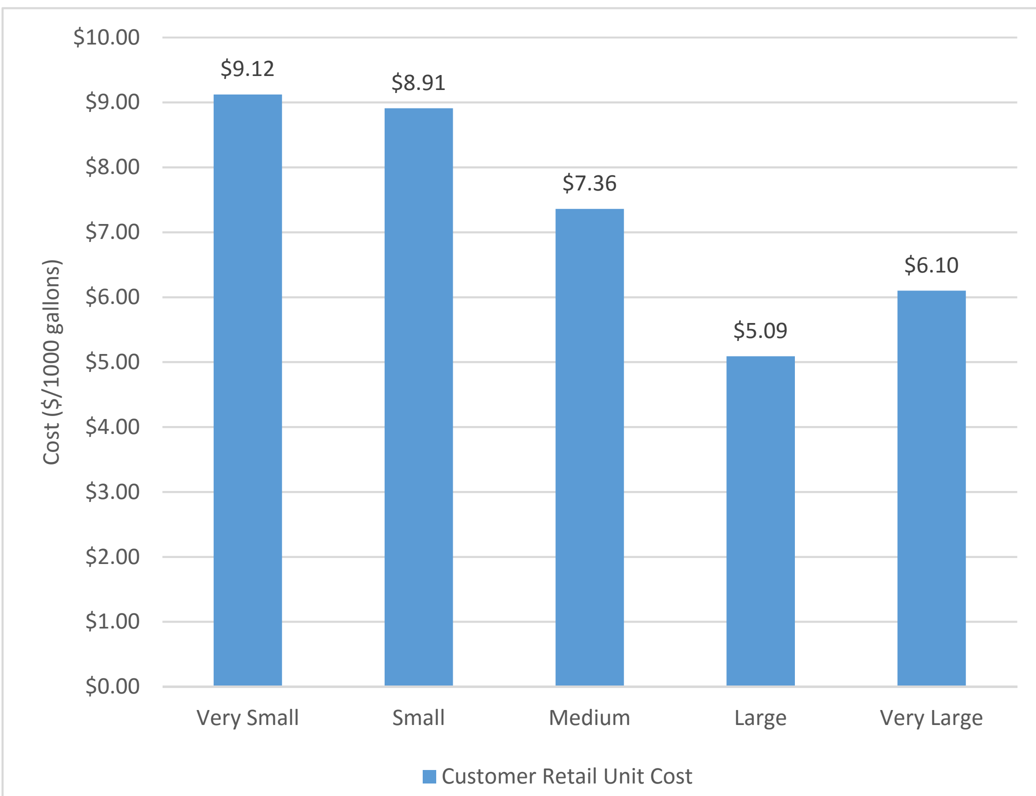

Figure 1. Average customer retail unit cost for survey utilities by size.

2.3 Average annual utility operating costs per capita decrease as size increases

The costs per capita decrease sharply with increasing utility size. The total annual cost of operating a water system includes operations, maintenance, and annually incurred costs for long-term up-keep of the drinking water supply and distribution system. It includes long-term financing such as repayment of bonds used to finance infrastructure expansion or improvement. *Figure 2* shows the average annual operating costs per capita for each utility size. The total reported annual operating cost of the utilities in the Infrastructure Survey was $667.1 million. Sixty-seven percent of that total cost is attributed to the large and very large systems, which serve 75 percent of the population.

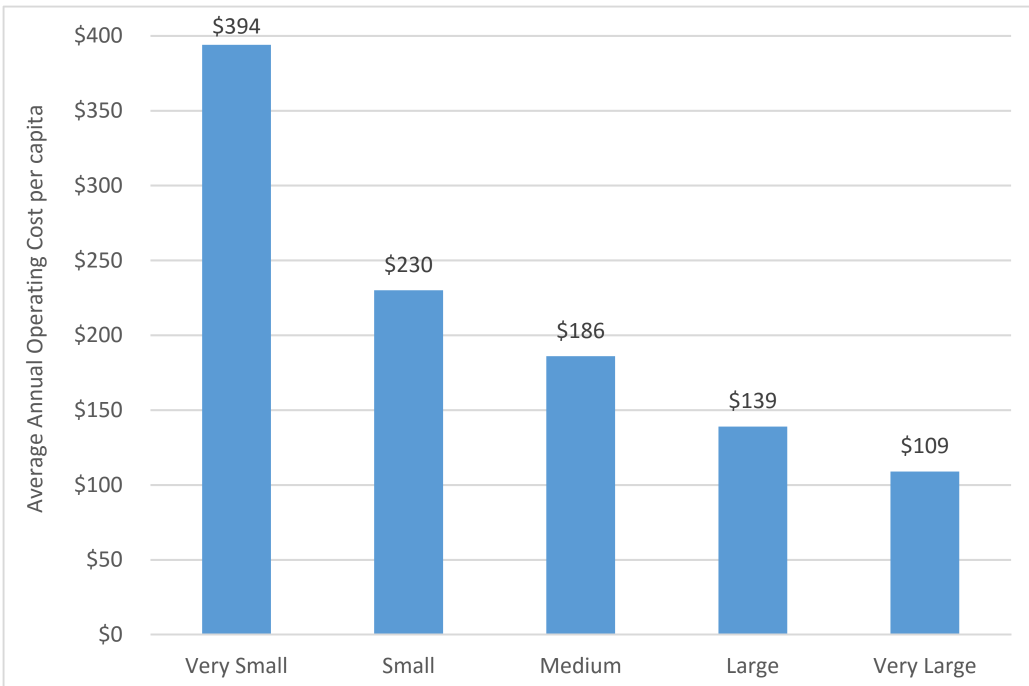

Figure 2. Average annual operating cost per capita by utility size.

2.4 Many water service lines in Indiana are nearing or at the end of their useful life

Too many water pipes in Indiana are nearing or at the end of their useful life and need to be replaced. Utilities were asked to report the age of pipe within their water systems according to size. Like most of the nation, a majority of Indiana pipes were installed post-World War II (AWWA, 2001a, Duffy, 2013). Now, pipes have been overused, undermanaged, and need to be replaced. Aging infrastructure contributes to the wear-and-tear of pipes that lead to multiple complications. Older pipes are subject to failures, main breaks, and water loss. The average age of a broken water main is 47 years (Folkman, 2012).

To meet the growing water demands of the State and reduce water loss, pipes must be appropriately replaced and maintained. Measuring over 46,000 miles, Indiana's pipes range in age from 1-120 years. Pipes sized between 6-12 inches were the most abundant in distribution systems. Pipes 4 inches and smaller were the oldest, with an average age of 49 years (*Figure 3*).

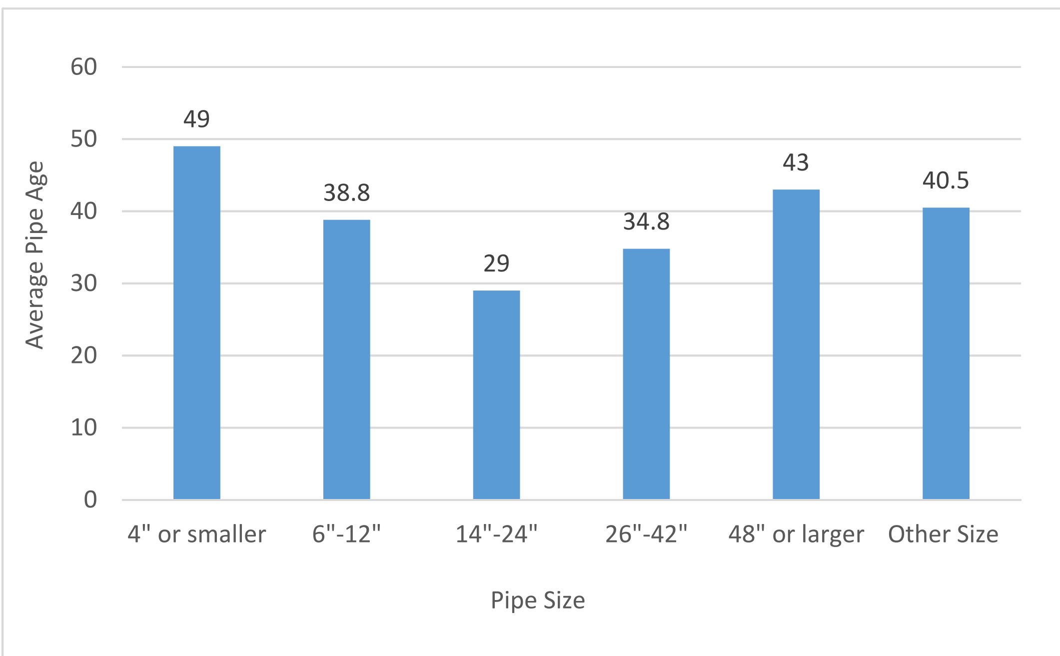

Figure 3. Average age of pipe by size.

2.5 Some utilities reported having lead service lines

Many utilities reported serving water through lead service lines. In most cases, the lead lines are the customer's property and not a part of the utility assets. Other utilities reported that they did not know whether they have lead lines and the remaining utilities did not respond to the question. Given the fact that there were 520 utilities surveyed, this response creates uncertainty that may have public health consequences. Lead may cause kidney damage, anemia, hypertension, and abnormal brain development (WHO, 2016).

Other water mains are made of materials that have different issues. Iron pipes generally have a life expectancy of 70 years before corrosion or other problems suggest the pipes should be replaced (AWWA, 2011b). Old corroded pipes may release chemicals into distributed drinking water and diminish water quality and cause public health problems. The potential for main breaks or failed pipes is influenced by pipe material. Plastic Polyvinyl Chloride (PVC), cast iron, and ductile iron make up the majority of pipes from surveyed utilities. Other pipe material included lead, asbestos cement and galvanized iron.

2.6 Many utilities do not consider treatment to prevent lead leaching

The recent disaster in Flint, Michigan changed the conversation about water utilities and the need to maintain infrastructure. In discussions taking place all over the country, utilities are struggling with the challenge of delivering water to homes, businesses and schools that may have lead service lines or plumbing on the customer's private property. In some utilities, there is no inventory of lead service lines. In others, these lines are clustered in the older parts of town where customers do not have the financial resources to pay for replacement. The risks posed are unprecedented and the problem is challenging because of the unforeseen difficulty of locating the problem pipes.

Along with continued treatment, the most effective way to assure the prevention of metals and other chemicals leaching into water systems is to remove lead lines and replace them with safer, corrosion-resistant material.

Utilities were asked if they have considered or currently use anti-corrosion treatment to prevent lead leaching. Many of responding utilities do not consider or use anti-corrosion treatment. It is important to note that those utilities that do use or consider anti-corrosion treatment serve a majority of the Community Water System population.

Some utilities further elaborated on their answers, explaining that no consideration for anti-corrosion practices is because they receive water previously treated by a supplier, or no lead lines are present in the distribution system. These utilities may not need this type of treatment. Though utilities serving the bulk of the population consider or implement anti-corrosion methods, it is not a clear as to how many utilities perform the treatment or do so consistently. Further investigation will be needed to understand the risks of lead in the State.

2.7 Non-revenue water is water produced which does not generate income

The AWWA Audit is designed to estimate system water losses. In particular, non-revenue water (NRW) is the water produced which does not generate income for the utility (*Table 2*). Specifically, it is the portion of the total water supplied consisting of real losses, apparent losses, and unbilled authorized consumption. Water losses include real losses, and apparent losses as defined in *Table 2*. The total water supplied includes non-revenue water and revenue water which consists of all billed authorized consumption.

Table 2. AWWA Audit water loss relationships defined.

<table>
<tr><td rowspan="8">Own Sources (Adjusted for known errors)</td><td rowspan="11">System Input</td><td>Water Exported</td><td colspan="3">Billed Water Exported</td><td>Revenue Water</td></tr>
<tr><td rowspan="10">Water Supplied</td><td rowspan="4">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption (water exported is removed)</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="8">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Water Imported</td><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections</td></tr>
</table>

2.8 Non-revenue water amounts to over 50 billion gallons per year in Indiana

The total non-revenue water in each system is proportional to the total volume of water supplied in each utility class size. The largest non-revenue water value is in the large systems and the lowest in the smallest systems. In each class, about 20 percent of the finished water produced ends up classified as non-revenue water. *Figure 4* shows the total volume of water supplied for 2015 and the total volume of non-revenue water by utility size. Non-revenue water amounts to over 50 billion gallons per year in Indiana.

