

Water Diversion REPORT



2019 Report on Water Diversion *April 2020*

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
TOTAL AMOUNT OF WATER DIVERTED.....	1
TOTAL MONTHLY SEWERAGE FLOW.....	2
TOTAL CONSUMPTIVE USE.....	2
SUMMARY OF THE IMPACT OF CONSERVATION AND EFFICIENCY MEASURES AND ADDITIONAL MEASURES IMPLEMENTED.....	3
APPENDIX A	
APPENDIX B	
APPENDIX C	
APPENDIX D	

2019 REPORT ON WATER DIVERSION

EXECUTIVE SUMMARY

The City of Racine (Racine) is submitting this report to satisfy the requirements in the Wisconsin Department of Natural Resources (DNR)'s approval of its diversion application.

The DNR's approval stipulated that Racine must annually report on the following items for the prior calendar year:

- 1) The total amount of water sold monthly or quarterly to each category of customer within the approved diversion area.
- 2) The total monthly sewerage flow to the City of Racine Wastewater Treatment Plant from the diversion area.
- 3) The total consumptive use as specified by the DNR.
- 4) A summary of the impact of the implemented conservation and efficiency measures required under Wisconsin Administrative Code NR 852.04 and NR 852.05, including quantifiable impacts to water use intensity, as defined in Wisconsin Administrative Code NR 852.03(29).
- 5) A description of any additional conservation and efficiency measures implemented.

The amount of water diverted in 2019 totaled just under 2.8 million gallons, which is an average of less than 8,000 gallons per day. The amount diverted is less than 0.05% of the water pumped for the year. The amount diverted includes water sold and water used to flush the mains for health and safety. Since the sanitary sewer infrastructure is not yet finished, none of the water was returned, so all of it counts as consumptive use. Water will be returned to the wastewater plant after the needed sanitary sewer infrastructure is completed.

Water use trends have shown declining demand. In 2019, per-capita residential demand was 45 gallons per day, down from 55 gallons per day in 2000. Industrial demand in 2019 was 3.6 million gallons per day, significantly lower than the 9.1 million gallons per day in 2000.

Racine forecasts that industrial demand will decline further in 2020 because of a major industrial user's plans to implement conservation measures. This user will reduce its demand by approximately 300 million gallons per year beginning in the summer of 2020. This reduction aligns with Racine's commercial and industrial demand management program, which is one of Racine's conservation and efficiency measures. Racine has implemented a number of other conservation and efficiency measures, including hiring an engineering firm to test over 240 miles of its mains for leaks.

TOTAL AMOUNT OF WATER DIVERTED

Racine Water Utility (RWU) diverted water to the Mississippi River basin, selling water to commercial customers as shown in Figure 1 below. All the customers supported construction in the area and were thus temporary. The sales were properly coded within RWU's billing system to track the amount of water that was diverted.

The reporting requirements specify the water sold should be segmented into months and/or quarters. RWU customers served were seasonal for the first year of reporting; therefore, RWU used temporary meters to track their water demand. Temporary meters are only measured once the meters are removed,

so water demand can and often does span multiple months and quarters. As permanent meters are installed, water demand will be recorded by quarter or month. Currently, RWU bills its industrial customers monthly and all others quarterly. These permanent meters will measure the demand to calculate the total amount of water diverted. Racine anticipates that permanent meters will be installed and in service in 2021.

Figure 1

2019 Water Sold (gallons)

Customer Class	Number of Customers	Total
Commercial	5	46,244

In addition to the water that was sold, RWU used water to flush mains for health and safety purposes. The flushing was metered to record the correct amounts.

Figure 2

Water Flushed (gallons)

Q1	Q2	Q3	Q4	Total
-	450,000	1,790,000	503,000	2,743,000

The total amount of water diverted is the sum of the water sold and the water flushed. It equals 2,789,244 gallons.

TOTAL MONTHLY SEWERAGE FLOW

2019 was the first year of diverting water for RWU. Per the application, the return flow was to be discharged to the City of Racine Wastewater Treatment Plant (WWTP) so that the water could be treated and returned to the Great Lakes basin. The sanitary sewer infrastructure for the diversion area has not yet been completed. Therefore, no water was returned, so the total monthly sewerage flow to the WWTP from the diversion area equals zero. Customers will be connected to sanitary sewer service with a return flow to the WWTP after the sanitary sewer infrastructure is completed. The return flow will be master-metered, and each customer will be billed based on their demand. The permanent meter that will be used to measure the sewer flow is expected to be in service in 2021.

