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PNNL-34006

Water and Wastewater Annual Price Escalation Rates for Selected Cities Across the United States: 2023 Edition

March 2023

Scott R Unger
Erica M Kilgannon
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U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Pacific Northwest National Laboratory
Richland, Washington 99354

Executive Summary

This report builds on the 2017 *Water and Wastewater Annual Price Escalation Rates for Selected Cities across the United States* report prepared by Pacific Northwest National Laboratory (PNNL) for the Department of Energy's Federal Energy Management Program.[1] The 2017 report examined annual water and wastewater price escalation rate trends across the United States. Annual water and wastewater price escalation rates are an important factor when conducting life-cycle cost analyses (LCCA) of water efficiency measures, which is required for federal agencies.

Following the framework of the 2017 report, PNNL used the American Water Works Association (AWWA) water and wastewater rate surveys to gather historical rate data for water and wastewater utilities in the United States, which were used to calculate a sample set of water and wastewater annual price escalation rates. Annual price escalation rates for industrial water and wastewater were calculated for 112 water utilities and 76 wastewater utilities that reported at least two AWWA surveys across the past 13 years (i.e., 2008 to 2021) and at least a five-year range between those two surveys. This report's timeframe is based on AWWA water and wastewater surveys from 2008, 2010, 2012, 2014, 2016, 2019, and 2021. Statistical trends in the annual price escalation rates are also provided by the seven regions identified in Figure E.1.

In the 2017 report, the average of the real (or net-of-inflation) compound annual price escalation rates for the surveyed sample of water and wastewater utilities was 4.1% and 3.3%, respectively. This report calculated the average of the real compound annual price escalation rates for the surveyed sample of water and wastewater utilities to be 3.0% and 3.2%, respectively. These escalation rates were based on 87 water utilities and 46 wastewater utilities that reported data in at least two AWWA surveys with at least a five-year range between those two surveys *and* reported at least one AWWA survey in 2019 or 2021. Among water utilities, the highest real compound annual price escalation rate was 8.8%, and the lowest real compound annual water price escalation rate was −2.0%. For wastewater utilities, the highest real compound annual wastewater price escalation rate was 10.2%, and the lowest real compound annual wastewater price escalation rate was −2.3%.

[1] https://www.energy.gov/sites/default/files/2017/10/f38/water_wastewater_escalation_rate_study.pdf

Figure E.1. Map of the United States Showing the Water and Wastewater Utilities in this Study

This report provides guidance on how to develop localized water and wastewater price escalation rates that can be integrated into LCCA models. Although local water or wastewater utilities remain the preferred source for forecasts of annual water and wastewater price escalation rates, alternative methodologies are provided here, including use of regional historical annual price escalation rates to yield annual water and wastewater price escalation rate estimates when local data are not available.

Acknowledgments

The authors of this report would like to acknowledge the Department of Energy's Federal Energy Management Program (FEMP) for supporting the development of this report. Special thanks go to Jason Koman as the project manager for FEMP's Water Management Project. In addition, we would like to acknowledge Sarah Barrows for her peer review of the report and Holly Campbell for her technical editing.

Acronyms and Abbreviations

AWWA	American Water Works Association
BLS	Bureau of Labor Statistics
CPI	Consumer Price Index
DOE	Department of Energy
EIA	Energy Information Administration
FEMP	Federal Energy Management Program
GDP	gross domestic product
kGal	1,000 gallons
LCCA	life-cycle cost analysis
PNNL	Pacific Northwest National Laboratory

Contents

Figures

Tables

1.0 Introduction

Pacific Northwest National Laboratory (PNNL) conducted this study for the Federal Energy Management Program (FEMP) of the Department of Energy (DOE) to identify current trends in annual water and wastewater price escalation rates across the United States. This report is an update to the 2017 *Water and Wastewater Annual Price Escalation Rates for Selected Cities across the United States,*[2] where this report adds data published after the previous report's publication to calculate more current escalation rates. Determining appropriate forecasts of water and wastewater price escalation rates is an important component for water efficiency projects' life-cycle cost analyses (LCCAs), and access to the most current rates is necessary for the most accurate analyses.

Federal agencies are required to conduct LCCA and implement life-cycle cost effective water efficiency measures per 42 U.S.C. § 8253.[3] FEMP commissioned this study to assist federal agencies in determining the appropriate water and wastewater escalation rates to select when conducting the required LCCA. Currently, there are no publicly available comprehensive projections of price escalation rates for water and wastewater in the United States. While DOE's Energy Information Administration (EIA) forecasts future changes in energy prices, no governmental organization projects future changes in water and wastewater prices. This report fills that knowledge gap by providing public data on water and wastewater forecasts in the United States.

There are multiple factors that influence water and wastewater rates, including environmental, economic, political, and geographic effects. A significant factor that drives large variances in price escalations across water and wastewater service providers is infrastructure costs.[4] Performing ongoing assessments of the most current water and wastewater rates enables the greatest level of accuracy and overall benefit for evaluating long-term economic effects of water infrastructure efficiency projects.

[2] https://www.energy.gov/sites/default/files/2017/10/f38/water_wastewater_escalation_rate_study.pdf
[3] 42 U.S.C. § 8253. https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section8253&num=0&edition=prelim
[4] Bluefield Research. *Spotlight on Infrastructure Drives $104 Billion Water and Sewer Pipe Forecast over Next Decade*. 2022. Accessed at: https://www.bluefieldresearch.com/ns/spotlight-on-infrastructure-drives-us104-billion-water-and-sewer-pipe-forecast-over-next-decade/

2.0 Water and Wastewater Rate Data

PNNL used the American Water Works Association (AWWA) water and wastewater rate surveys to gather historical rate data for water and wastewater utilities in the United States. These datasets were compiled and assessed to produce a single dataset of time series rate data for 112 water utilities and 76 wastewater utilities located throughout the United States, which represents an increase of over 50 water utilities and 30 wastewater utilities from the 2017 report. An annual price escalation rate was also calculated for each utility based on the reported rates across the past 13 years ranging from 2008 to 2021.

2.1 Data Source

The AWWA is an international, nonprofit, scientific and educational society aimed at providing total water solutions to help maintain the effective management of water.[5] The AWWA water and wastewater rate surveys collect water and wastewater rates and associated fees and charges from communities across the United States, Canada, and Puerto Rico. Water rates are based on the necessary services (i.e., collection, treatment, distribution) for providing potable water, and wastewater rates are based on the necessary services for collecting and treating wastewater to levels suitable for discharge permitting requirements. This report builds on the previous report, with the results of 2019 and 2021 AWWA water and wastewater rate surveys appended to the results of the 2008, 2010, 2012, 2014, and 2016 AWWA water and wastewater rate surveys used in the previous report (AWWA 2009, 2011, 2013, 2015, 2017, 2019, 2021).[6]

The 2019 and 2021 AWWA surveys collect a range of information related to residential, nonresidential, commercial, and industrial water and wastewater use across utilities in the United States, including what is shown in Table 1. This collected information is identical to the 2008 to 2016 surveys, with the exception that the 2019 and 2021 AWWA surveys do not collect residential ⅝-meter water consumption at 1,500 cubic feet and 3,000 cubic feet.

Table 1. AWWA 2019 and 2021 Water and Wastewater Survey Customer Class Bins

Customer Class	Water Meter Size	Consumption	
		Cubic Feet	Gallons
Residential	⅝ inch	0	0
Residential	⅝ inch	500	3,740
Residential	⅝ inch	1,000	7,480
Non-Residential/ Commercial	⅝ inch	3,000	22,440
Commercial/ Light Industrial	2 inch	50,000	374,000
Industrial	4 inch	1,000,000	7,480,000
Industrial	**8 inch**	**1,500,000**	**11,220,000**

*Highlighted row represents the customer class (i.e., industrial) and/or water meter size (i.e., 8 inch) analyzed in this report

[5] https://www.awwa.org/About-Us

[6] The 2021 AWWA water and wastewater rate survey is available at https://www.awwa.org/resources-tools/water-and-wastewater-utility-management/water-wastewater-rates.aspx. To access earlier versions of the water and wastewater rate surveys, please contact AWWA.

In the 2021 survey AWWA collected water data from approximately 150 water utilities and 130 wastewater utilities in 40 states. The limitations associated with the AWWA have not changed since the 2017 report. These limitations include:

- lack of consistent sets of time series for most utilities, which is primarily due to inconsistent submissions of AWWA surveys on a year-to-year basis
- shifts in naming conventions for utilities
- statistical anomalies that were likely caused by user-error when inputting survey responses (e.g., rates that differed by a full order of magnitude when compared against all other years for a particular utility).

Similar methods to those used in the previous report were applied to the compiled dataset to address these limitations. These methods included cross-referencing flagged data against previous AWWA survey data to confirm and correct the data issue in the sample set. The most common issues were misspelled data (e.g., City of Ann Arbor vs. Cty of Ann Arbor), as well as inconsistent naming conventions across years (e.g., City of Ann Arbor vs. Ann Arbor, City of).

2.2 Water and Wastewater Data Compilation

The AWWA water and wastewater surveys from 2008, 2010, 2012, 2014, 2016, 2019, and 2021 were collected and analyzed to determine industrial water and wastewater rate trends for utilities across the United States. These datasets were compiled and assessed to produce a single dataset of time-series rate data. Like the previous report, to accurately reflect the marginal cost of water and wastewater services over time, the analysis focused on volume-based charges and did not include fixed fees in calculations. The 8-inch water meter size industrial consumer class was determined to be an appropriate industrial volumetric rate, primarily because this class of consumer typically pays a relatively smaller portion of maintenance and infrastructure fees compared to the total volume of water and wastewater used. This in effect dampens out the flat, fixed fees and approximates more closely the marginal cost of water and wastewater.

Because AWWA's datasets were generally provided with commensurate formats, integrating datasets across multiple years was straightforward with one exception. The primary barrier with integrating the datasets was the shift in naming conventions for many surveyed utilities. To ensure the inclusion of relevant data for utilities, this barrier was addressed by carefully reviewing utility naming convention and joining names where needed (e.g., misspelled data and inconsistent naming conventions as described in Section 2.1). Utilities that responded to at least two AWWA surveys and with at least a five-year range between those two surveys were identified for inclusion in the analysis to determine how their specific rate changed over the respective time range. The necessary criterium of a five-year range between AWWA surveys was to ensure enough time between those surveys to observe price escalation. Appendix A provides detailed data for water and wastewater utilities, noting that several utilities in Appendix A are *not* included in the aggregate escalation rates calculated later in this report. The omission of those utilities from aggregate escalation rates is because they did not report 2019 or 2021 AWWA survey data. To ensure the aggregate escalation rates were based on current data, it was determined that the utility needed to report either 2019 or 2021 AWWA survey data to be included in aggregate escalation rate calculations.

Once utilities with at least two reported years in the AWWA surveys with at least a five-year range between those two surveys were identified, their respective rates were converted to 2021

dollar values using Bureau of Economic Analysis implicit price deflators.[7] As a result of this conversion, escalation rates provided in this report are real, or net of inflation. Overall price deflators for gross domestic product (GDP) were used as opposed to price deflators to any specific good or service. Based on the data compilation and consistency checks conducted on the AWWA water and wastewater rate surveys, there were 112 water utilities and 76 wastewater utilities that reported data in at least two AWWA surveys with at least a five-year range between those two surveys.

Figure 1 shows a map of the cities of each utility for which an annual price escalation rate is calculated. This map also shows U.S. regions that were used in the study to examine water rates regionally.

Figure 1. Map of the United States Showing the Water and Wastewater Utilities in This Study

[7] Bureau of Economic Analysis implicit price inflators can be found at: https://www.eia.gov/coal/transportationrates/pdf/Table%205.pdf.

3.0 Water and Wastewater Rate Trends

The focus of this section is to capture historical water and wastewater trends in the United States over the last 13 years (i.e., 2008 to 2021). Like the 2017 report, the 8-inch water meter size industrial consumer class was assumed to be an appropriate volumetric rate because it is the highest bin of use across the AWWA survey, and most costs for that bin are derived from actual water consumption and not necessarily infrastructure and maintenance costs. This selection attempts to capture water's marginal costs over time, as well as avoid calculated impacts related to fixed costs.

This section examines the utility rates collected and trends over time. Figure 2 shows the rates per 1,000 gallons (kGal) in 2021 dollars for 87 water utilities and Figure 3 shows the rates per kGal in 2021 dollars for 46 wastewater utilities, where both are ordered from lowest to highest rates per kGal. Note that the values of 87 water utilities and 46 wastewater utilities differ from the report's previously stated total of 112 water utilities and 76 wastewater utilities. The reduction of water and wastewater utilities in Figure 2 and Figure 3 is due to the additional criteria of requiring either 2019 or 2021 AWWA survey data (to ensure that analyzed data in those figures were as current as possible). Whereas other tables presented in this report do not require the utility to report 2019 or 2021 AWWA survey data.