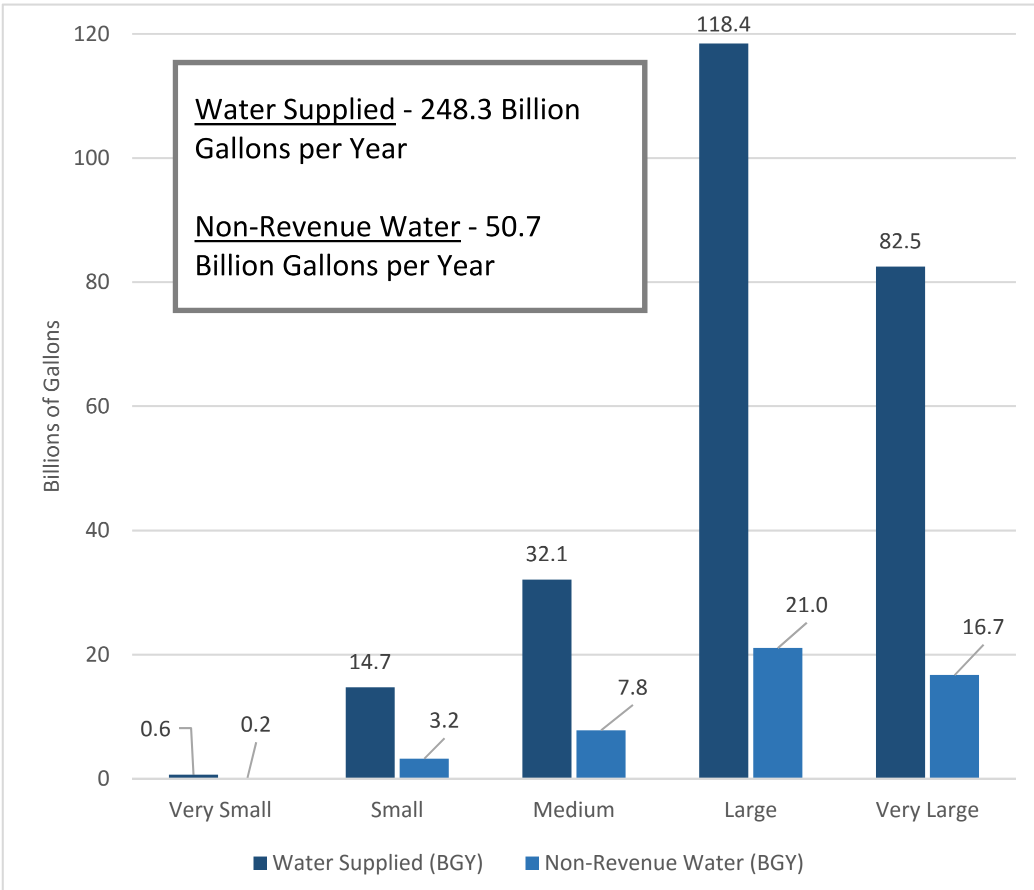

Figure 4. Total water supplied and non-revenue water in 2015.

2.9 Average non-revenue water is 19-24 percent of total water supplied per utility

Non-revenue water (NRW) as a percent of water supplied is a financial performance indicator for a utility. Average NRW as a percent of the water supplied for each utility size is presented in *Figure 5*. Average NRW ranges from 19 to 24 percent of water supplied, and does not vary considerably with utility size.

This is on par with the rest of the country. In the United States, utilities lose, on average, 20 percent of their water (Black and Veatch, 2016). *Figure 5* shows NRW as a percent of volume supplied and NRW as a percent of total operating costs. While the NRW as percent volume decline slightly with increasing size, the NRW as percent total costs increases with increasing utility size. The NRW as percent operating costs is high in very large utilities due to the already low cost operations of these systems.

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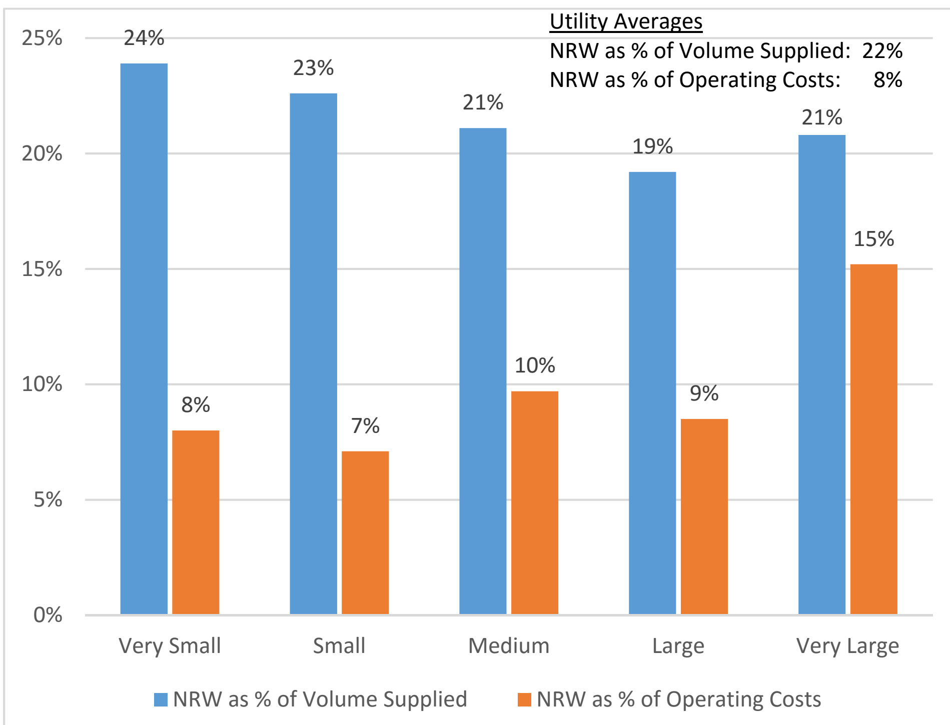

Figure 5. Non-revenue water as percent volume supplied and as percent of operating costs by utility size.

2.10 Total cost of non-revenue water is $54 million

The costs for non-revenue water are an important indicator of overall system efficiency. As described earlier, larger systems are able to take advantage of economies of scale to produce a gallon of finished water at a lower price than smaller systems. The total costs of the non-revenue water when added across the State is over $50 million. *Figure 6* shows the total cost of NRW distributed by utility size for 2015. The large and very large systems incur 74 percent of the cost of non-revenue water in the State.

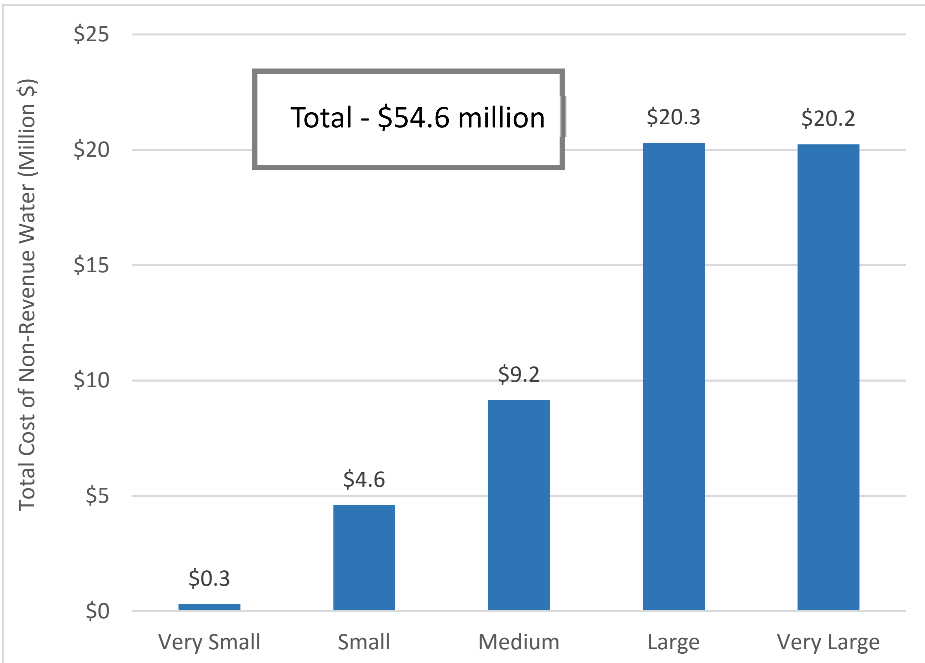

Figure 6. Total cost of non-revenue water by utility size.

2.11 IURC-regulated utilities provide water to 62 percent of population served

Using the combined dataset, we investigated the effect of regulation by the Indiana Utility Regulatory Commission (IURC) on water costs and losses. The IURC is an administrative agency that hears cases presented by utilities under its jurisdiction to ensure utilities provide safe and reliable service at just and reasonable rates. *Table 3* shows the number of utilities and population served, by size, for systems regulated by the IURC and those not regulated by the IURC. Ninety-four drinking water utilities in the Survey are regulated by the IURC, representing 62 percent of the population, with the largest population served by large and very large systems.

This 2016 IFA Utility Evaluation Report includes 426 utilities that are not regulated by the IURC, representing 38 percent of the population, with the majority of the systems being small, and the majority of the population served by medium and large systems. As shown in the *Table 3*, IURC regulated and non-regulated systems are composed of different distributions of utility sizes. Utility size was shown to have a large impact on costs. It is difficult to compare the effects of regulation on costs when the two data sets are composed of different utility sizes. Here, average cost values for each utility size are presented, focusing on medium and large systems, where the two data sets overlap, with similar utility counts and populations served.

Table 3. Number and population served of IURC utilities versus non-IURC utilities.

Utility Size	IURC		Non IURC	
	Utility Count	Population Served	Utility Count	Population Served
Very Small	7	1,409	38	13,028
Small	19	28,710	250	361,743
Medium	24	151,052	97	552,860
Large	39	1,234,513	41	811,308
Very Large	5	1,467,192	0	0
TOTAL	**94**	**2,882,876 (62%)**	**426**	**1,738,939 (38%)**

2.12 Average annual operating costs are lower for IURC-regulated utilities

The IURC-regulated utilities report average annual operating costs 30 percent less than the non-regulated utilities. *Figure 7* compares the average customer retail unit cost (CRUC) of water, and the average annual operating cost per capita for IURC regulated and non-regulated utilities. The customer retail unit costs are similar, but average annual operating costs per capita are notably lower for the IURC-regulated utilities.

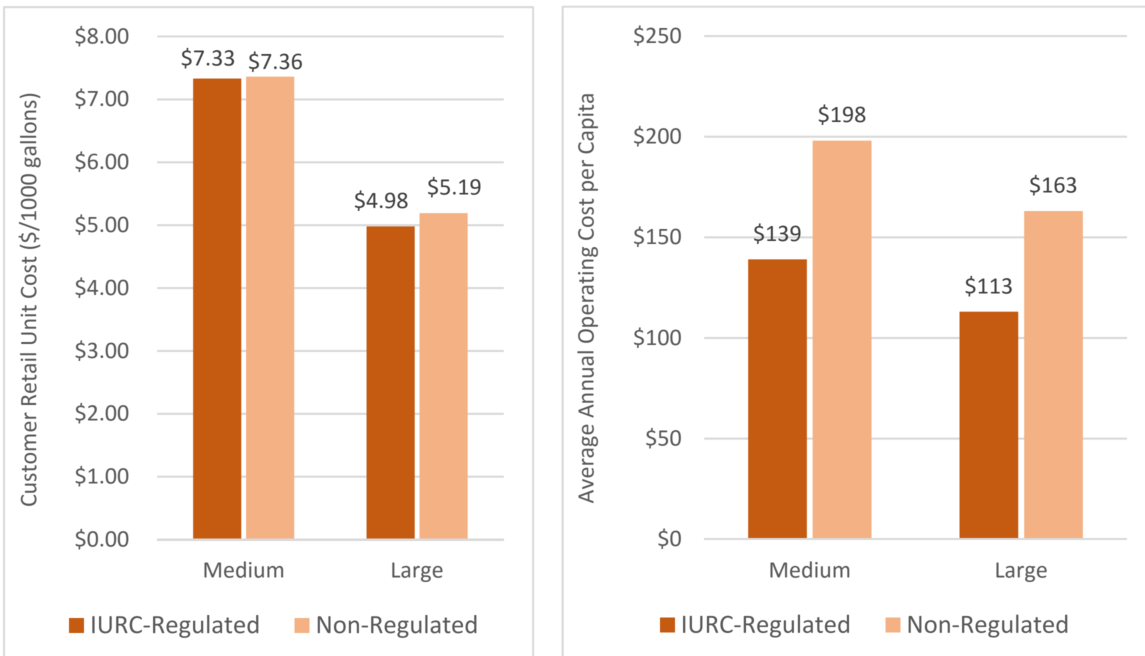

Figure 7. Customer retail unit cost and average annual operating cost per capita for IURC and non-IURC regulated utilities.

2.13 Non-revenue water per capita is less for medium-size IURC-regulated utilities

One question that we considered was the difference in non-revenue water between utilities that managed their systems independently and those regulated by the IURC. For most of the size classes of utilities there were not enough systems in each category. However, in medium and large systems there were similar numbers in each to consider the difference.

Average annual non-revenue water per capita is compared in *Figure 8*. For large utilities, the values are comparable; for medium-sized utilities, the average non-revenue water for IURC regulated utilities is half that of the non-regulated utilities. While it is not clear how this difference can be interpreted, it is worth noting as an outcome of this survey.

