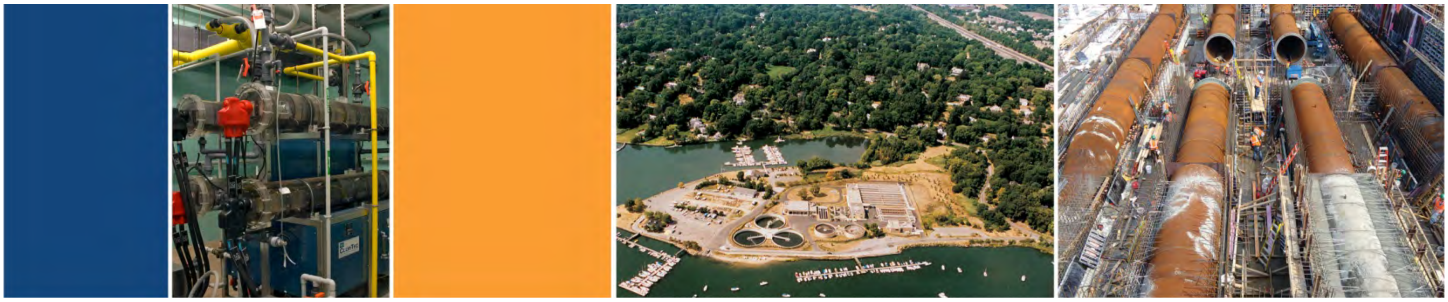

Technical Memorandum, Benchmarking Study for the City of Topeka

Submitted to:

City of Topeka
Utilities Department

Submitted by:

Gannett Fleming

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August 2021

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Executive Summary

The City of Topeka Utilities Department (COT) has identified a need to conduct a benchmark study of their core functions with other similar public and private sector utilities. In order to evaluate potential areas of improvement, Gannett Fleming was retained to complete a benchmarking study for the COT's distribution system management practices and operations and maintenance (O&M) programs. This Technical Memorandum presents the initial task of identifying best practices and procedures that may be implemented to improve performance and establish the foundation and justification for investments intended to improve utility efficiency. The benchmarking study is made up of data gathering and compilation, benchmarking and analysis, review of benchmarking standards and recommendations for best practices. Recommendations were developed with significant feedback and input from the COT.

The benchmarking study identified peer utilities whose data and various program information were analyzed and compared against the COT system to establish a peer benchmarking reference. When applicable, performance indicator median values were used from the 2019 AWWA Utility Benchmarking Performance Management for Water and Wastewater Utilities book. Results from the comparison allow for the review of COT's performance status in order to identify opportunities to improve the O&M of the distribution system.

System characteristics discussed include population served, water demands, customer account breakdown, distribution system total pipe length, pipe age breakdown and pipe material breakdown. A notable point among these results is although Topeka has the second largest population to serve, it has the highest average GPD water demand served. Additionally, Topeka has the second largest distribution system out of the peer group with 40% of its pipes consisting of pit cast iron.

Utility organization categories include the number of accounts per full-time employees (FTE). The City of Topeka number of accounts per FTE for water operations aligns with the median value from AWWA but far exceeds the median value for wastewater operations. The water operations department has almost double the staff compared to peer cities but has nearly half the staffing for wastewater operations.

Operations and maintenance characteristics discussed are planned maintenance ratio, pipe break repairs per 100 miles, leak repairs per 100 miles, distribution system integrity, and planned and corrective maintenance to distribution. Topeka currently operates in a reactive fashion, meaning unplanned and corrective maintenance is undertaken after an asset has failed. The distribution system maintenance is not likely to be as efficient or cost-effective for the long-term. The reported high volume of breaks and leaks in Topeka's system is 49% higher than the AWWA median benchmark. An efficient preventative maintenance program would significantly reduce the number of yearly breaks /leaks and cost to maintain the system.

Overall, COT is performing well in overall maintenance in comparison to its peers.

Because much of the data requested from the COT and the peer utilities are open to individual interpretation, it is important to be wary of external and internal data comparisons. This is especially apparent when looking at indicators associated with reported maintenance, such as how man-hours are reported by each utility and what each utility considers “corrective,” or “planned.”

1.0 Introduction

1.1 Objective

The City of Topeka Utilities Department (COT) provides water supply and associated services for a large incorporated area and neighboring communities. While the Topeka water distribution system is among the older utilities in the country, it has been successfully running for a century. COT is proactively seeking opportunities to improve the distribution system management and operations to improve performance and achieve greater efficiency. Efficient utility performance and providing a high quality and reliable water supply is critical to the financial viability of the system and community.

The objective of this distribution system benchmarking study is to identify best practices and procedures that may be implemented to improve performance. This could be the first step in updating the existing master planning process and establish the foundation and justification for investments intended to improve utility performance and efficiency.

This study presents benchmarking relative to peer utilities, AWWA utility benchmarks and standards. It provides observations and suggestions for areas of improvement. Peer utilities from which data was acquired included: Lawrence, KS; Manhattan, KS; Sioux City, IA; Water One, Johnson County, KS and operational/financial data collected from American Water Works Company (AWWC), Pennsylvania American Water Company (PAWC), and EPCOR Water Arizona Inc. annual reports to represent the private sector. The compiled data for each municipal utility generally includes: customers and population served; financial metrics, water demands; source of supply; treatment plants; distribution system features including pressure zones, pipe size and length, pipe age, and numbers of valves, meters and SCADA monitoring.

1.2 Purpose for Benchmarking

The basis of benchmarking is the collection and organization of data into useful metrics to establish current utility performance levels. When these metrics are compared to previous measurements at the same utility or to performance at other utilities, benchmarking functions as a tool for utility managers and decision makers to understand the status of their utility. Metrics operating as performance indicators provide a scale for reference or target that the utility can use for internal tracking.

It is important for a utility to be aware of how its peers are operating, and how the utility is operating in comparison to its peers or industry standards and best practices. Benchmarking provides decision makers with the ability to identify possible inefficiencies and areas for improvement. The results derived from benchmarking can be used to focus on short- and long-term programs intended to provide proactive O&M and efficient and effective investment in infrastructure rehabilitation and renewal.

1.3 Scope of Work

Based on the scope of services provided by Gannett Fleming, the following task have been completed for sections of this Technical Memorandum:

- Identified peer utilities based on characteristics including type of water supply, system capacity, approximate age, and customers/population served
- Collected and compiled COT and peer utility data using a questionnaire and interviews
- Organized and tabulated data
- Utilized the American Water Works Association (AWWA) 2019 Benchmarking Performance Management for Water and Wastewater
- Compared compiled data from the COT, peer utilities and AWWA Benchmarking Study
- Developed list of standards and best practices from the American Water Works Association (AWWA) Performance indicators
- Compared COT programs and practices in place relative to the AWWA Industry Standards
- Analyzed data comparison and identified gaps and improvement areas for consideration

2.0 Data Collection

The effort to acquire peer system information included developing and submitting a questionnaire, searching publicly available information, collaborating with peer utility staff, and follow-up data requests. Utility characterization included the compilation of specific organizational, financial, and physical distribution system data. Data collection for the COT included the initial questionnaire and interviews with COT staff to characterize the current status of the distribution system's operational and management programs.

The collected data is presented in Appendix A:

- Appendix A – Detailed peer utility characteristics from survey and interviews.

Empty spaces in the tables are colored tan and indicate that proper documentation was not made available.

The following sections describe the process involving peer utility selection, data collection and compilation for Topeka and peer utilities, and industry standards used in this benchmarking study.

2.1 Selection of Peer Utilities

Based on initial characterization of the Topeka system, an initial screening of peer utilities was performed based on population and land area of the primary city served and the team's knowledge of the associated systems. The cities and private utilities selected for initial screening and were requested to participate included Lawrence, KS; Olathe, KS; Sioux City, IA; Manhattan, KS; and two private utilities: American Water (Missouri); Suez Water (Idaho). Elected participants in the study include four (4) municipal water systems: The City of Lawrence Utilities Department; the City of Manhattan Utilities Department; City of Sioux City Utilities Department; Johnson County, Water One. American Water Works Company, Pennsylvania American Water Company, and EPCOR, Arizona.

2.2 Collection and Compilation of Data

The four (4) peer utilities available to participate and COT were asked to fill out and return a questionnaire generated by Gannett Fleming. The questionnaire was developed by Gannett Fleming with input from COT staff and guidance from the 2019 AWWA Utility Benchmarking Performance Management for Water and Wastewater Utilities book. Data / information was received through multiple back-and-forth communication efforts throughout December 2020 – February 2021. Gross data was compiled from the survey and normalized for comparison. The self-reported data from the survey was used to populate the fields in the tables of Appendix A, and organized in the following five (5) categories:

1. Table A-1: System Characteristics
2. Table A-2: Organizational Development
3. Table A-3: Business Operations
4. Table A-4: Customer Relationships
5. Table A-5: Water Operations
6. Table A-6: Wastewater Operations

Publicly available information, such as Water Quality reports, department fact sheets/brochures, utility performance plans, etc., were used as secondary data sources following the initial organization of the survey data. Additional data requests were also utilized, including GIS attribute data, in order to compile data that was deemed important to the study but not provided.

Multiple private utility companies were contacted to participate in the utility benchmarking study. After several follow up attempts for interviews and data collection, staffing and legal constraints had exhausted the private utilities to participate as active peers in the study. However, private utilities publicize operational and financial data that can be valuable for benchmarking. Operational and financial data were collected from American Water Works Company (AWWC), Pennsylvania American Water Company ("PAWC" a subsidiary of AWWC), and EPCOR Water Arizona Inc. ("EPCOR") annual reports that are submitted to their state-wide public utility commissions or the Securities Exchange Commission. Additional data were collected from rate increase filings with the Pennsylvania Public Utility Commission and the Arizona Corporation Commission. The benchmarking data available for these private utility peers are provided in the following sections of this report.

Public information from three private water utilities in Pennsylvania, Aqua Pennsylvania, Inc. (Aqua), Pennsylvania American Water Company (PAWC), and The York Water Company (York) was collected in order to provide Topeka benchmarking metrics and guidance on capital expenditure and proactive renewal and replacement (R&R) programs. The three private utilities selected are proactive with R&R and utilize infrastructure improvement mechanisms (Distribution System Improvement Charges) to fund these proactive programs.

The collected data is presented in Appendix B:

- Appendix B - Capital Expenditures & Proactive Renewal and Replacement Programs.

It is our opinion that COT and private utilities are exposed to similar economic, industry and business risks and the following study will show how COT's operations, on a system-wide level, are benchmarked against these three private utilities. However, consideration must be given to the fact that no two companies are alike.

Follow-up phone interviews were conducted with COT staff to verify data and to gather additional information for Appendix A.

The AWWA's 2019 Utility Benchmarking Performance Management for Water and Wastewater book was utilized as part of the peer utility benchmarking analysis. The AWWA resource provides key performance indicators, aggregate data from 36 US states and historical trends from previous AWWA utility benchmarking surveys for water, wastewater, and combined utilities. Where applicable, the performance indicator median values from the AWWA Benchmarking Report for utilities were included in the tables of Appendix A. The median values in the AWWA Benchmarking Report are median values from the survey responders and should not be considered an industry standard nor indicative of performance of industry leaders. The median values provide a baseline for comparing COT versus participating utilities.

3.0 Benchmarking and Analysis

This chapter describes the findings of Topeka's performance relative to the AWWA performance indicators. The Six (6) performance indicators used for benchmarking that are relevant to COT's Distribution System Operations and Maintenance department include:

- System Characteristics
- Organizational Development
- Business Operations
- Customer Relations
- Water Operations
- Wastewater Operations

Topeka's practices and status relative to these standards are compiled in Table A-1 through A-7 in Appendix A. The following sub-sections compare and contrast the COT data in these categories to the peer utilities (public and private) and the AWWA Benchmarking findings.

3.1 System Characteristics

System characteristics quantify and contrast the distribution system assets for the five utilities. Table A-1 in Appendix A lists the system characteristic data including population and customers served, quantities of distribution system piping by size, material and age, and numbers of valves, and meters. The table also includes information on the general hydraulic attributes of the systems such as the number of system pressure zones and storage facilities. Unless otherwise noted, discussions and charts presented in this chapter are based on the data collected and compiled in Appendix A. System characteristics for the DSIC peer utilities are included in Appendix B.

Topeka provides water supply to approximately 155,000 people. 87% of this population represents single family residential accounts. 10% are non-residential and the remaining 3% are multi-family residential accounts. Topeka's distribution system performs well, delivering adequate maximum daily demand, while maintaining minimum pressure goals in the system. Additionally, the system effectively provides fire service throughout the service area while maintaining adequate residual pressure. Figure 3-1 shows the population served for Topeka and the peer utilities. Figure 3-2 shows a breakdown of customers based on account types.

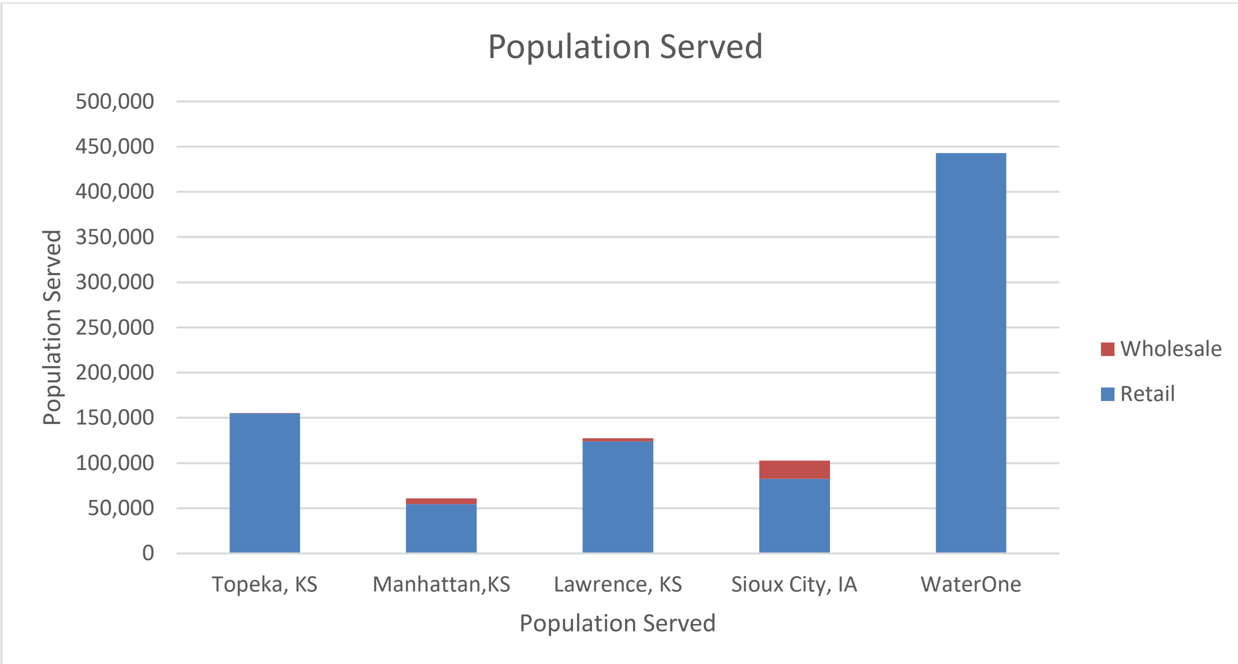

Figure 3-1 Population Served

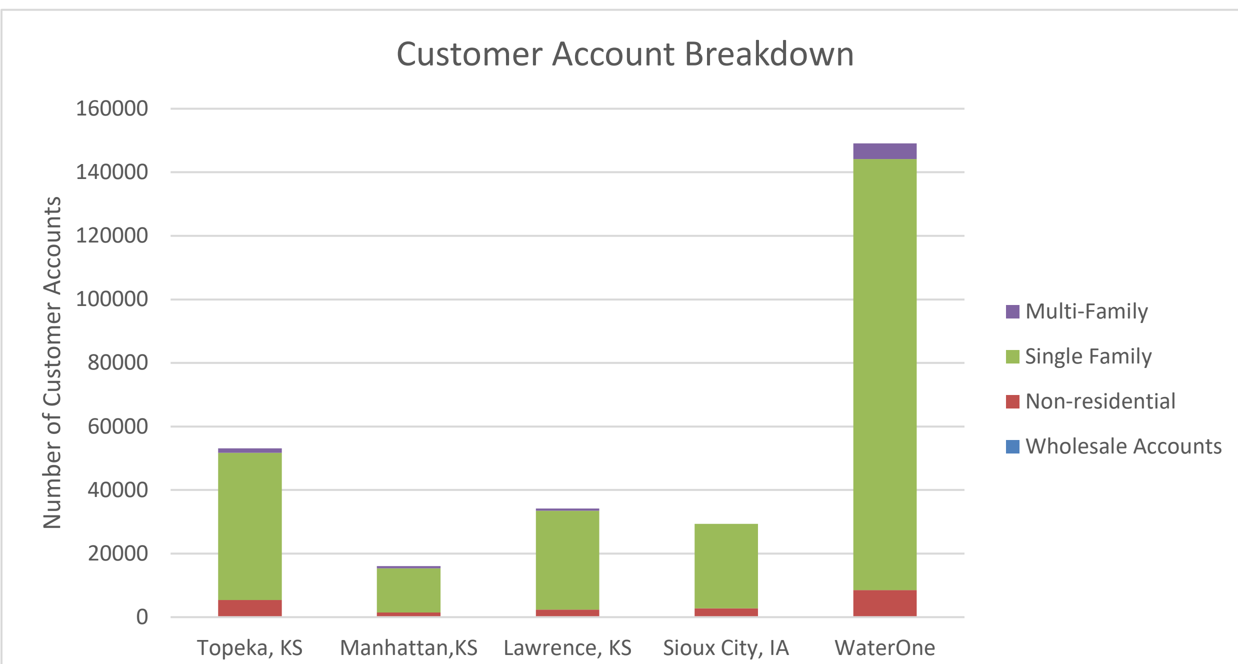

Figure 3-2 Customer Account Breakdown

All the utilities primarily serve single family residential customers; however, Topeka has the highest percentage of non-residential accounts (industrial, institutional, commercial) and the smallest percentage of wholesale accounts.

The populations served for the private utilities studied ranges from about 1,000,000 customers to 15,000,000. It is typical for investor-owned utilities such as American Water Works Company (AWWC) and EPCOR Utilities to operate and own statewide subsidiaries such as Pennsylvania American Water Company and EPCOR Water Arizona Inc.

Graphical comparisons of the system characteristics for the distribution system piping age and materials are described below.

3.1.1 Total Pipe Length

The Topeka distribution system has about 890 miles of distribution piping. Figure 3-3 shows the total pipe length for each utility. Overall, the Topeka system contains the second highest total pipe length of the peer utilities.

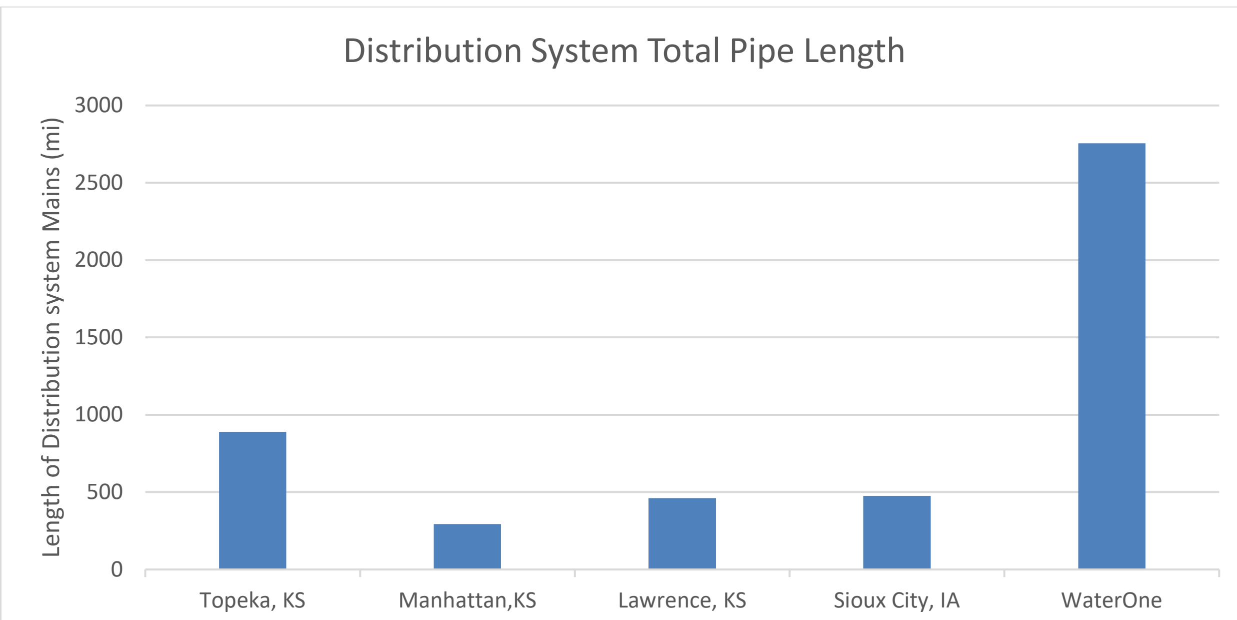

Figure 3-3 Distribution System Total Pipe Length

3.1.2 Pipe Age

Topeka's distribution system contains an average percentage of older pipes compared to its peer utilities. Figure 3-4 indicates nearly 21% of the system was built prior to 1960. Age breakdown for the peer utilities are shown in Figure 3-5. The oldest system is Sioux City with 84% of the mains installed prior to 1960.

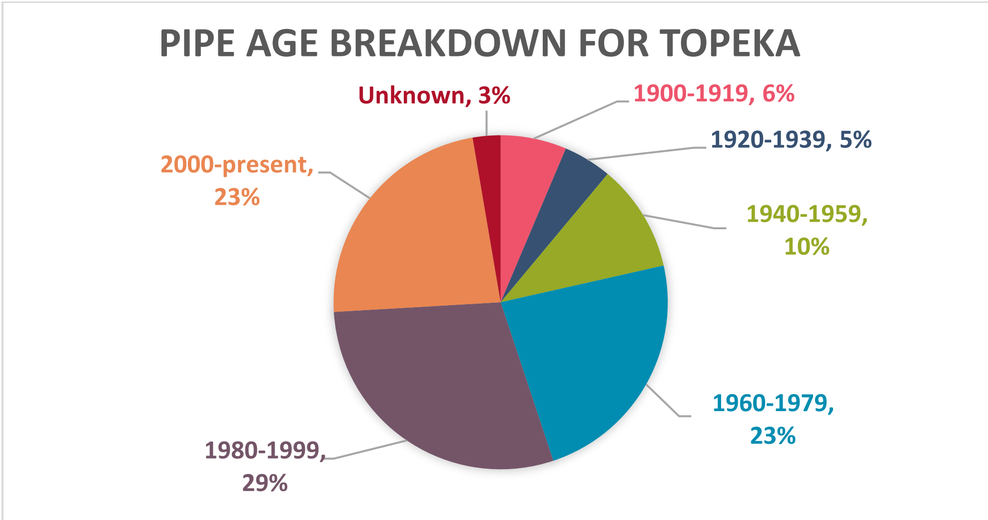

Figure 3-4 Pipe Age Breakdown for Topeka

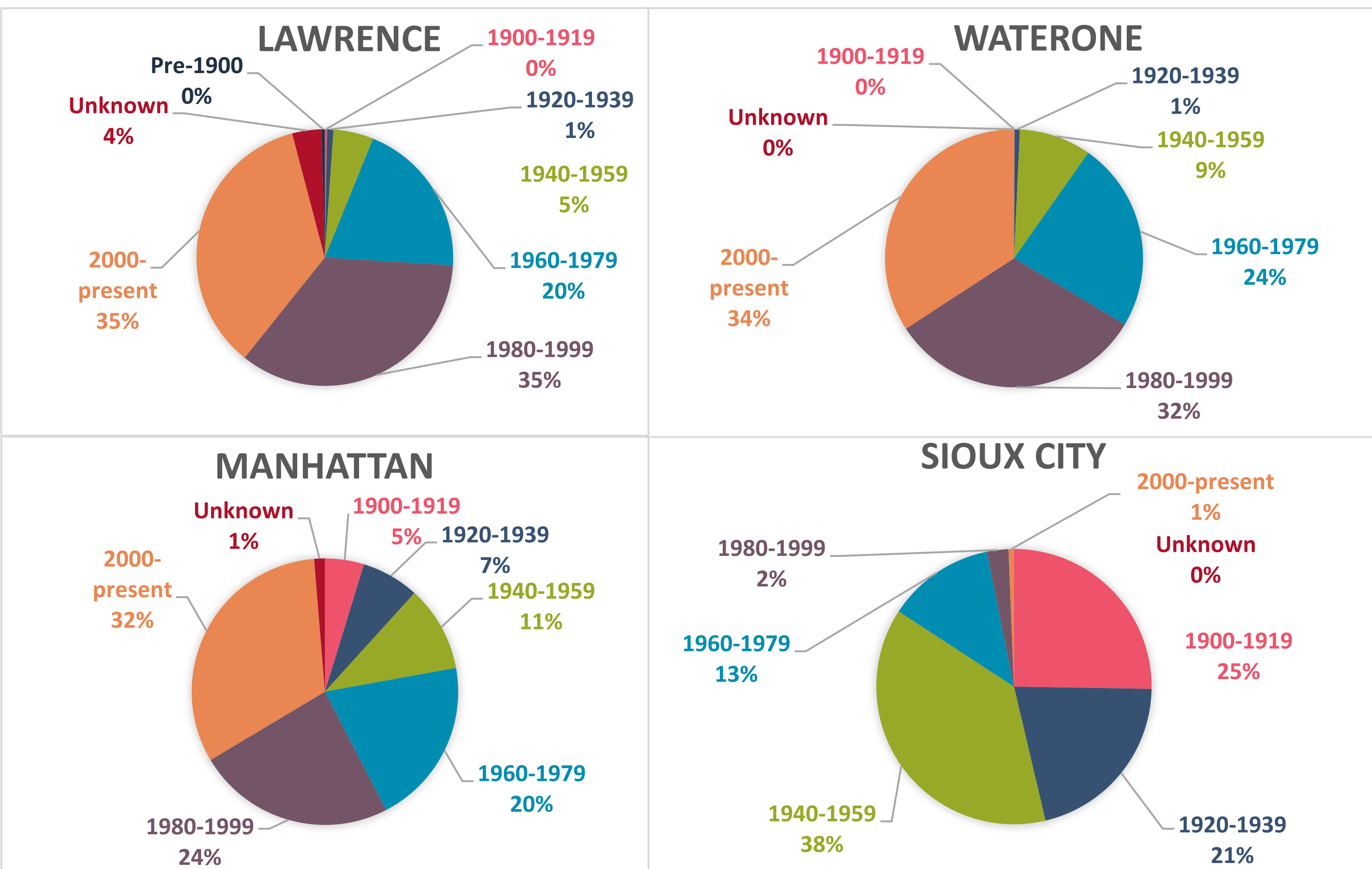

Figure 3-5 Pipe Age Breakdown for Peer Utilities

3.1.3 Pipe Materials

Figure 3-6 presents the percentage of various pipe materials within the Topeka's distribution system. Figure 3-7 presents the same information for the peer utilities. Forty percent (40%) of Topeka's distribution piping is cast iron mains. However, the COT does not differentiate between lined and unlined pipe.

Older unlined cast iron pipe is generally more susceptible to failure, so it is reasonable to expect a higher number of incidences for leaks and breaks in these systems. This could explain why Topeka has the highest number of reported main breaks. Break analysis indicates Topeka has 44 breaks/leaks per 100 miles of pipe. This is twice as high as the AWWA benchmark standard of 22 breaks/leaks per 100 miles of pipe.