Figure 2 and Figure 3 do not include utilities that did not respond to either the 2019 or 2021 AWWA surveys (i.e., did not include utilities whose most current AWWA survey response was 2016 or earlier). These figures show the associated region for each utility. There is not a strong discernible trend in regional rates, whereby rate patterns between regions are dispersed. However, the West-Mountain region has the lowest average water and wastewater rates at $2.74 and $3.12 per kGal, respectively, while the West-Pacific has the highest average water and wastewater rates at $5.63 and $11.90 per kGal. (See Section 4.0 for average water and wastewater rates for all regions.) Appendix B shows the utility name and state that corresponds with each number shown on the x-axis.

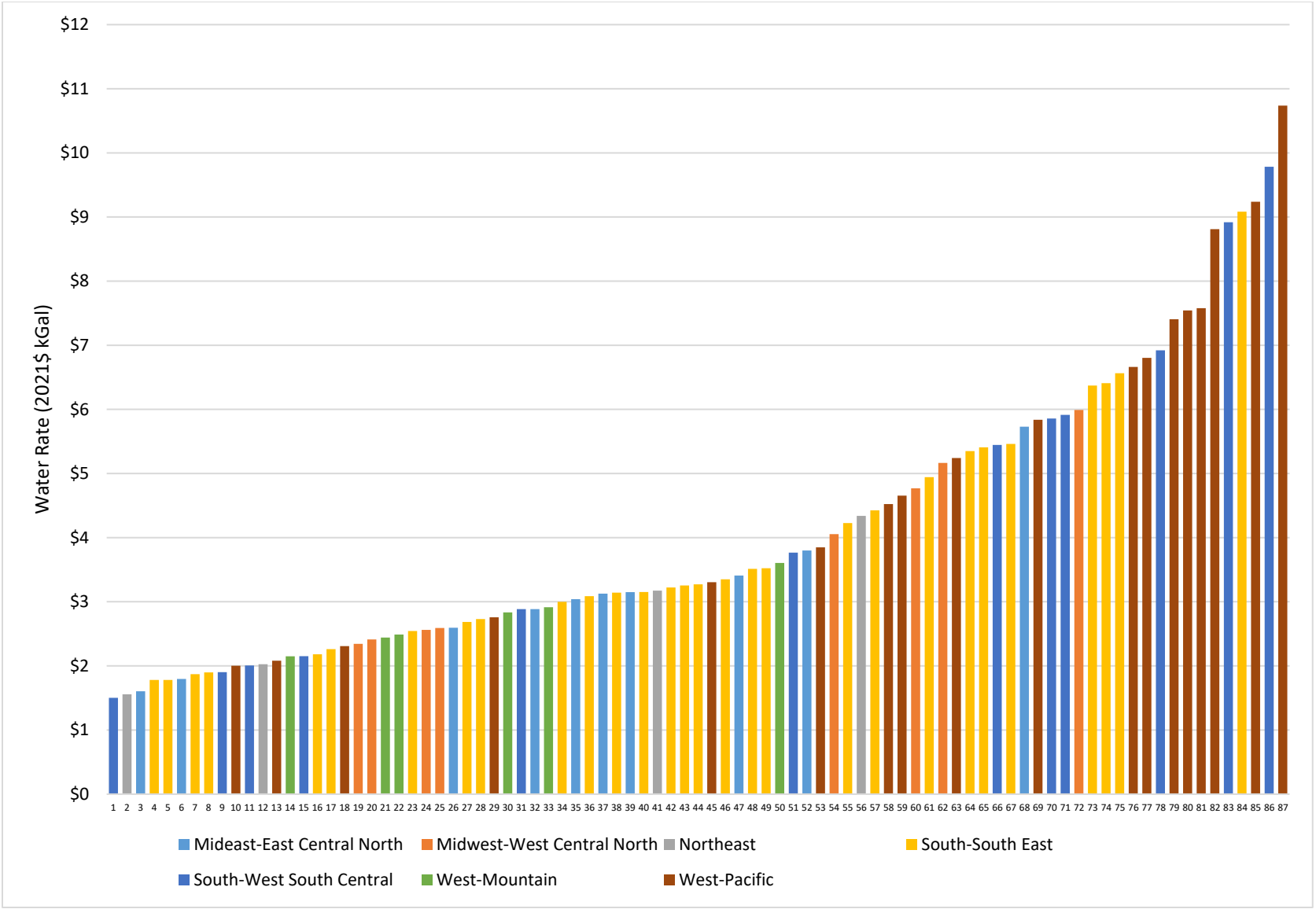

Figure 2. Industrial Water Rates for Water Utilities Included in this Study (in 2021$).

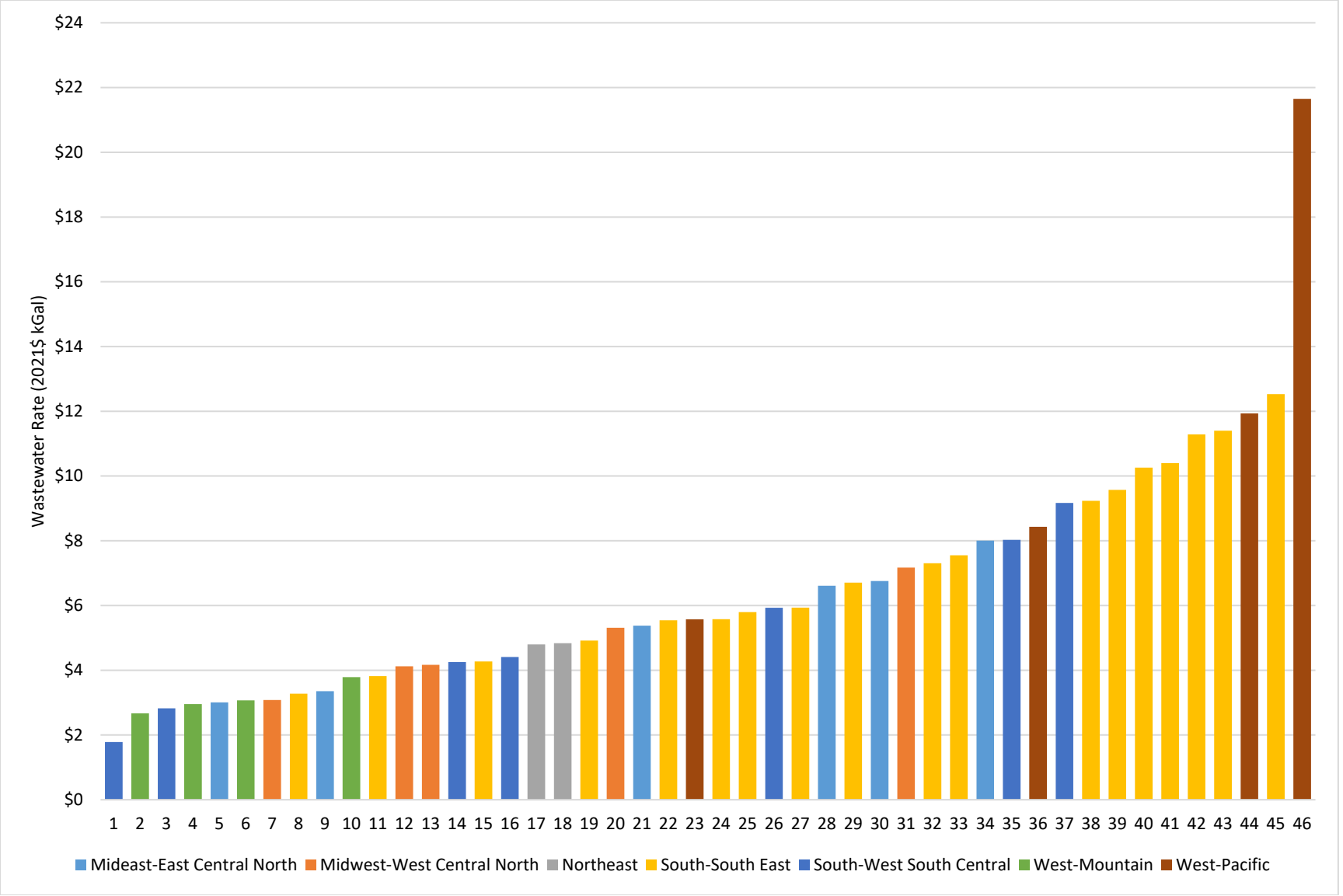

Figure 3. Industrial Wastewater Rates for Wastewater Utilities Included in this Study (in 2021$)

Figure 4 and Figure 5 provide the minimum and maximum water and wastewater rates (respectively), the average (mean) rates per kGal, and the standard deviation around the mean for seven separate years: 2008, 2010, 2012, 2014, 2016, 2019, and 2021 (all years adjusted to 2021 dollars to account for inflation) across all utilities. Both water and wastewater mean rates have been increasing over the 13-year period, where the rate for water increased approximately 37% between 2008 and 2021, and the rate for wastewater increased 67% between 2008 and 2021. There were single year occurrences of decreasing rates, which occurred in 2016 and 2021 for wastewater and water, respectively. The decreasing rates in those years were partially attributed to different sets of utilities reporting in adjacent AWWA survey years. For example, the San Francisco Public Utilities Commission reported the highest water rate (i.e., $10.74/kGal), but San Francisco Public Utilities Commission did not report a value in 2021 while neighboring utilities reported values that were lower. Additionally, Seattle Public Utilities reported the highest wastewater rates across all utilities in the United States for all surveyed years, apart from 2016 where Seattle Public Utilities did not report AWWA survey data.

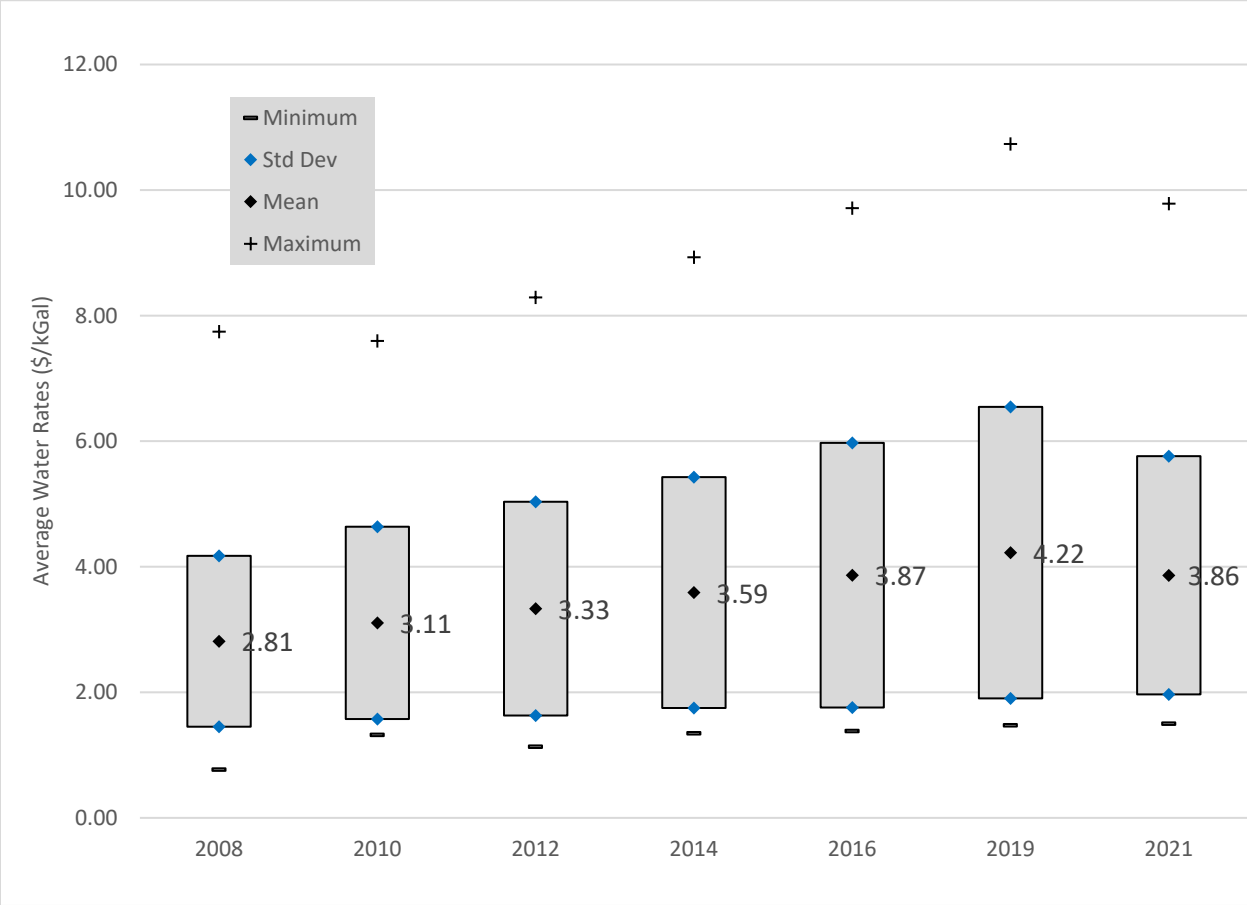

Figure 4. Average Industrial Water Rates Over Time (in 2021$)