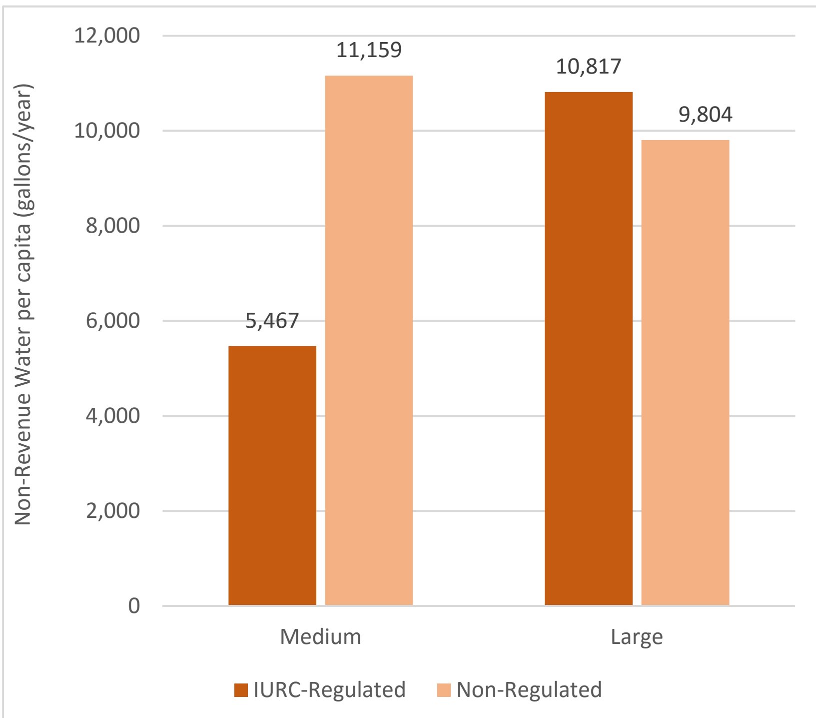

Figure 8. Average annual non-revenue water per capita for IURC and non-IURC regulated utilities.

2.14 Mapping illustrates utility distribution

When the State is subdivided into three regions, north to south, the distribution of utilities simply reflects the distribution of communities. Each region, however, has different characteristics that may be reflected in the responses of the utilities to the Survey and Audit. The Northern region, for example, is an area that has abundant aquifers and many older industrial communities. The Central region has many communities that surround the metropolitan area of Indianapolis. The Southern region includes smaller more rural communities that are serving water over longer distances. The distribution of utility sizes and population served for the North, Central, and South regions of the State are presented in *Figure 9*.

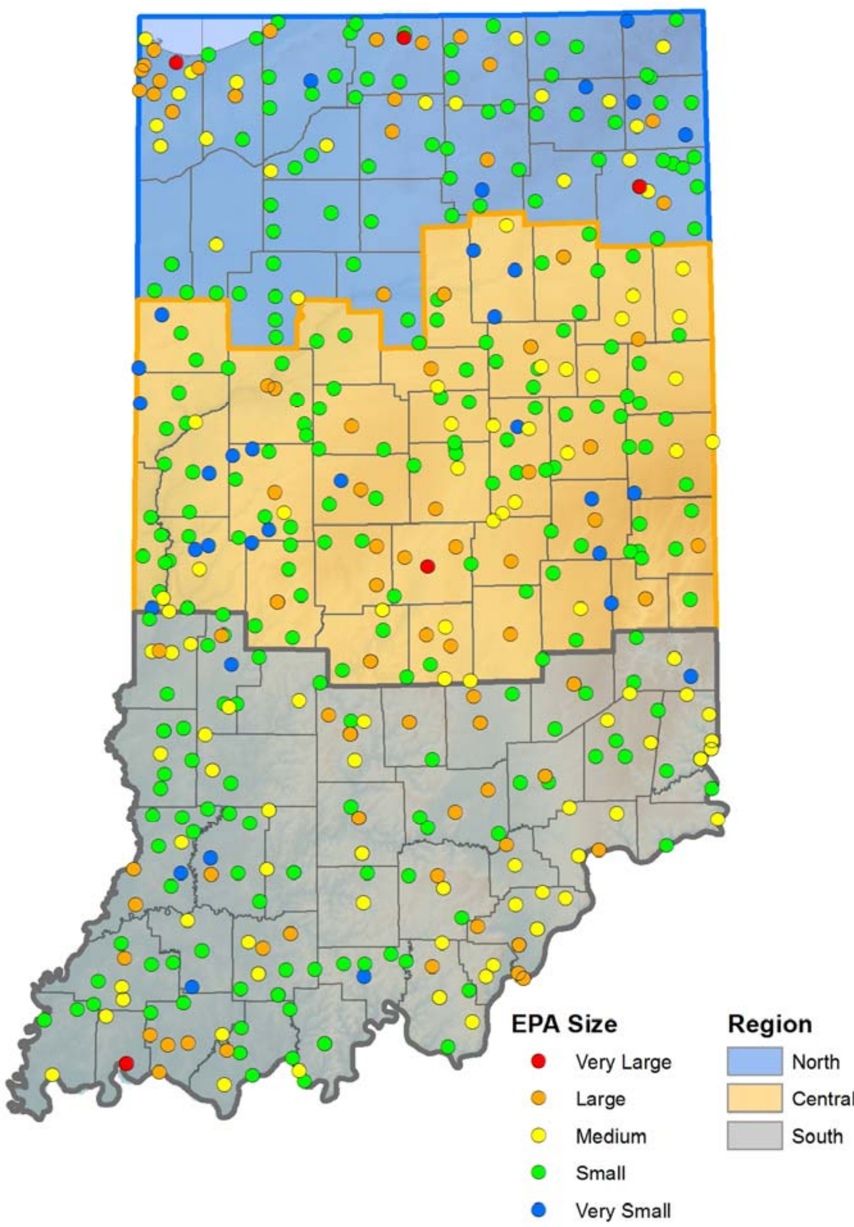

Figure 9. Distribution of utilities in the regions of the State.

2.15 Each region of the State has a similar distribution of utility sizes

The distribution of utility sizes in each region are comparable (*Table 4*). Of the more than 4.76 million people in the State served by a Community Water System, the North region includes 109 utilities serving 27 percent of that population; the Central region includes 205 utilities, serving 44 percent; and, the South region includes 206 utilities, serving 29 percent. Even though there are different numbers of utilities in each part of the State, the similar distribution of utility sizes among regions allows for a valid comparison of other characteristics.

Table 4. Utility count and population served by region of the State.

Utility Size	North		Central		South	
	Utility Count	Population Served	Utility Count	Population Served	Utility Count	Population Served
Very Small	10	2,788	23	8,066	12	3,583
Small	57	83,653	119	165,955	93	140,845
Medium	19	113,922	32	182,822	70	407,168
Large	20	534,223	30	899,250	30	612,348
Very Large	3	517,783	1	787,409	1	162,000
TOTAL	**109**	**1,252,369 (27%)**	**205**	**2,043,502 (44%)**	**206**	**1,325,944 (29%)**

2.16 Utility size, not region, determines average annual operating costs per capita

For any utility size, there is relatively little variation in annual operating costs among regions of the State (*Figure 10*). The utility size, more than the region, determines the operating expenses. While the average operating costs per capita for all utilities vary among regions (North $264, Central $206, South $207) the distribution of operating costs for different utility sizes within each region remains consistent.

This indicates that regional differences are minor relative to the economies of scale that determine costs. While the average operating costs vary among regions (the North averages about $55/capita higher than the rest of the State) the distribution of operating costs for different utility sizes within each region remains relatively consistent.

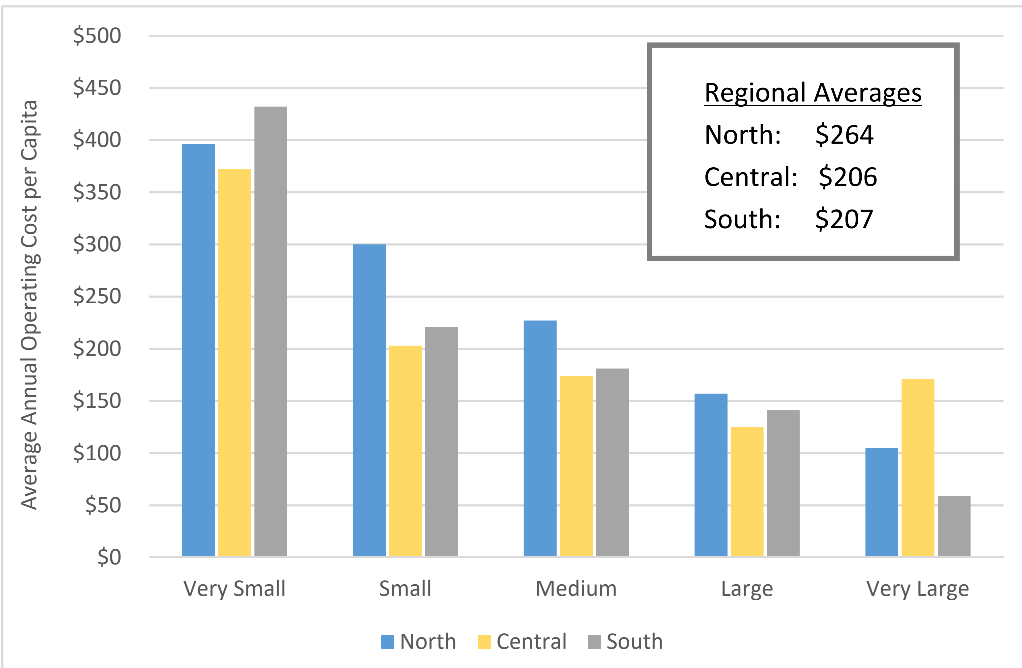

Figure 10. Average annual operating cost per capita by utility size and region.

2.17 Non-revenue water per capita is similar in each region

Non-revenue water loss varies among utilities but not among regions. The average non-revenue water loss per capita among utilities varies from 2,500 gallons per year to over 25,000 gallons per year by utility, but when averaged over the State and the regions, it is clear that the losses are independent of the region of the State (*Figure 11*). Non-revenue water losses vary for all the reasons that are expected, including metering problems, variable pressure in water mains, pipe breaks, etc. These problems happen evenly across the State and are only understandable at the local scale.

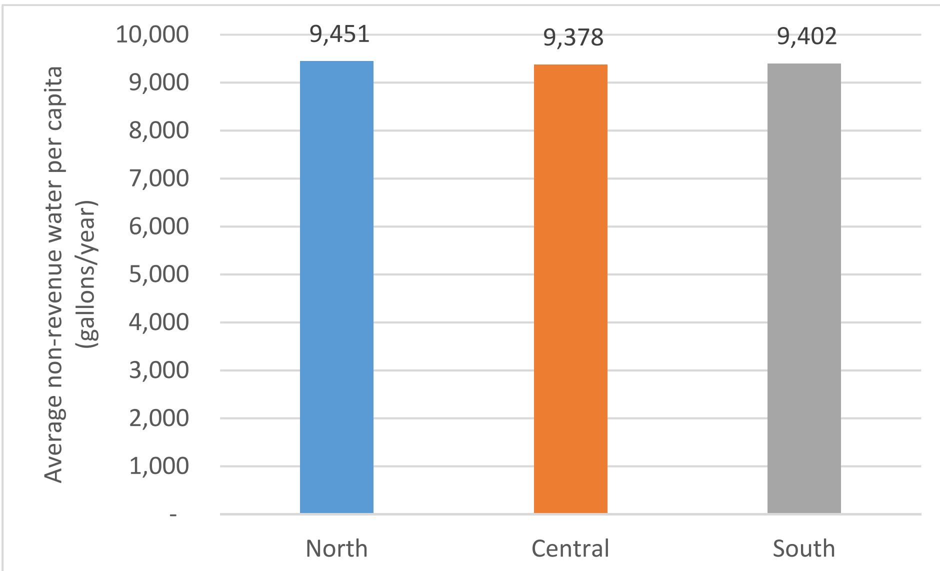

Figure 11. Regional average non-revenue water per capita.

2.18 Average customer retail unit costs are higher in southern Indiana

The average customer retail unit costs (CRUC) of water in the Southern region are higher than the rest of the State for each utility size *(Figure 12)*. The average price per gallon is highest in the South, lowest in Central Indiana, and second highest in the Northern part of the State.

As seen elsewhere in this report, average CRUC decreases as the utility size increases. The only exception to this trend is in the very large utilities that have somewhat higher average costs than the large systems. This difference is partly explained by the local factors faced by each system and the fact that there are only a handful of very large communities in the State.