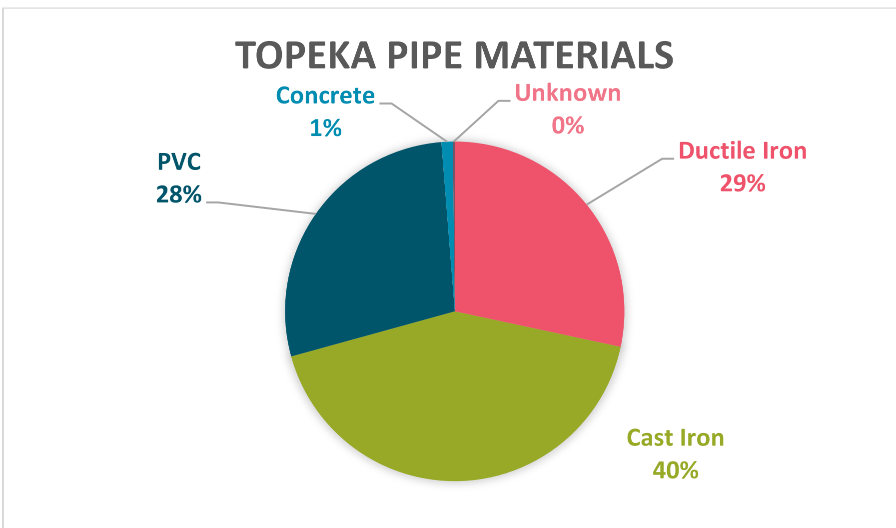

Figure 3-6 Topeka Pipe Material

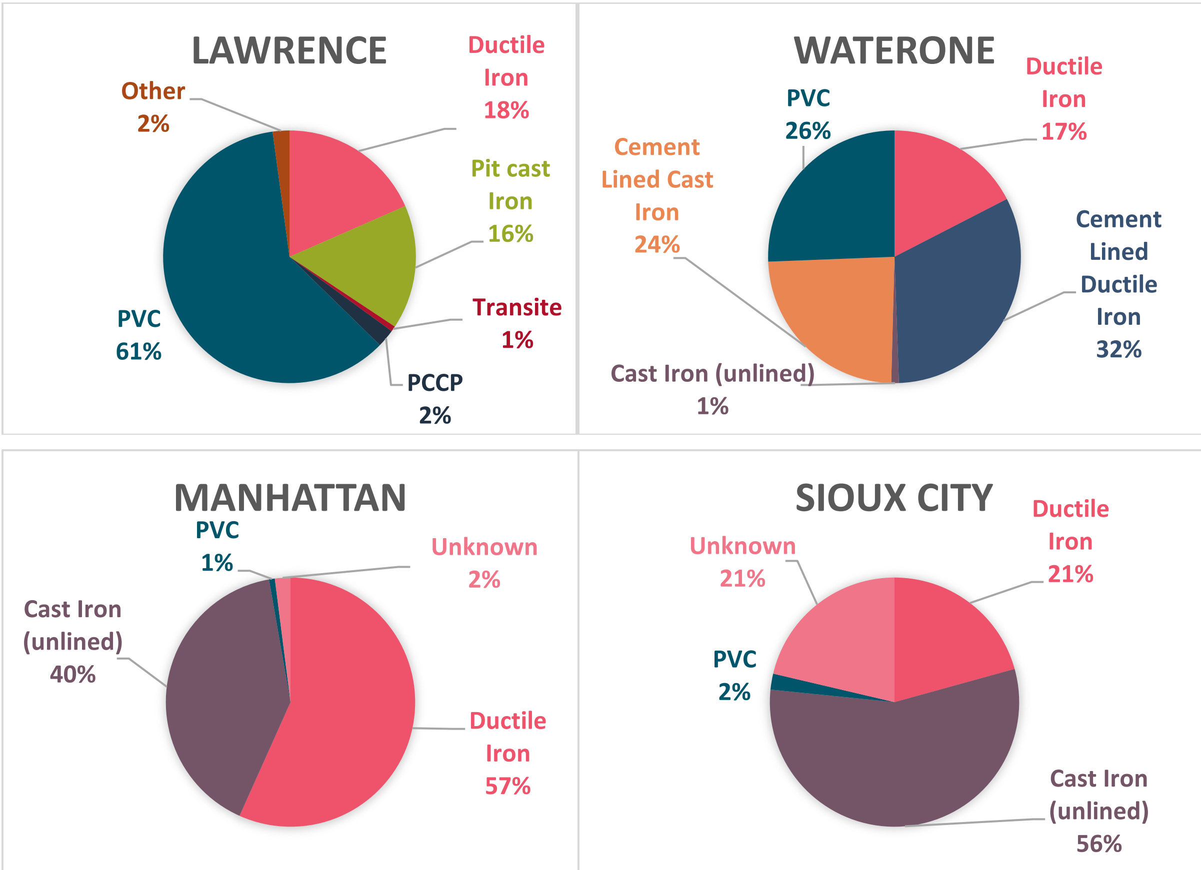

Figure 3-7 Peer Utility Materials

3.1.4 Other Distribution System Components

Table 3-1 summarizes the number of valves, hydrants, meters and service connections for Topeka and the peer utilities. Normalized values (number of items per mile) for each of these items indicate that these utilities are fairly uniform in infrastructure item distribution.

Table 3-1 Other Distribution System Components

Indicators and Data to be Benchmarked Items:	Topeka, KS Item / Mile	Manhattan, KS Item / Mile	Lawrence, KS Item / Mile	Sioux City Item / Mile
Valves	11	13	17	13
Hydrants	6		4	4
Meters	64	19	39	
Service Connections	64		38	

3.2 Organizational Development

Table A-2 in Appendix A lists the data compiled for various subcategories under utility organization. Topeka has approximately 224 staff positions. About 121 positions are in the water department and 79 positions in the wastewater department. These numbers can be normalized for comparison with the peer utilities by combining with data for numbers of customers, population served, and system supply.

Figure 3-8 shows the number of customer accounts per water and wastewater fulltime employees respectively. The indicator provides a measure of employee efficiency expressed by the total number of active accounts serviced by utility employees per year. The Topeka organization is below the AWWA benchmark value for the number of customer accounts per full time equivalents (FTE) for water and is slightly above this benchmark for wastewater.

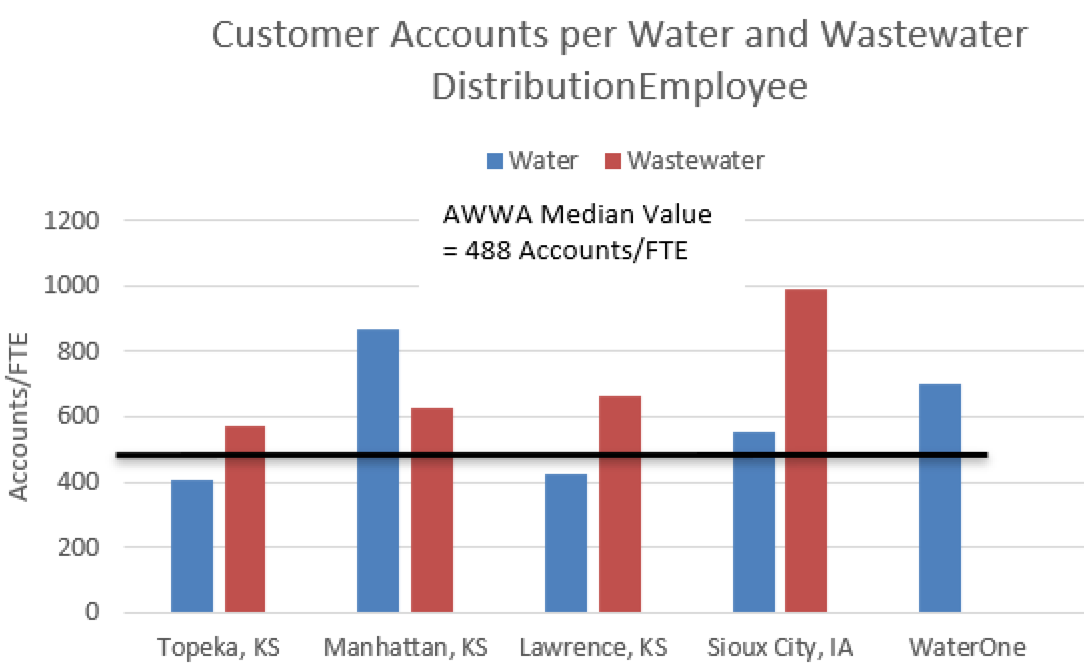

Figure 3-8 Customer Accounts Per Water and Wastewater Distribution Employee

Figure 3-9 illustrates the system wide customer accounts per employee compared to AWWC and PAWC. The system wide accounts per employee of 421 for Topeka falls below the two private utilities studied and the AWWA benchmark.

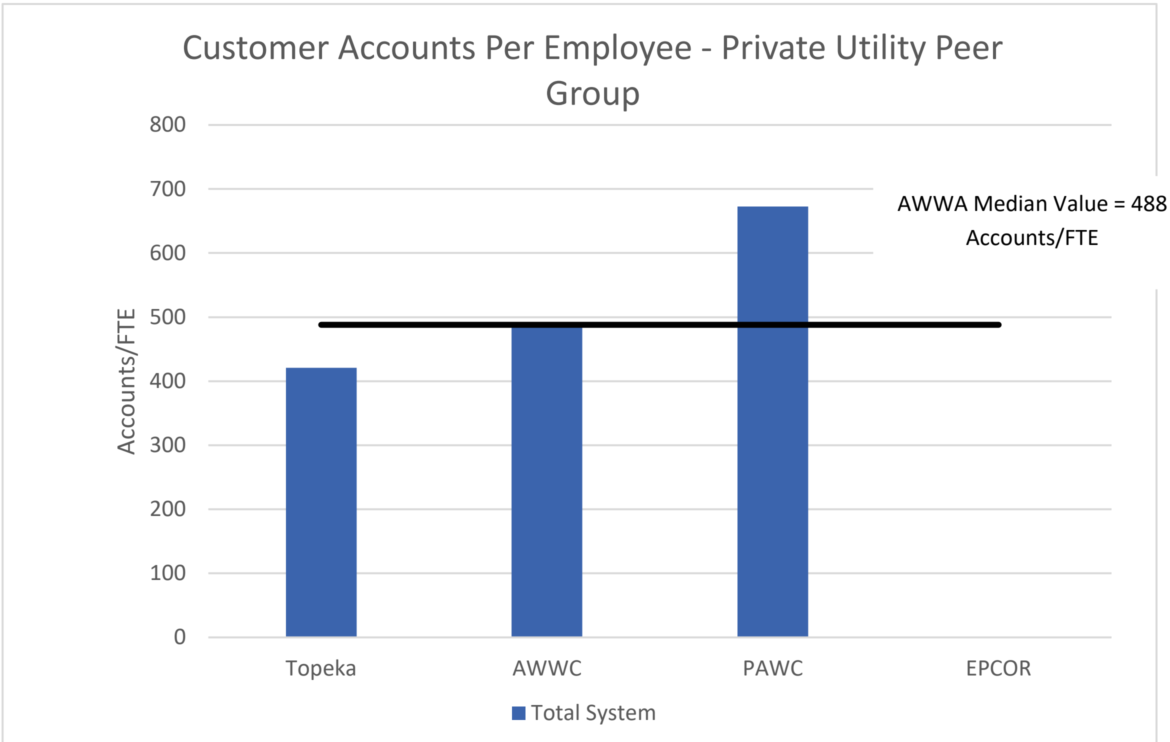

Figure 3-9 Customer Accounts Per Employee - Private Utility Group

Figure 3-10 shows the number of regular employee departures during the reporting period divided by the total number of FTEs to get the percentage of employee turnover for the water and wastewater operations. Topeka's water operations value fall in line with the AWWA benchmark standard falling just below this median by .5% while wastewater operations values are higher than the AWWA benchmark value by 9.2%.

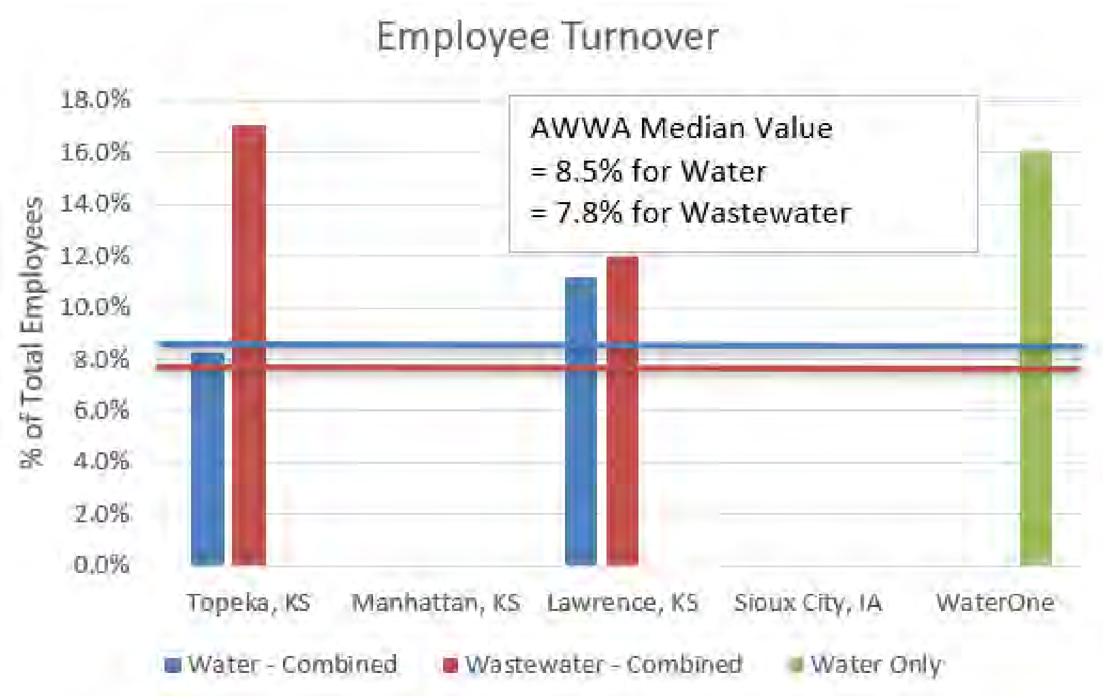

Figure 3-10 Employee Turnover

When comparing retirement eligibility, see Figure 3-11, it can be noted that Topeka's values are significantly lower than the AWWA benchmark values and lower than most of its peer cities. This indicator is given by the number of regular employees eligible for retirement in the next five years divided by the total number of FTEs. This is typical for both water and wastewater operations.

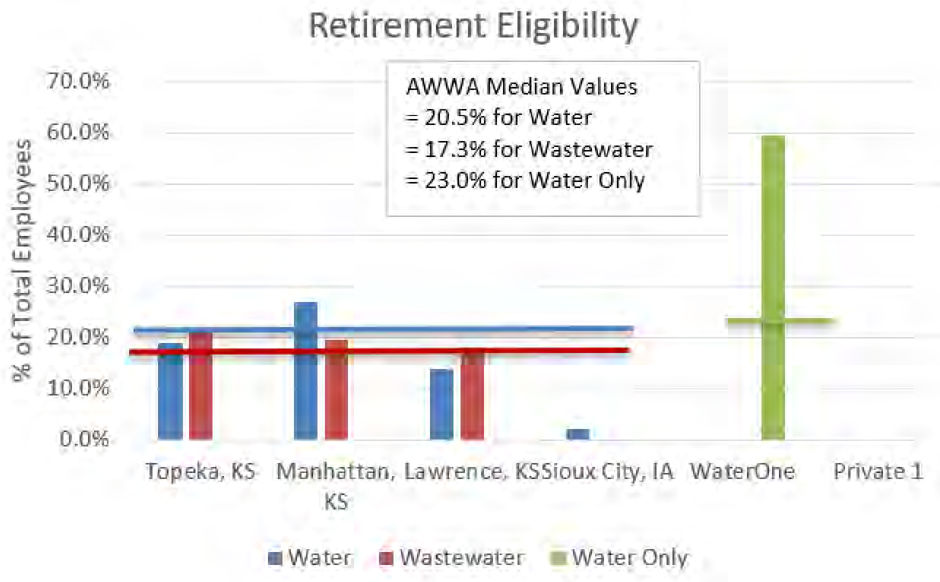

Figure 3-11 Retirement Eligibility

In order to run an efficient utility, it is important to look at the current workforce and its average length of employee tenure. The City of Topeka falls in line with the AWWA median value for employee tenure with 12.2%.

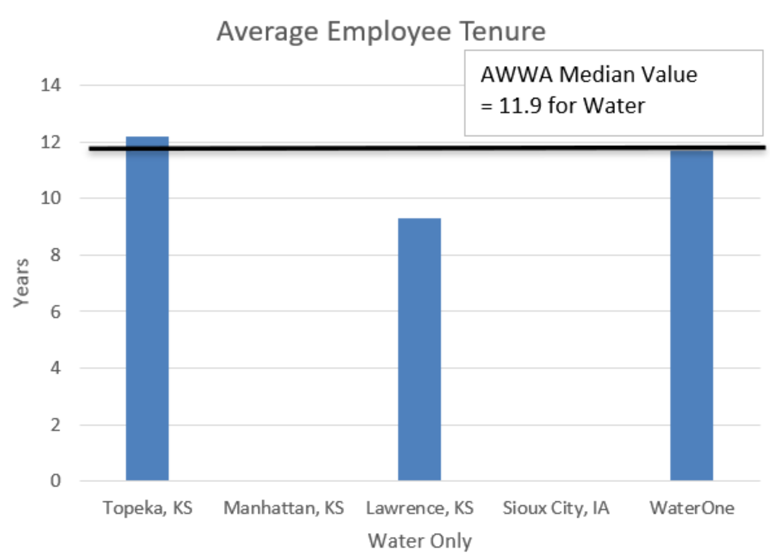

Figure 3-12 Average Employee Tenure

The operations and maintenance (O&M) costs for potable water service can be compared between peer utilities measuring the cost per account, daily production and per 100 miles of pipe and compared to the median value within the AWWA book. When looking at the cost per account by dividing the total O&M cost by the sum of residential and nonresidential accounts, Topeka's values compare significantly lower than its peers at $89.56/account. Figure 3-13 indicates that all peer utilities within this sample size have values below the AWWA median value. According to the AWWA Benchmarking, the median cost of potable water services (2004-2018) ranged from $240 to $470 per account for combined utilities and have not been adjusted for inflation rates. Pennsylvania American Water Company's total O&M cost of potable water service per customer account value of $29.50 also falls below the AWWA median value.

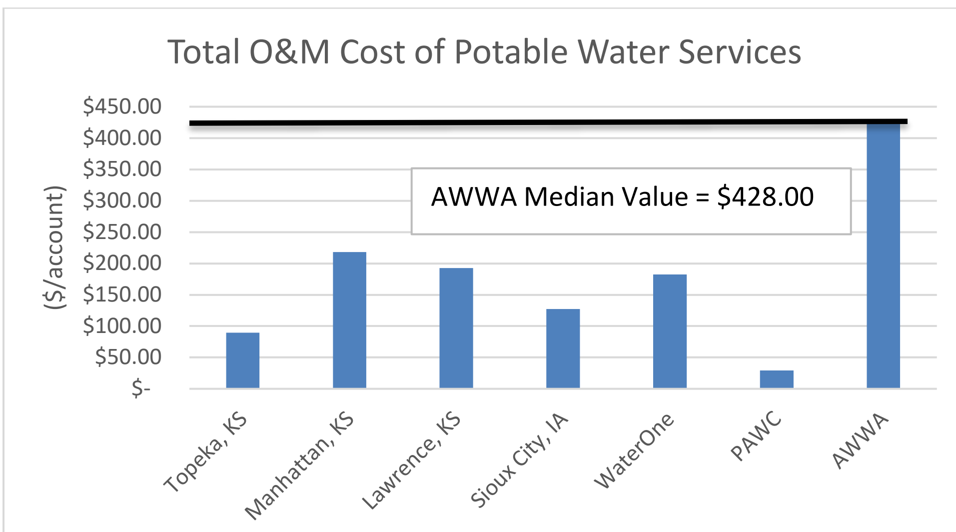

Figure 3-13 Total O&M Cost of Potable Water Service Per Account

The average daily production cost, in terms of O&M, according to the AWWA Benchmarking is $2,468.00 per Millions of Gallons. Comparing the median value to Topeka's $614, this is significantly lower. Other peer utilities values compare more closely to the values of the 75th percentile. Values for the cities displayed in Figure 3-14 fall within the historical trend values of $1,400 to $2,600 for years of 2004-2018 for combined utilities. For the private utilities studied with available data, PAWC's O&M costs for average daily production are $440 per millions of gallons.

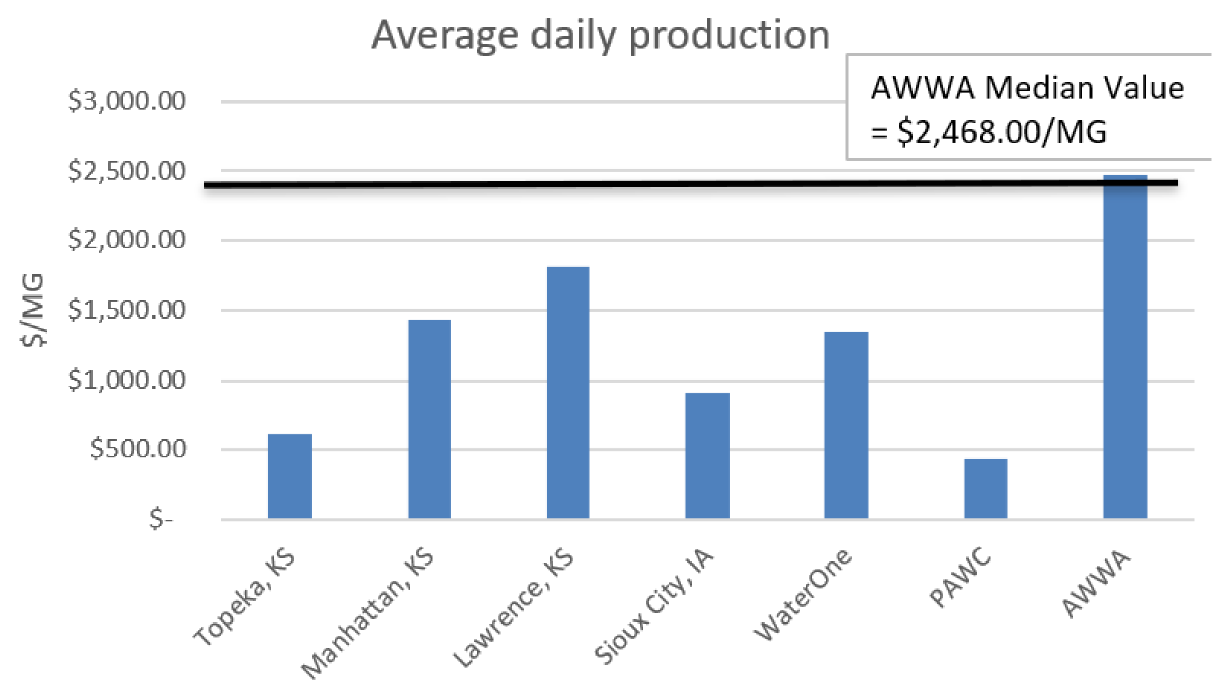

Figure 3-14 O&M Costs for Average Daily Production

Finally, the total O&M cost of potable water services per 100 miles of pipe were compared among peer utilities and PAWC. Similar to average daily production, all peer cities and PAWC values are below the AWWA median value, see figure 3-15 below. However, Topeka's O&M expense nearly reaches the AWWA median benchmark and doubles the values of some of its peer cities.

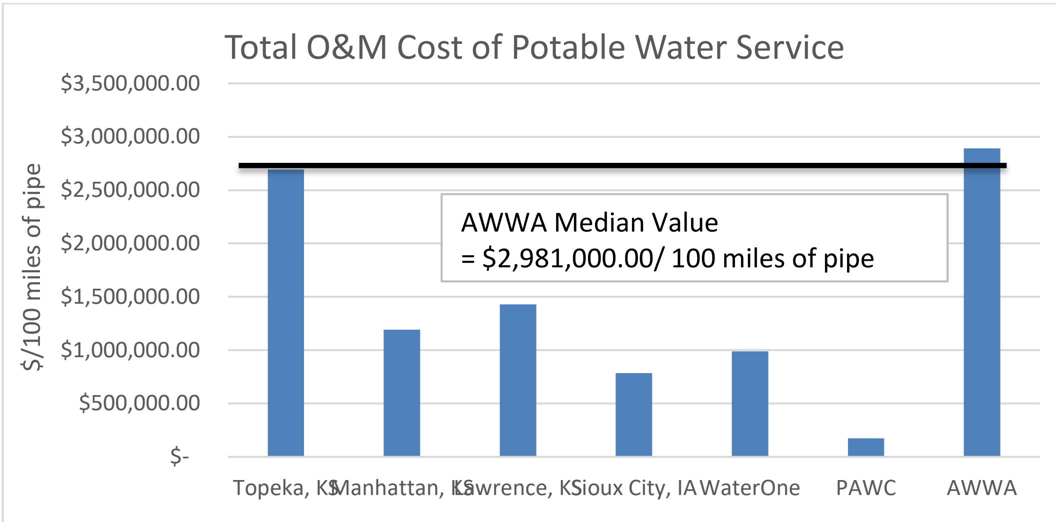

Figure 3-15 Total O&M Cost of Potable Water Service per 100 Miles of Pipe

As the City of Topeka improves its infrastructure condition through renewal and replacement programs, the O&M expenses may be reduced over time. The reduction rate would be dependent on replacement and renewal investment.

Another measure of employee efficiency can be expressed by the amount of wastewater treated by a full-time utility employee. This is measured by the average MGD of wastewater processed divided by the total number of FTE. The AWWA median value is 0.19 while the City of Topeka is 12% higher than the industry average at 0.29.

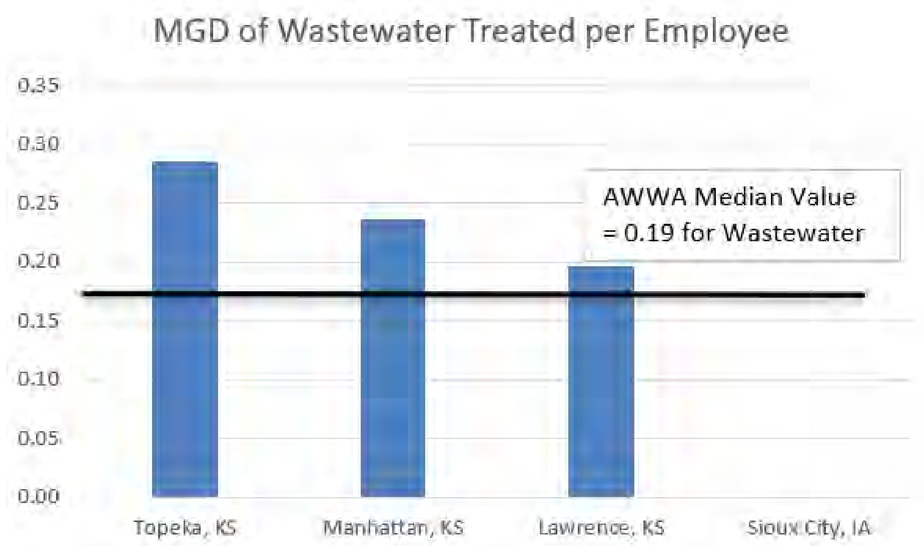

Figure 3-16 MGD of Wastewater Treated per Employee

Another value compared between the peer cities is the number of wastewater treatment plants within the City. All the peer cities have one to two treatment plants within their jurisdiction as seen in Figure 3-17. Topeka operates three plants, but only two are within the city.

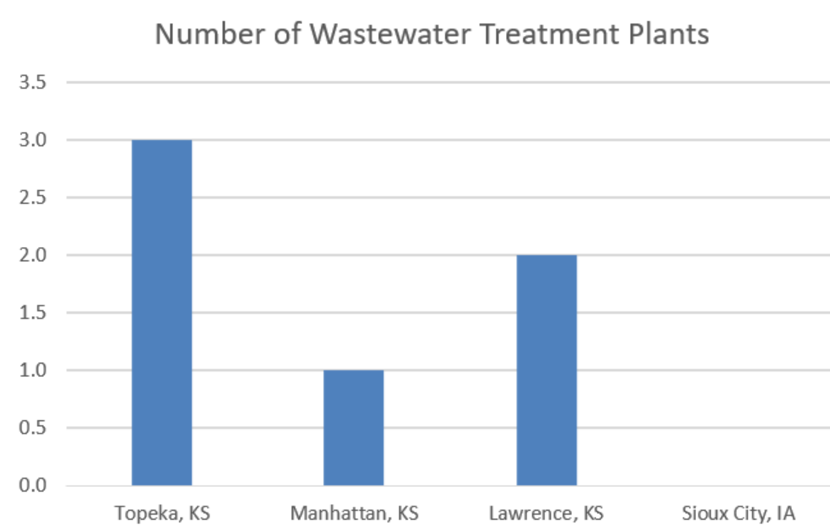

Figure 3-17 Number of Wastewater Treatment Plants

Wastewater treatment plant planned maintenance compared to corrective maintenance is displayed below in Figure 3-18. While the City of Topeka has over 1,500 corrective maintenance orders per year, they far exceed other cities when it comes to planned maintenance. Such values show that the City has invested time into reducing the number of corrective maintenances in the future.

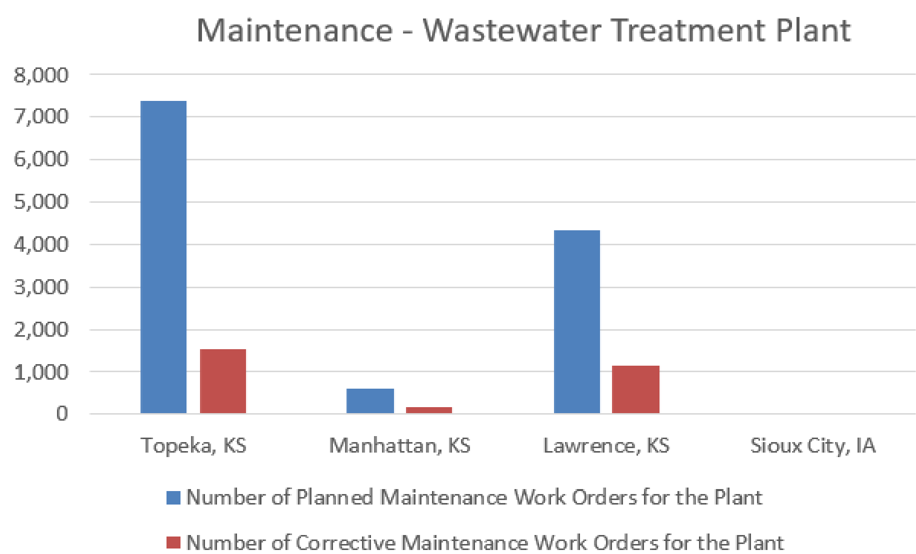

Figure 3-18 Wastewater Treatment Plant Maintenance

3.3 Business Operations

This section describes the findings of Topeka's business operation performance relative to the AWWA performance indicators for debt ratio, return on assets, debt to service ratio, operating ratio and capital funding sources.