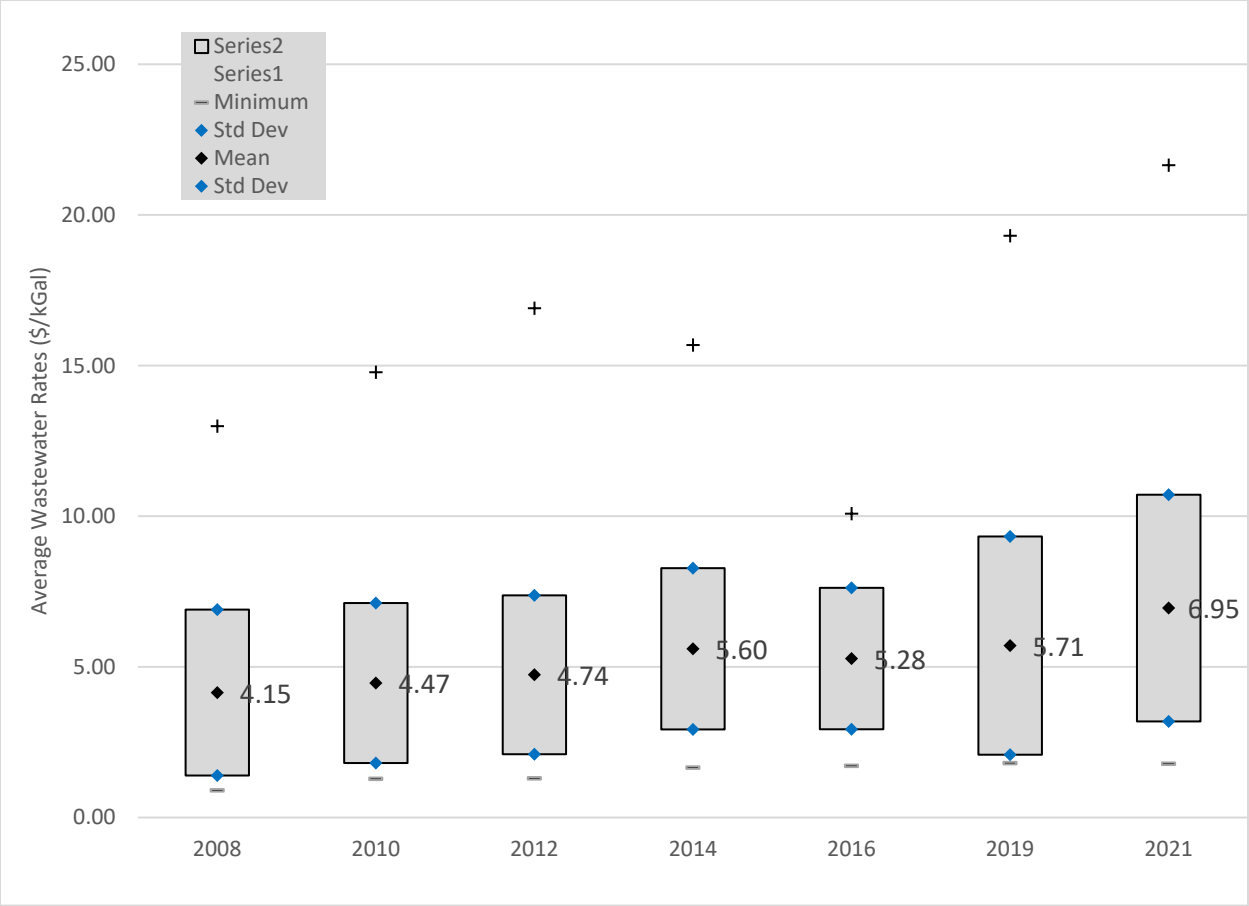

Figure 5. Average Industrial Wastewater Rates over Time (in $2021)

The next section of the report provides the analysis results using this price escalation method.

4.0 Water and Wastewater Price Escalation Analysis and Results

Like the 2017 report, the overall objective of this study was to estimate the compound annual price escalation rates for water and wastewater by examining historical trends in the AWWA survey data. This section presents the compound annual price escalation rate application analysis for both water and wastewater rates for each utility included in this analysis. It also includes summary statistics on regional rate trends, based on the sample of utilities examined.

4.1 Annual Price Escalation Determination

Compound annual price escalation rates were calculated for utilities based on an inflation rate calculation methodology, which shows how much the water or wastewater price has changed annually between two specific years. The compound annual price escalation rates were calculated using Equation 1:

$$Compound\ Annual\ Price\ Escalation\ Rate = \left(\frac{Final\ Year\ Rate}{First\ Year\ Rate}\right)^{\frac{1}{(Final\ Year - First\ Year)}} - 1$$

Equation 1. Compound Annual Price Escalation Rate

As mentioned earlier in the report, these price escalations are real, or net of inflation.

4.2 Annual Water Price Escalation Rate Results

The calculated compound annual price escalation rates for water utilities (based on historical rates from each utility's first and final year AWWA survey responses) are shown in Table 2 for each utility in the analysis, organized by census region. Utilities that reported data in at least two AWWA surveys with at least a five-year range between the two surveys were identified for inclusion in the analysis and are showing in Table 2. All rates were converted into 2021 dollars prior to determining the annual price escalation (Equation 1). Figure 6 shows the location of each water utility for which a compound annual price escalation rate is calculated.

Table 2 includes utilities that have provided either (or both) 2019 and 2021 rates and includes utilities that have ***not*** provided 2019 or 2021 rates. While some of the utilities did not report 2019 and/or 2021 AWWA survey rate data, their inclusion in Table 2 is intended to provide greater overall access to historical U.S. water and wastewater rate datasets. However, utilities/rows that do not show either 2019 or 2021 as their "Final Year" are not included in the aggregate water and wastewater escalation rate calculation results. Their omission is to ensure that the aggregate water and wastewater escalation rate calculations are based on current data.

Table 2. Compound Annual Industrial Price Escalation Rates for Water Utilities in the United States ($2021)

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
		Mideast-East Central North					
IL	Decatur	City of Decatur	1.86	3.41	2008	2021	4.8%

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
IN	Fort Wayne	Fort Wayne City Utilities	2.08	3.04	2008	2021	3.0%
MI	Ann Arbor	City of Ann Arbor	3.85	5.73	2008	2021	3.1%
MI	Grand Rapids	City of Grand Rapids Water Supply System and City of Grand Rapids Wastewater Resource Recovery Facility	2.63	2.88	2008	2021	0.7%
MI	Holland	Holland Board of Public Works	1.31	2.43	2008	2014	10.9%
MI	Rochester	City of Rochester Water and Sewer Department	1.16	2.78	2008	2016	11.5%
MI	Waterford	Waterford Township DPW	2.36	3.13	2012	2021	3.2%
OH	Cleveland	Cleveland Division of Water	3.81	4.77	2008	2014	3.8%
OH	Columbus	City of Columbus - Department of Public Utilities	2.25	3.15	2008	2021	2.6%
WI	Brookfield	Brookfield Municipal Water Utility	1.94	3.80	2008	2021	5.3%
WI	Green Bay	Green Bay Water Utility	2.05	2.60	2008	2021	1.8%
WI	Kenosha	Kenosha Water Utility	1.87	2.25	2008	2016	2.4%
WI	Manitowoc	Manitowoc Public Utilities	1.41	1.60	2008	2021	1.0%
		Midwest-West Central North					
IA	Des Moines	Des Moines Water Works	1.40	2.59	2008	2021	4.8%
IA	Newton	Newton Water Works	1.76	4.05	2008	2021	6.6%
IA	Waterloo	Waterloo Water Works	1.05	2.00	2008	2016	8.4%
KS	Lenexa	WaterOne	4.60	4.77	2014	2021	0.5%
KS	Olathe	City of Olathe	2.85	5.99	2008	2021	5.9%
MN	Minneapolis	City of Minneapolis	5.02	5.17	2010	2021	0.3%
MO	Springfield	City Utilities of Springfield Missouri	2.00	2.34	2014	2021	2.3%
ND	Bismarck	City of Bismarck	3.32	2.56	2008	2021	-2.0%
NE	Beatrice	Beatrice Board of Public Works	1.98	2.41	2012	2021	2.2%
		Northeast					
ME	Portland	Portland Water District	1.24	1.56	2008	2021	1.8%
NY	Buffalo	Erie County Water Authority	2.76	3.17	2008	2021	1.1%
NY	Syracuse	Onondaga County Water Authority	0.88	2.03	2008	2021	6.6%
PA	Philadelphia	Philadelphia Water Department	2.60	4.36	2008	2016	6.7%
PA	Warrington	Bucks County Water and Sewer Authority	4.76	4.34	2008	2021	-0.7%
		South-Southeast					
AL	Birmingham	Birmingham Water Works Board	4.09	5.46	2008	2019	2.7%
AL	Huntsville	Huntsville Utilities	1.59	1.78	2012	2021	1.3%
AL	Mobile	Mobile Area Water and Sewer System	1.90	2.54	2008	2019	2.7%
DC	Washington	District of Columbia Water and Sewer Authority	3.59	6.56	2008	2021	4.8%

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
FL	Clearwater	Pinellas County Utilities	5.69	5.41	2010	2021	-0.5%
FL	Fort Lauderdale	City of Fort Lauderdale	3.13	4.73	2008	2014	7.1%
FL	Jacksonville	JEA	1.20	1.87	2008	2019	4.1%
FL	Lakeland	City of Lakeland Water Utilities	1.87	2.69	2008	2019	3.4%
FL	Miami	Miami-Dade Water and Sewer Department	5.00	9.08	2008	2019	5.6%
FL	Orlando	Orange County Utilities	1.59	1.78	2008	2021	0.9%
FL	Pensacola	Emerald Coast Utilities Authority	2.02	2.49	2008	2014	3.6%
GA	Columbus	Columbus Water Works	1.84	2.26	2008	2019	1.9%
GA	Gainesville	City of Gainesville Department of Water Resources	4.06	3.52	2010	2021	-1.3%
GA	Griffin	City of Griffin	5.08	6.37	2014	2021	3.3%
GA	Savannah	City of Savannah	1.34	1.90	2008	2021	2.7%
KY	Louisville	Louisville Water Company	2.49	3.22	2008	2021	2.0%
KY	Owensboro	Owensboro Municipal Utilities	1.33	2.18	2008	2019	4.6%
MD	Baltimore	Baltimore City Department of Public Works	1.55	4.42	2008	2021	8.4%
MD	Laurel	Washington Suburban Sanitary Commission	5.15	8.32	2008	2014	8.3%
NC	Fayetteville	Fayetteville Public Works Commission	2.30	2.35	2012	2016	0.6%
NC	Gastonia	City of Gastonia/Two Rivers Utilities	3.30	3.25	2014	2021	-0.2%
NC	Greensboro	City of Greensboro Water Resources	3.78	4.52	2010	2021	1.6%
NC	Roanoke Rapids	Roanoke Rapids Sanitary District	1.66	3.51	2008	2021	5.9%
NC	Welcome	Davidson Water Inc	3.74	4.94	2008	2019	2.6%
NC	Winston-Salem	Winston-Salem/Forsyth County Utilities	2.77	3.15	2014	2021	1.9%
SC	Conway	Grand Strand Water and Sewer Authority	1.44	1.46	2008	2016	0.1%
SC	Moncks Corner	Berkeley County Water and Sanitation	2.05	3.14	2014	2021	6.3%
SC	Mount Pleasant	Mount Pleasant Waterworks	3.86	4.56	2008	2016	2.1%
TN	Clinton	Clinton Utilities Board	3.00	3.27	2012	2021	1.0%
TN	Erwin	Erwin Utilities	1.08	3.71	2008	2016	16.7%
TN	Johnson City	Johnson City Water and Sewer Services	2.48	2.73	2010	2021	0.9%
TN	Nashville	Metro Water Services Nashville	2.61	3.00	2008	2019	1.3%
TN	White House	White House Utility District	5.95	7.86	2008	2014	4.7%
VA	Chesterfield	Chesterfield County Department of Utilities	2.08	3.09	2008	2021	3.1%
VA	Fairfax	Fairfax Water	2.25	3.35	2010	2021	3.7%
VA	Newport News	Newport News Waterworks	4.89	5.35	2008	2019	0.8%
VA	Richmond	City of Richmond Department of Public Utilities	2.15	6.41	2008	2021	8.8%
VA	Verona	Augusta County Service Authority	4.90	6.04	2014	2021	3.1%