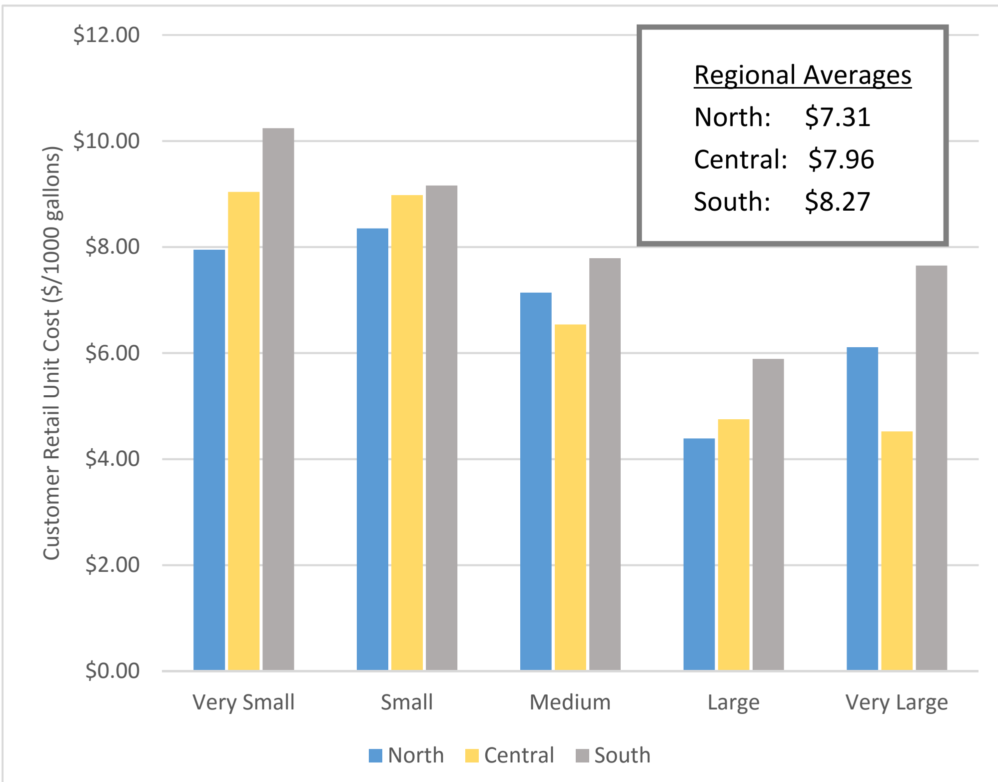

Figure 12. Average customer retail unit cost by utility size and region.

2.19 Infrastructure cost estimates are based on standard best practices

The infrastructure costs are based on the utility responses to the Survey and modeled replacement costs. The IFA used standard best practices to construct an idealized infrastructure replacement plan model (Appendix D). The IFA cost estimate assumes that utilities have not been able to maintain infrastructure to the standards defined by the National Association of Regulatory Utility Commissioners (NARUC) and the AWWA. Some of these costs may already be included in the utility's rate structure. However, the purpose was to provide a cost associated with the improvements recommended to be completed in the next twenty years. *Table 5* itemizes the cost assumptions used in the estimate.

Table 5. Assumptions used in the IFA infrastructure costs estimate.

Type	Infrastructure Cost Assumption	Initial Cost	Annual Cost
Wells	Wells older than 60 years old are replaced	X	
	Wells 20-60 years old are rehabilitated	X	
Treatment Plants	Water treatment plants with filtration are upgraded every 20 years	X	X
	Chemical feed treatment plants upgraded every 10 years	X	X
Mains	All 4" mains are replaced for fire protection	X	X
	Each main size replaced at 10% annually	X	X
Valves	All 4" valves are replaced for fire protection	X	X
	All valves are replaced at 10% annually	X	X
Meters	New AMR systems for 75% of the utilities with less than 3,500 customers each	X	
	All meters are replaced at 10% of annually with AMR systems	X	X
Hydrants	All hydrants older than 60 years old are replaced	X	
	Replace hydrants every 40 years	X	X
Storage Tanks	Storage tanks older than 60 years old are replaced	X	
	Storage tanks are rehabilitated every 15 years	X	X
Booster Stations	Replace booster stations every 20 years	X	X

2.20 Infrastructure costs vary widely across the State

To determine estimated costs, each utility was asked to describe their immediate and future infrastructure needs. Approximately 140 utilities responded with specific projects, upgrades, or utility additions needed. These costs, along with the immediate infrastructure costs calculated by the IFA, are estimated to be $2.3 billion dollars (*Figure 13*). This immediate cost for needed upgrades reflects the needs for new wells and intakes, treatment plants, water mains (pipe), new meters, fire hydrants, valves, storage tanks and booster stations throughout the State.

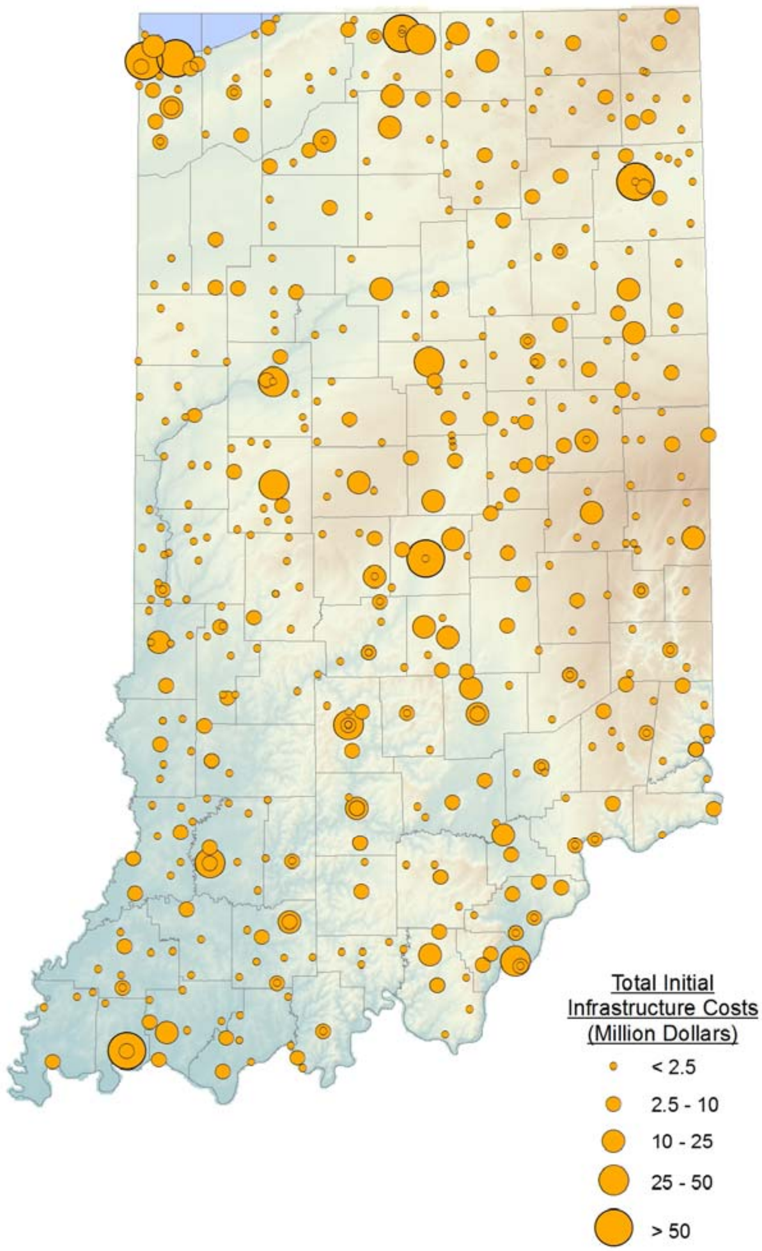

Figure 13. Initial infrastructure costs based on the Survey conducted in 2016 - $2.3 billion.

2.21 Initial infrastructure costs are $2.3 billion

The initial infrastructure costs of $2.3 billion, when considered across the State, is less than $500/person served by these systems. The primary needs for new infrastructure are in hydrants, meters, treatment plants, and water mains, which together make up over $1.5 billion of the $2.3 billion cost (*Figure 14)*.

The assumptions and standard best practices that defined the cost estimate model determined how many wells and meters, etc. needed to be replaced. The model did not include growth in the community or other changes that will increase cost.

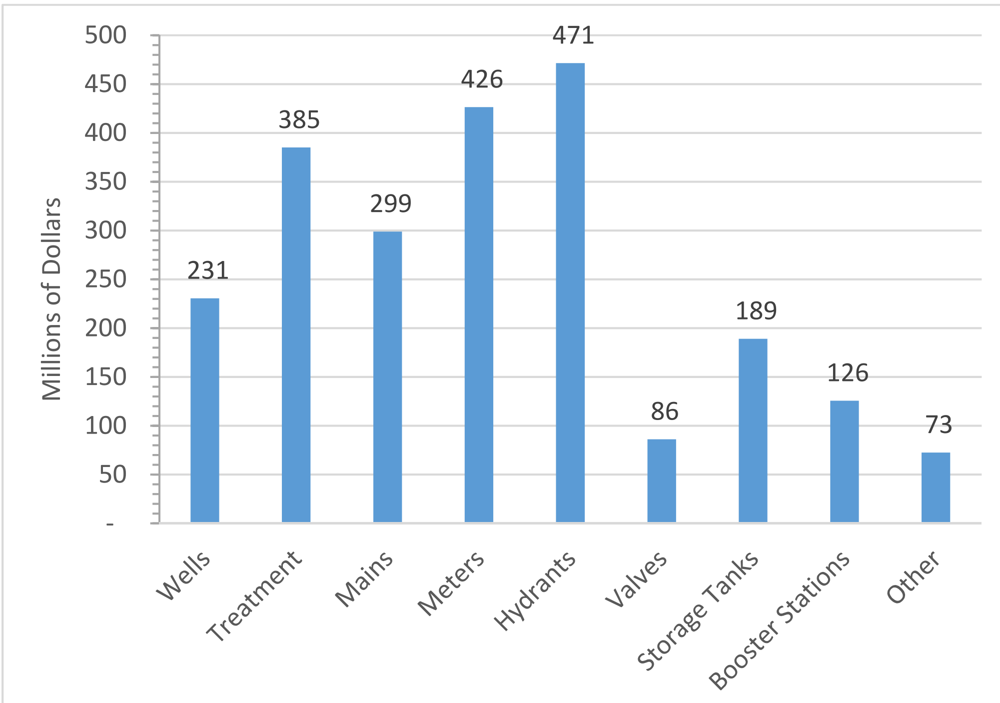

Figure 14. Initial infrastructure costs by type - $2.3 billion.

2.22 Long-term infrastructure costs are $815 million per year

After the initial infrastructure upgrade, to maintain the utilities into the future, approximately $815 million is needed annually. The costs are broken down by infrastructure type in *Figure 15*. The model used to estimate long-term sustainable infrastructure costs weighs the need for treatment and water mains but does include additional costs for wells and intakes. Seventy percent of the long-term annual infrastructure costs is for treatment and water mains, with the remainder spread across the other elements of the system.

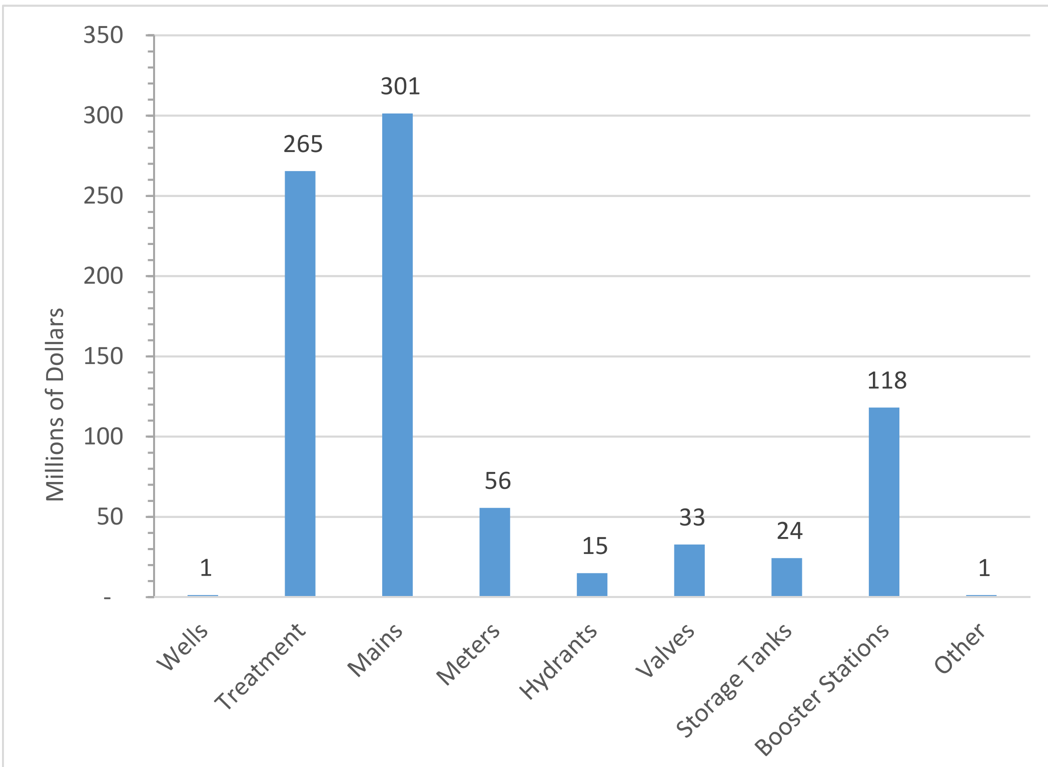

Figure 15. Annual long-term infrastructure costs by type - $815 million.