3.3.1 Debt Ratio

The debt ratio indicator quantifies a utility's level of indebtedness. It is a measure of the extent to which assets are financed through borrowing. The higher the debt ratio, the more dependent the utility is on debt financing. Debt ratio is calculated as the total liabilities divided by the total assets.

Table A-3 in Appendix A lists the budget and financial data for Topeka and its peer utilities, including values of total fixed assets, liability and debt services. Figure 3-19 shows the debt ratio for water, wastewater and storm water for Topeka and its peer cities compared to the AWWA median standard. Topeka exceeds the AWWA median standard for all 3 utility services. The AWWA median for water, wastewater and storm water are 36%, 43% and 8% respectively.

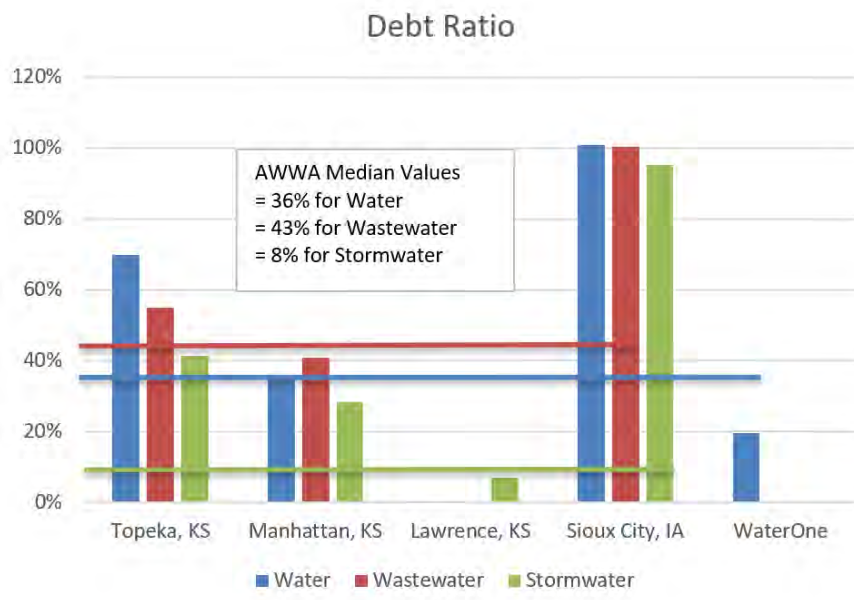

Figure 3-19 Debt Ratio

Figure 3-20 shows the system wide debt ratios for the private utilities and Topeka. Topeka exceeds the AWWA water operations debt ratio of 0.38 by 57%. However, the system wide debt ratio as of December 31, 2019 for Topeka is 20% lower than EPCOR, 18% lower than AWWC and 5% lower than PAWC. Private utilities typically operate with higher debt ratios based on total liabilities than public utilities due to differences in accounting rules.

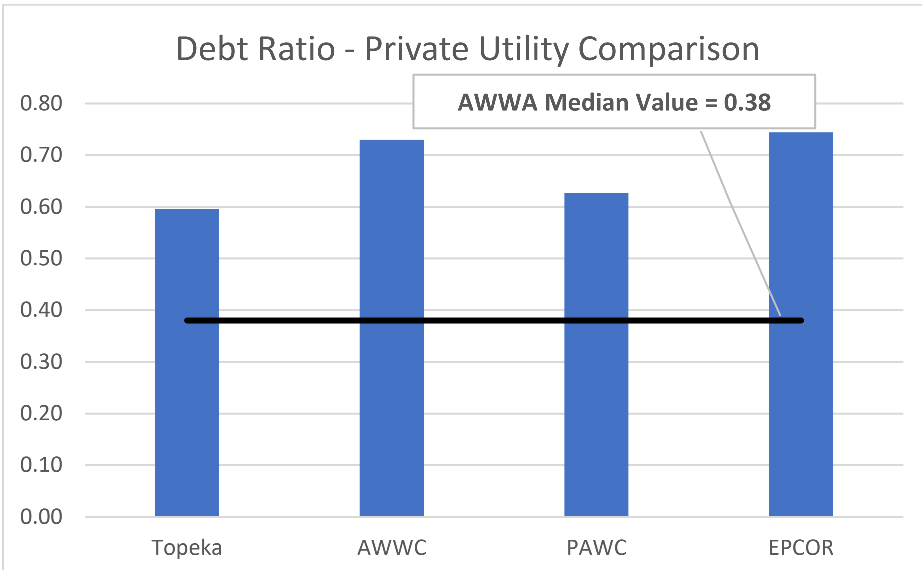

Figure 3-20 Debt Ratio - Private Utility Group – System Wide

3.3.2 Debt Service Ratio

The debt-service ratio or the debt coverage ratio is the ratio of net operating income to total debt service. This is the amount of cash flow available to cover interest, principal and sinking fund payments. Negative cash flow is indicated by ratios less than one meaning the utility is not generating enough income to pay its debt obligations strictly through operations. The debt-service coverage ratio is calculated by subtracting total O&M cost from the total operating revenue and dividing by the total debt service. The AWWA median for combined utilities is 2.16. Figure 3-21 shows Topeka is below this benchmark for water and wastewater and is 17% above this benchmark for storm water.

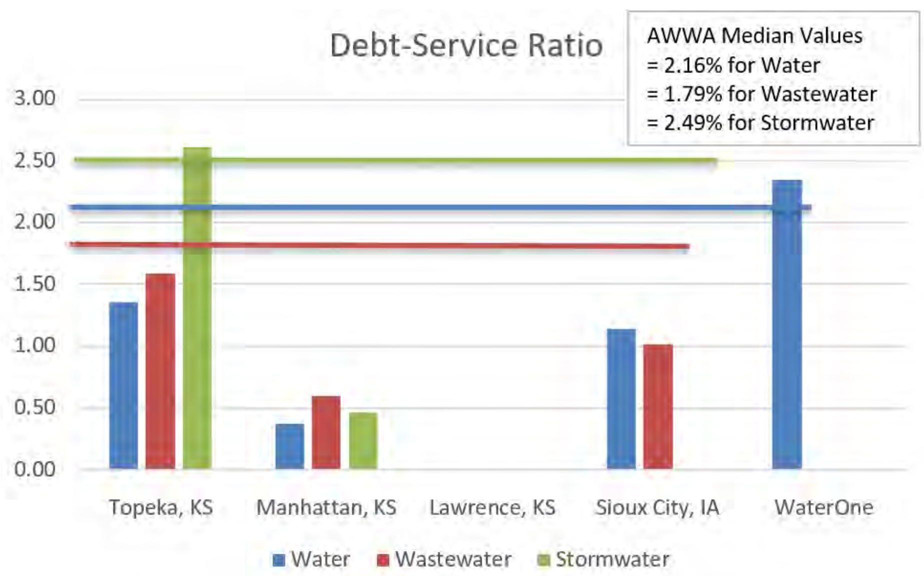

Figure 3-21 Debt to Service Ratio

3.3.3 Return on Asset

Return on asset is an indicator of the utility's financial effectiveness, defined by net income divided by total asset value, presented as a percentage. Figure 3-22 shows the Return on Asset for Topeka, the peer utilities and the AWWA Median Benchmark. Topeka's distribution system is mature in development and age. As a result, the asset value is depreciated. However, Topeka's return on asset is reported at 5.5% for water, 5.8% for wastewater and 6.2% for stormwater which is higher than the AWWA median for water, wastewater and storm water which are 2.2%, 2.0% and 3.4% respectively.

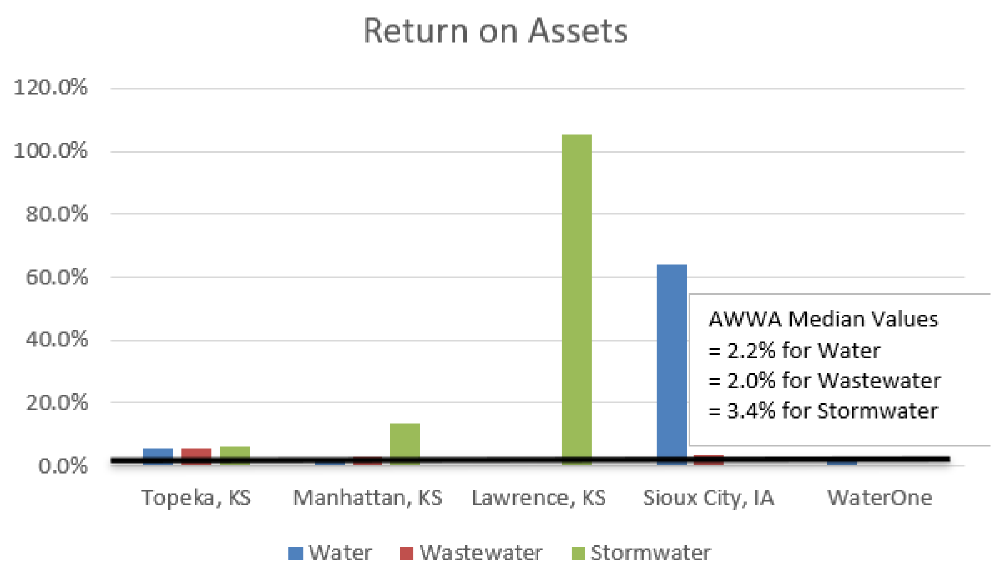

Figure 3-22 Return on Assets

Compared to the private utility peer group, Topeka's return on assets for its entire system is about 300 basis points higher than the AWWA median of 2.74%. We understand Topeka has an annual replacement and renewal program in place, and COT would experience a lower return on assets if it decided to accelerate its long-term investment improvement plan to replace its aging distribution system. Topeka could consider charging its customers a distribution system improvement charge (DSIC) to fund capital projects related to improving the distribution system to maintain their return on assets as explained in Appendix B. See Figure 3-23 below.

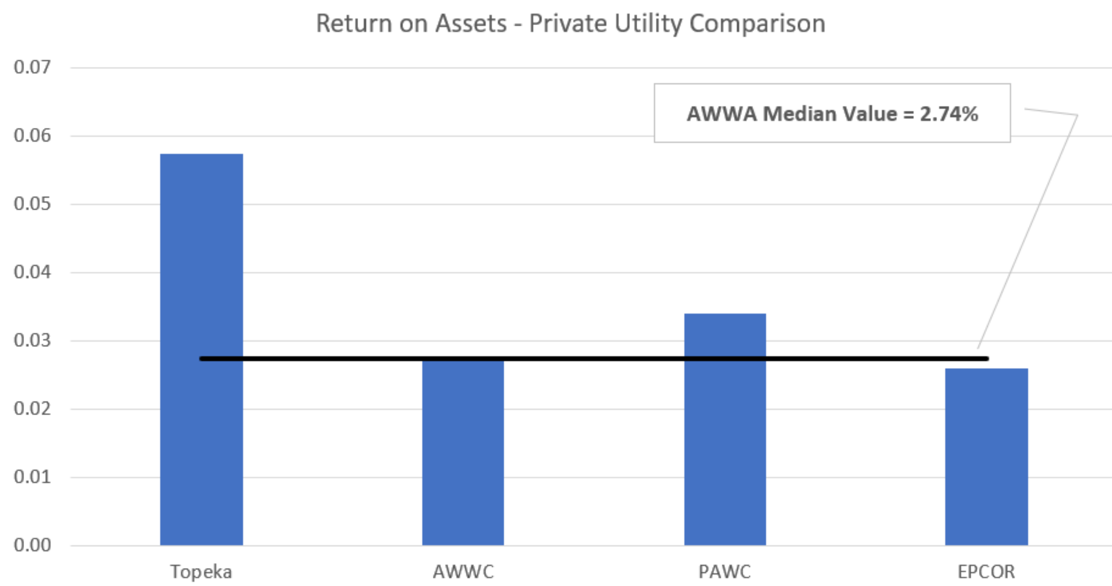

Figure 3-23 Return on Assets – Private Utility Group – System Wide

3.3.4 Operating Ratio

The operating ratio is defined as a utility's operating expenses divided by the operating revenue accounting for expansion or debt repayment. The AWWA median for water, wastewater and storm water is .58, .50 and .62 respectively. Topeka is about 11% higher than the AWWA median benchmark for water and wastewater and approximately 28% lower than the AWWA median for stormwater.

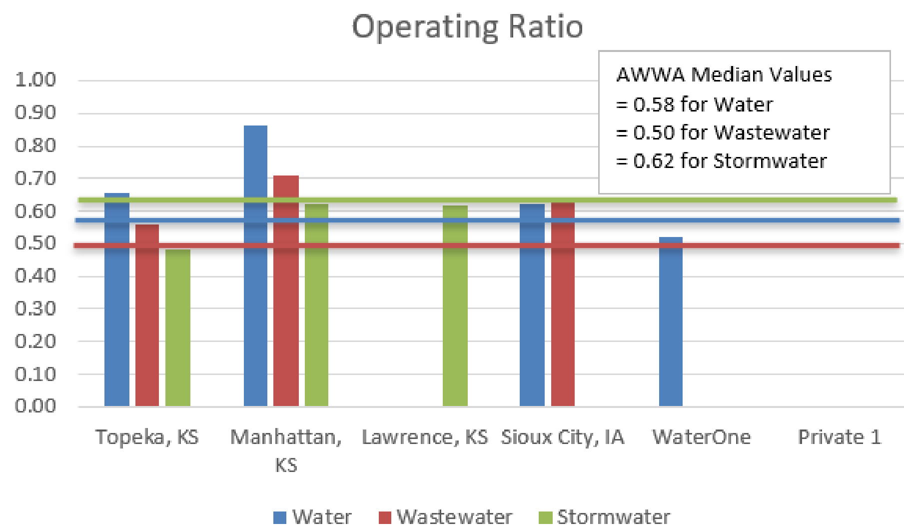

Figure 3-24 Operating Ratio

For the private utilities studied, Topeka's total system operation ratio is .60 which is 15% higher than American Water Works Company's operating ratio, 45% higher than Pennsylvania American Water and 21% higher than EPCOR. Topeka has the highest Operating Ratio in comparison to the peer group of private utilities.

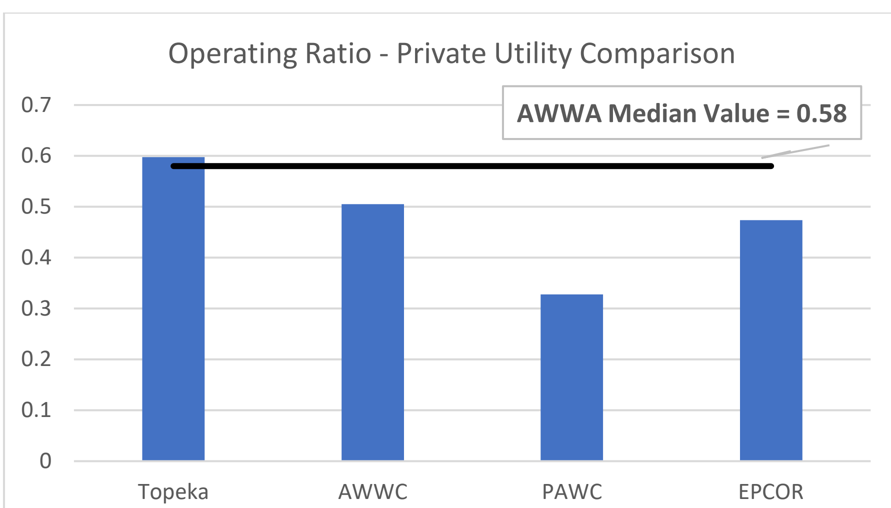

Figure 3-25 Operating Ratio – Private Utility Group – System Wide

3.4 Customer Relations

The Utilities Department is comprised of the Water, Water Pollution Control Utilities and the City of Topeka Customer Service Center. The COT has a designated call-in number for customers to pay bills, answer questions and report potential issues.

Topeka's customers experience the lowest call waiting times with an average of 37 seconds beating the AWWA call waiting standard of 1.4 minutes. The City of Lawrence experiences the highest call waiting and talk times of all the utilities. Call history shows Topeka's average talk time is 3.03 minutes just beating the AWWA Benchmark of 3.7 minutes. Topeka has roughly 24 call center/customer service FTE while Lawrence has about 11 FTEs. Despite a staff shortage, Topeka is likely performing well due to the number of annual overtime (762) hours incurred from customer service representatives. Figure 3-26 shows the call center indicators for data received from the peer cities.

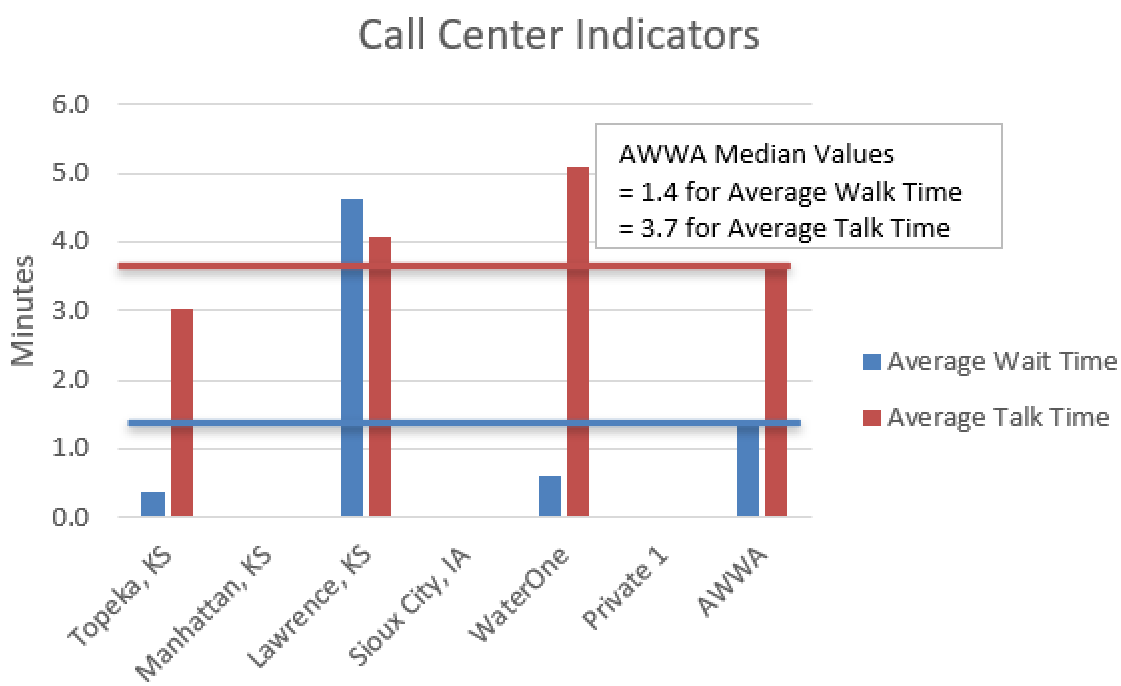

Figure 3-26 Call Center Indicators

Figures 3-27 and 3-28 show the number of complaints for water service per 1000 accounts and per population served and the complaint breakdown for customer service and technical quality categories. The complaint frequency related to customer service is expressed as the number of complaints per 1000 customers' accounts per reporting period for "people related" and "product related" complaints. Customer service complaints per 1,000 customers is calculated as the total number of customer service complaints times 1,000 divided by the number of residential and non-residential accounts. Technical service complaints per 1,000 customers is calculated as the total number of technical service complaints times 1,000 divided by the number of residential and non-residential accounts. The breakdown shows that Topeka receives a high number of customer service complaints compared to the AWWA average benchmark, however, Topeka has low technical service complaints per account and population served.

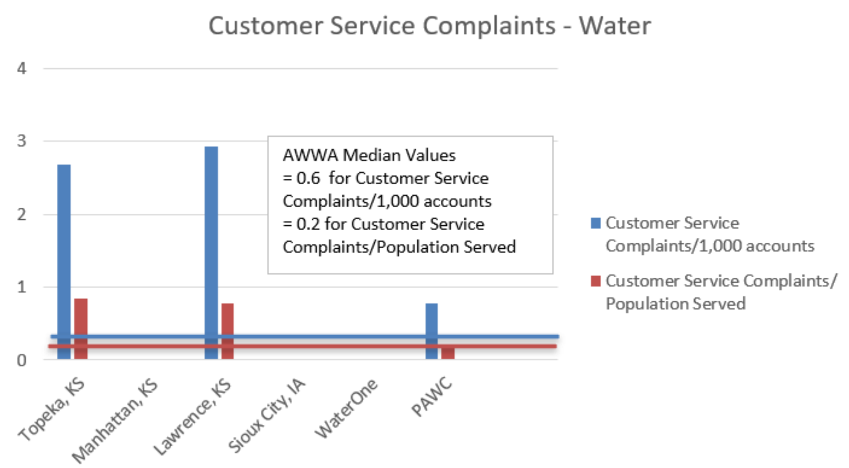

Figure 3-27 Customer Service Complaints per 1000 Customers (Water)

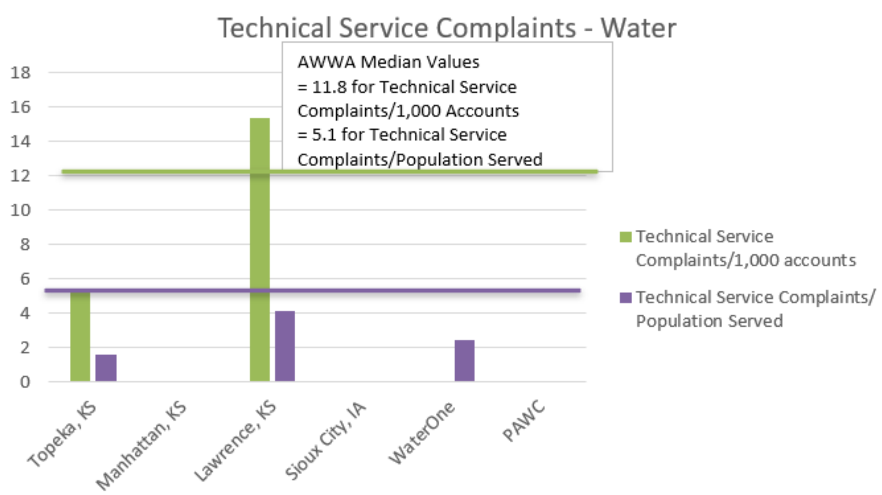

Figure 3-28 Technical Service Complaints per 1000 Customers (Water)

Figures 3-29 shows the number of complaints for wastewater services per 1000 accounts and per population (1000 people served). It also shows the complaint breakdown for customer service and technical quality categories. The breakdown shows that Topeka receives twice as many technical complaints as the AWWA average benchmark.

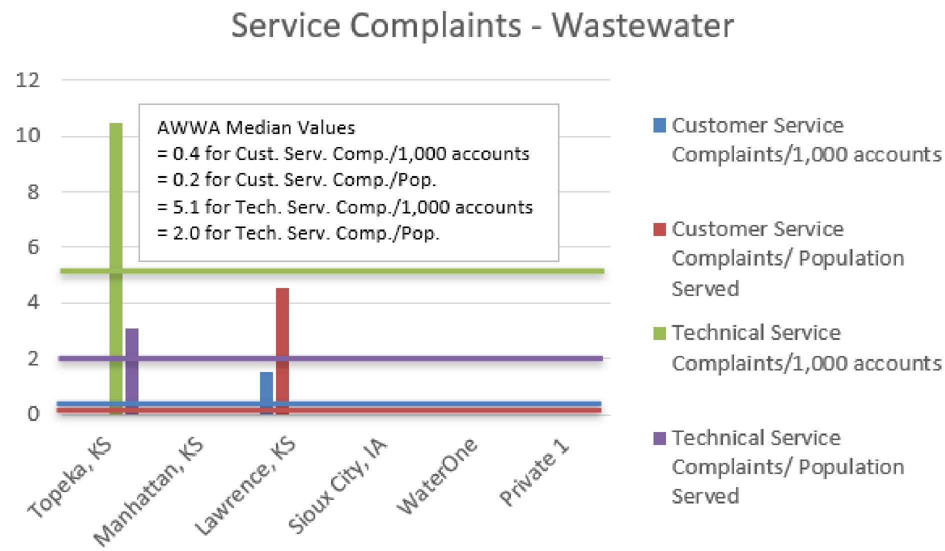

Figure 3-29 Customer & Technical Service Complaints per 1000 Customers (Wastewater)

3.5 Water Operations

3.5.1 Valve Maintenance

The O&M data are listed in Appendix A, Table A-5. The graphical comparison of the data for each subcategory provides a representation of Topeka's status relative to peer utilities. Topeka's maintenance program for water distribution includes exercising, repairing and replacing valves, meter calibrations and hydrant servicing. The two oldest cities, Sioux City and City of Lawrence are the only peer utilities with hydrants reported out of service. Figure 3-30 and Figure 3-31 show valve maintenance and valve replacements per 100 miles for all utilities respectively. Topeka ranks 3rd compared to its peer public utilities for valve maintenance and last for valve replacements.

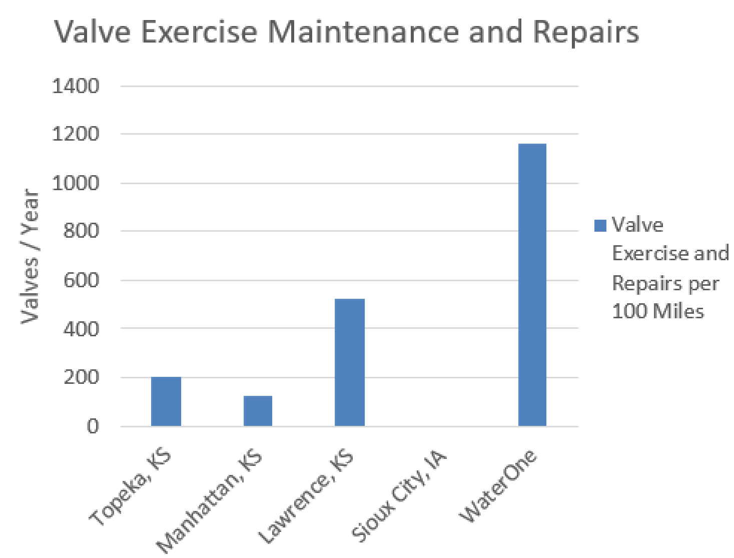

Figure 3-30 Valve Exercise Maintenance and Repairs

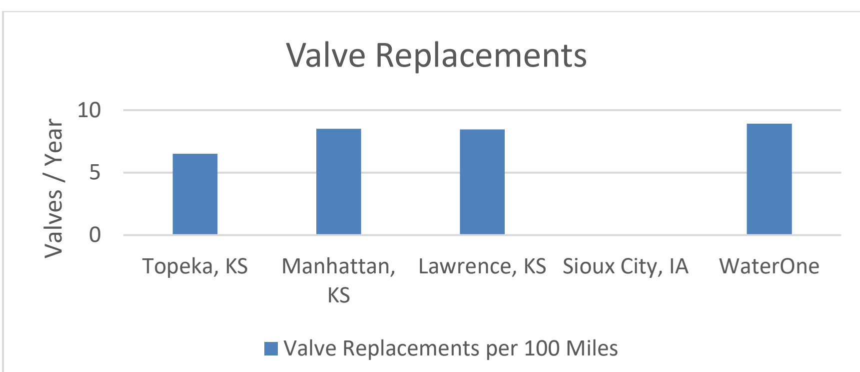

Figure 3-31 Valve Replacements

3.5.2 Distribution System Maintenance

The planned maintenance ratio is the ratio of planned maintenance hours to total maintenance hours in a year. Currently, all peer utilities have a Computerized Maintenance Management Systems (CMMS), except for Manhattan and Sioux City. Lawrence and Topeka have both achieved 90% of its planned work orders and Water One has achieved 79% per Figure 3-32 below.