TOTAL CONSUMPTIVE USE

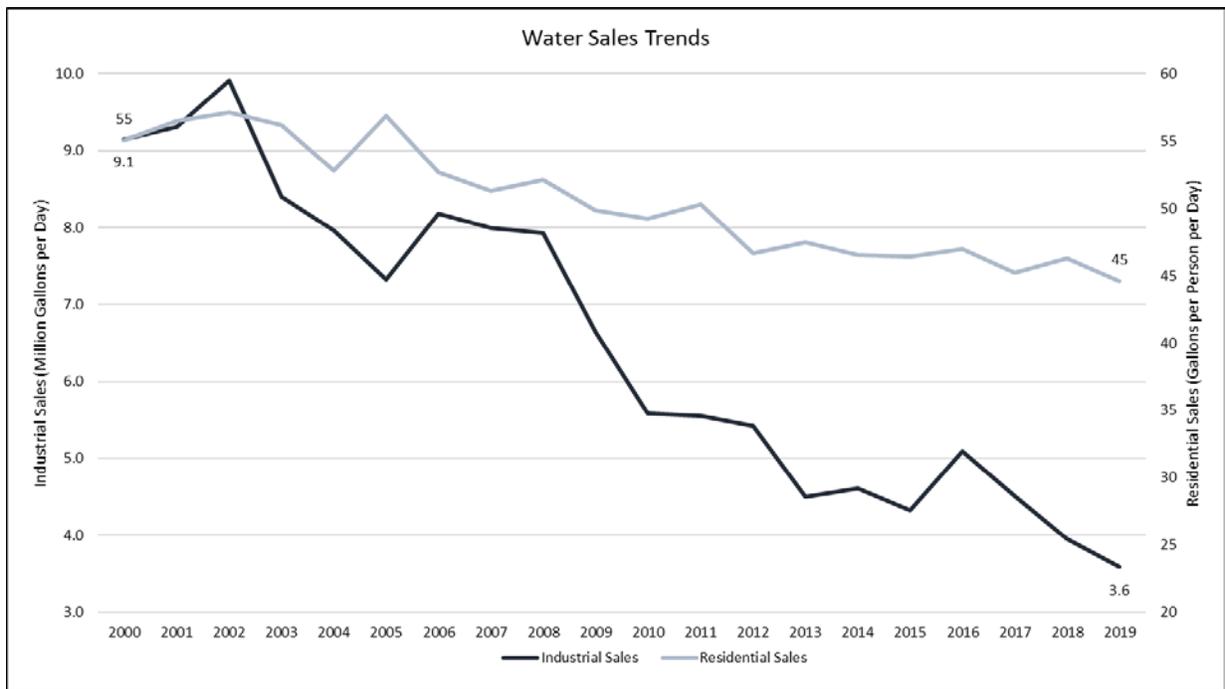
Since the sanitary sewer system infrastructure has not yet been built, none of the water that was flushed or sold was returned to the Great Lakes basin through the WWTP.

Hence the total amount consumed is the sum of the water sold and the water used for flushing, which equals 2,789,244 gallons. This annual consumptive use equals an average daily consumptive use of 7,642 gallons.

SUMMARY OF THE IMPACT OF CONSERVATION AND EFFICIENCY MEASURES AND ADDITIONAL MEASURES IMPLEMENTED

The declining water use trends noted in the diversion application for RWU have continued. Per-person demand has fallen from 55 gallons per person per day in 2000 to 45 gallons per person per day in 2019.¹ The industrial decline has continued with demand falling from 9.1 million gallons per day in 2000 to 3.6 million gallons per day in 2019. The conservation and efficiency measures described later in the report help explain these trends. Neither the residential class nor the industrial class had any demand within the Mississippi River basin this year; all the demand for both classes came from within the Great Lakes basin.

Figure 3



¹ Population estimates for the RWU retail service area come from the U.S. Census Bureau, except for 2018 and 2019 North Bay and Elmwood Park estimates, which both come from the Wisconsin Gazetteer. The annual water sales for the industrial and residential classes come from RWU’s annual reports to the Public Service Commission (PSC).