3.0 RECOMMENDATIONS

This 2016 IFA Utility Evaluation Report outlines the results of a detailed survey of utilities and offers new insights into the dimensions of a latent problem here in Indiana. While the costs reflected in these estimates are large, the problem of sustainable infrastructure is national in scope. New solutions are needed. The following recommendations describe how the needs could be organized into a State response.

3.1 Fund a new infrastructure program

The needs identified in the Water Audit and Infrastructure Survey are much larger than previous estimates. Those estimates do not include all the items that will need to be replaced. For example, U.S. EPA's estimates did not include fire hydrants.

If progress is going to be made to improve the state of our infrastructure, more financial support will be needed. Currently, there are limited federal funds available to help pay for this growing infrastructure expense. Existing rate payers are the only source of funds for utilities to add water lines or replace old wells and pumps. The 2015 IFA Water Utility Planning Report (IFA, 2015) found that the fastest replacement rate among the largest utilities was more than 140 years (0.7 percent main replacement), illustrating the gap between current best practice and sustainability.

Water utilities are doing their best to balance the growing need for infrastructure repair against the need to provide safe and affordable water to their customers. In the past several decades the federal government has had a historically minor role in financing many construction projects (CBO, 2015). While the federal role could expand, it would take broad changes in the political will of the U.S. Congress and our improvement in economic position. Recent work by the CBO and the Congressional Research Service (CRS, 2010) on this topic indicates that current trends and conditions make it more likely that the states need to be the primary support for utilities on this topic.

Indiana has not appropriated funds to address utility infrastructure needs. Kentucky, Michigan, Minnesota, Ohio, and Wisconsin all contribute substantially to drinking water and wastewater infrastructure. Over the last 3 years, Ohio and Michigan have invested $100 million and $75 million, respectively, in funding their state's utility needs. Indiana's relationship with drinking water systems will need to evolve if the utilities are going to move beyond this critical funding deficit.

3.2 Prioritize replacement of old water service lines

This 2016 IFA Utility Evaluation Report shows that many utilities across the State have drinking water mains that are very old. These mains need to be the focus of a special financing program that could support their replacement and address the unquestionably vulnerable components of the system. Older storage and treatment systems should also be evaluated and considered for replacement in an effort to reduce non-revenue water. Old water service lines that currently deliver water and may not be an issue today, are a latent water supply and public health problem. One way to change the long-term condition and create a sustainable utility is to convert these old pipes into new mains that are embedded in a system that is mapped, inventoried, and managed.

3.3 Cultivate and standardize asset management

This 2016 IFA Utility Evaluation Report indicates that, when a comparison was made between medium utilities that are either regulated or unregulated (where "regulation" refers to rates being reviewed and approved by the IURC), those regulated by the IURC had a lower cost for water than the other systems. The State has an opportunity to call for more careful attention to longer-termed thinking and analysis. The idea of evaluation and assessment of critical assets and long-term funding plans can only help a utility maintain infrastructure.

The recommended approach to managing large public assets is to develop a schedule of asset planning that organizes the construction needed to maintain and extend the life of the system (GAO, 2013). This means that life-cycle cost becomes the basis for equipment replacement and maintenance is done prior to failure on a schedule that avoids increased risks. Asset management is important to develop a baseline. That is, the baseline is used to measure progress and eventually evolves into an inventory of equipment and the system. This is a starting point for a more comprehensive assessment of the data to map and locate the features of the system, such as age and condition of the pipes, valves, etc. This approach to managing assets is the modern way to maintain system value and financial integrity. Asset management needs to become the primary way that utilities operate. Over time, there should be less guess-work and more engineering analysis behind system improvements and calculations of water rates as well as increasing the sustainability of utility operations.

While the existing regulatory framework has mechanisms that help organize a case for a rate increase or change, the IURC could become a more vocal advocate of asset management systems in the process of utility planning and operation. Such a change could raise the bar on all utilities and address the water resource needs of basins and the utility, including the consumer.

3.4 Name a leader to coordinate the water financing program

Another finding of the 2015 IFA Water Utility Planning Report (IFA, 2015) was that the State has many programs that involve water resources, water supply and the public health issues of water development, but there is no single group responsible for planning and/or coordination. The problem of sustainable development can only be done at a regional level. The responsibility could be given to a water institute that can act as a coordinating and management board for each region. Data and tools can be developed by the State, but regional priorities need to be determined by local water users.

3.5 The IFA could evaluate regionalizing utilities to improve efficiency

Given the observable economies of scale in water utilities, the State of Indiana may want to consider system regionalization. Collaborative planning has already begun among neighboring utilities in some areas of the State. The data from this 2016 IFA Utility Evaluation Report suggests that larger systems improve the economic performance for customers. In spite of this, new small systems continue to be formed instead of combining assets with existing utilities where value could be added. Regionalization could take many forms and any healthy approach requires willing and capable partners.

With larger size and capacity, regional utilities add efficiencies while being more reliable and sustainable than individual community water systems. In order to understand the economic and practical challenges of regional systems, the Indiana Finance Authority could evaluate the technical and regulatory hurdles that may exist to regional water utility development and planning. Multiple utilities could share the costs of production and treatment in addition to some regulatory and operational functions. Regional management may lead to a more optimized operation with less risk of conflict for a lower overall cost.

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4.0 NEXT STEPS

Over the past 5 years, there have been several reports that collected information from utilities to improve our knowledge about water systems in the State and consider alternative approaches for managing water utilities and ultimately, water use (IURC, 2013 and 2014, IFA, 2015). This 2016 IFA Utility Evaluation Report describes the results of a new assessment of the pressing problem of aging water infrastructure and water loss. After assembling the utility responses, we modeled the costs of our drinking water infrastructure needs. There are several conclusions that can be drawn:

- To avoid a more urgent problem in the future, substantial investment is needed now. The State should not depend upon federal financial support to relieve all long-term infrastructure needs.
- Other states have already developed sensible methods to pay for the long-term needs of water supply planning, including utility infrastructure improvement and replacement.

4.1 Suggested actions

In order to manage the resource and protect the public, the State will need to alter the way we fund infrastructure to arrest decay in one of the foundations of our communities. To make sure that any change addresses a need and is sustainable, we must collect data on the resource and the utility. This will enable the State to manage the system rather than react to unanticipated consequences. A program or agency should be designated to coordinate and focus the various parts of the State dedicated to water management and financing to support the water users that are anxious to begin the work. The actions outlined in this 2016 IFA Utility Evaluation Report reflect the consensus conclusions that have been reached in earlier studies and are confirmed in this Report. The goal is for the State to begin working to support the assets that improve everyone's life and the health of the natural environment. The gaps in funding for infrastructure improvements and water loss reduction described in this Report can be closed with the following actions:

New Water Infrastructure Funding Program - Devote new general fund appropriation to begin fixing the problem.

Agency Coordination - Centralized management and additional Full-Time Equivalents are needed in water agencies. This work needs to be coordinated to direct attention to the most pressing problems and move towards solutions.

Commission Water Availability and Demand Investigations in Priority Basins - Previous studies have confirmed the uncertainty of water resource limits on water supply (IFA, 2015). The State needs to forecast future demand for water and map availability of supply to avoid conflict and promote sustainable infrastructure.

State Data / Regional Authorities / Local Management - Educate the public, collect data, and create regional authorities that use a common water resource. The State needs to support the framework for local planning and management.

4.2 Consider new funding sources using ideas from other states

There are various mechanisms used by states to pay for infrastructure, provide incentives for conservation, and actively coordinate the agencies that manage water (Texas, 2011). Some states have put the issue before the voters and have added a small increase to their sales tax (not considered here), while others have simply charged for water use by the gallon. The following are alternative sources of revenue used by other states to create base funding for their water infrastructure and resource programs:

Bottled Water Fee

Currently bottled water is exempt from the standard 7 percent sales tax in Indiana. In other states and in some larger cities, a bottled water fee is used to pay for water – related programs. The city of Chicago generates $8M/year with a $0.05/bottle fee. Conservatively, Indiana could generate approximately $2M/year for conservation and management programs.

ADVANTAGE – clear policy signal: bottled water for conservation

DISADVANTAGE – difficult to estimate, volatile revenue stream

Management Fee for Water Use

Some states generate millions of dollars with an annual fee for all high capacity users. This fee is usually one of the ways that agencies are funded to protect water resources. Indiana already charges $33/million gallons for withdrawal of water in the newest Army Corps of Engineers reservoirs in southern Indiana. A similar fee could be applied to groundwater and to surface water users with minor statutory changes to generate anywhere from $10M to $40M/year.

ADVANTAGES – 1) direct connection between water use and management, 2) it is currently authorized by Indiana law for water use from State reservoirs, 3) stable source of funding (groundwater use is increasing), 4) simple to estimate State revenue for alternative fee models.

DISADVANTAGE – an equitable revenue model is a challenge

Federal Funds

Relative to many of our neighbors, Indiana receives less money from the federal government for water-related programs and projects. This gap is most apparent when comparing the funds allocated for water planning studies and other funds appropriated through the Water Resources Reform and Development Act (WRRDA), where Indiana has historically been less willing to provide the State match for the projects.

The U.S. Army Corps of Engineers does not know the water use priorities of the State. Federal funds are currently unapplied for. A new statewide coordinator can ensure that federal funds are identified, applied for, and utilized. Indiana has lost potential funding for investigations that could have helped the State better understand the availability of water in some of our larger rivers. Once we have made this decision, the State should develop an aggressive and integrated approach to identifying new federal funding for water projects that include sources that require a State match.

ADVANTAGE – Indiana needs to do what it can to become engaged with the U.S. Army Corps of Engineers and their planning programs

DISADVANTAGE – make the case to develop a coordinated strategy to inform congressional delegation

Impact Fees

Some states require an up-front impact fee for all new groundwater or surface water users. This fee could be annual for all high capacity water users or it could be a "new user" fee that is simply the incremental cost associated with additional consumers of the aquifers, streams and water resources of the State. This fee could generate several million dollars per year.

ADVANTAGE – impact fees connect the new users to the problem of management and water conservation

DISADVANTAGE – questions of equity when only "new" users pay the costs for a service that benefits all existing users

Gasoline Fee

Some states (Maine) use a fraction of the gasoline fee to pay for source water protection and groundwater programs. This may be the legislative session where the fee is reconsidered so an additional $0.05/gallon fee would generate several tens of millions of dollars in Indiana.

ADVANTAGE – the gasoline fee is being revised in the Winter 2016 Legislative Session and this fee could generate substantial revenue for infrastructure

DISADVANTAGE – lack of support in the transportation sector and indirect connection between the fee and water resources

Sales Fee on Retail Water

Currently, there is no fee on retail water delivered to homes. Iowa is considering a water utility delivery fee that would replace their excise fee for the utility property. This approach can be modified to add a fee to retail water that would be designed to collect funds for replacing old water mains, manage the resource and protect the quantity and quality of future supplies. A sales fee of several percent would generate tens of millions of dollars for the State from one sector of water users. Depending on the rate, Indiana could generate approximately $40M/year for infrastructure replacement programs.

ADVANTAGE – direct policy signal of funds to water use for water conservation

DISADVANTAGE – lack of utility support if no fee for other users

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- INTERA Incorporated,
- Indiana Rural Water Association (IRWA),
- Alliance of Indiana Rural Water (The Alliance),
- Indiana Department of Environmental Management (IDEM),
- American Water Works Association (AWWA),
- Rural Community Assistance Program (RCAP),
- M.E. Simpson, Inc.,
- GRW Engineers, and
- H.J. Umbaugh & Associates.

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ACRONYMS

AMR – Automatic Meter Reading

ASCE – American Society of Civil Engineers

AWWA – American Water Works Association

CBO – Congressional Budget Office

CRS – Congressional Research Service

CRUC – Customer Unit Retail Cost

DWINSA – Drinking Water Infrastructure Needs Survey and Assessment

FTE – Full Time Equivalent

GAO – U.S. Government Accountability Office

IDEM – Indiana Department of Environmental Management

IFA – Indiana Finance Authority

IGS – Indiana Geological Survey

IURC – Indiana Utility Regulatory Commission

NARUC – National Association of Regulatory Commissioners

NRW – Non-Revenue Water

O&M – Operation and Management

PWSID – Public Water Supply Identification

RCAP – Rural Community Assistance Program

SDWIS – Safe Drinking Water Information System

SEA 347 – Senate Enrolled Act 347

SRF – State Revolving Fund Loan Program

U.S. EPA (EPA) – United States Environmental Protection Agency

VPC – Variable Production Cost

WHO – World Health Organization

APPENDICES

Appendix A. Senate Enrolled Act 347

Second Regular Session 119th General Assembly (2016)

PRINTING CODE. Amendments: Whenever an existing statute (or a section of the Indiana Constitution) is being amended, the text of the existing provision will appear in this style type, additions will appear in **this style type**, and deletions will appear in ~~this style type.~~

Additions: Whenever a new statutory provision is being enacted (or a new constitutional provision adopted), the text of the new provision will appear in **this style type**. Also, the word **NEW** will appear in that style type in the introductory clause of each SECTION that adds a new provision to the Indiana Code or the Indiana Constitution.