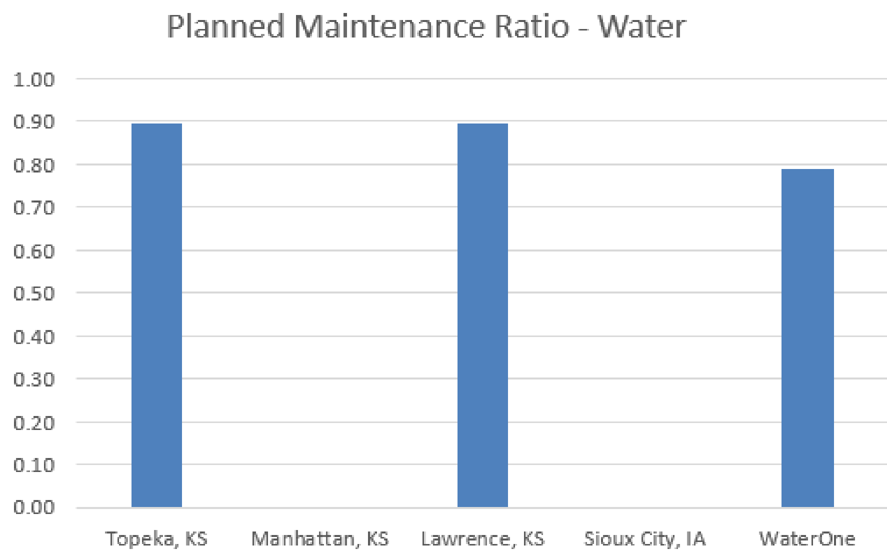

Figure 3-32 Planned Maintenance Ratio for Distribution Maintenance Work

The average AWWA benchmark is to attempt a 5-year rotation completion for all valve and hydrant maintenance intervals. Topeka is averaging 12% valve maintenance for this reporting period. At this rate, Topeka will not meet the AWWA benchmark standard. In comparison to the peer utilities, Topeka ranks 3rd for valve maintenance (excluding Sioux City – data not provided). Water One ranks number one with 61% of valves being maintained per year and Manhattan ranks last at 10%.

3.5.3 Condition Assessment, Main Breaks and Leaks

Every utility experiences water main breaks, however some utilities are better at managing main breaks to minimize both disruptions to the public and lost consumer confidence in the utility. Figure 3-33 shows pipe break repair per 100 miles of distribution piping. Topeka's incidence of break repairs per 100 miles of main is high compared to its peer utilities' systems that also contain older and unlined cast iron main.

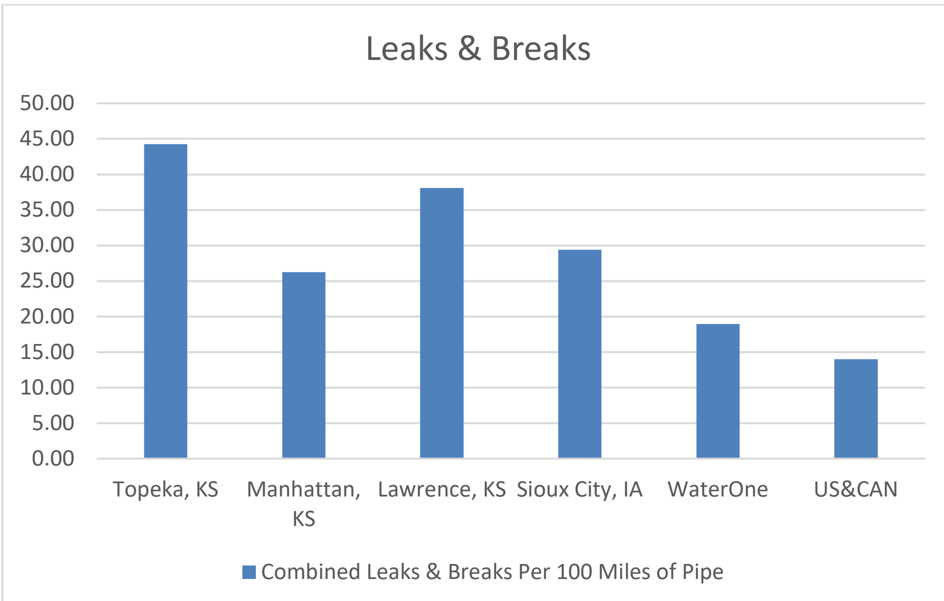

Figure 3-33 Pipe Break Repairs per 100 Miles

Figure 3-33 is based on the reporting period data. The number of main breaks for a system in a given year can vary significantly depending on a variety of conditions. To develop conclusions regarding the number of main breaks Topeka experiences, a multi-year break history would need to be evaluated.

Additionally, Figure 3-33 includes break rates from a study completed by Utah State University in 2018, "Water Main Break Rate in the USA and Canada: A Comprehensive Study ("Main Break Study"). The Main Break Study determined for the 281 water utilities studied, the overall failure rate was 14 breaks per 100 miles. Cast iron mains experienced the highest break rate of 34.8 per 100 miles and the lowest break rate was PVC pipe at 2.3. The Main Break Study was also broken down by regions of the USA and Canada where Kansas fell under Region 4. Region 4 experienced 8.7 breaks per 100 miles in 2018.

Distribution system integrity can be quantified by combining the number of break and leak repairs performed each year and normalized per 100 miles of pipe. Figure 3-34 represents distribution system integrity for Topeka and the peer utilities. Because Sioux City's system is older and has more unlined cast iron main it could be expected to have a higher number of breaks and leaks repaired per year. That is not the case compared to the peer utilities or the AWWA benchmark and can be considered a positive attribute or a function of a low rate of leak repair as indicated in Figure 3-33. Additional information concerning main breaks is covered in Appendix B.

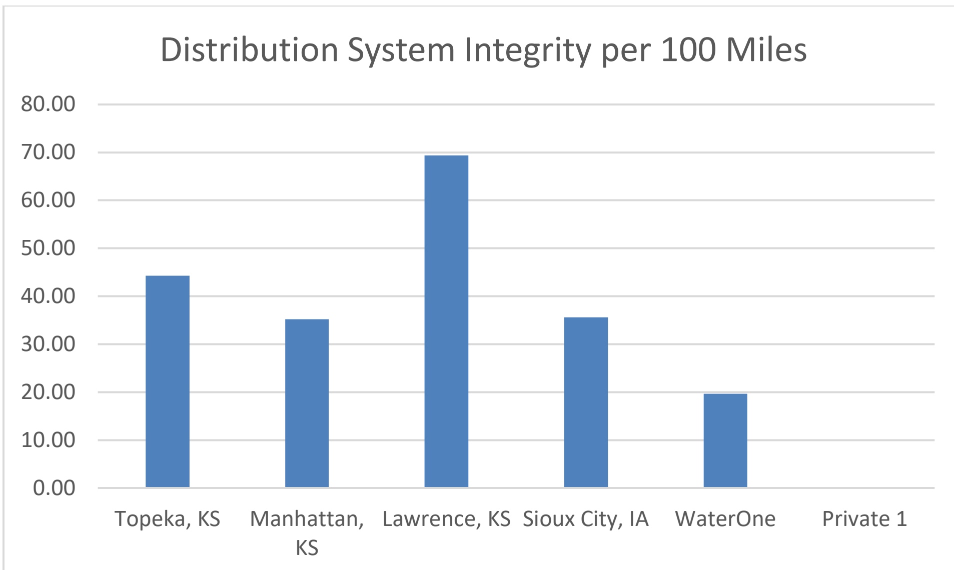

Figure 3-34 Distribution System Integrity

3.5.4 Site Restoration

Topeka experienced 394 water main breaks during 2019 reporting period with all sites restored. With the exception of the City of Manhattan, each of the peer utilities reported an equal number of breaks and site restorations. Manhattan exceeded site restoration repairs in 2019 compared to the number of breaks experienced, which indicates that there were some sites left unrestored from the previous reporting period. Additionally, Manhattan is the only City that does not contract any site restoration services. Figure 3-35 shows each Cities' completed site restorations and how many of those restorations were performed in the street or in grassy areas. Although Manhattan performs in-house site restorations, they have the highest average time for site restoration completion, see Figure 3-36. (Sioux City did not provide this data).

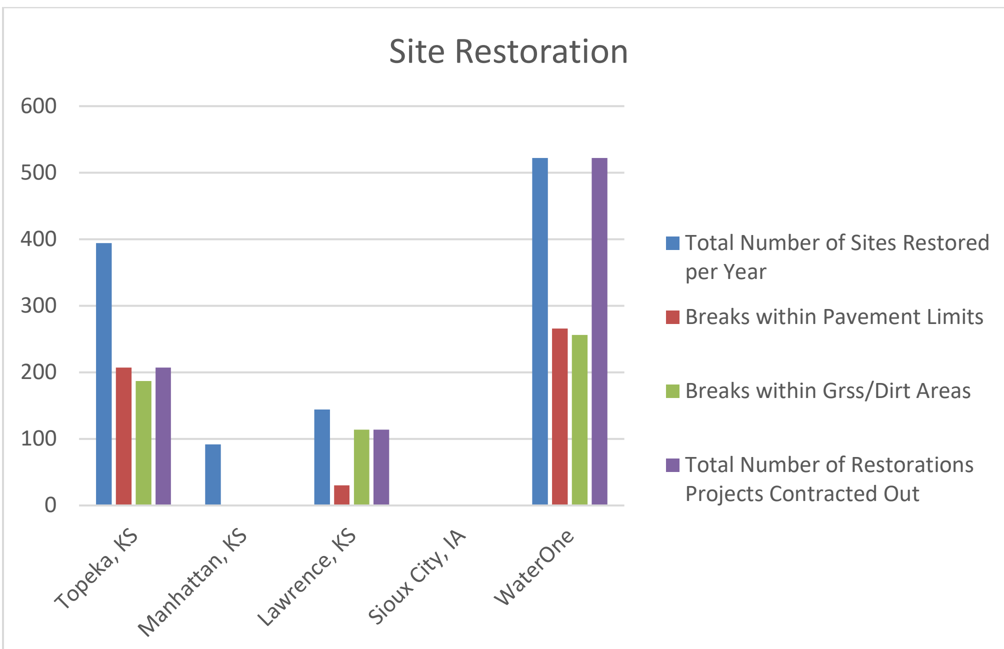

Figure 3-35 Water Main Repair Site Restoration

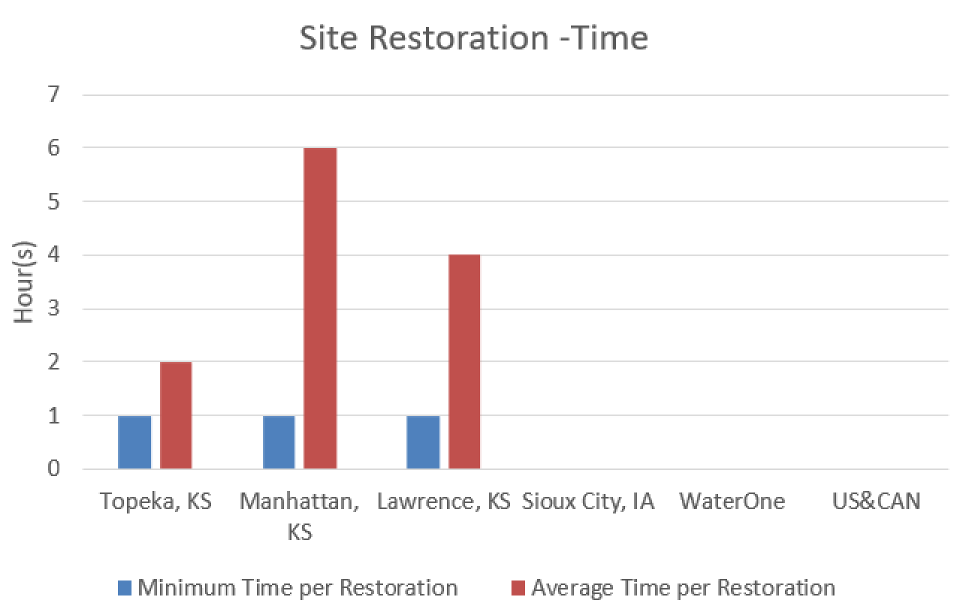

Figure 3-36 Water Main Repair Site Restoration Time

3.5.5 Maintenance of Distribution System

Table A-5 in Appendix A provides details for valve exercise, repair, and replacement; meter calibration and replacement; distribution piping replacement and rehabilitation; tank inspection and upgrades; service repair and replacement; and length of system flushing for Topeka and the peer utilities.

3.5.6 Performance

This section reviews the operational performance of the distribution system. Table A-5 in Appendix A lists the performance categories and the data obtained from Topeka and the peer utilities. Observations based on the collected data are summarized below.

3.5.7 Energy Consumption Efficiency

Water energy consumption indicator quantifies the energy consumed to supply potable water on an annual basis normalized by water demand in million gallons. Purchases of electricity, natural gas, fuel oil, propane and other oil derivatives are considered annual energy consumption. A good program to manage and optimize energy consumption should have the following elements:

- A review of energy usage, identification of energy use trends, and cost or usage tracking versus time
- Consideration of energy costs in its evaluation of new distribution system facilities
- Management of pressure to reduce energy usage
- Routine tests of distribution system pumps for efficiency
- Targets for maintenance or replacement based on efficiency

Topeka ranks 2nd compared to its peer utilities with its energy consumption rate for water being 4.4% higher than the AWWA median benchmark of 6,881 kBTU/year/MG.

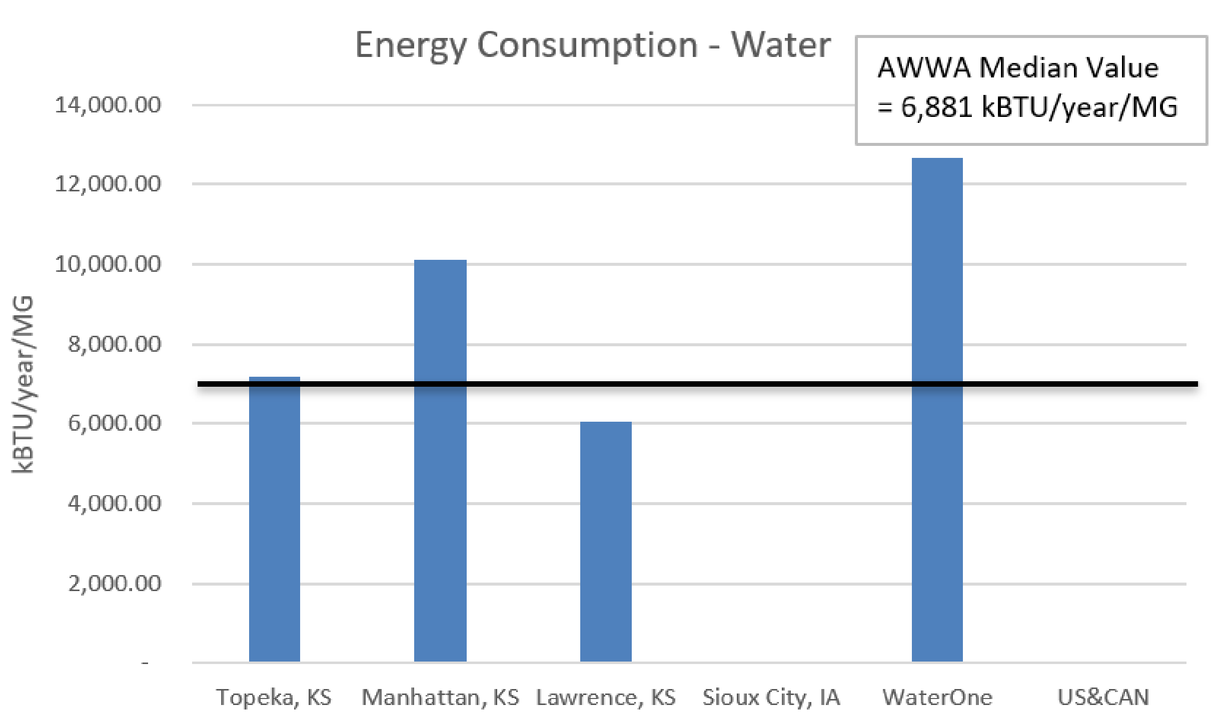

Figure 3-37 Energy Consumption (Water)

4.0 Recommendations

Topeka is facing common challenges similar to many water utilities across the country. These include rising costs, aging infrastructure, stringent regulatory requirements, decrease in growth related revenue, and a rapidly changing workforce. Topeka is seeking opportunities to use effective utility management techniques to become more proactive in handling its management and O&M responsibilities. The benchmarking of various distribution system related activities described in Sections 2 and 3 identify Topeka's present-day conditions in comparison to its peers and the potential for new or improved programs that can increase operational efficiency and performance.

Topeka set in place a five-year water distribution master plan in 2017 which was later updated in 2018. This master plan is a key strategy to identify areas that can be improved. Considering the existing master plan is near the end of its term, the next master plan should incorporate the necessary strategies and assessments resulting from this benchmarking analysis of the distribution system with peer utilities and industry guidance. An updated or new master plan geared towards improving operational optimization and proactive infrastructure rehabilitation and replacement will be most appropriate for Topeka's system.

The key programs of Topeka's master plan have been consolidated as major program components and prioritized. Priorities have been grouped into high, medium and low priority items as listed in Tables 4-1, 4-2, and 4-3 respectively.

Table 4-1 High Priority Programs

Asset Management Plan	• Develop strategy to increase ratio of planned vs. reactive maintenance expenses • Analyze location of aged, unlined cast iron main • Analyze system for other potential main breaks/causes • Include risk of failure and criticality of service interruption into prioritization process • Develop a prioritization list/schedule of proactive replacement and renewal.
Water Quality Program	• Improve management of regulatory affairs/policy • Perform hydraulic model to simulate water quality/water age to support planning activities

Water Quality Program	• Develop action plan to detect and control corrosion • Develop a plan to reduce water quality complaints by addressing color/staining and taste/odor issues
Distribution System Maintenance and Management Program	• Upgrade the existing software to generate automated preventive or planned maintenance work orders

Table 4-2 Medium Priority Programs

Water Loss Control Program	• Implement the recommendations from the water audit report • Implement routine, proactive leak detection program • Implement pipeline inspection program
Operational Optimization Plan	• Storage use optimization • Energy optimization for pumps
Customer Complaint Database	• Track with GIS

Table 4-3 Low Priority Programs

Long Term Goals and Action Plan	• Benchmark key objectives and performance indicators • Long term planning and goals
System Security Plan	• Use AWWA risk assessment tool • Access control • Intrusion detection • Contamination detection/monitoring • Real time video

4.1 Recommended Next Steps

The prioritized recommendations developed in this technical memorandum together with the performance matrices documented in the appendices can be used to plan for adding and updating programs to improve Topeka's water distribution system management, operation and maintenance. As a proactive utility, Topeka will use this document to develop strategies to increase efficiency and improve performance in its ongoing pursuit for excellence.

APPENDIX A

Table A-1
System Characteristics

AWWA	Indicators and Data to be Benchmarked	Values	Units	Normalized	Units	Values	Units	Normalized	Units	Values	Units	Normalized	Units
	1A. System Characteristics												
		TOPEKA				MANHATTAN				LAWRENCE			
	Customer Data												
-	**Customer Accounts**	53,145	**Total**			16,033	**Total**			34,151	**Total**		
	Residential Accounts - Single Family	46,356	No.	87.23%	% of Total	13,951	No.	87%	% of Total	31,110	No.	91%	% of Total
	Residential Accounts - Multi-Family	1,419	No.	2.67%	% of Total	642	No.	4%	% of Total	656	No.	2%	% of Total
	Non-residential Accounts (i.e., industrial, commercial or institutional)	5,352	No.	10.07%	% of Total	1,435	No.	9%	% of Total	2,376	No.	7%	% of Total
	Wholesale Accounts (i.e., sales for resale)	18	No.	0.03%	% of Total	5	No.	0.03%	% of Total	9	No.	0.026%	% of Total
-	**Population Served**	155,018	**Total**			60,887	**Total**			127,504	**Total**		
	Retail	155,000	No.	99.99%	% Total	54,604	No.	90%	% Total	123,978	No.	97%	% Total
	Wholesale	18	No.	0.01%	% Total	6,283	No.	10%	% Total	3,526	No.	3%	% Total
-	**Water Demands**												
	Annual average day demand (5 year period)	21.24	MGD	137	Avg. gpd/People served	6.7	MGD	110	Avg. gpd/People served	9.9	MGD	78	Avg. gpd/People served
	Maximum Day	31.04	MGD	200	Max. gpd/People served	13.5	MGD	222	Max. gpd/People served	20.2	MGD	158	Max. gpd/People served
	MDD/ADD Ratio	1.5			max. MGD/avg. MGD	2.0			max. MGD/avg. MGD	2.0			max. MGD/avg. MGD
-	**Source of Supply and Treatment**												
	Supply Average Yield	0	MGD			6.7	MGD			11.0	MGD		
	Avg. Surface Water Withdrawal	21.2	MGD	100%	% Total	0	MGD	0%	% Total	10.4	MGD	95%	% Total
	Avg. Groundwater Withdrawal	0	MGD	0%	% Total	6.7	MGD	100%	% Total	0.6	MGD	5%	% Total
	Avg. Water Purchased	0	MGD	0%	% Total	0	MGD	0%	% Total	0.0	MGD	0%	% Total
	No. of Water Treatment Plants	1	No.			1	No.			2	No.		
	Water Treatment Plants Total Capacity	60	MGD	100%	% Utilization (MDD basis)	30	MGD	45%	% Utilization (MDD basis)	41.5	MGD	49%	% Utilization (MDD basis)
				0.354	% Utilization (ADD basis)			22%	% Utilization (ADD basis)			24%	% Utilization (ADD basis)
-	**Distribution System - General**												
	Pressure zones	5	No.			6	No.			2	No.		
	Pressure levels	40-120	psi - Min & Max			27-152	psi - Min & Max			65-120	psi - Min & Max		
	Booster pumping stations	7	No.			6	No.			3	No.		
	Storage Tanks	10	No.			6	No.			10	No.		
	Pressure regulating stations	0	No.			13	No.			0	No.		
	Distribution storage - Total	16.5	MG			5.8	MG			6.25	MG		
	Distribution storage / Average day			0.8	Days			0.9	Days			0.6	Days
-	**Distribution System (Finished Water) - Piping (Approximate values)**												
	Total length	890	Miles			293.4	Miles			460.408	Miles		
	Ductile Iron - Material Length	236.24	Miles	27%	% Total	166.2	Miles	57%	% Total	84.65	Miles	18%	% Total
	Cement Lined Ductile Iron - Material Length	0	Miles	0%	% Total	0.0	Miles	0%	% Total	0	Miles	0%	% Total
	Pit cast Iron - Material Length	352.8	Miles	40%	% Total	0.0	Miles	0%	% Total	73.1	Miles	16%	% Total
	Spun cast Iron - Material Length	0	Miles	0%	% Total	0.0	Miles	0%	% Total	0	Miles	0%	% Total
	Cast Iron (unlined) - Material Length	0	Miles	0%	% Total	118.8	Miles	40%	% Total	0	Miles	0%	% Total
	Cement Lined Cast Iron- Material Length	0	Miles	0%	% Total	0.0	Miles	0%	% Total	0	Miles	0%	% Total
	Transite - Material Length	0	Miles	0%	% Total	0.0	Miles	0%	% Total	3.17	Miles	1%	% Total
	PCCP - Material Length	0	Miles	0%	% Total	0.0	Miles	0%	% Total	10.6	Miles	2%	% Total
	Steel - Material Length	1	Miles	0%	% Total	0.0	Miles	0%	% Total	0.81	Miles	0%	% Total
	PVC - Material Length	233.4	Miles	26%	% Total	2.2	Miles	1%	% Total	278.248	Miles	60%	% Total
	Concrete	9	Miles	1%	% Total	0.0	Miles	0%	% Total	0	Miles	0.00%	% Total
	Other	0	Miles	0%	% Total	0.3	Miles	0%	% Total	9.83	Miles	2%	% Total
	Unknown	1.5	Miles	0%	% Total	5.9	Miles	2%	% Total	0	Miles	0.00%	% Total
	0 diameter	0	Miles	0%	% Total	0	Miles	0%	% Total	0.36	Miles	0%	% Total
	< 8 inch	399	Miles	47%	% Total	152.2	Miles	52%	% Total	96.3	Miles	21%	% Total
	8 inch	200.1	Miles	24%	% Total	55.6	Miles	19%	% Total	241.1	Miles	52%	% Total
	10 inch	178.75	Miles	21%	% Total	13.7	Miles	5%	% Total	2.29	Miles	0.50%	% Total
	12 inch	0	Miles	0%	% Total	43.4	Miles	15%	% Total	88.2	Miles	19%	% Total
	14 inch	0	Miles	0%	% Total	0.0	Miles	0%	% Total	1.05	Miles	0.23%	% Total
	16-24 inch	50.5	Miles	6%	% Total	28.6	Miles	10%	% Total	29.85	Miles	6%	% Total
	> 30 inch	15.35	Miles	2%	% Total	0.0	Miles	0%	% Total	3.35	Miles	1%	% Total
-	**Distribution System Piping - Age**												
	Pre-1900	0	Miles	0%	% Total	0	Miles	0%	% Total	1.93	Miles	0%	% Total
	1900-1919	56.8	Miles	6%	% Total	13.9	Miles	5%	% Total	1.30	Miles	0%	% Total
	1920-1939	41.66	Miles	5%	% Total	20.5	Miles	7%	% Total	3.70	Miles	1%	% Total
	1940-1959	92.61	Miles	10%	% Total	30.5	Miles	10%	% Total	23.45	Miles	5%	% Total
	1960-1979	208.5	Miles	23%	% Total	59.4	Miles	20%	% Total	91.80	Miles	20%	% Total
	1980-1999	259.7	Miles	29%	% Total	70.4	Miles	24%	% Total	161.00	Miles	35%	% Total
	2000-present	206.8	Miles	23%	% Total	94.6	Miles	32%	% Total	162.76	Miles	35%	% Total
	Unknown	23.93	Miles	3%	% Total	3.8	Miles	1.30%	% Total	17.05	Miles	4%	% Total
-	**Distribution System - Valves**												
	Total number (excluding hydrants)	10,179	No.	11	No. / Mile	3,776	No.	13	No. / Mile	7,990	No.	17	No. / Mile
	Diameter	2" - 72"	Range		No./Dia	Unknown-72"	Range		No./Dia	.75 to 36"	Range		No./Dia
-	**Distribution System - Meters**												
	Total number	56,818	No.	64		16,586	No.	57		34,600	No.	75	
-	**Distribution System - Service Connections**												
	Total	56,877	No.	64			No.			34,261	No.	74	

AWWA	Indicators and Data to be Benchmarked	Values	Units	Normalized	Units	Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units
	1A. System Characteristics												
		SIOUX CITY				WATERONE				PRIVATE			
	Customer Data												
-	**Customer Accounts**	29,386	**Total**			149,102	**Total**			0	**Total**		
	Residential Accounts - Single Family	26,589	No.	90%	% of Total	135,616	No.	91%	% of Total		No.	#DIV/0!	% of Total
	Residential Accounts - Multi-Family	0	No.	0%	% of Total	4,943	No.	4%	% of Total		No.	#DIV/0!	% of Total
	Non-residential Accounts (i.e., industrial, commercial or institutional)	2,790	No.	9%	% of Total	8,543	No.	6%	% of Total		No.	#DIV/0!	% of Total
	Wholesale Accounts (i.e., sales for resale)	7	No.	0.02%	% of Total	0	No.	0%	% of Total		No.	#DIV/0!	% of Total
-	**Population Served**	102,716	**Total**			443,000	**Total**			0	**Total**		
	Retail	82,396	No.	80%	% Total	443,000	No.	100%	% Total		No.	#DIV/0!	% Total
	Wholesale	20,320	No.	20%	% Total	0	No.	0%	% Total		No.	#DIV/0!	% Total
-	**Water Demands**												
	Annual average day demand (5 year period)	11.3	MGD	110	Avg. gpd/People served	59.4	MGD	134	Avg. gpd/People served		MGD	#DIV/0!	Avg. gpd/People served
	Maximum Day	23	MGD	224	Max. gpd/People served	147	MGD	332	Max. gpd/People served		MGD	#DIV/0!	Max. gpd/People served
	MDD/ADD Ratio	2.0			max. MGD/avg. MGD	2.5			max. MGD/avg. MGD				max. MGD/avg. MGD
-	**Source of Supply and Treatment**												
	Supply Average Yield	15.6	MGD			62	MGD				MGD		
	Avg. Surface Water Withdrawal	0	MGD	0%	% Total	59.5	MGD	96%	% Total		MGD	#DIV/0!	% Total
	Avg. Groundwater Withdrawal	15.6	MGD	100%	% Total	2.5	MGD	4%	% Total		MGD	#DIV/0!	% Total
	Avg. Water Purchased	0	MGD	0%	% Total	0	MGD	0%	% Total		MGD	#DIV/0!	% Total
	No. of Water Treatment Plants	2	No.			2	No.				No.		
	Water Treatment Plants Total Capacity	40	MGD	58%	% Utilization (MDD basis)	200	MGD	74%	% Utilization (MDD basis)		MGD	#DIV/0!	% Utilization (MDD basis)
				28%	% Utilization (ADD basis)			30%	% Utilization (ADD basis)			#DIV/0!	% Utilization (ADD basis)
-	**Distribution System - General**												
	Pressure zones	5	No.			8	No.				No.		
	Pressure levels	20-115	psi - Min & Max			40-150	psi - Min & Max				psi - Min & Max		
	Booster pumping stations	5	No.			11	No.				No.		
	Storage Tanks	9	No.			16	No.				No.		
	Pressure regulating stations	1	No.			0	No.				No.		
	Distribution storage - Total	30.9	MG			90	MG				MG		
	Distribution storage / Average day			2.7	Days			1.5	Days			#DIV/0!	Days
-	**Distribution System (Finished Water) - Piping (Approximate values)**												
	Total length	476	Miles			2755	Miles				Miles		
	Ductile Iron - Material Length	100	Miles	21%	% Total	478	Miles	17%	% Total		Miles	#DIV/0!	% Total
	Cement Lined Ductile Iron - Material Length	0	Miles	0%	% Total	877.5	Miles	32%	% Total		Miles	#DIV/0!	% Total
	Pit cast Iron - Material Length	0	Miles	0%	% Total	13.4	Miles	0%	% Total		Miles	#DIV/0!	% Total
	Spun cast Iron - Material Length	0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	Cast Iron (unlined) - Material Length	270	Miles	57%	% Total	26.7	Miles	1%	% Total		Miles	#DIV/0!	% Total
	Cement Lined Cast Iron- Material Length	0	Miles	0%	% Total	657.2	Miles	24%	% Total		Miles	#DIV/0!	% Total
	Transite - Material Length	1.2	Miles	0.25%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	PCCP - Material Length	0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	Steel - Material Length	0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	PVC - Material Length	10	Miles	2%	% Total	702.2	Miles	25%	% Total		Miles	#DIV/0!	% Total
	Concrete	0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	Other	0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	Unknown	103	Miles	22%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	0 diameter	0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	0%	% Total
	< 8 inch	134	Miles	28%	% Total	1570	Miles	57%	% Total		Miles	#DIV/0!	% Total
	8 inch	174	Miles	37%	% Total	717	Miles	26%	% Total		Miles	#DIV/0!	% Total
	10 inch	12	Miles	3%	% Total	248	Miles	9%	% Total		Miles	#DIV/0!	% Total
	12 inch	60	Miles	13%	% Total	165	Miles	6%	% Total		Miles	#DIV/0!	% Total
	14 inch	0.0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	16-24 inch	74	Miles	16%	% Total	55	Miles	2%	% Total		Miles	#DIV/0!	% Total
	> 30 inch	20	Miles	4%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
-	**Distribution System Piping - Age**												
	Pre-1900	0	Miles	0%	% Total	0	Miles	0%	% Total		Miles	#DIV/0!	% Total
	1900-1919	120.00	Miles	25%	% Total	2.00	Miles	0%	% Total		Miles	#DIV/0!	% Total
	1920-1939	100.00	Miles	21%	% Total	18.00	Miles	1%	% Total		Miles	#DIV/0!	% Total
	1940-1959	180.00	Miles	38%	% Total	249.00	Miles	9%	% Total		Miles	#DIV/0!	% Total
	1960-1979	60.00	Miles	13%	% Total	656.00	Miles	24%	% Total		Miles	#DIV/0!	% Total
	1980-1999	12.00	Miles	3%	% Total	888.00	Miles	32%	% Total		Miles	#DIV/0!	% Total
	2000-present	3.00	Miles	1%	% Total	942.00	Miles	34%	% Total		Miles	#DIV/0!	% Total
	Unknown	0.00	Miles	0%	% Total	0.00	Miles	0.00%	% Total		Miles	#DIV/0!	% Total
-	**Distribution System - Valves**												
	Total number (excluding hydrants)	6,187	No.	13	No. / Mile	52,524	No.	19	No. / Mile		No.	#DIV/0!	No. / Mile
	Diameter	Unknown-72"	Range		No./Dia	Unknown-72"	Range		No./Dia		Range		No./Dia
-	**Distribution System - Meters**												
	Total number		No.			151,523	No.	55			No.	#DIV/0!	
-	**Distribution System - Service Connections**												
	Total		No.			151,523	No.	55			No.	#DIV/0!	