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
VA	Woodbridge	Prince William County Service Authority	3.88	4.23	2010	2019	1.0%
		South-West South Central					
AR	Conway	Conway Corporation	2.13	2.88	2008	2019	2.8%
AR	Jonesboro	City Water and Light	0.77	1.50	2008	2021	5.3%
AR	Little Rock	Central Arkansas Water	1.66	1.90	2008	2019	1.3%
LA	Lafayette	Lafayette Utilities System	1.63	1.96	2008	2016	2.3%
LA	New Orleans	Sewerage and Water Board of New Orleans	2.79	6.92	2008	2021	7.2%
OK	Tulsa	Tulsa Metropolitan Utility Authority	1.72	1.67	2008	2014	-0.5%
TX	Austin	Austin Water	4.36	5.86	2008	2021	2.3%
TX	Carrollton	City of Carrollton, Texas Water and Sewer Utility	1.84	2.15	2008	2019	1.4%
TX	Dallas	Dallas Water Utilities	2.48	3.77	2008	2021	3.3%
TX	Fort Worth	Fort Worth Water Department	2.85	3.52	2008	2016	2.7%
TX	North Richland Hills	City of Southlake	5.01	5.91	2008	2019	1.5%
TX	San Antonio	San Antonio Water System	3.43	5.45	2008	2021	3.6%
TX	San Marcos	City of San Marcos	7.75	8.92	2008	2019	1.3%
TX	Tyler	Tyler Water Utilities	1.63	2.01	2008	2021	1.6%
		West-Mountain					
AZ	Scottsdale	City of Scottsdale	4.30	4.31	2008	2016	0.0%
AZ	Yuma	City of Yuma	2.58	2.45	2008	2016	-0.6%
AZ	Yuma	City of Yuma Department of Utilities	2.58	2.49	2008	2021	-0.3%
CO	Denver	Denver Water	2.58	2.83	2008	2021	0.7%
CO	Fort Collins	Fort Collins Utilities	2.02	2.44	2010	2021	1.7%
MT	Kalispell	City of Kalispell	3.05	2.77	2008	2014	-1.5%
NM	Albuquerque	Albuquerque Bernalillo County Water Utility Authority	2.36	3.61	2008	2019	3.9%
NV	Gardnerville	Gardnerville Water Company	2.01	2.15	2014	2021	1.0%
NV	Henderson	City of Henderson	1.80	2.91	2010	2021	4.5%
NV	Las Vegas	Las Vegas Valley Water District	3.89	3.93	2012	2016	0.3%
NV	Reno	Truckee Meadows Water Authority	3.09	3.14	2008	2016	0.2%
UT	Salt Lake City	Salt Lake City Public Utilities	1.42	1.74	2008	2016	2.5%
		West-Pacific					
AK	Anchorage	Anchorage Water and Wastewater Utility	4.68	5.84	2008	2021	1.7%
CA	Alameda County	Alameda County Water District	4.00	4.52	2008	2019	1.1%
CA	Burbank	City of Burbank Water and Power	2.88	3.77	2008	2016	3.4%
CA	Chula Vista	Sweetwater Authority	6.12	9.24	2010	2019	4.7%

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
CA	Coachella	Coachella Valley Water District	1.69	2.00	2010	2019	1.9%
CA	Corona	City of Corona Department of Water and Power	2.97	3.30	2008	2021	0.8%
CA	Covina	Suburban Water Systems	2.37	4.65	2008	2021	5.3%
CA	Napa	City of Napa	6.00	6.66	2014	2021	1.5%
CA	Rialto	West Valley Water District	1.99	3.85	2010	2019	7.6%
CA	Riverside	Riverside Public Utilities	2.16	2.72	2008	2016	2.9%
CA	San Diego	City of San Diego Public Utilities Department	4.10	8.81	2008	2021	6.1%
CA	San Francisco	San Francisco Public Utilities Commission	4.89	10.74	2008	2019	7.4%
CA	South Lake Tahoe	South Tahoe Public Utility District	1.81	2.31	2010	2019	2.7%
CA	Valley Center	Valley Center Municipal Water District	4.13	7.58	2008	2019	5.7%
HI	Honolulu	Honolulu Board of Water Supply	3.46	5.24	2008	2021	3.2%
OR	Beaverton	Tualatin Valley Water District	4.92	6.80	2008	2019	3.0%
OR	Bend	City of Bend (OR) Utility department	2.56	2.76	2014	2021	1.0%
OR	Portland	Portland Water Bureau	3.47	7.41	2008	2021	6.0%
WA	Everett	City of Everett	1.97	2.08	2012	2021	0.6%
WA	Seattle	Seattle Public Utilities	4.39	7.54	2008	2021	4.2%

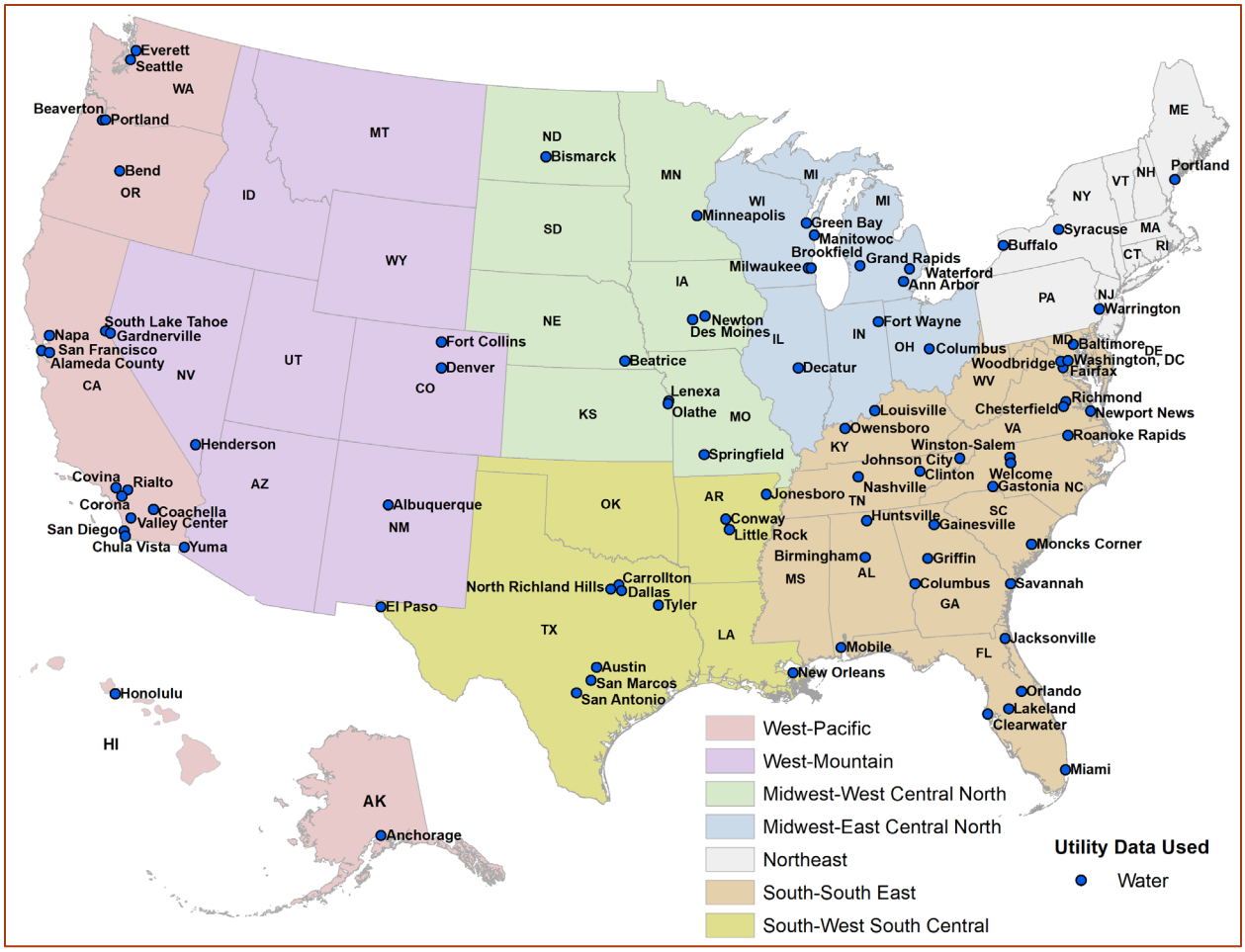

Figure 6. Map of the United States Showing the Water Utilities in This Study

Across the entire survey sample examined in this report, the average of the compound annual price escalation rates for water was 3.0% based on reported rates from 2008 through 2021 with at least one reported rate in 2019 or 2021 and a five-year span between those rate(s). Utilities that did not provide AWWA survey water rate data in either 2019 or 2021 were not included in the escalation rate calculations to ensure that only current data were used in those calculations. The highest price escalation rate was reported from City of Richmond Department of Public Utilities, Virginia (8.8%), while the lowest escalation rate was reported from City of Bismarck, North Dakota (−2.0%). Figure 7 and Figure 8 provide summary statistics by region for water price escalation rates and 2021 industrial water rates for the utilities in the survey sample.

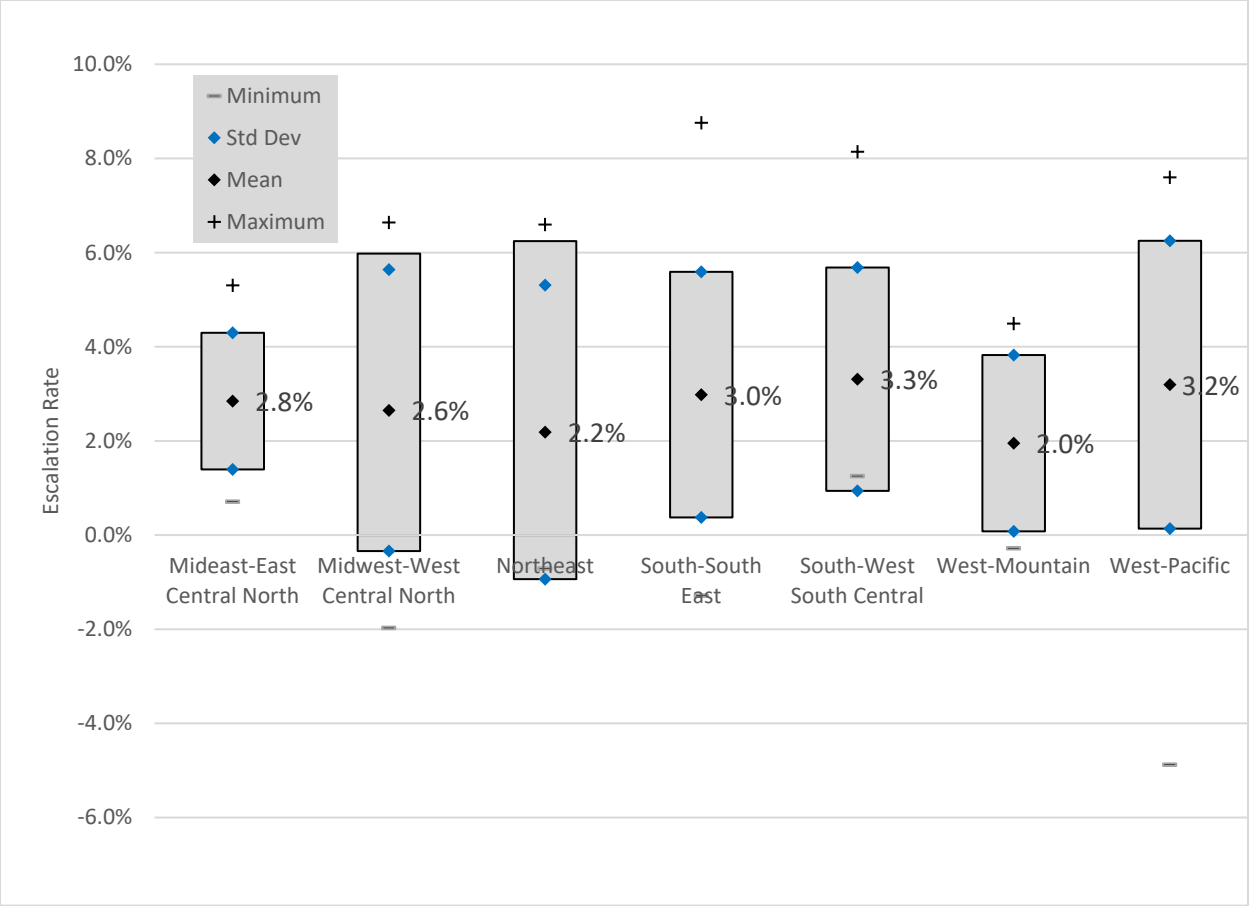

Figure 7. Compound Annual Industrial Water Price Escalation Rates by Region from 2008 to 2021