Conflict reconciliation: Text in a statute in *this style type* or ~~*this style type*~~ reconciles conflicts between statutes enacted by the 2015 Regular Session of the General Assembly.

SENATE ENROLLED ACT No. 347

AN ACT to amend the Indiana Code concerning utilities.

Be it enacted by the General Assembly of the State of Indiana:

SECTION 1. IC 8-1-30.5 IS REPEALED [EFFECTIVE JANUARY 1, 2016 (RETROACTIVE)]. (Water Utility Resource Data).

SECTION 2. IC 8-1-30.7 IS ADDED TO THE INDIANA CODE AS A **NEW** CHAPTER TO READ AS FOLLOWS [EFFECTIVE UPON PASSAGE]:

Chapter 30.7. Non-Revenue Water Auditing

Sec. 1. The general assembly makes the following findings:

(1) Safe and affordable drinking water is essential to public health and economic development throughout Indiana.

(2) The cost of providing reliable drinking water is increasing due to factors such as aging infrastructure, increased energy costs, and complex and costly changes in the regulatory requirements for safe drinking water.

(3) Water main breaks are visible and disruptive manifestations of the more widespread phenomenon of leakage from water systems.

(4) Leakage of drinking water from water distribution systems adds to the cost of service to customers and may lead to increased raw water demands that harm the natural environment.

(5) The failure of water utilities to recover revenue from some of the water delivered to users due to:

(A) metering and billing inaccuracies; and
(B) theft;
increases the cost per unit of water that is billed to customers.
(6) Best management practices suggest that drinking water utilities should conduct an annual water audit in accordance with the American Water Works Association (AWWA) Manual of Water Supply Practices M-36: Water Audits and Loss Control Programs.
(7) The AWWA has published software for use in categorizing and reporting water losses and has made the software available without charge.
(8) AWWA M-36 water audit protocol classifies water volumes entering water distribution systems into revenue water and non-revenue water, with:
(A) revenue water representing billed water consumption; and
(B) non-revenue water consisting of the difference between the volume entering the distribution system and revenue water.
(9) Regular auditing of water volumes is a necessary foundation for the adoption of cost effective strategies to reduce the level of non-revenue water to economically reasonable levels.

Sec. 2. As used in this chapter, "authority" refers to the Indiana finance authority established by IC 4-4-11-4.

Sec. 3. As used in this chapter, "commission" refers to the Indiana utility regulatory commission created by IC 8-1-1-2.

Sec. 4. As used in this chapter, "non-revenue water" means the difference between the annual volume of water entering a water distribution system and revenue water of the system.

Sec. 5. As used in this chapter, "revenue water" means the annual amount of water consumption billed to customers.

Sec. 6. As used in this chapter, "water audit" means an audit performed in accordance with the AWWA Manual of Water Supply Practices M-36: Water Audits and Loss Control Programs.

Sec. 7. As used in this chapter, "water related state agency" means any of the following:
(1) The Indiana finance authority established by IC 4-4-11.
(2) The department of administration created by IC 4-13-1-2.
(3) The commission.
(4) The office of utility consumer counselor created by IC 8-1-1.1-2.

(5) The department of environmental management established by IC 13-13-1-1.

(6) The department of natural resources created by IC 14-9-1-1.

(7) The state department of health established by IC 16-19-1-1.

(8) The Indiana geological survey established as a part of Indiana University by IC 21-47-2.

(9) The Indiana Water Resource Research Center of Purdue University.

(10) The state department of agriculture established by IC 15-11-2-1.

Sec. 8. As used in this chapter, "water utility" means:

(1) a public utility (as defined in IC 8-1-2-1(a));

(2) a municipally owned utility (as defined in IC 8-1-2-1(h));

(3) a not-for-profit utility (as defined in IC 8-1-2-125(a));

(4) a cooperatively owned corporation;

(5) a conservancy district established under IC 14-33; or

(6) a regional water district established under IC 13-26;

that provides water service to the public in Indiana for a fee.

Sec. 9. (a) For purposes of the report required by section 10 of this chapter, each water utility shall provide to the authority a water audit:

(1) according to requirements established by the authority; and

(2) not later than a date set by the authority so that the report prepared by the authority under section 10 of this chapter can reflect the results of the water audits of all water utilities.

(b) The authority shall summarize the results of the water audits provided under subsection (a) in the report prepared under section 10 of this chapter.

Sec. 10. Before November 1, 2017, the authority, in consultation with:

(1) the commission and any other water related state agencies;

(2) any political subdivisions (as defined in IC 36-1-2-13);

(3) any water utilities or organizations of water utilities; and

(4) any other interested parties;

that the authority chooses to consult with, shall prepare and submit in an electronic format under IC 5-14-6 to the executive director of the legislative services agency a report on non-revenue water and water loss in Indiana.

Sec. 11. This chapter expires July 1, 2018.

SECTION 3. IC 14-25-7-18 IS ADDED TO THE INDIANA CODE AS A **NEW** SECTION TO READ AS FOLLOWS [EFFECTIVE JULY 1, 2016]: **Sec. 18. (a) As used in this section, "authority" refers to the Indiana finance authority established by IC 4-4-11-4.**

(b) As used in this section, "quality assurance review" means a process of reviewing and verifying water resources data with the goal of assuring the reliability of the data. The term includes the application of certain objectives, principles, and policies already in use at the Indiana geological survey in maintaining consistency in water resources data and accountability to the scientific community and general public.

(c) The authority shall perform a quality assurance review of the water resources data compiled from the reports submitted by owners of significant water withdrawal facilities under:

(1) section 15 of this chapter; and

(2) IC 13-2-6.1-1 and IC 13-2-6.1-7 (before their repeal);

beginning with the reports submitted for the 1985 calendar year.

(d) The authority may enter into contracts with one (1) or more professionals or state educational institutions under which the professionals or state educational institutions will perform some or all of the duties imposed on the authority by this section. The authority may compensate the professionals or state educational institutions for work performed under this section with:

(1) money from the drinking water revolving loan fund established by IC 13-18-21-2; or

(2) any other funds appropriated to the authority.

(e) In performing the quality assurance review required by this section, the authority shall use the water resources data in a manner that:

(1) protects the confidential information of owners of significant water withdrawal facilities; and

(2) is consistent with IC 5-14-3-4.

(f) The authority shall present the results of the quality assurance review performed under this section, as those results become available, to the water rights and use section of the department's division of water. The water rights and use section shall maintain the results in the data base of data extracted from reports submitted by owners of significant water withdrawal facilities under section 15 of this chapter (and IC 13-2-6.1-1 and IC 13-2-6.1-7 before their repeal).

SECTION 4. [EFFECTIVE UPON PASSAGE] **(a) The following definitions apply throughout this SECTION:**

(1) "Authority" refers to the Indiana finance authority created by IC 4-4-11-4.

(2) "Commission" refers to the Indiana utility regulatory commission created by IC 8-1-1-2.

(3) "State educational institution" has the meaning set forth in IC 21-7-13-32.

(4) "Water utility" means any of the following:

(A) A public utility, as defined in IC 8-1-2-1(a), that furnishes water to its customers.

(B) A municipally owned utility, as defined in IC 8-1-2-1(h), that furnishes water to its customers.

(C) A not-for-profit utility, as defined in IC 8-1-2-125(a), that furnishes water to its customers.

(D) A utility that:

(i) is owned cooperatively by its customers; and

(ii) furnishes water to its customers.

(E) A conservancy district established under IC 14-33 that furnishes water to its customers.

(F) A regional district established under IC 13-26 that furnishes water to its customers.

(b) The authority shall:

(1) study; and

(2) prepare an analysis of;

the infrastructure needs of the water utilities of Indiana. The authority shall submit a report on its study and analysis in an electronic format under IC 5-14-6 to the executive director of the legislative services agency not later than November 1, 2016.

(c) In preparing the analysis required by this SECTION, the authority:

(1) shall consult with:

(A) water utilities; and

(B) the commission; and

(2) may consult with any other entity or individual having information the authority considers relevant to the infrastructure needs of water utilities.

(d) The authority may hold public meetings to gather information for the purposes of preparing the analysis required by this SECTION.

(e) The authority may enter into contracts with one (1) or more professionals or state educational institutions under which the professionals or state educational institutions will perform some or all of the duties imposed on the authority by this SECTION. The

authority may compensate the professionals or state educational institutions for work performed under this SECTION with:

(1) money from the drinking water revolving loan fund established by IC 13-18-21-2; or

(2) any other funds appropriated to the authority.

(f) In conducting the study and preparing the analysis required by this SECTION, the authority shall use any data it acquires in a manner that:

(1) protects the confidential information of individual water utilities; and

(2) is consistent with IC 5-14-3-4.

(g) This SECTION expires January 1, 2017.

SECTION 5. **An emergency is declared for this act.**

President of the Senate

President Pro Tempore

Speaker of the House of Representatives

Governor of the State of Indiana

Date: ____________________ Time: ____________________

Appendix B. AWWA Water Audit

AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:	
Email Address:	
Telephone | Ext.:	
Name of City / Utility:	
City/Town/Municipality:	
State / Province:	Select a state / province from the list
Country:	
Year:	Select Type...
Start Date:	Enter MM/YYYY numeric format
End Date:	Enter MM/YYYY numeric format
Audit Preparation Date:	
Volume Reporting Units:	
PWSID / Other ID:	

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

- Value can be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

? Click to access definition
\+ Click to add a comment

Water Audit Report for: << Please enter system details and contact information on the Instructions tab >>
Reporting Year:

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

PLEASE CHOOSE REPORTING UNITS FROM THE INSTRUCTIONS SHEET BEFORE ENTERING DATA

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

WATER SUPPLIED

<----------- Enter grading in column 'E' and 'J' ---------->

Pcnt: Value:

Volume from own sources:
Water imported:
Water exported:

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 0.000

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

Billed metered:
Billed unmetered:
Unbilled metered:
Unbilled unmetered: 0.000

Pcnt: 1.25% Value:

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: 0.000

WATER LOSSES (Water Supplied - Authorized Consumption) 0.000

Apparent Losses

Pcnt: Value:

Unauthorized consumption: 0.000 — 0.25%

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: 0.000
Systematic data handling errors: 0.000 — 0.25%

Apparent Losses: 0.000

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 0.000

WATER LOSSES: 0.000

NON-REVENUE WATER

NON-REVENUE WATER: 0.000

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:
Number of active AND inactive service connections:
Service connection density:

Are customer meters typically located at the curbstop or property line?
Average length of customer service line:

(length of service line, beyond the property boundary, that is the responsibility of the utility)

Average operating pressure:

COST DATA

Total annual cost of operating water system: $/Year
Customer retail unit cost (applied to Apparent Losses):
Variable production cost (applied to Real Losses): $/

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

Appendix C. Infrastructure Survey

Indiana Drinking Water Needs Survey

Welcome

Why-fi Water: Utility Infrastructure Needs Survey

This survey has been created by the Indiana Finance Authority to support the efforts mandated by Senate Enrolled Act 347 (2016). Your feedback is critical to ensure that legislators in the State of Indiana understand the needs of our community water systems. Please report the most current information available.

The survey should take less than 1 hour to complete, but will depend on the complexity of your system and the number of water sources. All responses will remain confidential and results will only be reported in aggregate. If you have any questions or concerns, please contact Staci Orr (sorr@ifa.in.gov or 317-232-8623).

The report will be available for distribution beginning November 1, 2016. A copy of the final report will be emailed to all survey respondents, after this date.