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Table A-2
Utility Organization

AWWA	Indicators and Data to be Benchmarked	Values	Units		Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units
	2A. Organizational Development	2019 AWWA Benchmark			TOPEKA				MANHATTAN			
	Organizational best practices											
1.3	Training				200	Total			44	Total		
	Full time employee's - Water				121	FTE			19	FTE		
	Total training hr completed by all employees during the reporting period - Water	13.3	hr/FTE	Median Value	1,235	hr	10.2	hr/FTE	Not Tracked	hr	-	hr/FTE
	Full time employee's - Wastewater				79	FTE			26	FTE		
	Total training hr completed by all employees during the reporting period - Wastewater	12.2	hr/FTE	Median Value	2,631	hr	33.3	hr/FTE	Not Tracked	hr	-	hr/FTE
1.4	Emergency Response Readiness Training											
	Total emergency response readiness training hours completed by all employees during the reporting period - Water	1.8	hr/FTE	Median Value	300	hr	2.5	hr/FTE	Not Tracked	hr	-	hr/FTE
	Total emergency response readiness training hours completed by all employees during the reporting period - Wastewater	1.9	hr/FTE	Median Value	100	hr	1.3	hr/FTE	Not Tracked	hr	-	hr/FTE
1.5	Customer Accounts per Employee				48,921	Total			16,033			
	Number of active residential accounts - Water				44781	No.	92%	% Total	14,593	No.	14593%	% Total
	Number of active nonresidential accounts - Water				4140	No.	8%	% Total	1,440	No.	1440%	% Total
	Customer accounts per employee - Water	488	accounts/FTE	Median Value	404			accounts/FTE	867			accounts/FTE
	Number of active residential accounts -Wastewater				41621	No.	85%	% Total	14,755	No.	14755%	% Total
	Number of active nonresidential accounts - Wastewater				3793	No.	8%	% Total	1,315	No.	1315%	% Total
	Customer accounts per employee - Wastewater	488	accounts/FTE	Median Value	575			accounts/FTE	630			accounts/FTE
1.6	Employee Turnover											
	Number of regular employee departures during the reporting period used on "***Instructions***" Tab - Water	8.5%	% of FTEs	Median Value	9.5	No.	8%	% Total	0	No.	0%	% Total
	Number of regular employee departures during the reporting period used on "***Instructions***" Tab - Wastewater	7.8%	% of FTEs	Median Value	13.5	No.	17%	% Total	0	No.	0%	% Total
1.7	Retirement Eligibility											
	Number of regular employees eligible for retirement in the next five years - Water	20.5%	% of FTEs	Median Value	23	No.	19%	% Total	5	No.	27%	% Total
	Number of regular employees eligible for retirement in the next five years - Wastewater	17.3%	% of FTEs	Median Value	17	No.	22%	% Total	5	No.	20%	% Total
1.12	Employee Vacancies											
	Average length of employee tenure (in years) at your utility - Water	11.9	Years	Median Value	12.2	Years			0	Years		
	# of full-time internal promotions				22	No.			0	No.		
	Total number of positions filled during the fiscal year				22	No.			0	No.		

AWWA	Indicators and Data to be Benchmarked	Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units
	2A. Organizational Development	LAWRENCE				SIOUX CITY				WATERONE				PRIVATE			
	Organizational best practices																
1.3	Training	131	Total			82	Total			213	Total			7,000	Total		
	Full time employee's - Water	81	FTE			53	FTE			213	FTE			7,000	FTE		
	Total training hr completed by all employees during the reporting period - Water	1,428	hr	17.7	hr/FTE	250	hr	4.7	hr/FTE	7,582	hr	35.6	hr/FTE	96,000	hr/FTE	13.7	hr
	Full time employee's - Wastewater	50	FTE			29	FTE			0	FTE			0	FTE		
	Total training hr completed by all employees during the reporting period - Wastewater	1,216	hr	24.3	hr/FTE	0	hr	0.0	hr/FTE								
1.4	Emergency Response Readiness Training																
	Total emergency response readiness training hours completed by all employees during the reporting period - Water	163	hr	2.0	hr/FTE	0	hr	0.0	hr/FTE	728	hr	3.4	hr/FTE	0	hr	0.0	hr/FTE
	Total emergency response readiness training hours completed by all employees during the reporting period - Wastewater	138	hr	2.8	hr/FTE	0	hr	0.0	hr/FTE								
1.5	Customer Accounts per Employee	34,142				29,382				149,102				0			
	Number of active residential accounts - Water	31766	No.	93%	% Total	26,589	No.	90%	% Total	140,559	No.	94%	% Total	-	No.	0%	% Total
	Number of active nonresidential accounts - Water	2376	No.	7%	% Total	2,793	No.	10%	% Total	8,543	No.	6%	% Total	-	No.	0%	% Total
	Customer accounts per employee - Water	424			accounts/FTE	554			accounts/FTE	700			accounts/FTE	0			accounts/FTE
	Number of active residential accounts -Wastewater	31513	No.	92%	% Total	26,043	No.	89%	% Total								
	Number of active nonresidential accounts - Wastewater	1845	No.	5%	% Total	2,672	No.	9%	% Total								
	Customer accounts per employee - Wastewater	667			accounts/FTE	990			accounts/FTE								
1.6	Employee Turnover									398				0			
	Number of regular employee departures during the reporting period used on "***Instructions***" Tab - Water	9	No.	11%	% Total	0	No.	0%	% Total	34	No.	16%	% Total	0	No.	0%	% Total
	Number of regular employee departures during the reporting period used on "***Instructions***" Tab - Wastewater	6	No.	12%	% Total	0	No.	0%	% Total								
1.7	Retirement Eligibility																
	Number of regular employees eligible for retirement in the next five years - Water	11	No.	14%	% Total	1	No.	2%	% Total	127	No.	60%	% Total	0	No.	0%	% Total
	Number of regular employees eligible for retirement in the next five years - Wastewater	9	No.	18%	% Total	0	No.	0%	% Total								
1.12	Employee Vacancies																
	Average length of employee tenure (in years) at your utility - Water	9.3	Years			0	Years			11.7	Years			0	Years		
	# of full-time internal promotions	4	No.			0	No.			15	No.			0	No.		
	Total number of positions filled during the fiscal year	22	No.			1	No.			76	No.			0	No.		

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Table A-3 Business Operations

AWWA	Indicators and Data to be Benchmarked	Values	Units		Values	Units	Values	Units	Values	Units	Values	Units	Values	Units	Values	Units
	2. Business Operations															
		2019 AWWA Benchmark			**TOPEKA**		**MANHATTAN**		**LAWRENCE**		**SIOUX CITY**		**WATERONE**		**PRIVATE**	
2.1	**Debt Ratio**															
	Total liabilities -Water				159,792,388	No.	26,363,184	No.	0	No.	144,892,186	No.	253,304,547	No.	0	No.
	Total assets - Water				228,315,919	No.	73,520,482	No.	0	No.	143,551,961	No.	1,290,947,408	No.	0	No.
	Debt ratio	36%	%	Median	70%	%	36%	%	#DIV/0!	%	101%	%	20%	%	#DIV/0!	%
	Total liabilities - Wastewater				139,355,540	No.	35,378,105	No.	0	No.	193,219,978	No.			0	No.
	Total assets - Wastewater				253,147,161	No.	86,545,322	No.	0	No.	192,350,657	No.			0	No.
	Debt ratio	43%	%	Median	55%	%	41%	%	#DIV/0!	%	100%	%			#DIV/0!	%
	Total liabilities - Stormwater				27,533,227	No.	9,948,621	No.	930,058	No.	2,377,855	No.			0	No.
	Total assets - Stormwater				66,484,254	No.	35,055,444	No.	13,102,713	No.	2,495,266	No.			0	No.
	Debt ratio	8%	%	Median	41%	%	28%	%	7%	%	95%	%			#DIV/0!	%
2.2	**Return on Assets**															
	Net Income - Water				12,626,116	No.	1,536,239	No.	0	No.	4,106,060	No.	18,078,072	No.	0	No.
	Total Assets - Water				228,315,919	No.	73,520,482	No.	0	No.	6,392,525	No.	1,290,947,408	No.	0	No.
	Return on Assets	2.2%	%	Median	6%	%	2.09%	%	#DIV/0!	%	64%	%	1.4%	%	#DIV/0!	%
	Net Income - Wastewater				14,719,812	No.	2,336,129	No.	0	No.	563,302	No.			0	No.
	Total Assets - Wastewater				253,147,161	No.	86,545,322	No.	0	No.	15,493,783	No.			0	No.
	Return on Assets	2.0%	%	Median	6%	%	2.70%	%	#DIV/0!	%	4%	%			#DIV/0!	%
	Net Income - Stormwater				4,103,596	No.	4,720,149	No.	13,824,400	No.	58,706	No.			0	No.
	Total Assets - Stormwater				66,484,254	No.	35,055,444	No.	13,102,713	No.	0	No.			0	No.
	Return on Assets	3.4%	%	Median	6%	%	13.46%	%	106%	%	#DIV/0!	%			#DIV/0!	%
2.4	**Debt-Service Ratio**															
	Total operating revenue - Water				$ 36,592,798.00	$	$ 10,494,331.00	$	$ -	$	$ 20,488,432.00	$	$ 104,212,832.00	$	$ -	$
	Total O&M cost - Water				$ 23,966,682.00	$	$ 9,029,608.00	$	$ -	$	$ 12,789,715.00	$	$ 54,398,113.13	$	$ -	$
	Total Debt Service - Water				$ 9,333,112.00	$	$ 3,900,354.00	$	$ -	$	$ 6,767,200.00	$	$ 21,203,687.52	$	$ -	$
	Debt-service coverage ratio	2.16		Median	1.35		0.38		#DIV/0!		1.14		2.35		#DIV/0!	
	Total operating revenue - Wastewater				$ 33,595,477.00	$	$ 10,467,950.00	$	$ -	$	$ 25,910,411.00	$			$ -	$
	Total O&M cost - Wastewater				$ 18,875,665.00	$	$ 7,414,808.00	$	$ -	$	$ 16,570,048.00	$			$ -	$
	Total Debt Service - Wastewater				$ 9,246,954.00	$	$ 5,122,401.00	$	$ -	$	$ 9,175,382.00	$			$ -	$
	Debt-service coverage ratio	1.79		Median	1.59		0.60		#DIV/0!		1.02				#DIV/0!	
	Total operating revenue - Stormwater				$ 7,941,369.00	$	$ 2,525,035.00	$	$ 3,627,660.00	$	$ -	$			$ -	$
	Total O&M cost - Stormwater				$ 3,837,773.00	$	$ 1,575,529.00	$	$ 2,245,220.00	$	$ -	$			$ -	$
	Total Debt Service - Stormwater				$ 1,572,259.00	$	$ 2,045,198.00	$	$ -	$	$ -	$			$ -	$
	Debt-service coverage ratio	2.49		Median	2.61		0.46		#DIV/0!		#DIV/0!				#DIV/0!	
2.6	**Operating Ratio**															
	Operating Ratio - Water	0.58		Median	$ 0.65	$	$ 0.86	$	#DIV/0!	$	$ 0.62	$	$ 0.52	$	#DIV/0!	$
	Operating Ratio - Wastewater	0.50		Median	$ 0.56	$	$ 0.71	$	#DIV/0!	$	$ 0.64	$			#DIV/0!	$
	Operating Ratio - Stormwater	0.62		Median	$ 0.48	$	$ 0.62	$	$ 0.62	$	#DIV/0!	$			#DIV/0!	$
	CIP Funding Source															
	Cash funded capital improvement projects				$ 3,625,000.00	$	$ -	$	$ -	$	$ 5,006,900.00	$	$ 62,814,810.00	$	$ -	$
	Debt funded capital improvement projects				$ 53,957,253.00	$	$ -	$	$ -	$	$ 1,140,000.00	$	$ 3,577,313.00	$	$ -	$

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Table A-4
Customer Relations

AWWA	Indicators and Data to be Benchmarked	Values	Units	Notes/Comments	Values	Units	Values	Units	Values	Units	Values	Units	Values	Units	Values	Units
	3. Customer Relations															
		2019 AWWA Benchmark			TOPEKA		MANHATTAN		LAWRENCE		SIOUX CITY		WATERONE		PRIVATE 1	
3.1	**Service Complaints**															
	Population served - Water				155,000	No.	0	No.	127,504	No.	29,382	No.	443,000	No.	0	No.
	Number of residential accounts - Water				44,781	No.	0	No.	31,766	No.	26,589	No.	0	No.	0	No.
	Number of nonresidential accounts - Water				4,140	No.	0	No.	2,376	No.	2,793	No.	0	No.	0	No.
	Total number of **customer** service complaints - Water				131	No.	Not Tracked	No.	100	No.	0	No.	0	No.	0	No.
	Customer Service Complaints/1,000 accounts	0.6	Complaints/1,000 Accounts	Median Value	3	Complaints/1,000 Accounts	#VALUE!	Complaints/1,000 Accounts	3	Complaints/1,000 Accounts	0	Complaints/1,000 Accounts	#DIV/0!	Complaints/1,000 Accounts	0	Complaints/1,000 Accounts
	Customer Service Complaints/ Population Served	0.2	Complaints/ Population Served	Median Value	8	Complaints/ Population Served	#VALUE!	Complaints/ Population Served	8	Complaints/ Population Served	0	Complaints/ Population Served	0	Complaints/ Population Served	0	Complaints/ Population Served
	Total number of **technical** service complaints - Water				254	No.	Not Tracked	No.	525	No.	0	No.	1,100	No.	0	No.
	Technical Service Complaints/1,000 accounts	11.8	Technical Service Complaints/1,000 accounts	Median Value	5	Technical Service Complaints/1,000 accounts	#VALUE!	Technical Service Complaints/1,000 accounts	15	Technical Service Complaints/1,000 accounts	0	Technical Service Complaints/1,000 accounts	#DIV/0!	Technical Service Complaints/1,000 accounts	0	Technical Service Complaints/1,000 accounts
	Technical Service Complaints/ Population Served	5.1	Complaints/ Population Served	Median Value	2	Complaints/ Population Served	#VALUE!	Complaints/ Population Served	4	Complaints/ Population Served	0	Complaints/ Population Served	2	Complaints/ Population Served	0	Complaints/ Population Served
	Population served - Wastewater				155,000	No.	55,574	No.	110,305	No.	0	No.				
	Number of residential accounts - Wastewater				41,621	No.	14,755	No.	31,513	No.	26,043	No.				
	Number of nonresidential accounts - Wastewater				3,793	No.	0	No.	1,845	No.	2,636	No.				
	Total number of **customer** service complaints - Wastewater				0	No.	Not Tracked	No.	50	No.	0	No.				
	Customer Service Complaints/1,000 accounts	0.4	Complaints/1,000 Accounts	Median Value	0	Complaints/1,000 Accounts	#VALUE!	Complaints/1,000 Accounts	1	Complaints/1,000 Accounts	0	Complaints/1,000 Accounts				
	Customer Service Complaints/ Population Served	0.2	Complaints/ Population Served	Median Value	0	Complaints/ Population Served	#VALUE!	Complaints/ Population Served	5	Complaints/ Population Served	#DIV/0!	Complaints/ Population Served				
	Total number of **technical** service complaints - Wastewater				475	No.	Not Tracked	No.	0	No.	0	No.				
	Technical Service Complaints/1,000 accounts	5.1	Technical Service Complaints/1,000 accounts	Median Value	10	Technical Service Complaints/1,000 accounts	#VALUE!	Technical Service Complaints/1,000 accounts	0	Technical Service Complaints/1,000 accounts	0	Technical Service Complaints/1,000 accounts				
	Technical Service Complaints/ Population Served	2.0	Complaints/ Population Served	Median Value	3	Complaints/ Population Served	#VALUE!	Complaints/ Population Served	0	Complaints/ Population Served	#DIV/0!	Complaints/ Population Served				
3.2	**Call Center Indicators**															
	Total number of calls received within reporting period used on "Instructions" Tab				157,893	No.	Not Tracked	No.	41,169	No.	0	No.	94,847	No.	0	No.
	Average wait time (min)	3	Minutes	Median Value	0.37	Minutes	Not Tracked	Minutes	4.63	Minutes	0	Minutes	0.6	Minutes	0.0	Minutes
	Average talk time (min)	3.3	Minutes	Median Value	3.03	Minutes	Not Tracked	Minutes	4.07	Minutes	0	Minutes	5.1	Minutes	0.0	Minutes
	Number of abandoned calls				721	No.	Not Tracked	No.	11,656	No.	0	No.	657	No.	0	No.
	Abandoned Call Ratio	6.5%	% of total calls	Median Value	0.46%	% of total calls	#VALUE!	% of total calls	28.31%	% of total calls	#DIV/0!	% of total calls	0.69%	% of total calls	0.00%	% of total calls
	Total number of Customer accounts (Sewer/Storm/Water)				61,042	No.	47,964	No.	31,766	No.	0	No.	149,102	No.	0	No.
	What is the total amount, in dollars, of delinquent accounts per year?				2,587,685	$	Not Tracked	$	$ 57,335.00	$	0	$	$ 105,000.00	$	$ -	$
	Please indicate if the collection efforts are internal or external?				External		Internal		Both		0		internal		0	
	What is the total number of payments received				633,874	No.	Not Tracked	No.	368,718	No.	0	No.	891,414	No.	0	No.
	How many are cash?				31,930	No.	Not Tracked	No.	9,998	No.	0	No.	1,598	No.	0	No.
	How many are credit card?				242,171	No.	95,161	No.	132,319	No.	0	No.	45,888	No.	0	No.
	How many are check?				359,773	No.	Not Tracked	No.	226,401	No.	0	No.	843,928	No.	0	No.
3.3	**Customer service cost per account**															
	Total annual customer service cost				$ 2,135,038.00	No.	$ 150,000.00	No.	$ 2,035,885.00	No.	0	No.	$ 5,222,622	No.	$ -	No.
	Number of active residential accounts				44,781	No.		No.	31,766	No.	26,589	No.	140,559	No.	0	No.
	Number of nonresidential accounts				4,140	No.		No.	2,376	No.	2,794	No.	8,543	No.	0	No.
	Customer service cost per account -	$ 31.95	annual $/ account	Median Value	$ 43.64	annual $/account	No provided	annual $/account	$ 59.63	annual $/account	$ -	annual $/account	$ 35.03	annual $/account	#DIV/0!	annual $/account
3.5	**Billing**															
	Number of bills generated per reporting period				715,530	No.	196,732	No.	416,422	No.	361,842	No.	990,782	No.		No.
	Frequency of billing (Level 1- Level 5) **(Use drop down list F41)**				Level 4= Monthly		Level 4= Monthly		Level 4= Monthly		Level 4= Monthly		Level 3= Bi monthly (every two months)			
	How many bills are mailed per reporting period used on "Instructions" Tab				662,739	No.	137,803	No.	414,657	No.	0	No.	574,654	No.		No.
	Mailing bills internally or externally handled by contractor?				External		Internal		External				external			
	Total number of customers billed				53,145	No.	Not Tracked	No.	416,422	No.	0	No.	149,102	No.		No.
	Cost to print and mail a bill				$ 0.65	$	Not Tracked	$	$ 0.13	$	$ -	$	$ 0.51	$		$
3.5	**Metering Services**															
	Total number of active/installed meters				56,818	No.	16,586	No.	35,600	No.	29,382	No.	0	No.		No.
	Average number of meters successfully read for each reading cycle				56,380	No.	16,586	No.	34,176	No.	99	No.	0	No.		No.
	What is the frequency of meter reads (Water only)? **(Use drop down list F50)**				Level 2= monthly		Level 2= monthly		Level 2= monthly				Level 1 = quarterly or bi monthly			
	Percentage read by AMI				53%	%	99%	%	0%	%	100%	%	#DIV/0!	%		%
	Number of estimated usage bills for the reporting period				5,214	No.	Less Than 1	No.	24,985	No.	0	No.	22,788	No.		No.
	What is the daily average number of service orders completed for maintenance and customer service				285	No.	63	No.	112	No.	60	No.	0	No.		No.
	Meter exchanges completed (daily average) for regular maintenance				8		Less Than 1		2		0		400			
	Meter exchanges completed (daily average) for exchange projects				41	No.	0	No.	0	No.	0	No.	4,000	No.		No.

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Table A-5
Water Operations

AWWA	Indicators and Data to be Benchmarked	2019 AWWA Benchmark Values	2019 AWWA Benchmark Units	2019 AWWA Benchmark Normalized Values	TOPEKA Values	TOPEKA Units	TOPEKA Normalized Values	TOPEKA Units
	4. Water Operations							
4.2	**MGD of water produced per employee**							
	Average daily demand				21	No.		
	Total number of FTE's				121	No.		
	MGD of water produced per employee	0.22	MGD of water produced per employee	Median Value	0.18			
-	**Work Order and Maintenance Management System**							
	CMMS System				Y	Cityworks		
	Total distribution system maintenance					No.		
	Planned maintenance					No.		
	Planned Maintenance Ratio						#DIV/0!	Work Orders
4.4	**Main Break and Leaks**							
	Break & Leak Repairs	21.6	Breaks & Leaks / 100 miles of pipe	Median Value	394	No. / Year	44.27%	Breaks & Leaks / 100 miles of pipe
	Distribution System Integrity				394	Total No. / Year	44.27	Leaks and Breaks per 100 miles
-	**Site Restoration**							
	Total number of site restorations per year?				394	No.		
	What is the minimum time per restoration?				1	Hour		
	What is the average time per restoration?				2	Hour		
	How many breaks are within pavement limits?				207	No.		
	How many breaks are within grass or dirt areas?				187	No.		
	What is the total number of restoration projects contracted out?				207	No.		
-	**Valve Maintenance**							
	Valve exercise and repairs				1838	Valves / Year	11.85%	% Total
	Valve replacements				58	Valves / Year	0.4%	% Total
	Valve Maintenance - How many valves are completed in house				All	No.		
	Valve Maintenance - How many valves are contracted out?				0	No.		
	How many valves are in your system?				15,508	No.		
	Valves maintained per day on a private contract?				0	No.		
	Valves maintained per day in house?				6	1569	261 work day - holidays = 250	
	How many people in a crew for valve maintenance?				2	No.		
	Private cost to perform valve maintenance on a private contract?				$ -	$		
-	**Storage**							
	Tank inspections				0	No. / Year	5-year cycle	Frequency
	Tank Upgrades (Cleaning, Painting maintenance)				0	No. / Year	5-year cycle	Frequency
-	**Services**							
	Repairs				0	No. / Year	0.00%	% Total
	Replacements				0	No. / Year	0.00%	% Total
4.5	**Hydrant Effectiveness & Maintenance**							
	Number of hydrants out of service in reporting period used on "Instructions" Tab				0	No.		
	Total number of Hydrants				5,329	No.		
	Hydrant out of service Rate	0.7%	%	Median Value	0.00%	%		
	Time spent per hydrant				1	Hour		
	Total number of hydrants maintained per year				637	No.		
	Private cost to perform maintenance				$ -	$		
	Number of hydrants for which maintenance is contracted out per year				0	No.		
4.7	**Maintenance - Water Treatment Plant**							
	Number of planned maintenance work orders for the plant				2,331	No.		
	Number of corrective maintenance work orders for the plant				369	No.		
	Planned Vertical Maintenance to Production (hr/MG)				0	hr/MG		
	Corretive Vertical Maintenace to Production				0	hr/MG		
	Total number of private contracts. List contract types in column M				0	No.		
4.6	**Water Plant Operations**							
	Number of residential accounts				47,775	No.		
	Number of nonresidential accounts				5,370	No.		
	Treatment O&M cost				$ 4,759,686.89	$		
	Total O&M Cost of Potable Water Services	$ 428.00	($/account)	Median Value	$ 4,759,686.89	($/account)		
	Average daily production				21	MG		
	Total O&M Cost of Potable Water Service	$ 2,468.00	$/MG	Median Value	$ 613.95	$/MG		
	Total O&M Cost of Potable Water Services	$ 2,891,000.00	$/100 miles of pipe	Median Value	$ 2,692,885.62	$/100 miles of pipe		
	Specific O&M cost				#REF!	$		
	Utility cost/MG				#REF!	$		
	Total number of private contracts				0	No.		
	Odor Control budget (Chemical cost only)				$ -	$		
4.8	**Energy Consumption - Water**							
	Energy consumption based on purchases of electricity(minus stored amounts) converted to kBTU				55781906.38	kBTU		
	Average daily demand				21.24	MG		
	Energy consumption - water	6,881	kBTU/year/MG	Median Value	7195.251	kBTU/year/MG		
3.11	**Water Service Disruptions**							
	Total number of water service disruptions of all durations				394	No.		
	Total number of disruptions greater than four hours (Unplanned)				394	No.		
	Disruption Frequency Index				8.25		2.01	
	Disruption of water service (Greater than four hours)				8		0.16	
	Number of residential accounts - Water				0	No.	No.	
	Number of nonresidential accounts - Water				0	No.		
	Average time to address water service disruptions				4-6	Hour		
	What is the total number of water disruptions per year (Unplanned)?				394	No.		
	Average time to address water service disruption (Unplanned)				4-6	Hour		
	Average cost per main repair (Grass) - break down labor, materials and equipment costs				$ 1,742.00	$		
	Average cost per main repair (Pavement) - break down labor, materials and equipment costs				$ 9,804.00	$		
-	**Drinking Water Compliance Rate**				100	% days		
-	**Water Distribution System Sampling and Water Quality**				2000	No./ Year	0	Samples / Mile