Figure 4

Year	Residential Demand per Year (million gallons)	Total Population in Service Area	Gallons per Person per Day
2000	2,003	99,669	55
2001	2,046	99,223	56
2002	2,066	99,149	57
2003	2,033	99,082	56
2004	1,923	99,780	53
2005	2,072	99,837	57
2006	1,920	99,827	53
2007	1,872	100,049	51
2008	1,905	100,152	52
2009	1,824	100,304	50
2010	1,790	99,569	49
2011	1,824	99,284	50
2012	1,909	112,104	47
2013	1,714	98,903	47
2014	1,678	98,786	47
2015	1,667	98,413	46
2016	1,687	98,342	47
2017	1,625	98,435	45
2018	1,664	98,504	46
2019	1,600	98,301	45

The ratio of max day pumpage to average day pumpage equaled 1.55 for 2019. This ratio has declined from 2018 when it equaled 1.59.

Figure 5

Total Pumpage (gallons)	Average Pumpage (gallons)	Max Day Pumpage (gallons)	Max to Average Day Ratio
5,748,000,000	15,747,945	24,359,000	1.55

Figures 6 and 7 provide the data and calculation for water use per residential equivalent unit (REU). The calculation shows water use per REU to be 237.8 gallons per day. The calculation is the average day water use divided by total REUs for 2019. The water use amount includes demand from all retail water users, including industrial and commercial users.

Figure 6

2019 Residential Equivalent Units (REUs)

Meter Size	Number of Meters	REU Ratio	REU
5/8	26,728	1	26,728
3/4	5,145	1	5,145
1	997	2.5	2,493
1 1/2	536	5	2,680
2	519	8	4,152
3	120	15	1,800
4	62	25	1,550
6	19	50	950
8	6	80	480
10	3	122	366
12	2	160	320
Total	34,137		46,664

Figure 7

Average Day Water Use per REU

Total Retail Water Sold	4,050,305,000	gallons
Average Day Water Use	11,096,726	gallons/day
Water Use/REU	237.8	gallons/day/REU

RWU has worked to implement the conservation and efficiency measures it laid out in the diversion application that meet requirements in Wisconsin Administrative Code NR 852. Figure 8 below summarizes these efforts. It describes additional measures undertaken since the application was submitted, such as partnering with AECOM to perform a leak detection survey and a major industrial user's efforts to reduce its demand by approximately 300 million gallons per year.

Figure 8

Conservation and Efficiency Measures

Abbreviation	Requirement	Location
PWS-1	Water-use audit	RWU annually audits and submits to the PSC its water production, sales, and nonrevenue water with its annual report as required by Wisconsin Administrative Code PSC 185.85(3). In 2019, RWU used the American Water Works Association water audit software to conduct audits that help quantify losses and identify areas to improve efficiency and recovery. See Appendix A for results.
PWS-2	Leak detection and repair program	<p>RWU prepared a water loss control plan under Wisconsin Administrative Code PSC 185.85(4) and submitted it to the PSC prior to submitting its diversion application.</p> <p>RWU continued its efforts to upgrade water mains by replacing close to 2 miles of older main in 2019.</p> <p>RWU negotiated with AECOM during 2019 and signed a contract in 2020 to perform a leak detection survey on approximately 241 miles of water main as part of RWU’s efforts to reduce nonrevenue water. See Appendix B for a copy of the agreement.</p>
PWS-3	Information and education outreach	<p>RWU includes the information required by Wisconsin Administrative Code PSC 185.33(1) and (1m), e.g. rates and volume unit conversions, in its customer water bills. See Appendix C for an example of a customer bill.</p> <p>RWU has posted the conservation and efficiency information required by Wisconsin Administrative Code PSC 185.96 online. See https://www.cityofracine.org/water.aspx and click on the Water Conservation links labeled “Conservation Practices” and “Leak Detection Program” to view the conservation and efficiency information.</p>
PWS-4	Source measurement	RWU meters water produced and pumped into the distribution system and verifies the accuracy of its station meters in accordance with Wisconsin Administrative Code PSC 185.83 and 185.85(2). RWU documents its compliance with these requirements in its annual report to the PSC on pages W-14, Sources of Water Supply-Statistics, and W-27, Water Conservation Programs.