System Information

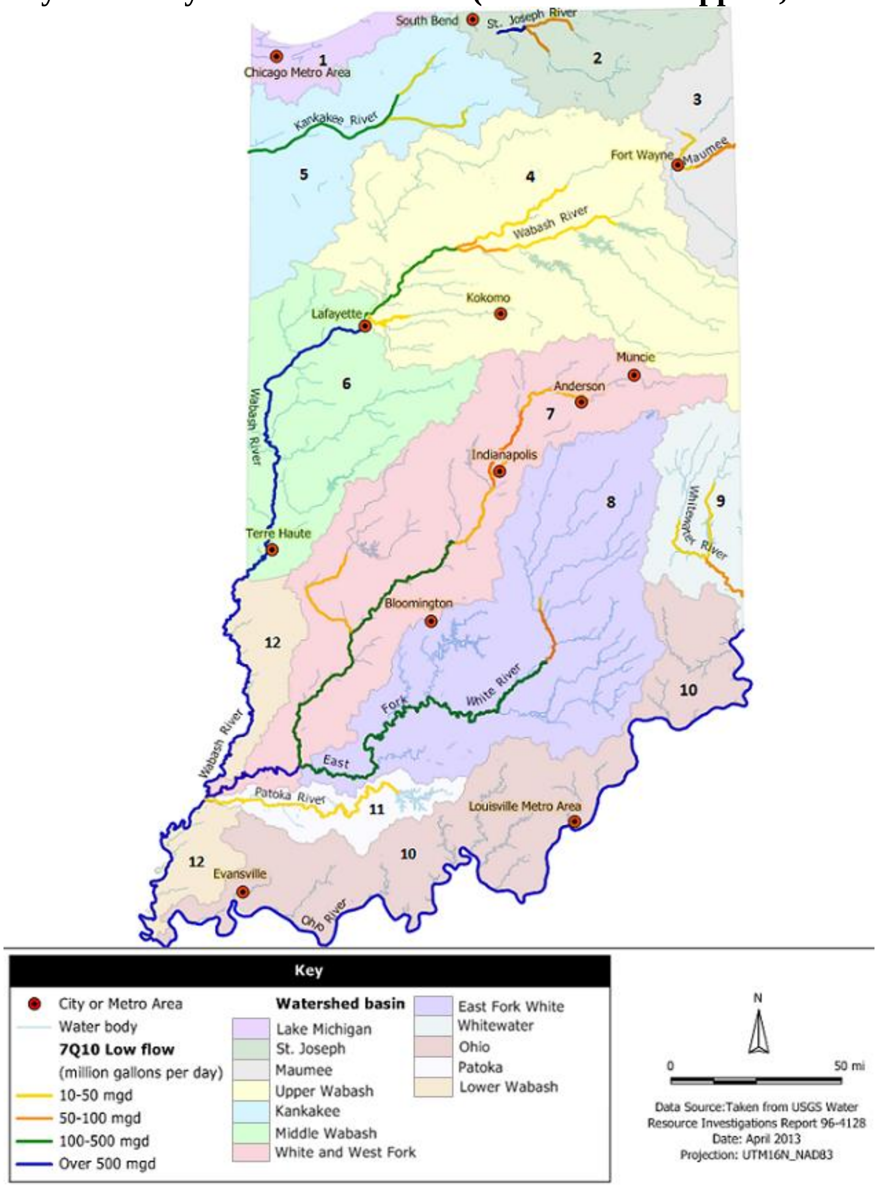
1) Utility name:____

PWSID number (e.g. 5210101): ________________________________

Population served:______________________________________

Year Utility was formed:___________________________________

Please select your Utility's Watershed Basin (if more than 1 applies, select multiple):



(Map Credit: IURC 2014 water utility resource report)

( ) Unknown
( ) 1. Lake Michigan
( ) 2. St. Joseph
( ) 3. Maumee
( ) 4. Upper Wabash
( ) 5. Kankakee
( ) 6. Middle Wabash
( ) 7. White and West Fork
( ) 8. East Fork White
( ) 9. Whitewater
( ) 10. Ohio
( ) 11. Patoka
( ) 12. Lower Wabash

USGS Quad Map Name(s) (if known)____

Service Counties

2) How many counties does your utility serve? ____

Which counties does your utility serve?

	County
Primary County:	____

Utility Contact Information

3) Utility Contact Information

First Name: ____________________________ Last Name: ________________________________

Contact Role (Superintendent, Operator, etc.): ____

Street Address: ____

Apt/Suite/Office: ____

City: ____ Zip:__________________

Email Address:) ______________________________ Phone:_____________________________

Fax Number: ______________________________ Mobile Phone: __________________________

Source of Water Supply

4) Source of Water Supply (Check all that apply):

[ ] Surface Water
[ ] Ground Water
[ ] Purchased Surface Water
[ ] Purchased Ground Water

Ground Water System

5) Ground Water System Specifications

Number of Wells: ____

Information about Wells:

6) Well 1 Details:

Capacity (GPM): ____

Year Installed: ____

Year of Last Inspection: ____

Additional Well Details (separate well information with a comma):
Capacity (GPM): ____

Year Installed: ____

Year of Last Inspection: ____

Surface Water System

7) How many sources of surface water does your utility use?______________________

What are the sources of your utility's surface water supply? (e.g. White River, Old Lake, etc.)

	Source Name(s)
Surface Water Source(s):	_______________________________

How many intakes does your utility use? ______________________________________

Intake Details

8) Intake 1 Details

What year was intake 1 constructed?:______________________________________

How many low head pumps does intake 1 use?_______________________________

Low Head Pump 1 Capacity (GPM): ____

Please provide the capacities for each additional pump, separated by a comma:

____

Purchased Ground Water

9) From how many providers do you purchase ground water? ______________________

Who are your utility's suppliers of ground water?

	Utility
Suppliers:	____

According to the contract, what is the minimum purchased amount for each supplier? (in MGY or specify units)

	Amount in MGY
Supplier(s):	______________________________

Purchased Surface Water

10) From how many providers does your utility purchase surface water? _______________

Who are your utility's providers of purchased surface water?

	Utility
Supplier(s):	____

According to the contract, what is the minimum purchased amount for each supplier? (in MGY or specify units)

	Amount in MGY
Supplier(s):	____

Emergency Power Source

11) Does your utility have an emergency power source?

( ) Yes
( ) No
( ) Unknown
( ) Other - Explain: ___________________

If yes, what is the capacity rating for your emergency power source? (in kW)

____

Water Treatment

12) Is your only treatment chemical feed?

( ) Yes
( ) No
( ) Unsure
( ) Other - Explain:____________________

How many treatment plants does your utility have? __________________________________

Treatment Plant 1:

13) What is the capacity of Treatment Plant 1? (In GPM or specify units):_______________

In what year was Treatment Plant 1 constructed? ____________________________________

How many High Service Pumps does Treatment Plant 1 have? _________________________

What is the capacity for each of the High Service Pumps in Treatment Plant 1?

	Capacity (GPM):
High Service Pump(s):	____

Distribution System

14) Which of the following main sizes are found in your system?

[ ] 4" and smaller
[ ] 6" to 12"
[ ] 14" to 24"
[ ] 26" to 42"
[ ] Greater than 48"
[ ] Other - Write In: ____
[ ] Unknown

Please describe the mains for your distribution system.

	Approximate Average Age of Pipe (years):	**Majority Pipe Type (Ductile Iron, PVC, Cast Iron, Asbestos Cement, etc.):**	**Approximate Total Length of Pipe (miles):**	**Length of Pipe Installed Prior to 1975 (miles):**	**Length of Pipe Installed After 1975 (miles):**
4" and smaller:	______________	_______________	______________	__________	__________
6" to 12":	______________	_______________	______________	__________	__________
14" to 24":	______________	_______________	______________	__________	__________
26" to 42":	______________	_______________	______________	__________	__________
Greater than 48":	______________	_______________	______________	__________	__________
Other:	______________	_______________	______________	__________	__________

Meters

15) Which of the following sizes of meters are present in your system?

[ ] 5/8"
[ ] 3/4"
[ ] 1"
[ ] 2"
[ ] 3"
[ ] 4"
[ ] 6"
[ ] 8"
[ ] 10"
[ ] 12"
[ ] Larger than 12"
[ ] Other - Write In: ____________________
[ ] None of the above

How many of each of the following sizes of meters does your utility have in the distribution system?

5/8": ________________________________

3/4": ________________________________

1":__________________________________

2":__________________________________

3":__________________________________

4":__________________________________

6": ________________________________

8": ________________________________

10": _______________________________

12": _______________________________

Larger than 12": ____________________

Other: _____________________________

Hydrants

16) How many hydrants are connected to your distribution system?

Fire: ____

Flushing: ____

Hydrant Installation Information

Number installed before 1975: ______________________________________

Number installed in or after 1975: ___________________________________

Valves

17) Which of the following valve sizes are present in your utility's distribution system?

[ ] 4" or smaller:
[ ] 6"
[ ] 8"
[ ] 10"
[ ] 12"
[ ] 14"
[ ] 16"
[ ] 18"
[ ] 20"
[ ] Larger than 20"
[ ] Other - Write In:
____
[ ] None of the above

How many of each of the following sizes of valves does your utility have in the distribution system?

4”:________________________________ **16”: ______________________________**

6”:________________________________ **18”: ______________________________**

8”:________________________________ **20”: ______________________________**

10”:_______________________________ **Larger than 20”: ___________________**

12”:_______________________________ **Other: ____________________________**

14”:_______________________________

Pressure

18) What is your average operating pressure? (psi):________________________________

Do you have areas of low pressure?

( ) Yes
( ) No
( ) Unsure

Storage

19) Does your system have at least 24 hours of storage?

( ) Yes
( ) No
( ) Unsure

How many elevated storage tanks does your utility have available?: _______________

Elevated Storage Tank Details

	Size (MG):	**Year Installed:**	**Year Last Painted:**
Elevated Storage Tank(s)	____________	____________	____________

How many ground storage tanks does your utility have available?:_________________

Ground Storage Tank Details

	Size (MG):	**Year Installed:**	**Year Last Painted:**
Elevated Storage Tank(s)	____________	____________	____________

Booster Stations

20) How many booster stations does your utility use?: ________________________________

Booster Stations

	Number of Pumps	Rated Capacity of Station (GPM):	Year Installed:
Elevated Storage Tank(s)	______________	______________	______________

Line Replacement Needs

21) How many lead service lines does your utility have in the distribution system?

____

22) How many dead end lines does your system have?

____

Main Breaks

23) How many main breaks did your utility experience last year (2015)?________________

Electronic Resources

24) Does your utility use SCADA (Supervisory Control and Data Acquisition)?

( ) Yes
( ) No
( ) Unsure

Which system components are connected to SCADA (Check all that apply)?

[ ] Wells
[ ] Booster Stations
[ ] Tanks
[ ] Treatment
[ ] Automatic Meter Reader
[ ] Other - Please specify: ____

25) Does your utility use billing software?

( ) Yes - Please specify: ____
( ) No
( ) Unsure

Do you think that your current billing system is adequate to meet the needs of your system?

( ) Yes
( ) No
( ) Unsure

Mapping

26) Do you have an adequate map of your system?

( ) Yes
( ) No
( ) Unsure

27) Does your system have access to a GIS-based mapping program?

( ) Yes
( ) No
( ) Other - Explain

Future Needs and Plans

28) Do you anticipate a need to serve additional customers in the next 5 years?

( ) Yes
( ) No
( ) Unsure

29) How many of each of the following types of customers do you anticipate needing to serve in the future?

Residential:____________________________________

Commercial: ____________________________________

Industrial: ____________________________________

30) Does your system have a need for a new or replacement truck, excavator, backhoe, or other similar equipment?

( ) Yes - Describe: ____________________________
( ) No
( ) Unsure

31) What infrastructure needs has your utility identified for the next 3 years? Please provide item and estimated cost if known.

____

____

____

32) What are your utility's future plans? Please include specific information (price, type of upgrade/construction) whenever possible.

____

____

____

33) Has your utility begun discussions with an engineer for future planning purposes?

( ) Yes
( ) No
( ) Unsure
( ) Other - Explain: ____

34) Other comments:

____

____

____

Thank you for taking our survey. Your response is very important to us.

WHY-FI WATER

Appendix D. Details of Future Infrastructure Cost Model

Infrastructure Funding and Replacement Model

Many of the respondents did not respond to the future needs question with specific projects and associated costs. Therefore, the Indiana Finance Authority (IFA) used standard best practices to construct an idealized infrastructure replacement plan model. This model uses AWWA and IDEM guidelines as well as engineering best practices to develop useful life estimates. *Note*: Any costs associated with the age of infrastructure (i.e. storage tanks equal to or greater than 60 years old) ONLY takes into consideration the average age at the time of the survey (2016). Infrastructure that exceeds the useful life parameters that are set in the model AFTER year 1 are not included in the cost estimates that are provided. It is important to note that this model applies to utilities differently depending on their response to the question regarding future needs.

Model costs were created based on bid tabulations reviewed by staff for State Revolving Fund (SRF) funded projects. The bid tabulations for each modeled facility description for the 3 years ending December 31, 2015 were averaged to determine a cost per unit. This cost was applied to each utility regardless of utility size.

It should be noted that the model does not necessarily indicate unfunded infrastructure improvement needs. Many of the modeled costs should already be included in the utility's rate structure. Instead, the purpose of the model was to provide a cost to the improvements that are recommended to be completed in the next 20 years.

Model Assumptions

Wells: NARUC estimates average well useful life of 25-35 years. Utah Administrative Code estimates 25 years.

- Wells **older than 60 years old** need to be replaced. This model uses average age, as reported by the utility. Thus, some wells may fall into this category that are not over 60, while others that may be over 60 are not included.