Indicators and Data to be Benchmarked	MANHATTAN Values	MANHATTAN Units	MANHATTAN Normalized Values	MANHATTAN Units	LAWRENCE Values	LAWRENCE Units	LAWRENCE Normalized Values	LAWRENCE Units
4. Water Operations								
MGD of water produced per employee								
Average daily demand	6	No.			10	No.		
Total number of FTE's	19	No.			81	No.		
MGD of water produced per employee	0.32				0.12			
Work Order and Maintenance Management System								
CMMS System	N	Y/N Type			Y	Y/N Type		
Total distribution system maintenance		Work Orders			1,376	Work Orders		
Planned maintenance		Work Orders			1,232	Work Orders		
Planned Maintenance Ratio			#DIV/0!	Work Orders			0.90	Work Orders
Main Break and Leaks								
Break & Leak Repairs	77	No. / Year	26%	Breaks & Leaks / 100 miles of pipe	144	No. / Year	31%	Breaks & Leaks / 100 miles of pipe
Distribution System Integrity	103.24	Total No. / Year	35.19	Leaks and Breaks per 100 miles	319.28	Total No. / Year	69.35	Leaks and Breaks per 100 miles
Site Restoration								
Total number of site restorations per year?	92	No.			144	No.		
What is the minimum time per restoration?	1	Hour			1	Hour		
What is the average time per restoration?	6	Hour			4	Hour		
How many breaks are within pavement limits?	Not Tracked	No.			30	No.		
How many breaks are within grass or dirt areas?	Not Tracked	No.			114	No.		
What is the total number of restoration projects contracted out?	0	No.			114	No.		
Valve Maintenance								
Valve exercise and repairs	360	Valves / Year	9.53%	% Total	2402	Valves / Year	30.06%	% Total
Valve replacements	25	Valves / Year	0.7%	% Total	39	Valves / Year	0.5%	% Total
Valve Maintenance - How many valves are completed in house	0	No.			41	No.		
Valve Maintenance - How many valves are contracted out?	25	No.			0	No.		
How many valves are in your system?	0	No.			0	No.		
Valves maintained per day on a private contract?	0	No.			0	No.		
Valves maintained per day in house?	1	No.			50	No.		
How many people in a crew for valve maintenance?	0	No.			2	No.		
Private cost to perform valve maintenance on a private contract?	$ -	$			$ -	$		
Storage								
Tank inspections	7	No. / Year	3-year cycle	Frequency	2 or 3	No. / Year	3-year cycle	Frequency
Tank Upgrades (Cleaning, Painting maintenance)	1	No. / Year	3-year cycle	Frequency	1	No. / Year	3-year cycle	Frequency
Services								
Repairs	303	No. / Year	0.46%	% Total	8	No. / Year	0.01%	% Total
Replacements	10	No. / Year	0.02%	% Total	3	No. / Year	0.00%	% Total
Hydrant Effectiveness & Maintenance								
Number of hydrants out of service in reporting period used on "Instructions" Tab	Not Tracked	No.			115	No.		
Total number of Hydrants	0	No.			3,666	No.		
Hydrant out of service Rate	#VALUE!	%			3.14%	%		
Time spent per hydrant	Not Tracked	Hour			2	Hour		
Total number of hydrants maintained per year	Not Tracked	No.			1,376	No.		
Private cost to perform maintenance	$ -	$			$ 25,004.00	$		
Number of hydrants for which maintenance is contracted out per year	0	No.			0	No.		
Maintenance - Water Treatment Plant								
Number of planned maintenance work orders for the plant	Not Tracked	No.			3,886	No.		
Number of corrective maintenance work orders for the plant	Not Tracked	No.			472	No.		
Planned Vertical Maintenance to Production (hr/MG)	0				0			
Corretive Vertical Maintenace to Production	0				0			
Total number of private contracts. List contract types in column M	2	No.			0	No.		
Water Plant Operations								
Number of residential accounts	14,593	No.			31,766	No.		
Number of nonresidential accounts	1,440	No.			2,385	No.		
Treatment O&M cost	$ 3,500,000	$			$ 6,575,000.00	$		
Total O&M Cost of Potable Water Services	$ 218.30	($/account)			$ 192.53	($/account)		
Average daily production	6.7	MG			9.9	MG		
Total O&M Cost of Potable Water Service	$ 1,431.20	$/MG			$ 1,819.57	$/MG		
Total O&M Cost of Potable Water Services	$ 1,192,910.70	$/100 miles of pipe			$ 1,428,081.18	$/100 miles of pipe		
Specific O&M cost	$ 1.00	$			#REF!	$		
Utility cost/MG	$ 1,431.20	$			#REF!	$		
Total number of private contracts	0	No.			0	No.		
Odor Control budget (Chemical cost only)	$ -	$			$ 270,000.00	$		
Energy Consumption - Water								
Energy consumption based on purchases of electricity(minus stored amounts) converted to kBTU	24,760,911	kBTU			21836709	kBTU		
Average daily demand	7	MG			9.9	MG		
Energy consumption - water	10,125.09	kBTU/year/MG			6043.09	kBTU/year/MG		
Water Service Disruptions								
Total number of water service disruptions of all durations	Not Tracked	No.			1,025	No.		
Total number of disruptions greater than four hours (Unplanned)	Not Tracked	No.			506	No.		
Disruption Frequency Index	-				32.27			
Disruption of water service (Greater than four hours)	#VALUE!				15.93			
Number of residential accounts - Water	0	No.			0	No.		
Number of nonresidential accounts - Water	0	No.			0	No.		
Average time to address water service disruptions	Not Tracked	Hour			4	Hour		
What is the total number of water disruptions per year (Unplanned)?	Not Tracked	No.			144	No.		
Average time to address water service disruption (Unplanned)	Not Tracked	Hour			0	Hour		
Average cost per main repair (Grass) - break down labor, materials and equipment costs	$ -	$			$ -	$		
Average cost per main repair (Pavement) - break down labor, materials and equipment costs	$ -	$			$ 3,658.06	$		
Drinking Water Compliance Rate	100	% days			100	% days		
Water Distribution System Sampling and Water Quality	720	No./ Year	0	Samples / Mile	0	No./ Year	0	Samples / Mile

Indicators and Data to be Benchmarked	SIOUX CITY Values	SIOUX CITY Units	SIOUX CITY Normalized Values	SIOUX CITY Units	WATERONE Values	WATERONE Units	WATERONE Normalized Values	WATERONE Units	PRIVATE Values	PRIVATE Units	PRIVATE Normalized Values	PRIVATE Units
4. Water Operations												
MGD of water produced per employee												
Average daily demand	11	No.			0	No.			0	No.		
Total number of FTE's	53	No.			53	No.			0	No.		
MGD of water produced per employee	0.21				0.00				#DIV/0!			
Work Order and Maintenance Management System												
CMMS System	N	Y/N Type			Y	Y/N Type			0	Y/N Type		
Total distribution system maintenance	0	Work Orders			62038	Work Orders				Work Orders		
Planned maintenance	0	Work Orders			48893	Work Orders				Work Orders		
Planned Maintenance Ratio			#DIV/0!	Work Orders			0.79	Work Orders			#DIV/0!	Work Orders
Main Break and Leaks												
Break & Leak Repairs	140	No. / Year	29%	Breaks & Leaks / 100 miles of pipe	522	No. / Year	19%	Breaks & Leaks / 100 miles of pipe		No. / Year	#DIV/0!	Breaks & Leaks / 100 miles of pipe
Distribution System Integrity	169.41	Total No. / Year	35.59	Leaks and Breaks per 100 miles	540.95	Total No. / Year	19.64	Leaks and Breaks per 100 miles		Total No. / Year	#DIV/0!	Leaks and Breaks per 100 miles
Site Restoration												
Total number of site restorations per year?	0	No.			522	No.			0	No.		
What is the minimum time per restoration?	0	Hour			Not Tracked	Hour			0	Hour		
What is the average time per restoration?	0	Hour			Not Tracked	Hour			0	Hour		
How many breaks are within pavement limits?	0	No.			266	No.			0	No.		
How many breaks are within grass or dirt areas?	0	No.			256	No.			0	No.		
What is the total number of restoration projects contracted out?	0	No.			522	No.			0	No.		
Valve Maintenance												
Valve exercise and repairs	0	Valves / Year	0.00%	% Total	32028	Valves / Year	60.98%	% Total		Valves / Year	0.00%	% Total
Valve replacements	0	Valves / Year	0.0%	% Total	246	Valves / Year	0.5%	% Total		Valves / Year	0.0%	% Total
Valve Maintenance - How many valves are completed in house	0	No.			32,028	No.			0	No.		
Valve Maintenance - How many valves are contracted out?	0	No.			0	No.			0	No.		
How many valves are in your system?	0	No.			0	No.			0	No.		
Valves maintained per day on a private contract?	0	No.			0	No.			0	No.		
Valves maintained per day in house?	0	No.			128	No.			0	No.		
How many people in a crew for valve maintenance?	0	No.			2	No.			0	No.		
Private cost to perform valve maintenance on a private contract?	0	$			$ -	$			$ -	$		
Storage												
Tank inspections	0	No. / Year	3-year cycle	Frequency	0	No. / Year	3-year cycle	Frequency		No. / Year	3-year cycle	Frequency
Tank Upgrades (Cleaning, Painting maintenance)	0	No. / Year	3-year cycle	Frequency	0	No. / Year	3-year cycle	Frequency		No. / Year	3-year cycle	Frequency
Services												
Repairs	0	No. / Year	0.00%	% Total	0	No. / Year	0.00%	% Total	0	No. / Year	0.00%	% Total
Replacements	0	No. / Year	0.00%	% Total	0	No. / Year	0.00%	% Total	0	No. / Year	0.00%	% Total
Hydrant Effectiveness & Maintenance												
Number of hydrants out of service in reporting period used on "Instructions" Tab	15	No.			0	No.			0	No.		
Total number of Hydrants	4,000	No.			18,395	No.			0	No.		
Hydrant out of service Rate	0.38%	%			0	%			0	%		
Time spent per hydrant	0	Hour			0	Hour			0	Hour		
Total number of hydrants maintained per year	0	No.			18,395	No.			0	No.		
Private cost to perform maintenance	$ -	$			$ 111,074	$			$ -	$		
Number of hydrants for which maintenance is contracted out per year	0	No.			3,365	No.			0	No.		
Maintenance - Water Treatment Plant												
Number of planned maintenance work orders for the plant	0	No.			7,700	No.			0	No.		
Number of corrective maintenance work orders for the plant	0	No.			1,600	No.			0	No.		
Planned Vertical Maintenance to Production (hr/MG)	0				0				0			
Corretive Vertical Maintenace to Production	0				0				0			
Total number of private contracts. List contract types in column M	0	No.			0	No.			0	No.		
Water Plant Operations												
Number of residential accounts	26,589	No.			140,559	No.			0	No.		
Number of nonresidential accounts	2,797	No.			8,543	No.			0	No.		
Treatment O&M cost	11	MG			$ 27,199,221.00	$			$ -	$		
Total O&M Cost of Potable Water Services	$ 127.28	($/account)			$ 182.42	($/account)			$ -	($/account)		
Average daily production	$ 3,740,117.00	$			55	MG			0	MG		
Total O&M Cost of Potable Water Service	$ 906.80	$/MG			$ 1,347.53	$/MG			$ -	$/MG		
Total O&M Cost of Potable Water Services	$ 785,738.87	$/100 miles of pipe			$ 987,267.55	$/100 miles of pipe			$ -	$/100 miles of pipe		
Specific O&M cost	#REF!	$			#REF!	$			$ -	$		
Utility cost/MG	#REF!	$			#REF!	$			$ -	$		
Total number of private contracts	0	No.			0	No.			0	No.		
Odor Control budget (Chemical cost only)	$ -	$			905,041.00	$			$ -	$		
Energy Consumption - Water												
Energy consumption based on purchases of electricity(minus stored amounts) converted to kBTU	0	kBTU			255,350,816	kBTU			-	kBTU		
Average daily demand	11.3	MG			55	MG			-	MG		
Energy consumption - water	0	kBTU/year/MG			12,650.84	kBTU/year/MG			-	kBTU/year/MG		
Water Service Disruptions												
Total number of water service disruptions of all durations	250	No.			522	No.			0	No.		
Total number of disruptions greater than four hours (Unplanned)	140	No.			70	No.			0	No.		
Disruption Frequency Index	9.40				3.71				0			
Disruption of water service (Greater than four hours)	5.27				0.50				0			
Number of residential accounts - Water	0	No.			0	No.			0	No.		
Number of nonresidential accounts - Water	0	No.			0	No.			0	No.		
Average time to address water service disruptions	5	Hour			0	Hour			0	Hour		
What is the total number of water disruptions per year (Unplanned)?	150	No.			522	No.			0	No.		
Average time to address water service disruption (Unplanned)	5	Hour	30.0		0	Hour			0	Hour		
Average cost per main repair (Grass) - break down labor, materials and equipment costs	$ -	$			$ 9,410.00	$			$ -	$		
Average cost per main repair (Pavement) - break down labor, materials and equipment costs	$ -	$			$ 9,410.00	$			$ -	$		
Drinking Water Compliance Rate	0	% days			100	% days			0	% days		
Water Distribution System Sampling and Water Quality	0	No./ Year	0	Samples / Mile	0	No./ Year	0	Samples / Mile	0	No./ Year	0	Samples / Mile

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Table A-6
Wastewater Operations

AWWA	Indicators and Data to be Benchmarked	Values	Units		Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units	Values	Units	Normalized Values	Units
	5. Wastewater Operations																							
		2019 AWWA Benchmark			TOPEKA				MANHATTAN				LAWRENCE				SIOUX CITY							
5.2	MGD of wastewater treated produced per employee																							
	Average daily demand of treated wastewater				23	No.			6	No.			9.8	MG			0	No.			0	No.		
	Total number of FTE's				79	No.			26	No.			50	No.			29	No.			0	No.		
	MGD of wastewater treated per employee	0.19		Median Value	0.29				0.24				0.20				0.00				#DIV/0!			
5.4	Collection System Integrity																							
	Total number of failures				0	No.			20	No.			43	No.			0	No.			0	No.		
	Total miles of collection system piping				0	Miles			254	Miles			428	Miles			0	Miles			0	Miles		
	Collection system integrity	2.1	failures/100 miles pipe	Median Value	#DIV/0!	failures/100 miles pipe			7.87	failures/100 miles pipe			0	failures/100 miles pipe			#DIV/0!	failures/100 miles pipe			2	failures/100 miles pipe		
5.7	Maintenance - Wastewater Treatment Plant																							
	Total number of private contracts. List contract types in column L				10	No.			0	No.			0	No.			0	No.			0	No.		
	Number of planned maintenance work orders for the plant				7,393	No.			586	No.			4,341	No.			0	No.			0	No.		
	Number of corrective maintenance work orders for the plant				1,541	No.			158	No.			1,124	No.			0	No.			0	No.		
	Total number of plants				3	No.			1	No.			2	No.			0	No.			0	No.		
5.8	Energy Consumption - Wastewater																							
	Energy consumption based on purchases of electricity (minus stored amounts)				55055928	kBTU			0	kBTU			48910482	kBTU			0	kBTU			0	kBTU		
	Average daily demand				23	MG			6	MG			9.8	MG			0	MG			0	MG		
	Energy consumption - Wastewater	8,531.00	kBTU/year/MG	Median Value	6,558.18	kBTU/year/MG			-	kBTU/year/MG			13,673.60	kBTU/year/MG			#DIV/0!	kBTU/year/MG			#DIV/0!	kBTU/year/MG		
-	Plant Operations - Water Pollution Control				$ 5,005,667.48								$ -											
	Total O&M Cost				$ -	$			$ 2,800,000	$			$ -	$			$ -	$			$ -	$		
	Number of residential accounts				47,775	No.			14,593	No.			31,766	No.			26,589	No.			0	No.		
	Number of nonresidential accounts				5,370	No.			1,440	No.			2,385	No.			2,797	No.			0	No.		
	Average daily flow (MG)				22.6	MG			6	MG			9.8	MG			0	MG			0	MG		
	Total O&M cost of Wastewater Services	$ 378.00	($/account)	Median Value	$ 94.19	($/account)			$ 174.64	($/account)			$ -	($/account)			$ -	($/account)			$ -	($/account)		
	Total O&M cost of Wastewater Services	$ 2,489.00	$/MG	Median Value	$ 606.82	$/MG			$ 1,278.54	$/MG			$ -	$/MG			#DIV/0!	$/MG			#DIV/0!	$/MG		
	Total O&M cost of Wastewater Services	$ 2,868,950.00	$/100 miles of pipe	Median Value	$ 562,434.55	$/100 miles of pipe			$ 954,328.56	$/100 miles of pipe			$ -	$/100 miles of pipe			$ -	$/100 miles of pipe			$ -	$/100 miles of pipe		
	Specific O&M cost				#REF!	$			$ 2,800,000	$			#REF!	$			#REF!	$			$ -	$		
	Utility cost/MG				#REF!	$			$ 1,279	$			#REF!	$			#REF!	$			$ -	$		
	Total number of private contracts				4	No.			0	No.			$ -	No.			$ -	No.			$ -	No.		
	Odor Control budget				$ 100,000.00	$			$ -	$			$ 40,900.00	$			$ -	$			$ -	$		
-	Collection Piping																							
	Replacement				0.00	Miles/year	0.0%	% Total	0.00	Miles/year	0.0%	% Total	0.00	Miles/year	0.0%	% Total	0.00	Miles/year			0.00	Miles/year		
	Renewal (Cleaning/Lining)				0.00	Miles/year	0.0%	% Total	4.00	Miles/year	0.4%	% Total	998707.00	Miles/year	102679.0%	% Total	0.00	Miles/year			0.00	Miles/year		
	System Renewal Replacement Rate - Water Transmission and Distribution Systems				#DIV/0!	R&R budget/ present worth			#DIV/0!	R&R budget/ present worth			#DIV/0!	R&R budget/ present worth			#DIV/0!	R&R budget/ present worth	0.0%	% Total	0%	R&R budget/ present worth	0.0%	% Total
3.12	Wastewater service disruptions																		0.0%	% Total			0.0%	% Total
	Total number of collection disruptions of all durations (Planned & Unplanned)				20	No.			0	No.			58	No.			229	No.			0	No.		
	Total number of disruptions of specific duration (Unplanned)				0	No.			0	No.			15	No.			197	No.			0	No.		
	Number of residential accounts - Wastewater				0	No.			0	No.			0	No.			0	No.			0	No.		
	Number of nonresidential accounts - Wastewater				0	No.			0	No.			0	No.			0	No.			0	No.		
	Average time to address water service disruptions				1	Hour			0	Hour			2	Hour			1	Hour			0	Hour		
	Total time to address water service disruptions				0	Hour			0	Hour			0	Hour			0	Hour			0	Hour		
	Total number of water disruptions				0	No.			0	No.			0	No.			0	No.			0	No.		
	Total number of water service disruptions of all durations				0	No.			0	No.			0	No.			0	No.			0	No.		
	What is the total number of collection system disruptions per year (Unplanned)?				20	No.			0	No.			15	No.			140	No.			0	No.		
	Average time to address water service disruption (Unplanned)				0	Hour			0	Hour			0	Hour			6	Hour			0	Hour		
	Average cost per main repair (Grass) - break down labor, materials and equipment costs				$ 810.96	$			$ -	$			$ -	$			$ 8,205.00	$			$ -	$		
	Average cost per main repair (Pavement) - break down labor, materials and equipment costs				$ 810.96	$			$ -	$			$ -	$			$ 2,500.00	$			$ -	$		

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Table A-7
Wastewater Stormwater Collections

AWWA	Indicators and Data to be Benchmarked	Values	Units		Values	Units	Values	Units	Values	Units	Values	Units	Values	Units
	6. Wastewater and Stormwater Collections													
		2019 AWWA Benchmark			TOPEKA		MANHATTAN		LAWRENCE		SIOUX CITY		PRIVATE	
	Wastewater													
5.5	**Wastewater Collections - General**													
	Total O&M Cost				$ 5,715,521.50	$	$ 1,400,000	$	$ 2,874,482.00	$	$ -	$	$ -	$
	Number of residential accounts				47,775	No.	14,593	No.	31,766	No.	26,589	No.	0	No.
	Number of nonresidential accounts				5,370	No.	1,440	No.	2,385	No.	2,797	No.	0	No.
	Total O&M Cost of Potable Water Services				$ 107.55	($/account)	$ 87.32	($/account)	$ 84.17	($/account)	$ -	($/account)	$ -	($/account)
	Average daily flow (MG)				22.6	MG	6	MG	9.8	MG	0	MG	0	MG
	Total O&M Cost of Wastewater Services	$ 2,489.00	$/MG	Median Value	$ 692.87	$/MG	$ 639.27	$/MG	$ 803.60	$/MG	#DIV/0!	$/MG	$ -	$/MG
	Total cost of corrective maintenance				$ 340,630.17	$	$ 40,000	$	$ -	$	$ -	$	$ -	$
	Total cost of planned maintenance				$ 90,709.96	$	$ 412,129	$	$ -	$	$ -	$	$ -	$
	~~Treatment O&M cost~~				$ -	$	$ 2,800,000	$	$ 4,829,204.00	$	$ -	$	$ -	$
	Total mile of collection system piping				0	Miles	0	Miles	0	Miles	0	Miles	0	Miles
	Average daily production				#REF!	MG	0	MG	#REF!	MG	0	MG	0	MG
	Specific O&M cost				#DIV/0!	$	$ 0.50	$	$ 0.60	$	#DIV/0!	$	$ -	$
2.9	**Main Cleaning and Inspection**													
	Linear feet of sanitary sewer pipes cleaned per year				2,225,689	Feet	250,771	Feet	935,084	Feet	58,101	Feet	0	Feet
	Total number of private contracts				0	No.	1	No.	1	No.	0	No.	0	No.
	Private cost for main cleaning and inspection				$ -	$	$ 58,000.00	$	$ -	$	$ -	$	$ -	$
	Length of pipe inspected				363,908	Feet	235124	Feet	76,349	Feet	15000	Feet	0	Feet
	Total length of pipe network				4,172,520	Feet	254	Feet	2,259,840	Feet	277	Feet	0	Feet
	System inspection	7.5	%	Median Value	8.7%	%	0.1%	%	3.4%	%	1.8%	%	0.0%	%
	Stormwater													
-	**Main Cleaning and Inspection**													
	Total length of pipe network				2,225,746	Feet	0	Feet	886,962	Feet	277	Feet	0	Feet
	Linear feet of sanitary sewer pipes cleaned per year				18,498	Feet	0	Feet	116,816	Feet	25,137	Feet	0	Feet
	Length of pipe inspected				46,933	Feet	0	Feet	-	Feet	0	Feet	0	Feet
-	**Inlet Maintenance & Cleaning**													
	Total number of inlets				16,706	No.	0	No.	5,737	No.	19,940	No.	0	No.
	Number of inlets inspected and cleaned annually				7,205	No.	0	No.	4,269	No.	1,861	No.	0	No.

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APPENDIX B

Capital Expenditures & Proactive Renewal and Replacement Programs

Capital expenditures (CAPX) includes costs associated with major capital projects and costs associated with annual renewal and replacement (R&R) of plant, property, and equipment assets. Topeka provides water, wastewater, and stormwater services. Topeka's water, wastewater, and stormwater systems are comprised of various types of assets providing treatment, storage, transmission, and collection/distribution.

The aim of this appendix is R&R related to collection/distribution water and wastewater assets. Topeka's R&R predominantly operates in a reactive fashion for its water distribution system, meaning unplanned and corrective expenditures are undertaken after an asset has failed. The reported high volume of breaks in Topeka's water system are a sign of reactive R&R.[1] Beginning in 2015, Topeka has taken a more proactive approach to its water main replacement funding and invested an average of $3 million annually into main replacement from 2015 to 2019. Recently, Topeka has increased its customer rates for 2021 through 2023 which will provide additional funding to its water main replacement program. Topeka plans to invest $6.5 million into its distribution system in 2021. If Topeka continues to run an efficient proactive R&R program, the City should significantly reduce the number of yearly breaks and reduce cost to maintain its system.

RENEWAL AND REPLACEMENT BACKGROUND

Utilities, both municipally owned and investor-owned, across the country contend with rapidly aging water and wastewater infrastructure. Much of our country's water and wastewater infrastructure is almost a century old and nearing the end of its useful life. When the American Society of Civil Engineers released its 2021 Infrastructure Report Card (March 2021), it gave grades of "C-" to U.S. water infrastructure, "D+" to U.S. wastewater infrastructure, and "D" to U.S. stormwater infrastructure.[2]

Aged infrastructure can lead to poor service for customers, including service interruptions, increased main breaks, discolored water, and environmental protection agency/department violations. While there is no single solution for how to manage and fund replacement of aged infrastructure, publicly regulated water and wastewater

[1] Utilities do not generally track main break statistics for wastewater collection assets.

[2] Every four years, the American Society of Civil Engineers' Report Card for America's Infrastructure depicts the condition and performance of American infrastructure in the familiar form of a school report card by assigning letter grades based on the physical condition and needed investments for improvement.

companies have emerged as major players in addressing their aged infrastructure challenges through the use of infrastructure improvement mechanisms.[3] In 1997 the first infrastructure improvement mechanism (Distribution System Improvement Charge or DSIC) was implemented by the Pennsylvania Public Utilities Commission for a regulated water utility as a solution to funding for critical infrastructure investments. Since 1997, almost 40% of all state utility regulatory commissions have implemented similar infrastructure improvement mechanisms to tackle aged infrastructure replacement. Although the first infrastructure improvement mechanism was only applicable to water infrastructure, infrastructure improvement mechanisms have been expanded to cover wastewater and energy utility infrastructure improvements as well. Infrastructure improvement mechanisms have allowed regulated water and wastewater utilities to proactively replace aging parts of their systems to improve the quality of service to customers.

The National Association of Regulatory Utility Commissioners Committee on Water has endorsed the use of infrastructure improvement mechanisms as a “best practice” for water systems and the Council of State governments included the infrastructure improvement mechanism as “model legislation.”

Infrastructure Improvement Mechanisms

Infrastructure improvement mechanisms utilize an automatic surcharge for cost recovery outside of a utility's general rate case related to R&R of water and wastewater distribution/collection assets. Without automatic surcharges, a utility is unable to earn a return on and return of (depreciation expense) infrastructure replacement projects until the next general rate case. For a regulated municipal utility, the infrastructure improvement mechanism can be based on the debt service related to infrastructure replacement projects. Infrastructure improvement mechanisms are limited to replacing or rehabilitating existing infrastructure, and do not provide funds for utility growth or expansion. However, this mechanism can provide an additional source of funds to allocate toward Topeka’s water main replacement program and accelerate R&R that is necessary within the Topeka distribution system.

Below is a listing of the types of water and wastewater infrastructure improvements typically allowed recovery through infrastructure improvement mechanisms:

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[3] Infrastructure improvement mechanisms go by various names in different states. Some of the more common names for infrastructure improvement mechanisms include Distribution System Improvement Charge, System Improvement Benefit Mechanism, Water Infrastructure and Conservation Adjustment, Qualifying Infrastructure Plant Surcharge, System Infrastructure Charge, and Water System Improvement Charge.

- Water
  - Services;
  - Meters and Hydrants installed as in-kind replacements for customers;
  - Mains and valves installed as replacements;
  - Main extensions installed to eliminate dead ends and to implement solutions to regional water supply problems that present a significant health and safety concerns for customers;
  - Main cleaning and relining projects;
  - Unreimbursed costs related to highway relocation projects where a water utility must relocate its facilities; and
  - Other related capitalized costs.
- Wastewater
  - Collection sewers;
  - Collecting mains and service laterals (including sewer taps, curb stops, and lateral cleanouts installed as in-kind replacements for customers;
  - Collection mains and valves for gravity and pressure systems and related facilities such as manholes, grinder pumps, air and vacuum release chambers, cleanouts, main line flow meters, valve vaults, and lift stations installed as replacements or upgrades for existing facilities that have worn out, are in deteriorated condition, or are required to be upgraded by law, regulation, or order;
  - Collection main extensions installed to implement solutions to wastewater problems that present a significant health and safety concern for customers currently receiving service from the wastewater utility;
  - Collection main rehabilitation including inflow and infiltration projects;
  - Unreimbursed costs related to highway relocation projects where a wastewater utility must relocate its facilities; and
  - Other related capitalized costs.

Under an infrastructure improvement mechanism, customers are billed a small surcharge each billing period that provides a return on and a return of capital to finance specific, utility and commission approved water and wastewater infrastructure upgrades (R&R). Between general rate cases, the surcharge related to the infrastructure improvement mechanisms typically increase over time as more and more infrastructure is replaced and is generally capped to a maximum percentage of a utility's revenue requirement (e.g., 5% to 7.5%). The infrastructure improvement mechanism is then reset to 0% if a utility is over-earning its authorized rate of return or during the next general rate case when the recently added replacement infrastructure becomes part of base rates.

Selection of Peer Utilities

As noted previously, Topeka currently operates in a reactive fashion regarding R&R, meaning corrective actions are undertaken after an asset has failed. Since the infrastructure improvement mechanism (Distribution System Improvement Charge or DSIC) was first introduced in Pennsylvania over 20 years ago, we selected the three largest private water and wastewater utilities providing service in Pennsylvania to provide benchmark examples of proactive replacement and renewal programs. The three large private water and wastewater utilities selected for these purposes include Aqua Pennsylvania, Inc. (Aqua), Pennsylvania American Water Company (PAWC), and The York Water Company (York). These three Pennsylvania utilities have each been providing service for over 150 years and each has utilized an infrastructure improvement mechanism for many years. These three large private water and wastewater utilities are referred to collectively as the "DSIC peer utilities."