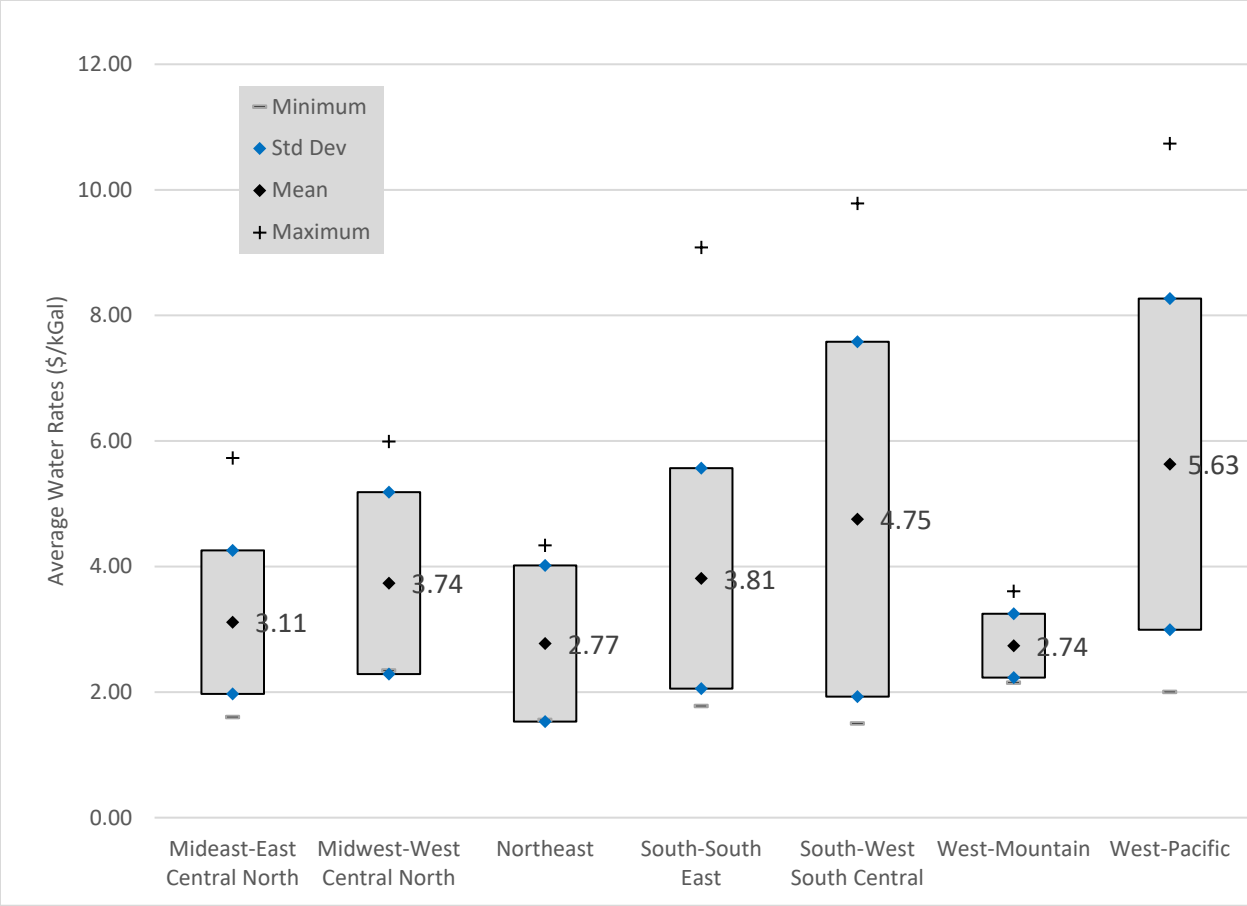

Figure 8. Average Industrial Water Rates by Region (2021)

4.3 Annual Wastewater Price Escalation Rate Results

The calculated compound annual price escalation rates for wastewater utilities (based on historical rates from each utility's first and final year AWWA survey responses) are shown in Table 3 for each utility in the sample survey, organized by census region. All rates were converted into 2021 dollars prior to being entered into Equation 1. This table includes utilities that reported in two or more AWWA surveys with at least a five-year range between their reporting. Figure 9 shows the location of each wastewater utility for which an annual price escalation rate is calculated.

Table 3. Compound Annual Industrial Price Escalation Rates for Wastewater Utilities in the United States ($2021)

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
		Mideast-East Central North					
IL	Naperville	City of Naperville Department of Public Utilities	2.04	3.35	2008	2019	4.6%
IN	Fort Wayne	Fort Wayne City Utilities	5.23	8.01	2012	2021	4.9%

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
MI	Ann Arbor	City of Ann Arbor	5.29	6.61	2012	2019	3.2%
MI	Holland	Holland Board of Public Works	3.37	3.97	2008	2014	2.8%
MI	Waterford	Waterford Township DPW	4.41	5.38	2010	2021	1.8%
OH	Columbus	City of Columbus - Department of Public Utilities	6.27	6.75	2012	2021	0.8%
WI	Brookfield	City of Brookfield	4.14	4.52	2008	2014	1.5%
WI	Kenosha	Kenosha Water Utility	3.13	3.01	2008	2019	−0.4%
		Midwest-West Central North					
IA	Ames	City of Ames Water and Pollution Control	5.32	4.12	2010	2021	−2.3%
KS	Olathe	City of Olathe	4.11	7.17	2008	2021	4.4%
KS	Wichita	City of Wichita	2.48	4.17	2008	2021	4.1%
ND	Bismarck	City of Bismarck	2.73	5.31	2010	2021	6.2%
NE	Beatrice	Beatrice Board of Public Works	2.27	3.08	2012	2021	3.4%
		Northeast					
ME	Portland	Portland Water District	11.61	14.52	2008	2016	2.8%
NH	Manchester	City of Manchester Environmental Protection Division	6.14	4.84	2010	2021	−2.1%
PA	Philadelphia	Philadelphia Water Department	2.97	4.80	2008	2019	4.5%
		South-South East					
AI	Gadsden	Gadsden Water Works and Sewer Board	3.28	3.82	2014	2021	2.2%
AL	Mobile	Mobile Area Water and Sewer	5.34	7.88	2008	2016	5.0%
DC	Washington	District of Columbia Water and Sewer Authority	5.41	7.24	2008	2014	5.0%
FL	Jacksonville	JEA	5.95	7.30	2008	2021	1.6%
FL	Lakeland	City of Lakeland Water Utilities	3.21	4.24	2008	2016	3.6%
FL	Miami	Miami-Dade Water and Sewer Department	6.25	9.24	2008	2019	3.6%
FL	Naples	Collier County	4.49	5.54	2012	2021	2.4%
FL	Orange County	Orange County Utilities	3.97	4.27	2008	2019	0.7%
FL	Pensacola	Emerald Coast Utilities Authority	6.14	7.57	2008	2014	3.5%
FL	Pinellas County	Pinellas County Utilities	4.65	5.42	2010	2016	2.6%
FL	St. Petersburg	City of St. Petersburg	4.46	5.34	2008	2016	2.3%
GA	Augusta	Augusta Utilities	3.36	3.65	2008	2014	1.4%
GA	Gainesville	City of Gainesville Department of Water Resources	6.24	11.28	2010	2021	5.5%
GA	Griffin	City of Griffin	8.77	9.57	2014	2021	1.3%
GA	Savannah	City of Savannah	3.89	5.93	2008	2021	3.3%
MD	Baltimore	Baltimore City Department of Public Works	5.99	11.40	2012	2021	7.4%
MD	Laurel	Washington Suburban Sanitary Commission	8.27	12.22	2008	2014	6.7%

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
NC	Fayetteville	Fayetteville Public Works Commission	4.14	4.20	2012	2016	0.3%
NC	Gastonia	City of Gastonia/Two Rivers Utilities	4.34	4.30	2014	2021	−0.1%
NC	Greensboro	City of Greensboro Water Resources	4.69	5.58	2010	2021	1.6%
NC	Winston-Salem	Winston-Salem/Forsyth County Utilities	4.41	4.92	2014	2021	1.6%
SC	Conway	Grand Strand Water and Sewer Authority	2.19	2.23	2008	2016	0.2%
SC	Mount Pleasant	Mount Pleasant Waterworks	5.45	6.41	2008	2016	2.0%
TN	Clinton	Clinton Utilities Board	5.25	5.80	2014	2021	1.4%
TN	Erwin	Erwin Utilities	3.08	9.87	2008	2016	15.6%
TN	Johnson City	Johnson City Water and Sewer Services	5.13	6.70	2012	2021	3.0%
TN	Nashville	Metro Water Services	4.34	4.98	2008	2014	2.3%
VA	Chesterfield County	Chesterfield County Department of Utilities	2.20	3.28	2008	2021	3.1%
VA	Prince William County	Prince William County Service Authority	8.05	7.55	2012	2021	−0.7%
VA	Richmond	City of Richmond Department of Public Utilities	6.15	10.40	2010	2021	4.9%
VA	Suffolk	Suffolk Department of Public Utilities	8.89	10.26	2014	2021	2.1%
		South-West South Central					
AR	Jonesboro	City Water and Light	0.90	1.78	2008	2021	5.4%
LA	Baton Rouge	City of Baton Rouge/Parish of East Baton Rouge	4.74	5.93	2010	2021	2.1%
LA	Lafayette	Lafayette Utilities System	4.74	6.34	2008	2016	3.7%
LA	New Orleans	Sewerage and Water Board of New Orleans	4.78	9.17	2012	2021	7.5%
OK	Tulsa	Tulsa Metropolitan Utility Authority	3.82	8.03	2008	2019	7.0%
TX	Austin	Austin Water Utility	7.92	10.37	2008	2016	3.4%
TX	Carrollton	City of Carrollton	2.44	2.37	2008	2016	−0.4%
TX	Dallas	Dallas Water Utilities	3.37	4.25	2010	2021	2.1%
TX	El Paso	El Paso Water	2.13	2.82	2008	2019	2.6%
TX	Fort Worth	Fort Worth Water Department	5.30	5.94	2008	2016	1.4%
TX	Lubbock	City of Lubbock	2.29	2.80	2008	2014	3.4%
TX	San Antonio	San Antonio Water System	2.45	4.41	2008	2021	4.6%
TX	San Marcos	City of San Marcos	8.09	7.75	2008	2016	−0.5%
TX	Southlake	City of Southlake	3.76	3.36	2008	2016	−1.4%
		West-Mountain					
AZ	Scottsdale	City of Scottsdale	3.57	3.02	2008	2016	−2.1%
AZ	Yuma	City of Yuma Department of Utilities	2.77	2.96	2012	2019	0.9%
CO	Fort Collins	Fort Collins Utilities	3.25	3.79	2010	2021	1.4%

State	City	Water Utility	First Year Rate ($ per kGal)	Final Year Rate ($ per kGal)	First Year	Final Year	Escalation Rate
MT	Kalispell	City of Kalispell	5.25	5.46	2008	2014	0.6%
NM	Albuquerque	Albuquerque Bernalillo County Water Utility Authority	1.29	3.07	2010	2019	10.2%
NV	Henderson	City of Henderson	2.20	2.67	2010	2019	2.2%
UT	Salt Lake City	Salt Lake City Corp Public Utilities	3.57	4.79	2008	2016	3.7%
		West-Pacific					
AK	Anchorage	Anchorage Water and Wastewater Utility	5.79	5.57	2008	2021	−0.3%
CA	Coachella	Coachella Valley Water District	1.63	1.60	2010	2016	−0.3%
CA	Lompoc	Vandenberg Village Community Services District	1.52	1.28	2014	2021	−2.5%
CA	San Diego	City of San Diego Public Utilities Department	5.96	8.43	2012	2019	5.1%
CA	San Francisco	San Francisco Public Utilities Commission	10.37	8.53	2012	2019	−2.8%
CA	Santa Barbara	City of Santa Barbara	4.63	5.93	2008	2016	3.1%
WA	Everett	City of Everett	5.96	11.93	2012	2021	8.0%
WA	Seattle	Seattle Public Utilities	12.99	21.65	2008	2021	4.0%

Figure 9. Map of the United States Showing the Wastewater Utilities in This Study

Across the dataset analyzed in this report, the average of the compound annual price escalation rates for wastewater is 3.2% based on reported rates from 2008 through 2021 with at least one reported rate in 2019 or 2021 and a five-year span between those rate(s). Utilities that did not provide AWWA survey wastewater rate data in either 2019 or 2021 were not included in the escalation rate calculations to ensure that only current data were used in those calculations. For example, Portland Water District is listed in Table 3 but is not included in Figure 10, Figure 11, or aggregate escalation rate calculations. This distinction is because Figure 10 and Figure 11 require the utility have 2019 and/or 2021 data, and the most recent data for Portland Water District are from 2017. Table 3 only requires two data points with at least five years between those points, and the Portland Water District fulfills this criteria.