(Continued on Next Page)

Figure 8 (continued)

Abbreviation	Requirement	Location
PWS-R1	Distribution system pressure management	RWU analyzed distribution system pressure management in a 2017 water-system study. It operates the distribution system to meet pressure requirements in Wisconsin Administrative Code NR 811.70(4). The study concluded that pressure does not appear to be a major contributor to main breaks or leaks.
PWS-R2	Residential demand management program	RWU has posted residential water conservation information on its website. See explanation for PWS-3 for the link. RWU continues to notify customers of high-water use through mailings that accompany the water bills and survey residences for leaks on customer request. RWU generally sends mailings if water use has risen for the quarter over fifty percent of what it had been in the prior year.
PWS-R3	Commercial and industrial demand management program	<p>RWU has coordinated with the City of Racine’s largest industrial water user, who plans to begin reducing demand mid-year in 2020. Implementing these plans will lead to an annual reduction in demand of approximately 300 million gallons. See Appendix D.</p> <p>RWU will work with the communities in which it provides service to review their requirements for commercial and industrial landscaping and watering.</p>
PWS-R4	Water reuse	RWU will continue to look for opportunities to work with individual large-volume commercial and industrial water users to explore opportunities for water reuse within their facilities.

AWWA Free Water Audit Software: System Attributes and Performance Indicators

WAS v5.0

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Water Audit Report for: Racine Water Utility (WI 25200626)
 Reporting Year: 2019 1/2019 - 12/2019

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 80 out of 100 ***

System Attributes:

Apparent Losses:	64.703	MG/Yr
+	Real Losses:	973.752 MG/Yr
=	Water Losses:	1,038.456 MG/Yr

? Unavoidable Annual Real Losses (UARL): 218.05 MG/Yr

Annual cost of Apparent Losses: \$223,158

Annual cost of Real Losses: \$204,663 Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumption

Performance Indicators:

Financial:	{	Non-revenue water as percent by volume of Water Supplied:	22.3%	
		Non-revenue water as percent by cost of operating system:	2.8%	Real Losses valued at Variable Production Cost

Operational Efficiency:	{	Apparent Losses per service connection per day:	4.77	gallons/connection/day
		Real Losses per service connection per day:	71.74	gallons/connection/day
		Real Losses per length of main per day*:	N/A	
		Real Losses per service connection per day per psi pressure:	1.17	gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): 973.75 million gallons/year

? Infrastructure Leakage Index (ILI) [CARL/UARL]: 4.47

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

Appendix A



AWWA Free Water Audit Software: User Comments

WAS
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Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	Change period date on "Instructions" sheet
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Audit Item	Comment
Volume from own sources:	Total volume pumped from high lift pumps to distribution system.
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	Wholesale water sales to Caledonia.
Water exported: master meter error adjustment:	
Billed metered:	Sum of billed metered usage, seasonal meters, and meter changes In/Out differences.
Billed unmetered:	Meter changeout In/Out differences; also, Racine WW total vector cleaning water (measured by known volume load).
Unbilled metered:	Consists mainly of carrier water for plant Cairox (potassium permanganate) chemical to remove zebra mussels from water intakes. All plant water usage is metered.
Unbilled unmetered:	Water used for main flushing, hydrant flushing, and fire fighting.

Appendix A

Audit Item	Comment
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	Includes total O&M costs + total Depreciation costs (does not include PILOT costs, as not representative to other utilities outside of WI).
Customer retail unit cost (applied to Apparent Losses):	Current PSC-approved water rate.
Variable production cost (applied to Real Losses):	Per AWWA M36 Manual (Task 9, Step 9-2 on Page 51), the rate is determined by adding the total utility electric and chemical costs (also add basin cleaning costs) per volume of water pumped from the lake (ie, total low lift volume). For 2019: Electric (\$715,028) + Chemical (\$345,348) + Basin Cleaning (\$254,975) = total cost \$1,315,351 divided by total source water (low lift water treated) 6,258.265 MG = \$210.18/MG



AWWA Free Water Audit Software: Water Balance

WAS v5.0

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Water Audit Report for:	Racine Water Utility (WI 25200626)	
Reporting Year:	2019	1/2019 - 12/2019
Data Validity Score:	80	