Collection and Compilation of Data

We relied on publicly available Annual Reports and Annual Asset Optimization Plans (AAOP) filed by Aqua, PAWC, and York with the Pennsylvania Public Utility Commission (PAPUC) for the years 2015 to 2019. The AAOP and related 5-year Long-Term Infrastructure Improvement Plans are required to be approved by the PAPUC prior to the implementation of a DSIC and each change to the DISC rate is also reviewed by the PAPUC. We also relied on the City of Topeka's 2015 to 2019 Comprehensive Annual Financial Reports and supplemented this information with customer count and miles of mains information provided by COT. Although the rest of this benchmark study reports on metrics for 2019, we expanded the years reviewed to at least the five-year period 2015-2019 to get a longer-term viewpoint of the internal funding and the CAPX and R&R programs since internal funding, CAPX and R&R often fluctuate from year to year.

Systems Characteristics

Topeka's water system serves approximately 53,000 water accounts within a population of 0.16 million people, inside a 70 square mile area in and around Topeka Kansas. Topeka's wastewater system serves approximately 53,000 accounts within a 60 square mile area in and around Topeka Kansas. In total, Topeka provides water and wastewater services to 106,290 customer accounts.

Aqua owns and operates non-contiguous water systems serving approximately 433,000 water customers, or a population of 1.4 million people, in 32 counties throughout Pennsylvania. Aqua also owns and operates 37 non-contiguous wastewater systems serving approximately 38,000 customers in 15 counties throughout Pennsylvania. In total, Aqua provides water and wastewater services to 481,360 customers.

PAWC owns and operates 66 non-contiguous water systems across Pennsylvania, providing potable water service to approximately 666,000 water customers, or a population of 2.4 million people, in approximately 404 communities located in 36 counties in Pennsylvania. PAWC also owns and operates 20 non-contiguous wastewater systems serving approximately 74,000 customers located in 12 counties in Pennsylvania. In total, PAWC provides water and wastewater services to 740,183 customers.

York provides water service to approximately 68,460 customers, or a population of 0.2 million people, throughout its certificated service territory, which includes the City of York and surrounding municipalities in portions of York and Adams Counties, Pennsylvania. York also owns and operates three wastewater systems which provide service to approximately 2,950 customers in portions of York County. In total, York provides water and wastewater services to 71,411 customers.

Table 1 summarizes the miles of water mains, number of valves, hydrants, meters, and customers for Topeka and the DSIC peer utilities water operations. Normalized values (number of items per mile) for valves and for customers indicate that the DSIC peer utilities water operations either serve a more densely populated customer base or have more market penetration than Topeka. As shown in Table 1, the DSIC peer utilities provide water service to between 10% to 27% more customers per mile of water main than Topeka.

Table 1

Water Metrics	Topeka	Aqua	PAWC	York
Miles of Mains	890	5,821	10,164	999
Valves / Mile	11	14	19	12
Hydrants	5,329	24,300	38,745	3,901
Meters	56,818	433,555	665,375	66,856
Customers	53,145	443,152	665,829	68,463
Customers / Mile	60	76	66	69

Table 2 provides a summary comparison of the miles of wastewater mains, the manholes, and customers for Topeka and the DSIC peer utilities wastewater operations. Normalized values (number of items per mile) for customers indicate that Topeka falls within the range of the DSIC peer utilities wastewater operations.

Table 2

Wastewater Metrics	Topeka	Aqua	PAWC	York
Miles of Mains	790	654	1,053	28
Manholes	16,000	10,127	23,821	663
Customers	53,145	38,208	74,354	2,948
Customers / Mile	63	58	71	105

Table 3 summarizes Topeka's and the DSIC peer utilities' combined water and wastewater operations miles of mains, and number of customers. Normalized values (number of items per mile) for customers indicate that the DSIC peer utilities water and wastewater operations either serve a slightly more densely populated customer base or have more market penetration than Topeka. As presented in Table 3, the DSIC peer utilities provide water and wastewater service to between 4% to 18% more customers per mile of main than Topeka. Topeka's customers per mile of main metric most closely aligns with PAWC's metric.

Table 3

Water & Wastewater Metrics	Topeka	Aqua	PAWC	York
Miles of Mains	1,680	6,475	11,217	1,027
Customers	106,290	481,360	740,183	71,411
Customers / Mile	63	74	66	70

Condition Assessment, Main Breaks and Leaks

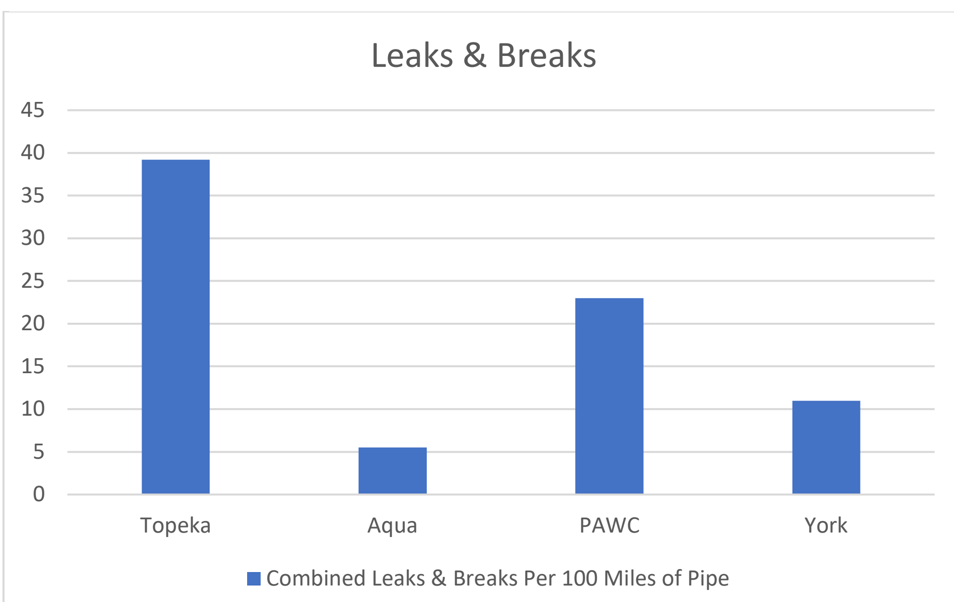
Every water utility experiences water main breaks but obtaining water main breaks statistics can be a daunting undertaking. Few water utilities openly publicize water main break statistics because main break statistics can unnerve customers, creditors, and investors. Table 4 shows water main breaks per 100 miles of water distribution mains for Topeka and the DSIC peer utilities base on the most recent information reported for each.

Table 4

Subject	Most Recent Year Reported	Number of Main Breaks	Miles of Water Main in Reported Year	Breaks Per 100 Miles	Break Frequency
Topeka	2020	391	890	39	39%
Aqua	2020	321	5,844	5	5%
PAWC	2016	2,276	9,896	23	23%
York	2016	108	983	11	11%

Figure 5 illustrates the magnitude difference for main breaks per 100 miles of distribution mains. Topeka's incidence of breaks per 100 miles of main is high compared to DSIC peer utilities. Topeka's incidence of main breaks per 100 miles of main is about 2-times higher than the highest DSIC peer utility (PAWC) and about 7-times higher than the lowest DSIC peer utility (Aqua).

Figure 5



Pipe Age

Age breakdown for Topeka and the DSIC peer utilities water systems are shown in Figures 6 and 7, respectively. Topeka's water distribution system contains an average percentage of newer pipes compared to the DSIC peer utilities. Figure 7 indicates 33% of York's system was built prior to 1960, 25% of PAWC's system was built prior to 1960, while only 21% of Topeka's system was built prior to 1960 (Figure 6). Aqua has the newest system with only 13% of Aqua's system being built prior to 1960.

Figure 6

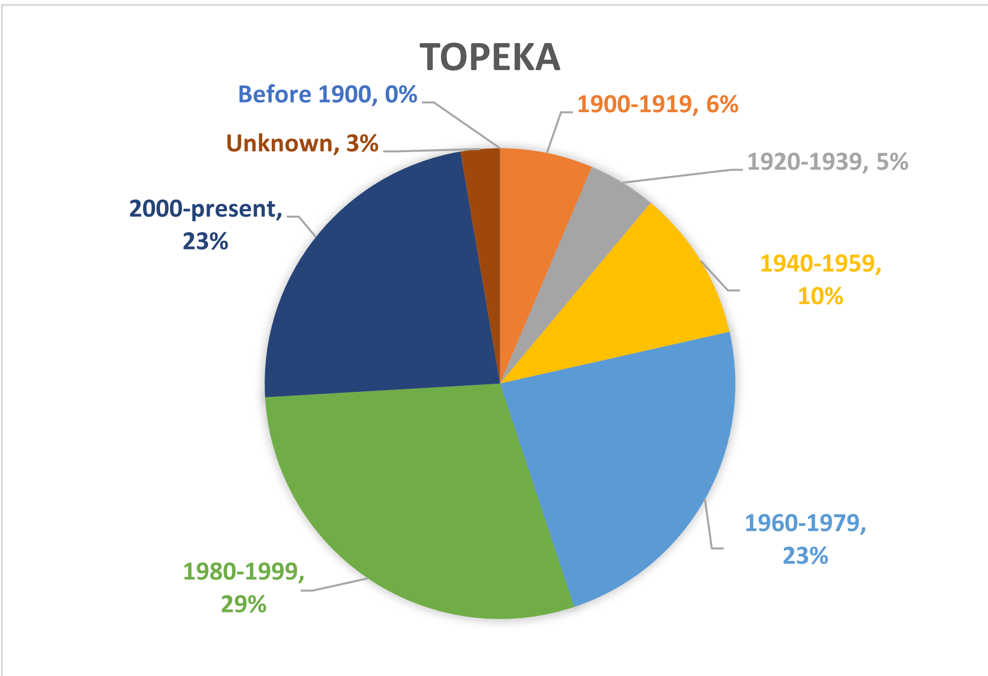
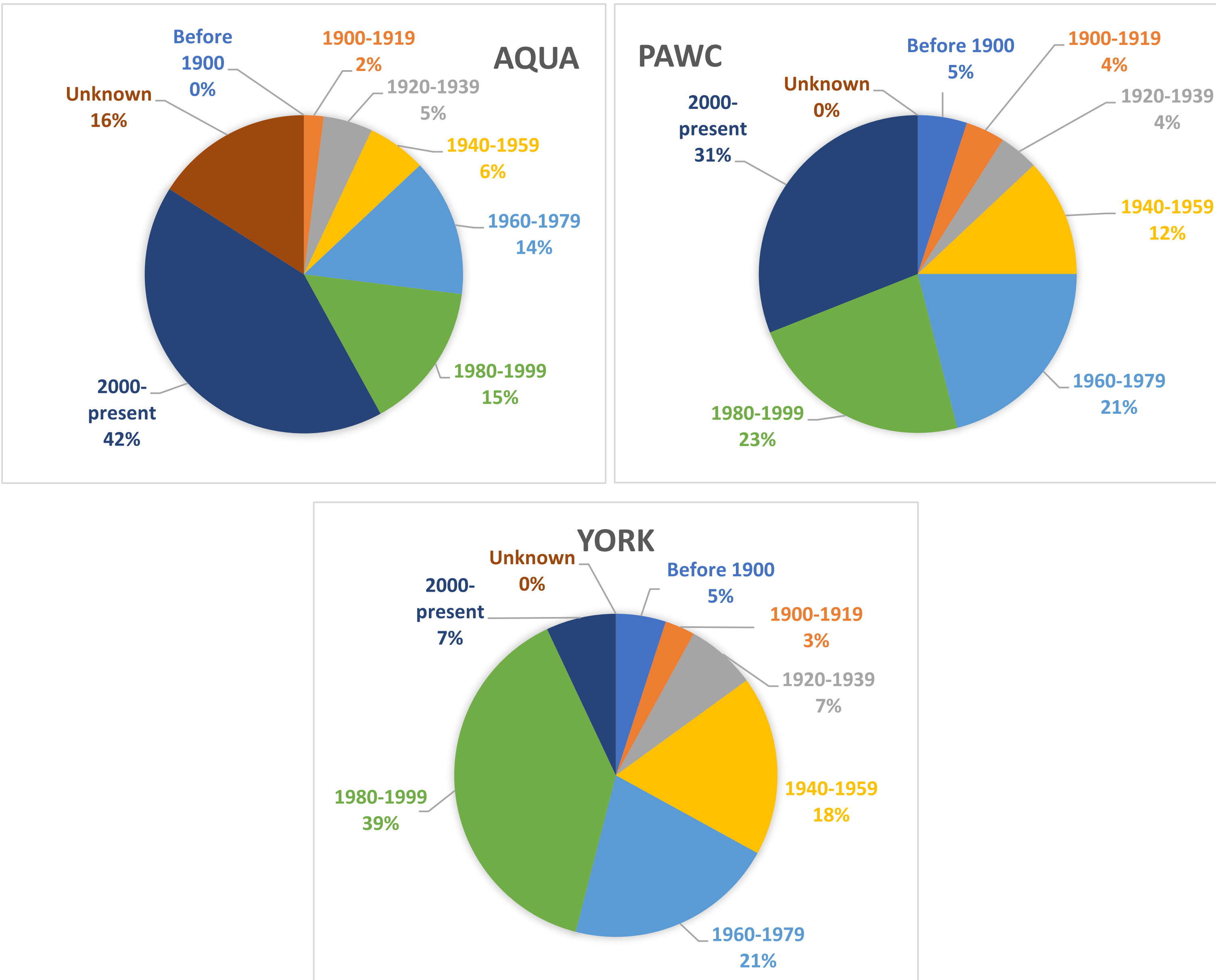


Figure 7

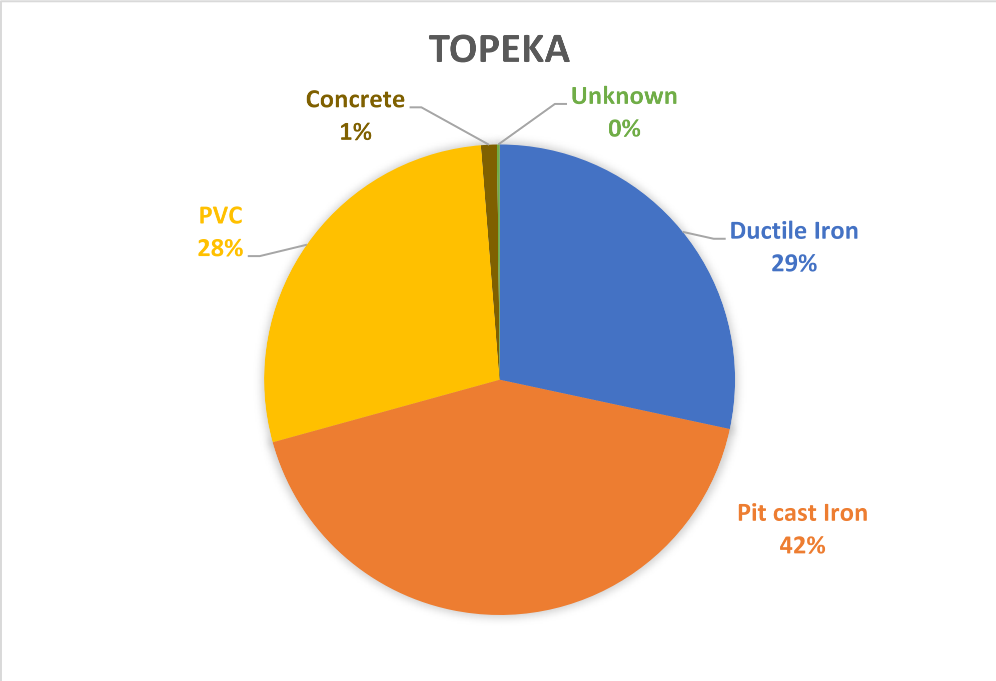


Three percent (3%) of Topeka's mains installation dates are unknown, sixteen percent (16%) of Aqua's mains installation dates are unknown, while all main installation dates are known for both PAWC and York. Excluding the mains with an unknown installation date suggests Topeka's water mains average installation date was 1977, Aqua's average installation date was 1988, PAWC's average installation date was 1976, and York's average installation date was 1968.

Pipe Materials

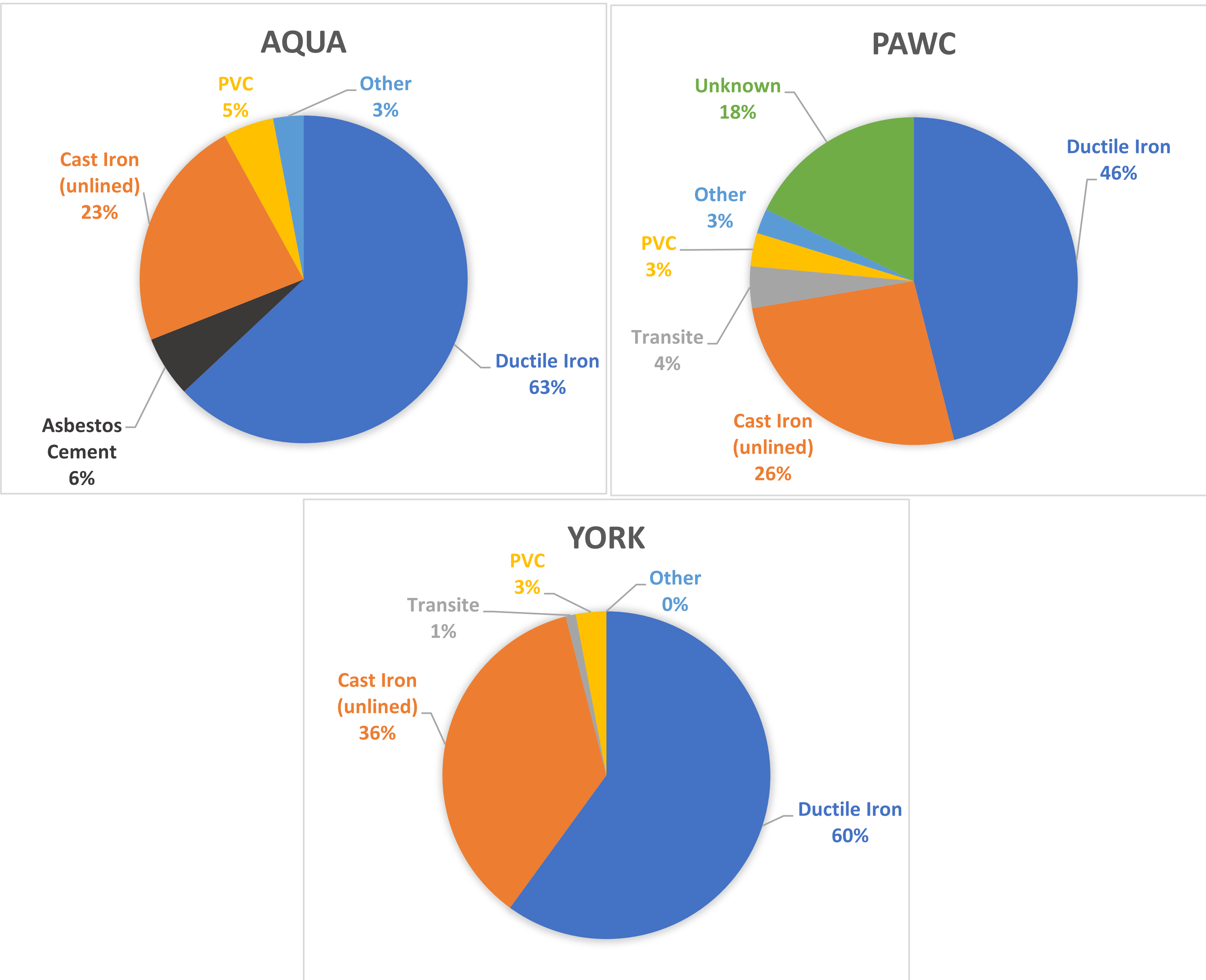
Figure 8 presents the percentage of the various pipe materials within the Topeka's water distribution system. Figure 9 shows the same information for the DSIC peer utilities. Cast iron mains, especially unlined cast iron mains, and asbestos cement mains typically have the highest break rates, while PVC and ductile iron mains usually have the lowest break rates. Forty-two percent (42%) of Topeka's water distribution mains are comprised of pipe materials which generally have the highest break rate (cast iron and asbestos cement mains), whereas twenty nine percent (29%) to thirty-six (36%) of the DSIC peer utilities' mains consist of similar materials. Fifty three percent (53%) of Topeka's water distribution mains consist of pipe materials which generally have the lowest break rate (PVC and ductile iron mains), while sixty percent (60%) to sixty-eight percent (68%) of the DSIC peer utilities' mains contain comparable materials.[4]

Figure 8



[4] Topeka's ductile iron mains have a high break rate.

Figure 9

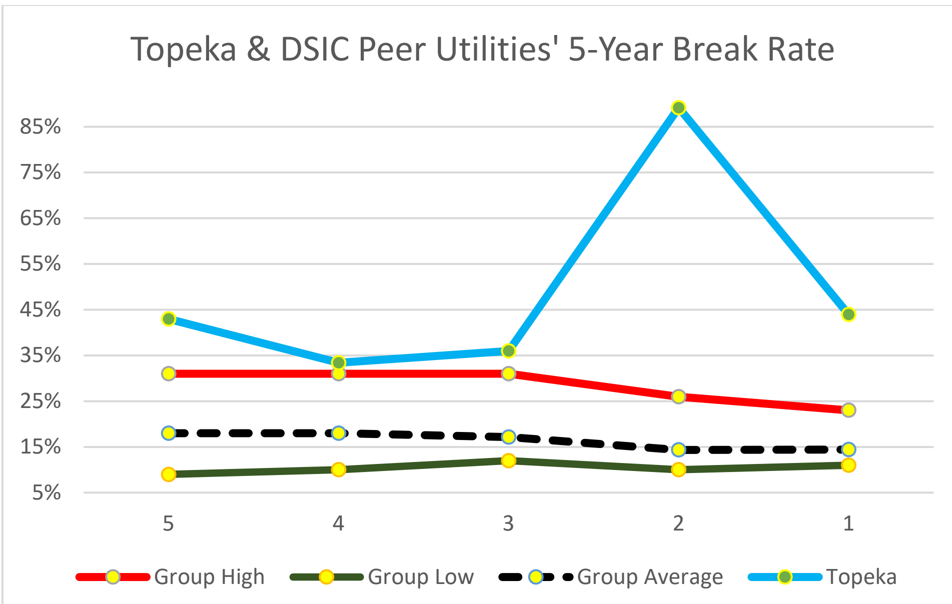


Topeka's incidence of main breaks (Table 4) are about 2-times higher than the highest DSIC peer utility's break rate and about 8-times higher than the lowest DSIC peer utility's break rate. Differences in pipe materials only explain a small percentage of the difference between Topeka's and the DSIC peer utilities' break rates.

Main Break Rate Trends

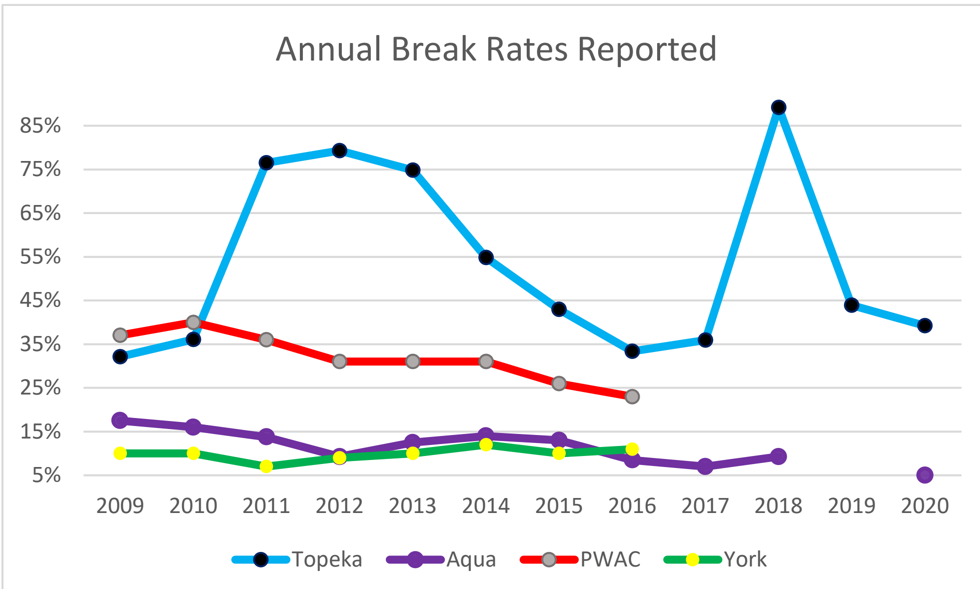
We believe the DSIC peer utilities lower break rates are attributable to their use of their infrastructure improvement mechanisms in recent years. Figure 10 presents Topeka's and the DSIC peer utilities' most recent reported five-year period annual break rates. The information depicted in Figure 10 reflects Topeka's break rates from 2015 to 2019, Aqua's break rates from 2014 to 2018, PAWC's and York's break rate rates from 2012 to 2016. The data illustrated in Figure 10 shows a general down-trend in break rates for the DSIC peer utilities which we believe is attributable to their use of their infrastructure improvement mechanisms.

Figure 10



All known annual break rates for Topeka and the DSIC peer utilities are depicted in Figure 11. As shown, Topeka break rates trended downward from 2012 to 2016 before reversing course and becoming more volatile from 2017 through 2020. The data illustrated in Figure 11 shows a general down-trend in break rates for the DSIC peer utilities which we believe is attributable to their use of their infrastructure improvement mechanisms. However, we recognize that other factors impact break rates each year such as soil and climate conditions.

Figure 11



Financial Review

The purpose of this financial review is to provide benchmark metrics regarding levels of CAPX and R&R and their means of funding. The benchmark metrics presents the 2015 through 2019 financial performance of Topeka and the DSIC peer utilities relating to CAPX and R&R. As noted previously, the financial benchmark metrics for Topeka are based in the information presented in the City of Topeka's 2015 to 2019 Comprehensive Annual Financial Reports for the Water, Water Pollution Control, and Stormwater Utility Fund. The financial benchmark metrics for Aqua, PAWC, and York Water are based on combining separate water and wastewater Annual Reports filed with the PAPUC for the years 2015 to 2019. Therefore, the financial benchmark metrics for Topeka reflect their water, wastewater, and stormwater operations while the results for the DSIC peer utilities reflect their water and wastewater operations.

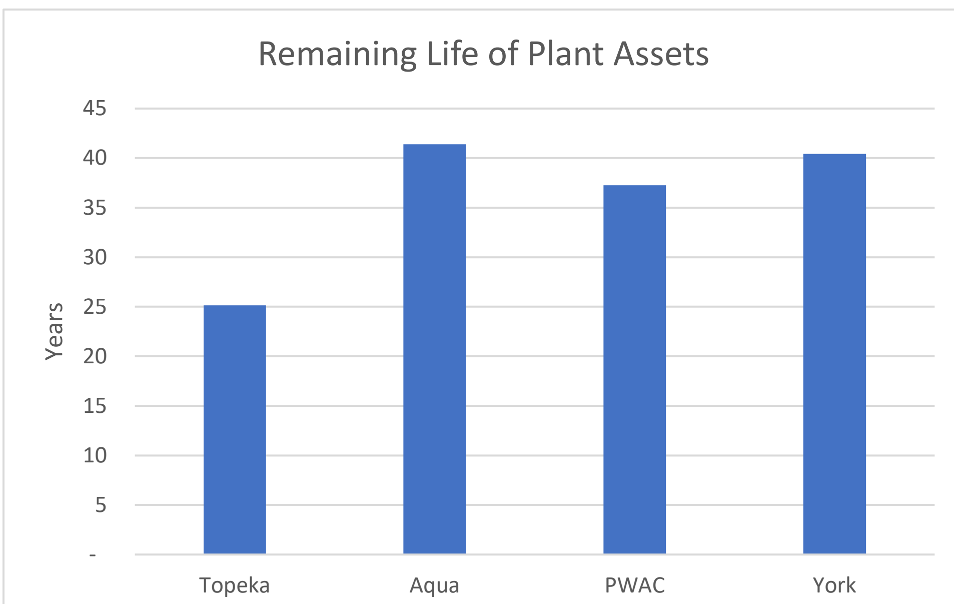
For descriptive purposes, when describing the results of the benchmark metrics, the terms "favorably", "neutral", and "unfavorably" are sometimes used to describe

Topeka's benchmark metric relative to the DISC peer utilities' benchmarks. The term "favorably" is used when Topeka's benchmark metric is near or above the upper end of the DISC peer utilities' benchmarks. The term "neutral" is used for a more central rank, or when Topeka's benchmark metric is near the average of the DISC peer utilities' benchmarks. The term "unfavorably" is used when Topeka's benchmark metric is near or below the lower end of the DISC peer utilities' benchmarks.