The highest compound annual wastewater price escalation rate was reported for Albuquerque Bernalillo County Water Utility Authority, New Mexico (10.2%), while the lowest compound annual price escalation rate was reported for City of Ames Water and Pollution Control, Iowa (-2.3%). Figure 10 and Figure 11 provide summary statistics by region for wastewater price escalation rates and industrial wastewater rates for the utilities in the survey sample.

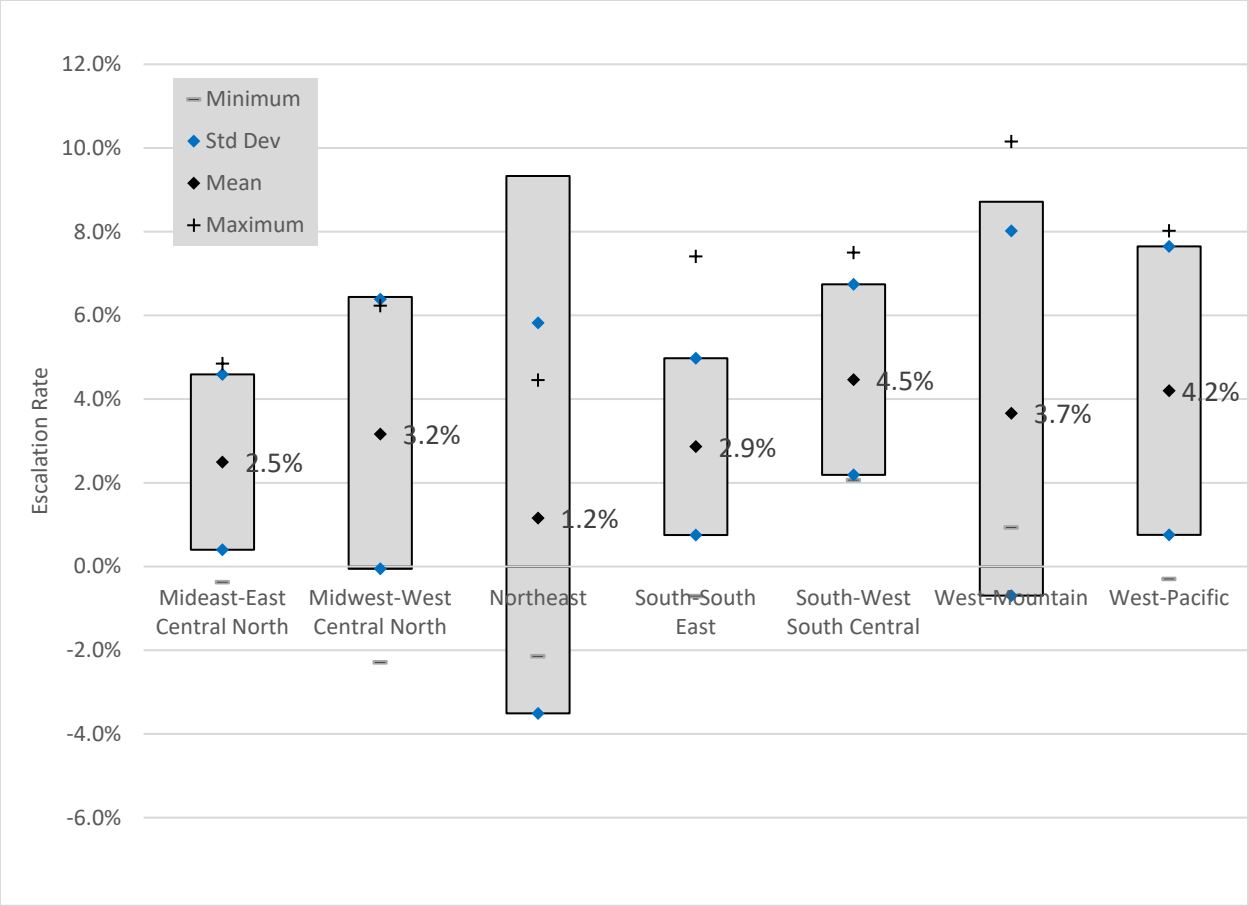

Figure 10. Compound Annual Industrial Wastewater Price Escalation Rates by Region

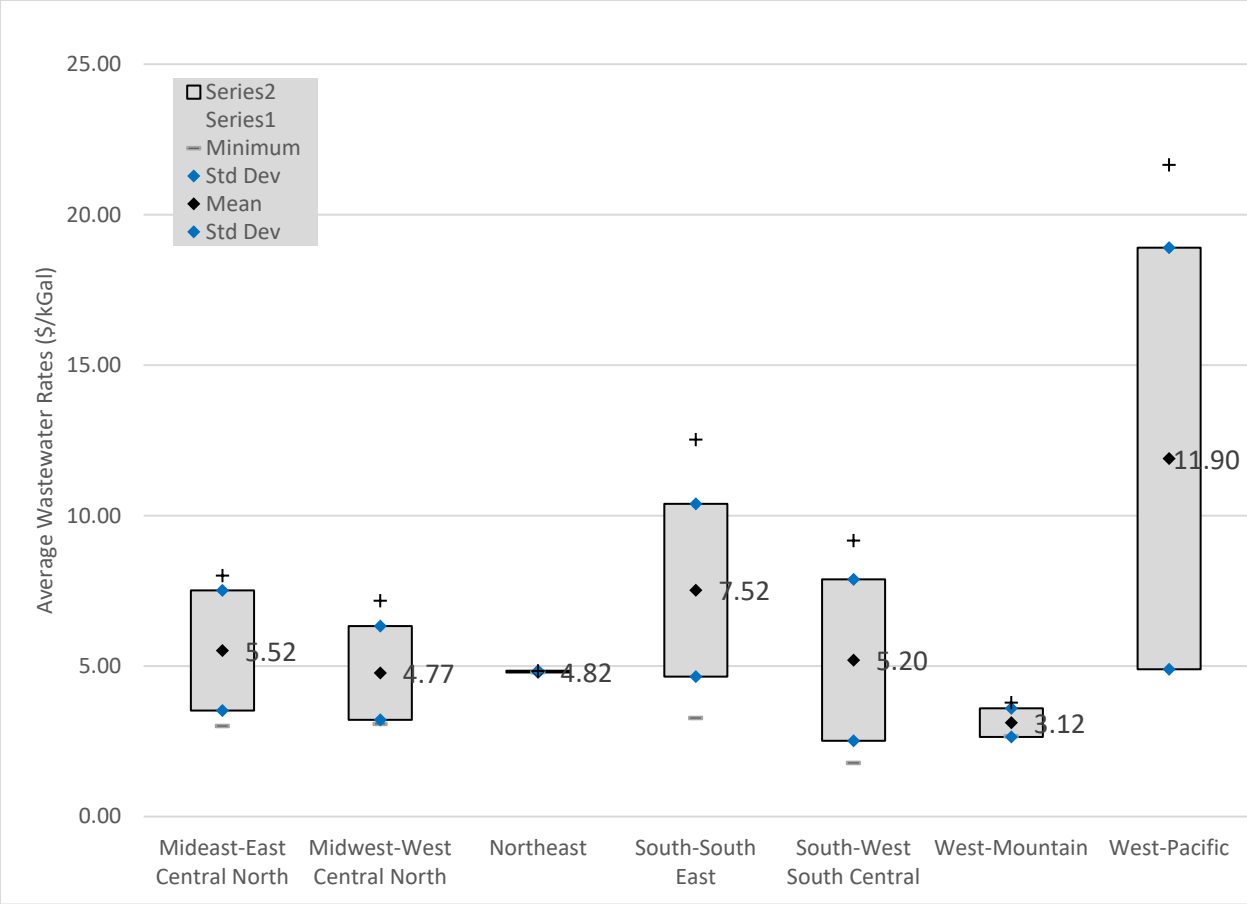

Figure 11. Average Industrial Wastewater Rates by Region

5.0 Annual Water and Wastewater Price Escalation Rates for Use in Life-Cycle Cost Analysis

Annual water and wastewater price escalation rates are needed in LCCAs to estimate the overall cost savings of water efficiency projects. However, determining appropriate forecasts of water and wastewater price escalation rates can be more difficult than ascertaining comparable rates for various forms of energy. While the EIA forecasts future changes in energy prices, no governmental organization estimates future changes in water and sewer prices. Energy prices are also significantly driven by commodity prices, whereas infrastructure projects often drive large variances in price escalations across water and sewer service providers. This section provides several options for deriving water and wastewater price escalation rates.

5.1 Local Utility Forecast

The preferred source for a forecast of annual water and wastewater price escalation rates is the local water or wastewater utility. The serving utility can be contacted to determine whether there are any forecasts of future water and wastewater rate changes, whether published or via a written statement or other documentation from the utility. If possible, obtain year-specific price escalation rates rather than a multiyear average for use in the LCCA. The Building Life Cycle Cost program,[8] for example, allows entry of such year-specific rates.

5.2 Historical Utility Rate Data

Absent a forecast from the serving water or wastewater utility, the next recommended method for forecasting water and wastewater prices is to look at past local rate changes as a general prediction of future rate changes. Relying on historical data does require care, however, as changes in infrastructure investment may substantially affect values. Consult with the local utility to learn of past and future projects and their potential impacts on the relevance of historical data. To determine historical annual rates of change, collect at least 5 years of past billing statements or rate data from the local utility and use the equation presented in Section 4.1 of this document to calculate a compound annual price escalation rate. Other important guidelines for this option include the following:

- When directly calculating the compound annual price escalation rates, make sure to use *marginal* rates (typically \$/kGal or \$/100 ft^3) rather than *average* rates. Do not simply take a bill total and divide it by total usage to obtain an average rate. Rather, obtain the volumetric charge for water (and wastewater, as relevant), which should be stated on the bill or provided by the serving utility in their rate schedule. In some cases, the average and marginal rates can differ tremendously, and water efficiency projects avoid costs at the marginal rates.
- If monthly rates differ within a calendar year, choose the historical rates from the same month of each year. For example, choose the rates from January or December of each year.
- Finally, calculate water and wastewater price escalation rates separately.

[8] Information about the Building Life Cycle Cost program can be found at https://energy.gov/eere/femp/building-life-cycle-cost-programs.

5.3 Historical Data from This Report

If past billing data is not available and the local utility cannot provide price escalation rates, the results of this study may be used to approximate rates of price escalation. When relying on price escalation rates from this analysis, the analyst may use differing criteria to select appropriate rates, depending on the type of project and region in which the water efficiency project is located. For example, in some cases it might be appropriate to find utilities in a similar region and/or perhaps of a similar size. In other cases, the analyst might consider the base volumetric water rate when selecting a representative price escalation rate. Statistics on these characteristics are provided in Sections 4.2 and 4.3 of this report to assist with this selection process.

While the historical price escalation rates presented in this report could help inform a regional LCCA study, it is important to note the limitations and caveats of this dataset:

- *Limited Sample:* The sample size is limited, and the data does not reflect a balanced geographic distribution, nor does it represent some of the more populous cities throughout the United States.
- *Rate Definition Variability and Time Series Consistency:* Although an effort was made to compile clean datasets for a sample of utilities across the United States, as discussed in Section 2.2 of this report, the AWWA survey is voluntary and often is completed by different utilities, people, and/or departments from year to year. Thus, consistency issues can arise related to the manner in which "a rate" is defined from one survey to the next. Utility rate structures and customer classifications may also change over time, which also poses consistency issues in the time-series data.
- *Historical Data, Utility Specificity:* In general, historical water and wastewater price escalation rates can help provide useful forecasts of future price escalation rates; however, history is never a perfect predictor of the future. All data observed in this analysis is historical data and may or may not be an appropriate indication of future rates, depending on the circumstances for a given utility. Future rates may be affected by several factors, including infrastructure updates, drought, and population growth. Appropriate price escalation rates may be very specific to a utility, given that infrastructure projects may be primary drivers of costs for water and wastewater utilities.