(IFA average used $404.20 per gpm, where capacity is the average of all wells operated by a single utility. Cost applied to year 1)

<u>Example</u>: *Utility Z has 2 wells with an average age of 65, and an average capacity of 500 gpm. According to the model both wells will be replaced, for a total cost of $404,200.00).*

- All wells **between 20 and 59 years old** should be rehabbed once in the next 20 years. This formula uses average age information. Thus some wells may be included/excluded.

(IFA average used $209.49 per gpm, per year, where capacity is the average of all wells operated by a single utility. Cost applied to year 1)

<u>Example</u>: *Utility Y has 3 wells with an average age of 32, and an average capacity of 350 gpm. According to the model, all three wells will be rehabbed in*

the next 20 years, for a total cost of $212,614.50.

Sources:

National Association of Regulatory Utility Commissioners (NARUC), 1979. "Depreciation Practices for Small Water Utilities." Washington, D.C. Page 11, Figure 1.

Utah Division of Administrative Rules, 2016. Utah Administrative Code: R746-332.1. Accessed [September 2016] at URL http://www.rules.utah.gov/publicat/code/r746/r746-332.htm.

Water Treatment Plant: NARUC estimates average useful life of 20-40 years. Utah Administrative Code estimates 20 years.

- Water Treatment plants (distinguished from chemical feed on the basis of filtration) should be upgraded every 20 years

(IFA average used $4,528.52 per gpm. This cost has been annualized, at a rate of $226.43 per year over 20 years.)

> Example: *Utility X has 2 Water Treatment Plants with an average age of 35 and average capacity of 1500 gpm. Thus, Utility D need is calculated at $6,792,780.00, or $339,639.00 per year.*

- Systems that treat water using solely chemical feed should undergo rehabilitation every 10 years.

(IFA average used of $375.05 per gpm over 10 years, or $37.05 per gpm annually, for 10 years.)

> *Note: The number/type of chemical feed processes was not collected. Thus, systems either have a solely chemical feed system, or they do not.*

"…treatment plants are often initially planned with a first-phase design of 10 to 25 years, with a plan to allow for future increments of expansion to accommodate the full life of the project. Equipment such as pumps and chemical feed systems may have an expected life of 10 to 15 years" (McGraw Hill, 2.3).

Distribution Lines/Pipes: NARUC estimates and average of 50-75 year useful life of mains. Utah Administrative Code estimates 50 years.

- 4" and smaller mains should **ALL be replaced over the next 20 years** to support fire protection. Cost applied annually.

(IFA average used of $300,587 per mile of main in this range over 20 years, or $15,029 per mile per year.)

> Example: *Utility W has 45 miles of main in this size range. 45 miles need to be replaced over the next 20 years, for a total cost of $13,526,415, or $676,320.75 per (mile/20) per year).*

- 6"-12" mains should be replaced at a rate of **10% over 20 years**. (This number is very conservative, but utilized by EPA Drinking Water Needs Survey.) Cost applied annually.

(IFA average used $500,313 per mile of main in this range over 20 years, or $25,016 per (mile/10) per year.)

> Example: *Utility V has 330 miles of main in this size range. 33 miles should be replaced over the next 20 years, for a total cost of $825,528, or $41,276.40 per year).*

- 14"-24" mains should be replaced at a rate of **10% over 20 years**. (This number is very conservative, but utilized by EPA Drinking Water Needs Survey.) Cost applied annually.

(IFA average used $1,214,400 per mile of main in this range over 20 years, or $60,720 per (mile/10) per year.)

> Example: *Utility U has 25 miles of main in this size range. 2.5 miles should be replaced over the next 20 years, for a total cost of $3,036,000.00, or $151,800 per year).*

- 26"-42" mains should be replaced at a rate of **10% over 20 years**. (This number is very conservative, but utilized by EPA Drinking Water Needs Survey.) Cost applied annually.

(IFA average used of $1,372,800 per mile of main in this range over 20 years, or $68,640 per (mile/10) per year.)

> Example: *Utility S has 9 miles of main in this size range. About 1 mile should be replaced over the next 20 years, for a total cost of $1,372,800.00, or $68,640.00 per year).*

- > 42" mains should be replaced at a rate of **10% over 20 years**. (This number is very conservative, but utilized by EPA Drinking Water Needs Survey.)

(Estimate used of $1,600,000 per (mile/10) of main in this range over 20 years, or $80,000 per (mile/10) per year.)

> Example: *Utility R has 1 mile of main in this size range. Depending on age and condition, about 1 mile should be replaced over the next 20 years, for a total cost of $1,600,000.00 or $68,640.00 per year).*

Meters: AWWA M6 – Water Meters – selection, Installation, Testing and Maintenance recommends meter replacement program of replacing 10% of meters every 10 years.

Assumption: 75% of systems serving fewer than 3,500 customers do NOT have AMR meters.

- 75% of all small systems need new AMR meters/system
(IFA average of $1,430 per meter, all costs applied to year 1)

- Replace 10% of existing meters per year. Assumption: System currently uses AMR
(IFA average of $30 per meter per year)

> Example: *Utility Q has 6,000 meters. 10% of the meters should be replaced each year, for a cost of $180,000.00 annually, or $3,600,000 total for the next 20 years.*

Hydrants: NARUC estimates average hydrant useful life of 40-60 years. Utah Administrative Code estimates 40 years.

- Replace hydrants installed before 1975
(Estimate of $5,255 per hydrant, cost applied to year 1.

> Example: *Utility P has 545 hydrants installed before 1975. All should be replaced for a total cost of $2,863,975.00.*

- Replace hydrants installed after 1975 at a rate of once every 40 years.
(Estimate of $131 per year, per hydrant)

> Example: *Utility O has 2000 hydrants installed after 1975. They should be replaced once over the next 40 years. Thus, in 20 years, 50% of hydrants should be replaced for a cost of $5,255,000.00 total, or $262,750.00, annually.*

Valves:

- 4” and smaller: Replace all valves of this size to be compatible with the replaced 4” water main and support fire protection over the next 20 years.

(IFA average of $31.50 per valve per year)

> <u>Example</u>: *Utility N has 400 valves in this size range. According to the model, all 400 would need to be replaced in the next 20 years, for a total cost of $252.000.00, or $12,600 per year.*

- 6” – 12”: Replace 10% over 20 years (The valves will be replaced on the same schedule as the corresponding water main.)

(IFA average of $1,380 per valve, applied annually to 10% of the total valves in this size)

> <u>Example</u>: *Utility M has 370 valves in this size range. 37 would need to be replaced in the next 20 years, for a total cost of $51,060*

- 14” – 20”: Replace 10% over 20 years (The valves will be replaced on the same schedule as the corresponding water main.)

(Estimate of $6,000 per valve, applied annually to 10% of the total valves in this size)

> <u>Example</u>: *Utility L has 10 valves in this size range. 1 would need to be replaced in the next 20 years, for a total cost of $6,000, or $300 per year.*

- >20”: Replace 10% over 20 years (The valves will be replaced on the same schedule as the corresponding water main.)

(Estimate of $12,000 per valve, applied annually to 10% of the total valves in this size)

> <u>Example</u>: *Utility K has 30 valves in this size range. 3 would need to be replaced in the next 20 years, for a total cost of $36,000, or $1,800 per year.*

Elevated and Ground Storage Tanks: NARUC estimates an average useful life of 30-60 years. Utah Administrative Code estimates 30 years.

- If 60 years old or older, tank needs replaced

(IFA average of $3,101,101 per million gallons for elevated storage tanks and $1,418,400 per million gallons for ground storage tanks, costs applied to year 1)

> Example: *Utility J has 2 elevated storage tanks with an average age of 65 and average size of 0.5 million gallons and 1 ground storage tank with an age of 75 and size of 1 million gallons. According to the model, the 3 tanks would all need to be replaced in the next 20 years, for a total cost of $4,519,101.00 or $225,955.10 per year.*

- Tanks less than 60 years old should be rehabbed once every 15 years

(IFA average of $876,700 total per million gallons, or $58,447 per million gallons, applied annually over 15 years.)

> Example: *Utility I has 3 tanks with an average age of 37 years and average size of 0.225 million gallons. According to the model, the 3 tanks should be rehabbed once in the next 15 years, for a total cost of $591,772.50, or $29,599.63 per year.*

Booster Stations: NARUC estimates an average useful life of 20 years. Utah Administrative Code estimates 20 years.

- Replace every 20 years

(IFA average of $79.47 per year, or $1,589.31 total, cost applied annually)

> Example: *Utility H has 2 booster stations with an average rated capacity of 650 gpm. Both stations will need replaced in the next 20 years, for a total cost of $2,066,103.00, or $103,311.00 per year.*

Data Quality Control

In order to ensure that utilities provided data that was accurate, the Indiana Rural Water Association (IRWA) assisted the IFA in planning and executing a series of 8 live workshops to go through both assessments. IFA Engineers, professionals from the field of Water Resource Management and technical support were available to answer questions and walk systems through both the Audit and the Survey on an individual basis. 237 people attended, representing 162 utilities throughout the State of Indiana.

In addition to workshops, the IFA and several state water organizations including Alliance of Indiana Rural Water (The Alliance), Indiana Department Environmental Management (IDEM), Indiana Rural Community Assistance Program (RCAP), and IRWA visited utilities to review the assessments and ensure that questions were answered using the best available information.

Once all data was collected, the dataset was checked against IDEM Sanitary Survey records, H.J. Umbaugh & Associates 2016 rate study, and the Indiana Drinking Water Needs Survey responses for accuracy. Any values that did not match reported values were investigated to determine the correct response for each system.

Every AWWA Water Loss Audit was reviewed for accuracy by a member of the data collection team as they were submitted by utilities. This review consisted of simple screening methods to identify potential errors. Any values that did not make sense or follow general trends were verified with utilities. The IFA discovered many mistakes that would have resulted in a lower estimate of infrastructure needs than truly exists. Although the IFA did not verify all responses for each of the 552 utilities, they looked at the extreme values for each question to cut down the amount of incorrect information in the dataset. Preparing the data for analysis required IFA staff to check responses for consistency. This process included removing any extraneous units that were reported, ensuring that data was entered in a systematic manner, and identifying outliers. All unusually large or small values were verified with IDEM and/or utility personnel to ensure quality of the dataset.

IFA Infrastructure Survey responses were verified on a macro scale, after the data collection process came to an end. All values were sorted to identify all values reported in the wrong order of magnitude. These values were verified and changed. The most common source of error in the survey was in the question that read, “Is your only treatment chemical feed.” Many utilities answered this question incorrectly, either as a result of confusion or associating chemical feed with adding chemicals of any kind. Thus, the number of treatment plants was largely underreported. To rectify this problem and properly account for future costs associated with treatment plants, multiple years of IDEM Sanitary Surveys were used to account for all plants.

Cost discrepancies between EPA Drinking Water Needs Survey and Why-fi Water

The Drinking Water Infrastructure Needs Survey and Assessment (DWINSA) was developed by the U.S. EPA to provide an assessment of the number and type of projects eligible for Drinking Water State Revolving Fund (DWSRF) monies. This survey captures information on both large and medium-sized systems. However, small systems have not been surveyed in the past decade. As a result, there are many gaps in the dataset.

There are many items that were included as approved costs for future infrastructure needs in the Why-fi Water study that are not approved projects for SRF funding. See the following table for a list of projects that are allowable and unallowable under the DWINSA (EPA 2013, p. 46). Projects in bold were included in infrastructure costs.

DWINSA Allowable Projects	**DWINSA Unallowable Projects**
Criteria: • Eligible for DWSRF Funding • Capital improvement needs • In furtherance of the public health goals of the Safe Drinking Water Act • Adequate documentation Project Types: • New or expanded/upgraded infrastructure to meet the needs of existing customers • Replacement or rehabilitation of existing undersized or deteriorated infrastructure	• **Raw water reservoir – or – dam-related needs** • **Projects needed primarily to serve future population growth** • **Projects solely for fire protection** • **Non-capital needs** (including studies, operation and maintenance tools including vehicles, computers, etc.) • **Needs not related to furthering the SDWA's public health objectives** • Acquisition of existing infrastructure • Projects not the responsibility of the water system • Needs associated with compliance with proposed or recently promulgated regulations (Derived instead from EPA's economic analyses and added to the national total) • Projects or portions of projects started prior to January 1, 2011 • Projects or portions of projects needed after December 31, 2030

In addition to the stringent requirements regarding the type of projects that are acceptable for inclusion in the DWINSA, the level of documentation required for submission is much greater than the 2016 IFA Utility Evaluation Report required. The information reported on the Survey by utilities was accepted at face value. Any future projects that did not have a cost reported, were assigned costs using SRF bid tab history and engineering experience.

Finally, the EPA recognizes that the total cost identified in the DWINSA is conservative, because many systems have not undertaken the long-term planning necessary to identify future infrastructure needs," (EPA, 2013).

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Sources for guidelines used in the report

Unaccounted-for Water standard for Indiana: 10 – 20% (EPA, 2011. Indiana Department of Environmental Management)