Remaining Financial Life

Figure 12 provides a summary comparison of the remaining financial life of plant assets, expressed in years, for Topeka and the DSIC peer utilities operations. The benchmark was determined by dividing net plant by depreciation expense. As illustrated in Figure 12, the DSIC peer utilities' remaining financial life of plant is 37 to 41 years, which is between 48% to 65% more than Topeka's 25 year remaining financial life of plant. Since net plant is comprised of non-depreciable assets (e.g., land, construction work in progress), Topeka's and the DSIC peer utilities' remaining financial life of plant may be as less than that shown in Figure 12. Remaining financial life of plant can be increased by increasing rates of CAPX.

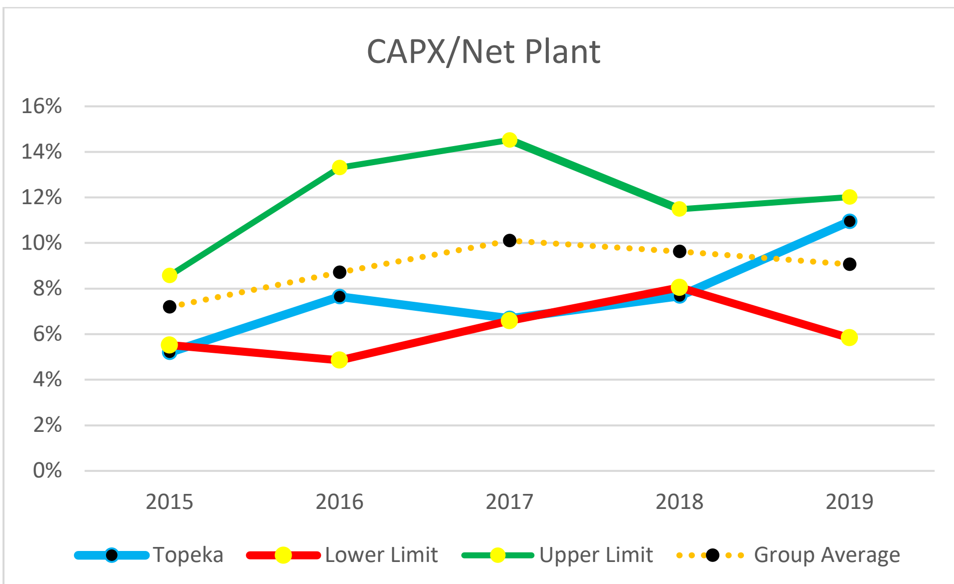
Figure 12



CAPX/Net Plant

As shown in Figure 13, Topeka's CAPX/Net Plant metric trended upward over the five-year period. A higher CAPX/Net Plant indicates the reinvestment rate of plant as well as the need for either internal or external financing. Without CAPX, net plant will cease overtime. Topeka's CAPX/Net Plant metric ranged from a low of 5% to a high of 11% from 2015 to 2019, averaged 8% during this period, and was 11% in 2019. The DSIC peer utilities' metric ranged from a low of 5% to a high of 15% from 2015 to 2019, averaged 9% during this period, and was 9% in 2019. Topeka's metric was positioned neutral relative to the DSIC peer utilities' DSIC peer utilities' five-year average but improved to favorably for 2019 when compared to the DSIC peer utilities.

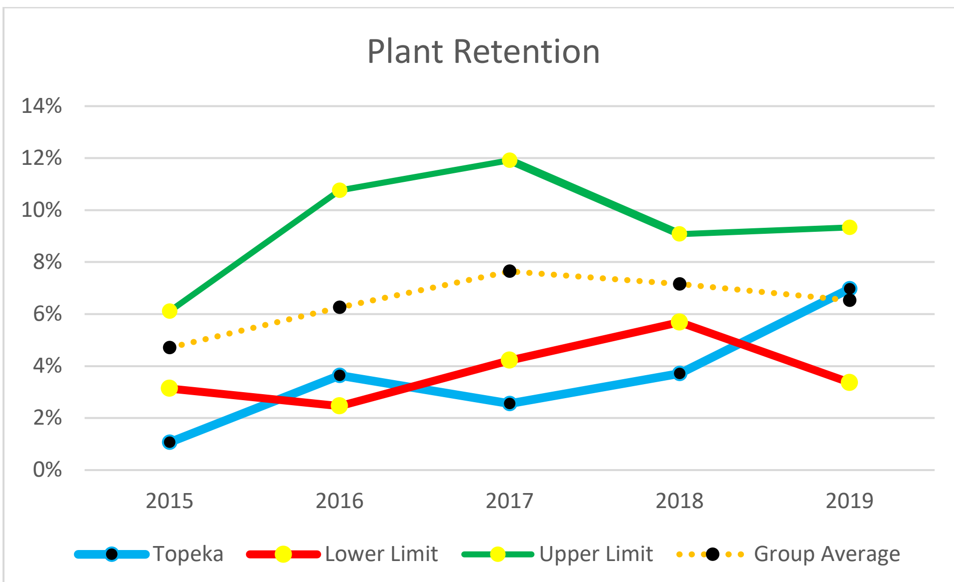
Figure 13



Plant Retention

As demonstrated in Figure 14, Topeka's Plant Retention metric trended upward over the five-year period. A higher Plant Retention indicates a higher natural (internal) reinvestment rate of plant. Plant Retention is calculated by dividing the difference of CAPX less depreciation expense by net plant. Without Plant Retention, net plant will cease overtime. Topeka's Plant Retention metric ranged from a low of 5% to a high of 11% from 2015 to 2019, averaged 8% during this period, and was 11% in 2019. The DSIC peer utilities' metric ranged from a low of 5% to a high of 15% from 2015 to 2019, averaged 9% during this period, and was 9% in 2019. Topeka's metric was positioned unfavorably relative to the five-year average but improved to neutral for 2019 when compared to the DSIC peer utilities.

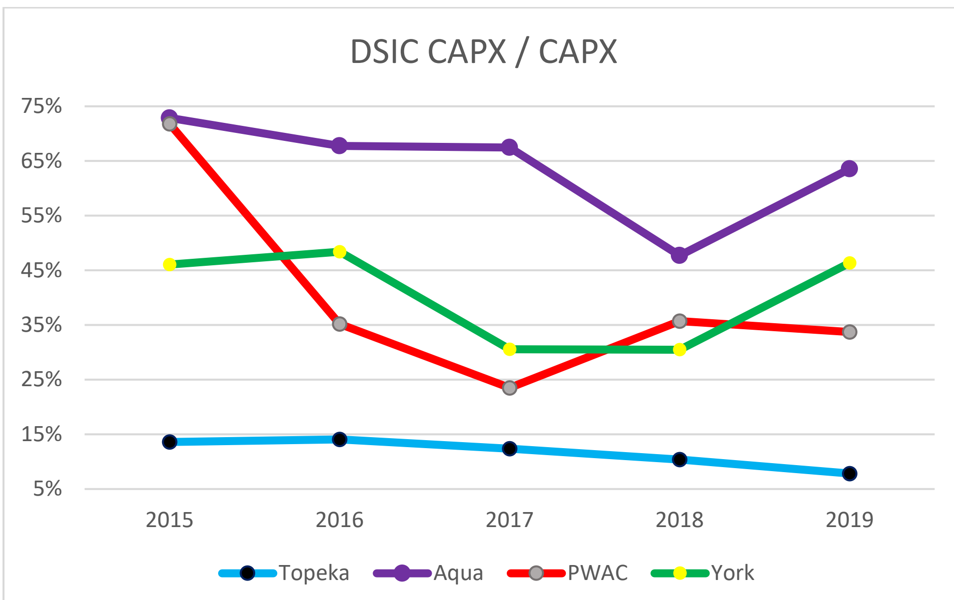
Figure 14



DSIC CAPX / CAPX

As discussed previously, the DSIC peer utilities utilize an infrastructure improvement mechanism, which helps and encourages their R&R. Figure 15 shows the percentage of the DSIC peer utilities annual CAPX devoted to distribution/collection related assets' R&R as measured by their annual DSIC related investment. The DSIC peer utilities' DSIC CAPX / CAPX metric ranged from a low of twenty-four percent (24%) to a high of seventy-three percent (73%) from 2015 to 2019, averaged forty-eight percent (48%) during this period, and was forty-eight percent (48%) in 2019. Sixty-four percent (64%) of Aqua's CAPX was DSIC related investment, while both PAWC and York averaged forty percent (40%) from 2015 to 2019. Topeka does not have a DSIC. The information depicted for Topeka in Figure 15 only shows water main related R&R as a percentage of total CAPX for their water, wastewater, and stormwater systems. Topeka's DSIC CAPX / CAPX metric, based on water main spending, ranged from a low of eight percent (8%) to a high of fourteen percent (14%) from 2015 to 2019, averaged twelve percent (12%).

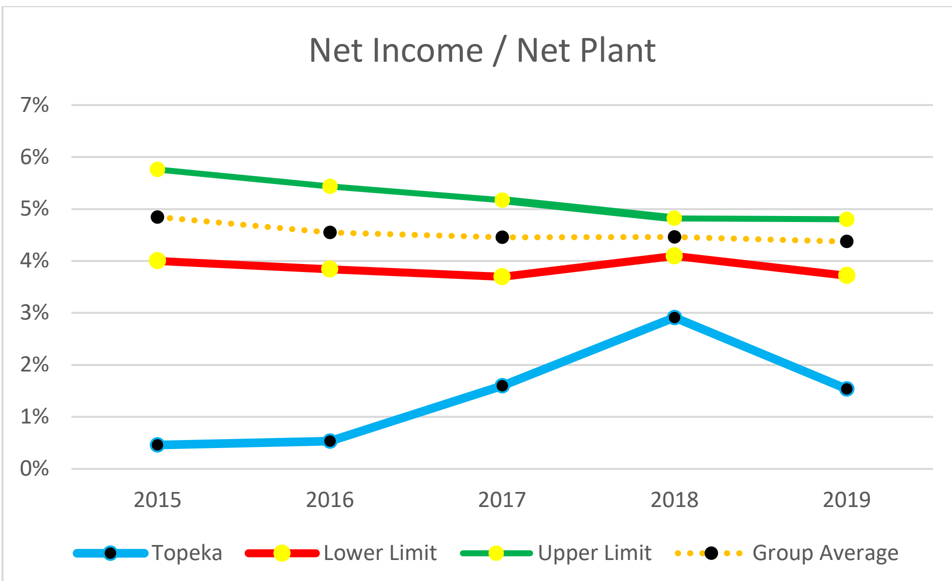
Figure 15



Net Income / Net Plant

As exhibited in Figure 16, Topeka's Net Income / Net Plant metric trended upward over the five-year period. A higher Net Income / Net Plant indicates more cash (retained net income) is available for internally financing CAPX. Without Net Income / Net Plant, more external financing (debt) is required to finance CAPX. Topeka's Net Income / Net Plant metric ranged from a low of 0% to a high of 3% from 2015 to 2019, averaged 1% during this period, and was 2% in 2019. The DSIC peer utilities' metric ranged from a low of 4% to a high of 6% from 2015 to 2019, averaged 5% during this period, and was 4% in 2019. Topeka's metric was positioned unfavorably during to the five-year average and for 2019 when compared to the DSIC peer utilities' metric.

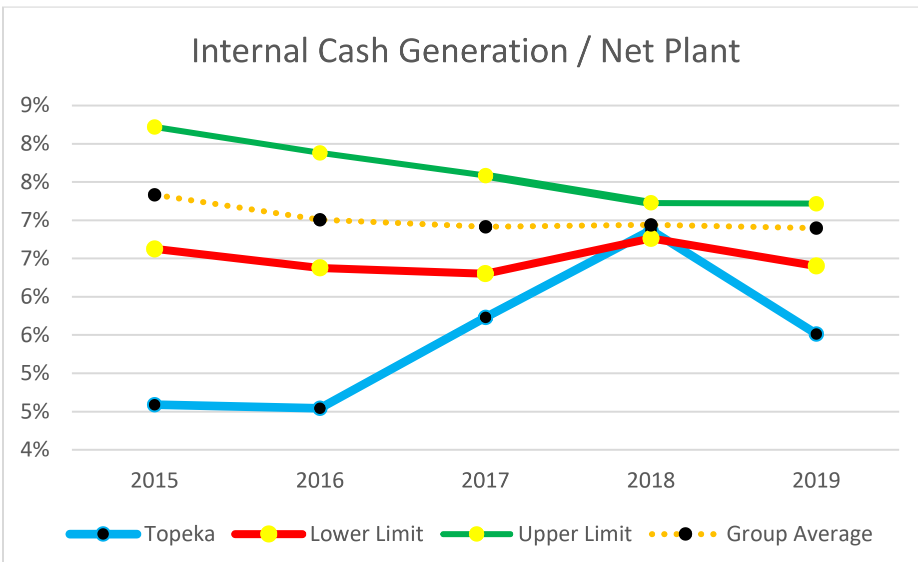
Figure 16



Internal Cash Generation / Net Plant

As shown in Figure 17, Topeka's Internal Cash Generation / Net Plant metric trended upward from 2015 through 2018 before decreasing in 2019. A higher Internal Cash Generation / Net Plant indicates more internally generated cash is available to finance CAPX. Internal Cash Generation / Net Plant is calculated by dividing the sum of net income and depreciation expense by net plant. Without internal cash generation, more external financing (debt) is required. Topeka's Internal Cash Generation / Net Plant metric ranged from a low of 5% to a high of 7% from 2015 to 2019, averaged 5% during this period, and was 6% in 2019. The DSIC peer utilities' metric ranged from a low of 6% to a high of 8% from 2015 to 2019, averaged 7% during this period, and was 7% in 2019. Topeka's metric was positioned unfavorably relative to the five-year average and for 2019 when compared to the DSIC peer utilities.

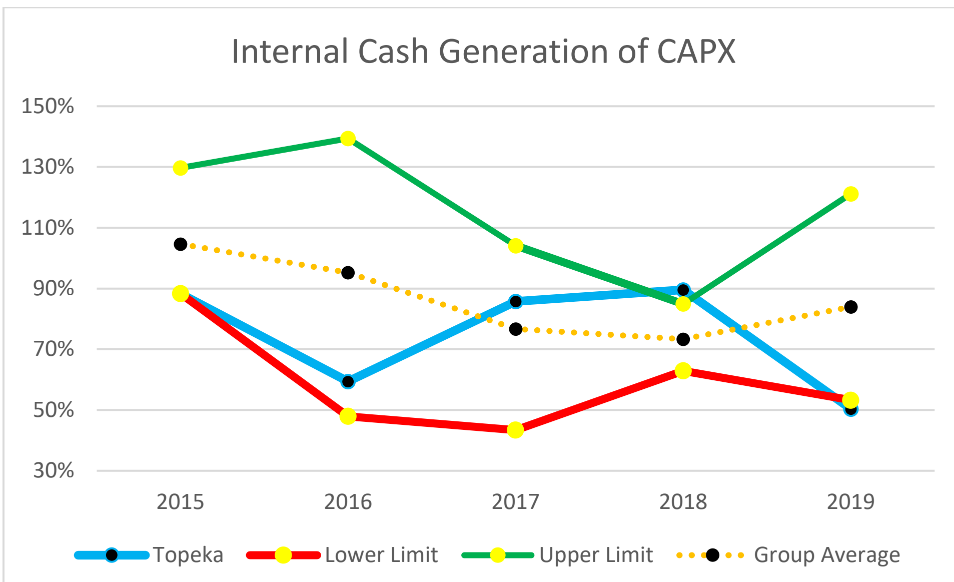
Figure 17



Internal Cash Generation of CAPX

As illustrated in Figure 18, Topeka's Internal Cash Generation of CAPX metric trended upward from 2015 through 2018 before decreasing in 2019. A higher Internal Cash Generation of CAPX indicates more internally generated cash is available to finance CAPX. Internal Cash Generation of CAPX is calculated by dividing the sum of net income and depreciation expense by CAPX. Without internal cash generation, more external financing (debt) is required. Topeka's Internal Cash Generation of CAPX metric ranged from a low of 50% to a high of 90% from 2015 to 2019, averaged 75% during this period, and was 50% in 2019. The DSIC peer utilities' metric ranged from a low of 43% to a high of 139% from 2015 to 2019, averaged 87% during this period, and was 84% in 2019. Topeka's metric was positioned neutral relative to the five-year average and unfavorable for 2019 when compared to the DSIC peer utilities.

Figure 18



Deciphering CAPX & Renewal and Replacement Benchmark Metrics

As stated, the purpose of this financial review is to provide benchmark metrics regarding Topeka's and the DSIC peer utilities' levels of CAPX and R&R and their methods of funding. The benchmark metrics presents in Figures 12 through 18 tell part of the story, but not the complete story. That is, the benchmark metrics presents in Figures 12 through 18 provide quantitative indications of credit quality related to net plant and CAPX, but not the levels of CAPX and R&R required for Topeka to be in parity with the DSIC peer utilities' CAPX and R&R. Topeka's remaining financial life of plant assets (Figure 12) is 25 years, while the DSIC peer utilities is 40 years. From a financial analyst's viewpoint, this 63% difference (40 ÷ 20) should be considered when determining a satisfactory level of CAPX and R&R to reduce Topeka's number of main breaks.

From 2015 to 2019 the DSIC peer utilities' CAPX/Net Plant averaged 9%, while Topeka's CAPX/Net Plant was 11% for 2019. This means for Topeka's CAPX to be equivalent to the DSIC peer utilities, Topeka's 2019 CAPX/Net Plant would have to be 15% (9% × 1.63). A 15% CAPX/Net Plant for Topeka suggests CAPX of $59,428,869 for 2019 was required for Topeka to be in parity with the DSIC peer utilities, which is 33% more than Topeka's actual 2019 CAPX. As stated, this assumption is based on a financial analyst's viewpoint, not an actual engineering assessment. However, we note that Topeka has increased its customer rates for 2021 through 2023 which will provide additional funding. These rates are intended to enable Topeka to have CAPX averaging $62.5 million annually for 2021 through 2023.

Rates of Renewal and Replacement

Table 19 shows the DSIC peer utilities' 2019 rate of replacement for miles of water mains, hydrants, valve, services, and meters. Table 19 also shows the number of years to replace the DSIC peer utilities' water distribution inventory based on their 2019 rates of replacement. As shown, the DSIC peer utilities replaced between 1% to 1.8% of their inventory of mains in 2019 and averaged 1.3%. Based on their current rate of replacement, it will take between 55 year to 105 years for the DSIC peer utilities to replace their entire inventory of mains. Although not shown in Table 19, Topeka's 2019 rate of replacement of miles of water mains was 0.6%. Based Topeka's 2019 rate of replacement, it will take 179 years for Topeka to replace their entire inventory of water mains. It should be emphasized that the DSIC peer utilities' have been aggressively replacing their inventory for more than a decade with the assistance of their infrastructure improvement mechanisms, or DSIC. Both Aqua and PAWC first began their DSIC in 1997, while York began their DSIC around 2008.

Table 19

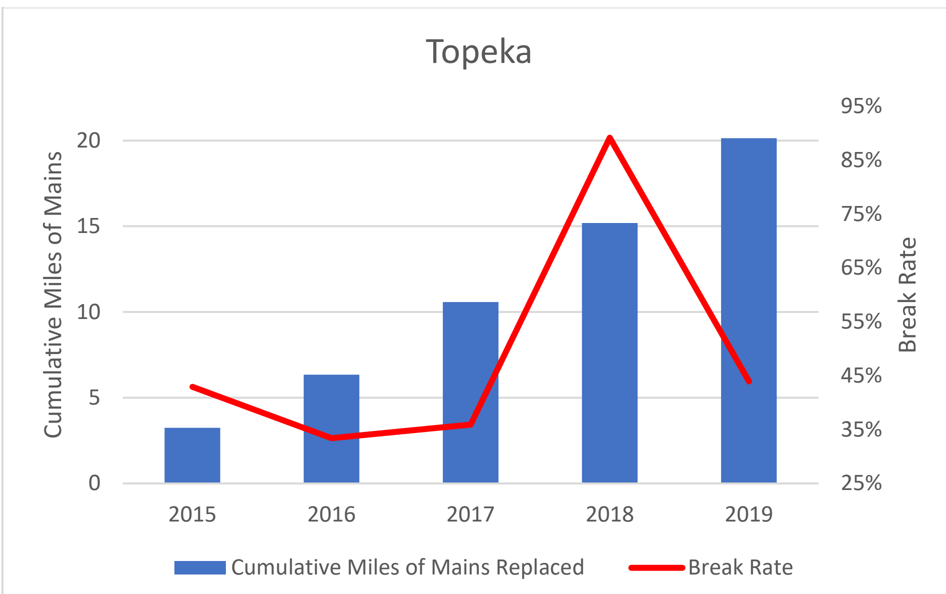
Company	Miles of Mains	Hydrants	Valves	Services	Meters
2019 Replacement Rate					
Aqua	1.8%	1.1%	2.3%	2.2%	10.8%
PAWC	1.0%	3.3%	1.9%	2.9%	10.9%
York	1.0%	2.2%	1.6%	0.7%	3.3%
Average	1.3%	2.2%	1.9%	1.9%	8.3%
Years to Replace Inventory					
Aqua	55	88	43	46	9
PAWC	99	30	53	34	9
York	105	46	62	137	30
Average	86	55	53	72	16

Cumulative Impact of Renewal and Replacement & Main Breaks

We believe the DSIC peer utilities lower break rates are attributable to their use of their infrastructure improvement mechanisms over many years. The DSIC peer utilities have been investing in new and replacement infrastructure for many years, some at an accelerated rate, to proactively address aging infrastructure. The accelerated levels of investment have enabled significant enhancements to the DSIC peer utilities' water infrastructure. As a result, main breaks and water quality complaints have been reduced.

Figure 20 reflects Topeka's main break rates, and their cumulative miles of mains replaced from 2015 to 2019. Over that 5-year period, about 2% of the pipe in Topeka's current inventory was renewed. The City's water main replacement funding program averaged 4 miles per year, or 0.5% annually.

Figure 20



The information depicted in Figure 21 reflects Aqua's main break rates and their cumulative miles of mains replaced from 2009 to 2019. Over that 11-year period, over 27% of the pipe (1,595 miles) in Aqua's water system current inventory was renewed. This amount of pipe mileage renewed over 11 years equates to an average of 145 miles per year. This accelerated rate of renewal of 2.5% annually produced a 47% drop in Aqua's main break rate.

Figure 21

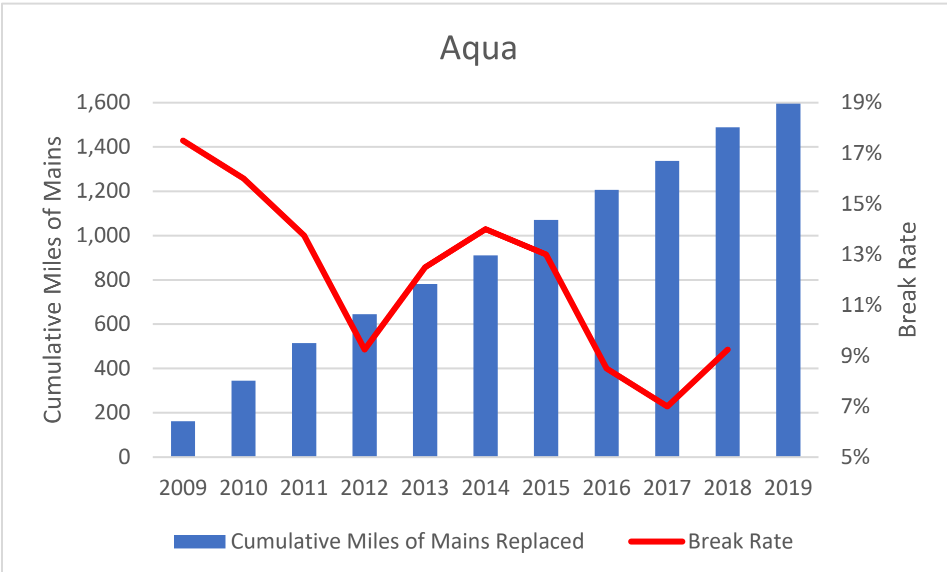
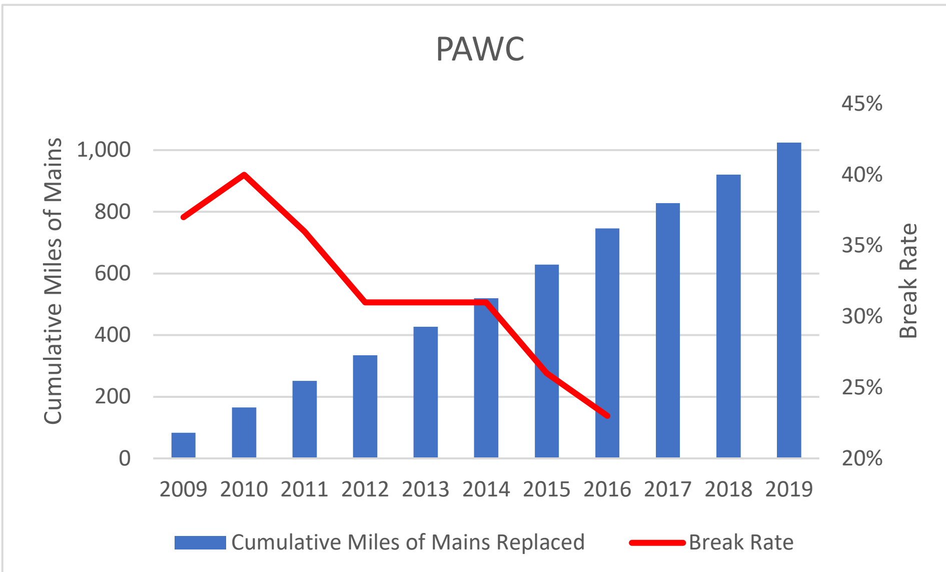


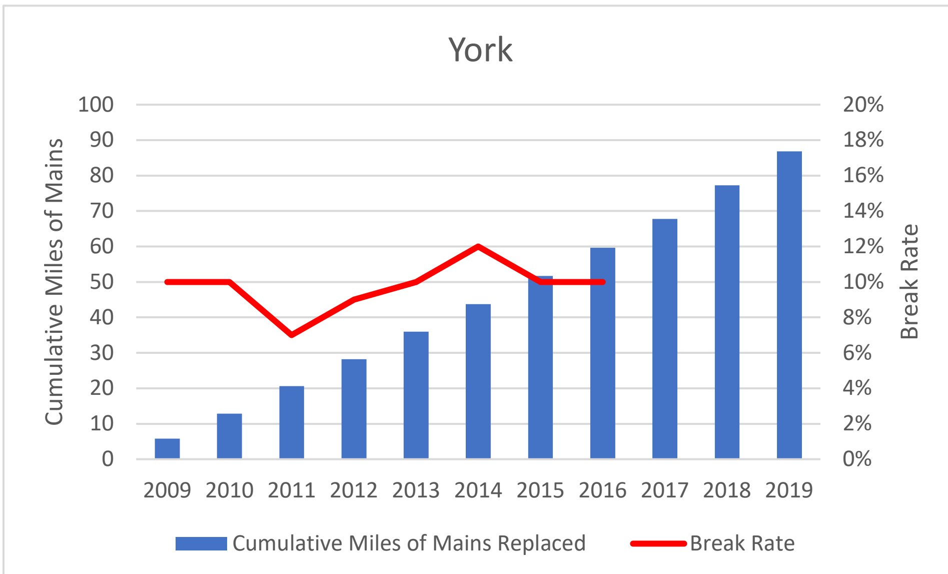
Figure 22 reflects PAWC's main break rates, and their cumulative miles of mains replaced from 2009 to 2019. Over that 11-year period, about 10% of the pipe (1,024 miles) in PAWC's current inventory was renewed. PAWC's 11-year R&R averaged of 93 miles per year, or 0.9% annually. The 0.9% annual rate of renewal produced a 38% reduction in PAWC main break rate during the 2009 to 2016 period.

Figure 22



York's main break rates, and their cumulative miles of mains replaced from 2009 to 2019 are depicted in Figure 23. York replaced 9.7% of the pipe (97 miles) in their current inventory over an 11-year period. This amount of pipe mileage renewed over 11 years averaged 7.9 miles per year, or 0.8%. A 0.8% annual rate of renewal helped York maintain a low and relative flat main break rate, which averaged under 10%, during the 2009 to 2016 period.

Figure 23



2016 is the most recent year that Topeka, Aqua, PAWC and York all reported main break rates. In 2016 Topeka's incidence of main breaks was about 2-times higher than the highest DSIC peer utility's break rate (PAWC) and was more than 5-times higher than the lowest DSIC peer utility's break rate (Aqua). Differences in pipe materials and pipe age only explain a small percentage of the difference between Topeka's and the DSIC peer utilities' break rate.

We believe the DSIC peer utilities lower break rates are attributable to their use of their infrastructure improvement mechanism. The DSIC peer utilities' use of their infrastructure improvement mechanism has been working effectively and its utilization has made a significant impact in terms of improving the DSIC peer utilities' water distribution systems. Through their usage of an infrastructure improvement mechanism, the DSIC peer utilities have proactively replaced and repaired their aging infrastructure and lowered their main break rates.

In addition to reducing the number and frequency of water main breaks, use of an infrastructure improvement mechanism has improved customer service levels and increased the safety and reliability of the DSIC peer utilities' water distribution systems. Accelerating Topeka's rate of infrastructure replacement will enable Topeka to reduce water main breaks and continue to provide its customers with safe and reliable service.

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