5.4 National Inflation Data

If utility- or region-specific options for price escalation rates are not viable, another option to consider is to use historical, national-level Consumer Price Index (CPI) data maintained by the Bureau of Labor Statistics (BLS)[9] to serve as a basis for an estimate of future price increases. Included as a component of the overall CPI is "water and sewerage maintenance." For the most recent 20 years of data (2002–2022), the national nominal compound annual price increase for water and sewerage maintenance has been 4.89%, for example.[10] For comparison, economy-wide inflation, as measured by the BLS CPI-U All Items index, has run 2.46% over the same period. Thus, on a real, or net-of-inflation basis, the national compound annual price increase for water and sewerage maintenance was 2.36% over that period. As for other utility services, the natural gas and electricity components of CPI-U-

[9] Bureau of Labor Statistics, Consumer Price Index: https://www.bls.gov/cpi/home.htm.
[10] Utilizing a relatively long period (e.g., 20 years) helps to dampen year-to-year swings in prices, providing a long-term average.

measured inflation have each increased at nominal compound annual rates of 3.15%, or 0.67% in real terms, over that time period.

The past several years of BLS data have shown a moderation of price increases in the water and sewerage maintenance component, both in nominal and real terms. Since 2017, its real annual price changes have not reached 2.0%, with 2021 and 2022 exhibiting negative real price changes. This aligns with the findings of this report, which also found some moderation of price increases. In the 2017 report, the average of the real compound annual price escalation rates for the surveyed sample of water and wastewater utilities was 4.1% and 3.3%, respectively. This report calculated the average of the real compound annual price escalation rates for the surveyed sample of water and wastewater utilities to be 3.0% and 3.2%, respectively.

6.0 References

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Appendix A – Water and Wastewater Utility Rates

This appendix contains the data associated with the utilities that contributed to at least two American Water Works Association water and wastewater rate surveys. Table A.1 shows the water rates in 2021 dollars for the volume charge of the large industrial consumers with an 8-inch water meter. Table A.2 shows the wastewater rates in 2021 dollars for the volume charge of the large industrial consumers with an 8-inch wastewater meter.

Table A.1. Water Utility Volume Charge in 2021$ per kGal for Large Industrial Consumers

City	State	Water Utility	2008	2010	2012	2014	2016	2019	2021
Anchorage	AK	Anchorage Water and Wastewater Utility	4.68	5.03	5.23	5.80	5.69		5.84
Birmingham	AL	Birmingham Water Works Board	4.09		5.02	4.92		5.46	
Huntsville	AL	Huntsville Utilities			1.59	1.82	1.81		1.78
Mobile	AL	Mobile Area Water and Sewer System	1.90	2.12	2.10	2.46	2.53	2.54	
Conway	AR	Conway Corporation	2.13		2.17	2.15	2.14	2.88	
Jonesboro	AR	City Water and Light	0.77		1.13	1.72	1.44		1.50
Little Rock	AR	Central Arkansas Water	1.66	1.81	1.82	1.88	1.84	1.90	1.90
Scottsdale	AZ	City of Scottsdale	4.30	4.87	4.69	4.22	4.31		
Yuma	AZ	City of Yuma	2.58	2.53	2.44	2.35	2.45		
Yuma	AZ	City of Yuma Department of Utilities	2.58	2.53	2.44	2.35	2.45	2.49	2.49
Alameda County	CA	Alameda County Water District	4.00	4.53	4.99		5.05	4.52	
Burbank	CA	City of Burbank Water and Power	2.88	3.36	3.23	3.60	3.77		
Chula Vista	CA	Sweetwater Authority		6.12	8.29	8.93	9.10	9.24	
Coachella	CA	Coachella Valley Water District		1.69	2.04	1.71	1.68	2.00	
Corona	CA	City of Corona Department of Water and Power	2.97		3.15				3.30
Covina	CA	Suburban Water Systems	2.37	2.64	3.51	4.16	4.17	4.29	4.65
Napa	CA	City of Napa				6.00	6.36	6.47	6.66
Rialto	CA	West Valley Water District		1.99	2.34	2.90	3.79	3.85	
Riverside	CA	Riverside Public Utilities	2.16	2.69	2.88	2.78	2.72		
San Diego	CA	City of San Diego Public Utilities Department	4.10	5.64	5.95	6.82	7.51	7.88	8.81
San Francisco	CA	San Francisco Public Utilities Commission	4.89		7.15	8.27	9.71	10.74	
South Lake Tahoe	CA	South Tahoe Public Utility District				1.83	1.92	2.31	
Valley Center	CA	Valley Center Municipal Water District	4.13	4.85	5.85	6.14	6.55	7.58	
Denver	CO	Denver Water	2.58	1.82	2.11	2.10		3.39	2.83
Fort Collins	CO	Fort Collins Utilities		2.02	2.12	2.30	2.25	2.56	2.44
Washington	DC	District of Columbia Water and Sewer Authority	3.59		5.13	5.92			6.56
Clearwater	FL	Pinellas County Utilities		5.69		5.46	5.44	5.44	5.41

City	State	Water Utility	2008	2010	2012	2014	2016	2019	2021
Fort Lauderdale	FL	City of Fort Lauderdale	3.13	4.06	4.37	4.73			
Jacksonville	FL	JEA	1.20	1.74	2.19	2.12	2.08	1.87	1.87
Lakeland	FL	City of Lakeland Water Utilities	1.87	1.96	2.05	2.46	2.46	2.69	
Miami	FL	Miami-Dade Water and Sewer Department	5.00	5.48	7.23	5.64	8.34	9.08	
Orlando	FL	Orange County Utilities	1.59	1.66	1.65	1.63	1.65	1.74	1.78
Pensacola	FL	Emerald Coast Utilities Authority	2.02	2.19	2.43	2.49			
Columbus	GA	Columbus Water Works	1.84	1.65	2.03	2.23		2.26	
Gainesville	GA	City of Gainesville Department of Water Resources		4.06	4.32	4.40			3.52
Griffin	GA	City of Griffin				5.08	5.51	5.90	6.37
Savannah	GA	City of Savannah	1.34	1.51	1.57	1.63	1.72		1.90
Honolulu	HI	Honolulu Board of Water Supply	3.46	3.85	4.06		5.55		5.24
Des Moines	IA	Des Moines Water Works	1.40	1.56	1.86	1.91	2.00	2.33	2.59
Newton	IA	Newton Water Works	1.76	1.73	2.75				4.05
Waterloo	IA	Waterloo Water Works	1.05	1.45	1.56	1.76	2.00		
Decatur	IL	City of Decatur	1.86	2.10	2.32	3.03			3.41
Fort Wayne	IN	Fort Wayne City Utilities	2.08		1.96	2.73	2.83	3.03	3.04
Lenexa	KS	WaterOne				4.60			4.77
Olathe	KS	City of Olathe	2.85	2.99	3.07	3.33	3.52	3.89	5.99
Louisville	KY	Louisville Water Company	2.49	2.72	2.71	2.78	2.84	3.05	3.22
Owensboro	KY	Owensboro Municipal Utilities	1.33	1.64	1.81	2.03	2.09	2.18	
Lafayette	LA	Lafayette Utilities System	1.63	1.60	2.07	2.00	1.96		
New Orleans	LA	Sewerage and Water Board of New Orleans	2.79	3.48	3.66	4.69	4.60	5.89	6.92
Baltimore	MD	Baltimore City Department of Public Works	1.55	1.65	1.88				4.42
Laurel	MD	Washington Suburban Sanitary Commission	5.15	6.25	7.67	8.32			
Portland	ME	Portland Water District	1.24		1.36	1.35	1.38	1.48	1.56
Ann Arbor	MI	City of Ann Arbor	3.85	4.28	4.61			5.50	5.73
Grand Rapids	MI	City of Grand Rapids Water Supply System and City of Grand Rapids Wastewater Resource Recovery Facility	2.63		2.94				2.88
Holland	MI	Holland Board of Public Works	1.31		2.10	2.43			
Rochester	MI	City of Rochester Water and Sewer Department	1.16	1.14	1.10	1.11	2.78		
Waterford	MI	Waterford Township DPW			2.36				3.13
Minneapolis	MN	City of Minneapolis		5.02	5.06	5.14	5.16		5.17
Springfield	MO	City Utilities of Springfield Missouri				2.00			2.34
Kalispell	MT	City of Kalispell	3.05	2.99	2.88	2.77			
Fayetteville	NC	Fayetteville Public Works Commission			2.30	2.38	2.35		

City	State	Water Utility	2008	2010	2012	2014	2016	2019	2021
Gastonia	NC	City of Gastonia/Two Rivers Utilities				3.30	3.24		3.25
Greensboro	NC	City of Greensboro Water Resources		3.78		3.89	4.03		4.52
Roanoke Rapids	NC	Roanoke Rapids Sanitary District	1.66	2.40			2.46	2.48	3.51
Welcome	NC	Davidson Water Inc	3.74	4.45		4.97	4.87	4.94	
Winston-Salem	NC	Winston-Salem/Forsyth County Utilities				2.77	3.02		3.15
Bismarck	ND	City of Bismarck	3.32						2.56
Beatrice	NE	Beatrice Board of Public Works			1.98	2.12	2.35		2.41
Albuquerque	NM	Albuquerque Bernalillo County Water Utility Authority	2.36	2.32	2.46			3.61	
Gardnerville	NV	Gardnerville Water Company				2.01	1.97		2.15
Henderson	NV	City of Henderson		1.80	2.42	2.63	2.74	2.83	2.91
Las Vegas	NV	Las Vegas Valley Water District			3.89	3.93	3.93		
Reno	NV	Truckee Meadows Water Authority	3.09	3.45	3.32	3.20	3.14		
Buffalo	NY	Erie County Water Authority	2.76	3.15	3.63	4.29	4.33		3.17
Syracuse	NY	Onondaga County Water Authority	0.88	1.71	1.93	1.91	1.99	2.10	2.03
Cleveland	OH	Cleveland Division of Water	3.81	4.43	4.35	4.77			
Columbus	OH	City of Columbus - Department of Public Utilities	2.25		2.91	2.92		2.85	3.15
Tulsa	OK	Tulsa Metropolitan Utility Authority	1.72	1.27	2.00	1.67			
Beaverton	OR	Tualatin Valley Water District	4.92		3.97	4.66	5.31	6.80	
Bend	OR	City of Bend (OR) Utility department				2.56	2.72	2.82	2.76
Portland	OR	Portland Water Bureau	3.47	4.02	4.88	5.25	5.90	6.61	7.41
Philadelphia	PA	Philadelphia Water Department	2.60	3.32	3.89	4.45	4.36		
Warrington	PA	Bucks County Water and Sewer Authority	4.76			4.04			4.34
Conway	SC	Grand Strand Water and Sewer Authority	1.44	1.42	1.42	1.42	1.46		
Moncks Corner	SC	Berkeley County Water and Sanitation				2.07			3.14
Mount Pleasant	SC	Mount Pleasant Waterworks	3.86	4.22	4.26	4.65	4.56		
Clinton	TN	Clinton Utilities Board			3.00	2.64	2.59	2.61	3.27
Erwin	TN	Erwin Utilities	1.08	1.60	2.15	3.12	3.71		
Johnson City	TN	Johnson City Water and Sewer Services		2.48	2.38	2.60	2.65		2.73
Nashville	TN	Metro Water Services Nashville	2.61	2.70	2.86	2.76		3.00	
White House	TN	White House Utility District	5.95	6.79	7.65	7.86			
Austin	TX	Austin Water	4.36	4.84	5.55	7.05			5.86
Carrollton	TX	City of Carrollton, Texas Water and Sewer Utility	1.84	1.87	1.80	1.79	1.76	2.15	
Dallas	TX	Dallas Water Utilities	2.48	2.70	3.37	3.07		3.41	3.77
Fort Worth	TX	Fort Worth Water Department	2.85	2.96	3.31	3.28	3.52		

City	State	Water Utility	2008	2010	2012	2014	2016	2019	2021
North Richland Hills	TX	City of Southlake	5.01	5.18	5.48	6.18	6.48	5.91	
San Antonio	TX	San Antonio Water System	3.43	2.13	3.74	3.87	4.06	4.42	5.45
San Marcos	TX	City of San Marcos	7.75	7.60	7.53	7.99	8.22	8.92	
Tyler	TX	Tyler Water Utilities	1.63						2.01
Salt Lake City	UT	Salt Lake City Public Utilities	1.42	1.45	1.47	1.65	1.74		
Chesterfield	VA	Chesterfield County Department of Utilities	2.08	2.04	2.09	2.43	2.51	2.82	3.09
Fairfax	VA	Fairfax Water		2.25	2.41	2.91	3.00	3.17	3.35
Newport News	VA	Newport News Waterworks	4.89	5.00	5.25	5.57	5.46	5.35	
Richmond	VA	City of Richmond Department of Public Utilities	2.15	3.17	3.98	5.19	5.39		6.41
Verona	VA	Augusta County Service Authority				4.94			6.04
Woodbridge	VA	Prince William County Service Authority		3.88	4.14	4.23	4.14	4.23	
Everett	WA	City of Everett			1.97	1.52			2.08
Seattle	WA	Seattle Public Utilities	4.39	5.76	6.39	6.02		7.48	7.54
Brookfield	WI	Brookfield Municipal Water Utility	1.94	1.91	3.15	3.22			3.80
Green Bay	WI	Green Bay Water Utility	2.05						2.60
Kenosha	WI	Kenosha Water Utility	1.87	1.95	1.89	2.24	2.25		
Manitowoc	WI	Manitowoc Public Utilities	1.41	1.34	1.46	1.53		1.61	1.60

Table A.2. Wastewater Utility Volume Charge in 2021$ per kGal for Large Industrial Consumers

City	State	Water Utility	2008	2010	2012	2014	2016	2019	2021
Anchorage	AK	Anchorage Water and Wastewater Utility	5.79	6.20	5.04	8.02	7.86		5.57
Gadsden	Al	Gadsden Water Works and Sewer Board				3.28			3.82
Mobile	AL	Mobile Area Water and Sewer	5.34	6.58	6.53	7.65	7.88		
Jonesboro	AR	City Water and Light	0.90		1.30	1.66	1.71	1.80	1.78
Scottsdale	AZ	City of Scottsdale	3.57	3.27	3.14	3.19	3.02		
Yuma	AZ	City of Yuma Department of Utilities			2.77	2.81	2.93	2.96	
Coachella	CA	Coachella Valley Water District		1.63	1.69	1.63	1.60		
Lompoc	CA	Vandenberg Village Community Services District				1.52			1.28
San Diego	CA	City of San Diego Public Utilities Department			5.96	8.13	7.97	8.43	8.43
San Francisco	CA	San Francisco Public Utilities Commission			10.37		8.69	8.53	
Santa Barbara	CA	City of Santa Barbara	4.63	4.72	5.40	5.73	5.93		
Fort Collins	CO	Fort Collins Utilities		3.25	3.68	3.52	3.61	3.84	3.79
Washington	DC	District of Columbia Water and Sewer Authority	5.41	4.20	6.27	7.24			
Jacksonville	FL	JEA	5.95	6.51	7.22	7.30	7.15	7.30	7.30
Lakeland	FL	City of Lakeland Water Utilities	3.21	3.64	3.63	4.12	4.24		
Miami	FL	Miami-Dade Water and Sewer Department	6.25	6.90	7.36	7.10	8.48	9.24	
Naples	FL	Collier County			4.49	4.33			5.54
Orange County	FL	Orange County Utilities	3.97	4.03	3.99	3.96	4.00	4.27	
Pensacola	FL	Emerald Coast Utilities Authority	6.14		7.37	7.57			
Pinellas County	FL	Pinellas County Utilities		4.65		5.22	5.42		
St. Petersburg	FL	City of St. Petersburg	4.46	4.60	4.88	5.25	5.34		
Augusta	GA	Augusta Utilities	3.36		3.47	3.65			
Gainesville	GA	City of Gainesville Department of Water Resources		6.24	6.51	6.91			11.28
Griffin	GA	City of Griffin				8.77	8.60		9.57
Savannah	GA	City of Savannah	3.89	3.87	2.33	4.98	5.36		5.93
Ames	IA	City of Ames Water and Pollution Control		5.32	3.50	3.98	4.10		4.12
Naperville	IL	City of Naperville Department of Public Utilities	2.04	2.01	2.77	2.82	2.77	3.35	
Fort Wayne	IN	Fort Wayne City Utilities			5.23	6.65	7.18	8.27	8.01
Olathe	KS	City of Olathe	4.11		4.95	5.97	6.29	6.77	7.17
Wichita	KS	City of Wichita	2.48	2.56	3.20	3.62	3.73	4.05	4.17
Baton Rouge	LA	City of Baton Rouge/Parish of East Baton Rouge		4.74	4.94	5.34	5.45		5.93
Lafayette	LA	Lafayette Utilities System	4.74	4.65	6.70	6.46	6.34		

City	State	Water Utility	2008	2010	2012	2014	2016	2019	2021
New Orleans	LA	Sewerage and Water Board of New Orleans			4.78	6.13	6.01	7.80	9.17
Baltimore	MD	Baltimore City Department of Public Works			5.99				11.40
Laurel	MD	Washington Suburban Sanitary Commission	8.27	6.63	9.82	12.22			
Portland	ME	Portland Water District	11.61		12.83	13.45	14.52		
Ann Arbor	MI	City of Ann Arbor			5.29	5.57		6.61	
Holland	MI	Holland Board of Public Works	3.37		3.85	3.97			
Waterford	MI	Waterford Township DPW		4.41	3.59				5.38
Kalispell	MT	City of Kalispell	5.25	5.16	4.96	5.46			
Fayetteville	NC	Fayetteville Public Works Commission			4.14	4.05	4.20		
Gastonia	NC	City of Gastonia/Two Rivers Utilities				4.34	4.25		4.30
Greensboro	NC	City of Greensboro Water Resources		4.69		4.82	4.98	5.27	5.58
Winston-Salem	NC	Winston-Salem/Forsyth County Utilities				4.41	4.54		4.92
Bismarck	ND	City of Bismarck		2.73					5.31
Beatrice	NE	Beatrice Board of Public Works			2.27	2.42	2.52		3.08
Manchester	NH	City of Manchester Environmental Protection Division		6.14	5.49				4.84
Albuquerque	NM	Albuquerque Bernalillo County Water Utility Authority		1.29	1.92			3.07	
Henderson	NV	City of Henderson		2.20	2.34	2.55	2.64	2.67	2.67
Columbus	OH	City of Columbus - Department of Public Utilities			6.27				6.75
Tulsa	OK	Tulsa Metropolitan Utility Authority	3.82	4.38	5.05	6.44		8.03	
Philadelphia	PA	Philadelphia Water Department	2.97	3.38	3.50	4.29	4.20	4.80	
Conway	SC	Grand Strand Water and Sewer Authority	2.19	2.15	2.19	2.20	2.23		
Mount Pleasant	SC	Mount Pleasant Waterworks	5.45	5.97	6.03	6.54	6.41		
Clinton	TN	Clinton Utilities Board				5.25	5.15		5.80
Erwin	TN	Erwin Utilities	3.08	3.34	4.24	6.14	9.87		
Johnson City	TN	Johnson City Water and Sewer Services			5.13	6.26	6.46		6.70
Nashville	TN	Metro Water Services	4.34	4.64	5.16	4.98			
Austin	TX	Austin Water Utility	7.92	8.17	9.24	10.07	10.37		
Carrollton	TX	City of Carrollton	2.44	2.49	2.39	2.42	2.37		
Dallas	TX	Dallas Water Utilities		3.37	3.60	3.86		3.41	4.25
El Paso	TX	El Paso Water	2.13	1.88	1.87		2.23	2.82	
Fort Worth	TX	Fort Worth Water Department	5.30	3.55		6.06	5.94		
Lubbock	TX	City of Lubbock	2.29	2.52	2.43	2.80			
San Antonio	TX	San Antonio Water System	2.45	2.53	3.09	3.61	3.94	4.16	4.41
San Marcos	TX	City of San Marcos	8.09		7.83	7.82	7.75		

City	State	Water Utility	2008	2010	2012	2014	2016	2019	2021
Southlake	TX	City of Southlake	3.76		3.55	3.43	3.36		
Salt Lake City	UT	Salt Lake City Corp Public Utilities	3.57	2.17	2.18	4.52	4.79		
Chesterfield County	VA	Chesterfield County Department of Utilities	2.20	2.39	2.37	2.96	3.02	3.27	3.28
Prince William County	VA	Prince William County Service Authority			8.05	8.17	8.00	8.16	7.55
Richmond	VA	City of Richmond Department of Public Utilities		6.15	6.76	9.42	9.61		10.40
Suffolk	VA	Suffolk Department of Public Utilities				8.89	10.09		10.26
Everett	WA	City of Everett			5.96	8.39			11.93
Seattle	WA	Seattle Public Utilities	12.99	14.78	16.90	15.68		19.31	21.65
Brookfield	WI	City of Brookfield	4.14		4.26	4.52			
Kenosha	WI	Kenosha Water Utility	3.13		3.05	2.95	2.98	3.01	

Appendix B – Water and Wastewater Utility Rates

This appendix provides data crosswalks for the quantitative values shown on the x-axis of Figure 2 and Figure 3.

Table B.1. Key for X-Axis in Figure 2

Value	State: Utility
1	AR: City Water and Light
2	ME: Portland Water District
3	WI: Manitowoc Public Utilities
4	FL: Orange County Utilities
5	AL: Huntsville Utilities
6	WI: Milwaukee Water Works
7	FL: JEA
8	GA: City of Savannah
9	AR: Central Arkansas Water
10	CA: Coachella Valley Water District
11	TX: Tyler Water Utilities
12	NY: Onondaga County Water Authority
13	WA: City of Everett
14	NV: Gardnerville Water Company
15	TX: City of Carrollton, Texas Water and Sewer Utility
16	KY: Owensboro Municipal Utilities
17	GA: Columbus Water Works
18	CA: South Tahoe Public Utility District
19	MO: City Utilities of Springfield Missouri
20	NE: Beatrice Board of Public Works
21	CO: Fort Collins Utilities
22	AZ: City of Yuma Department of Utilities
23	AL: Mobile Area Water and Sewer System
24	ND: City of Bismarck
25	IA: Des Moines Water Works
26	WI: Green Bay Water Utility
27	FL: City of Lakeland Water Utilities
28	TN: Johnson City Water and Sewer Services
29	OR: City of Bend (OR) Utility department
30	CO: Denver Water

Value	State: Utility
31	AR: Conway Corporation
32	MI: City of Grand Rapids Water Supply System and City of Grand Rapids Wastewater Resource Recovery Facility
33	NV: City of Henderson
34	TN: Metro Water Services Nashville
35	IN: Fort Wayne City Utilities
36	VA: Chesterfield County Department of Utilities
37	MI: Waterford Township DPW
38	SC: Berkeley County Water and Sanitation
39	OH: City of Columbus - Department of Public Utilities
40	NC: Winston-Salem/Forsyth County Utilities
41	NY: Erie County Water Authority
42	KY: Louisville Water Company
43	NC: City of Gastonia/Two Rivers Utilities
44	TN: Clinton Utilities Board
45	CA: City of Corona Department of Water and Power
46	VA: Fairfax Water
47	IL: City of Decatur
48	NC: Roanoke Rapids Sanitary District
49	GA: City of Gainesville Department of Water Resources
50	NM: Albuquerque Bernalillo County Water Utility Authority
51	TX: Dallas Water Utilities
52	WI: Brookfield Municipal Water Utility
53	CA: West Valley Water District
54	IA: Newton Water Works
55	VA: Prince William County Service Authority
56	PA: Bucks County Water and Sewer Authority
57	MD: Baltimore City Department of Public Works
58	CA: Alameda County Water District
59	CA: Suburban Water Systems
60	KS: WaterOne
61	NC: Davidson Water Inc
62	MN: City of Minneapolis
63	HI: Honolulu Board of Water Supply
64	VA: Newport News Waterworks
65	FL: Pinellas County Utilities

Value	State: Utility
66	TX: San Antonio Water System
67	AL: Birmingham Water Works Board
68	MI: City of Ann Arbor
69	AK: Anchorage Water and Wastewater Utility
70	TX: Austin Water
71	TX: City of Southlake
72	KS: City of Olathe
73	GA: City of Griffin
74	VA: City of Richmond Department of Public Utilities
75	DC: District of Columbia Water and Sewer Authority
76	CA: City of Napa
77	OR: Tualatin Valley Water District
78	LA: Sewerage and Water Board of New Orleans
79	OR: Portland Water Bureau
80	WA: Seattle Public Utilities
81	CA: Valley Center Municipal Water District
82	CA: City of San Diego Public Utilities Department
83	TX: City of San Marcos
84	FL: Miami-Dade Water and Sewer Department
85	CA: Sweetwater Authority
86	TX: El Paso Water
87	CA: San Francisco Public Utilities Commission

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