	Water Exported	Billed Water Exported				
	<i>435.072</i>		Billed Authorized Consumption	Billed Metered Consumption (water exported is removed)	Revenue Water	
Own Sources (Adjusted for known errors) 5,656.233	Water Supplied 5,221.161	Authorized Consumption 4,182.705	4,056.823	4,050.305	4,056.823	
				6.518		
		Water Losses 1,038.456	Apparent Losses 64.703	125.883	60.618	1,164.338
					65.265	
	13.053					
Water Imported 0.000	Real Losses 973.752		41.524			
			10.126			
			Not broken down			
			Not broken down			
			Not broken down			



AWWA Free Water Audit Software: Dashboard

WAS v5.0

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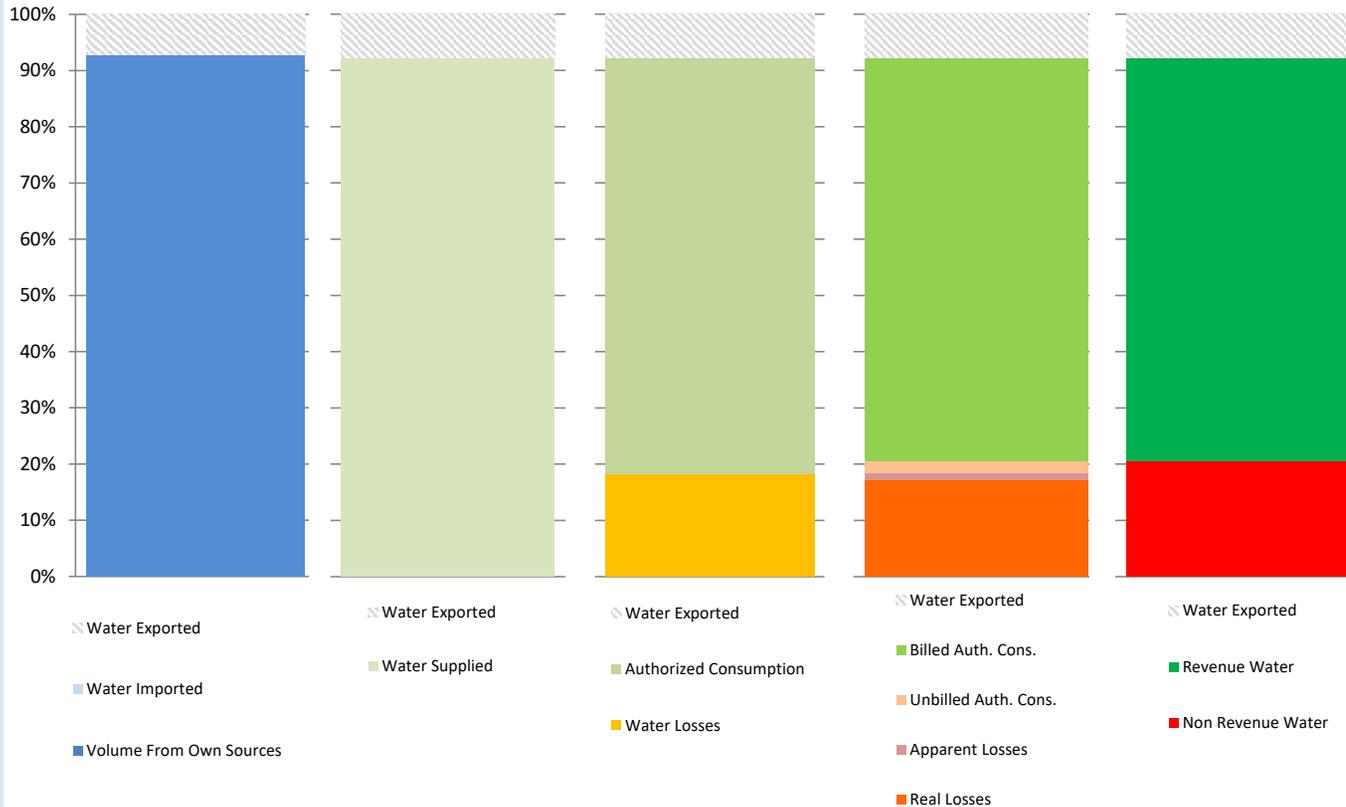
The graphic below is a visual representation of the Water Balance with bar heights proportional to the volume of the audit components

Water Audit Report for: **Racine Water Utility (WI 25200626)**

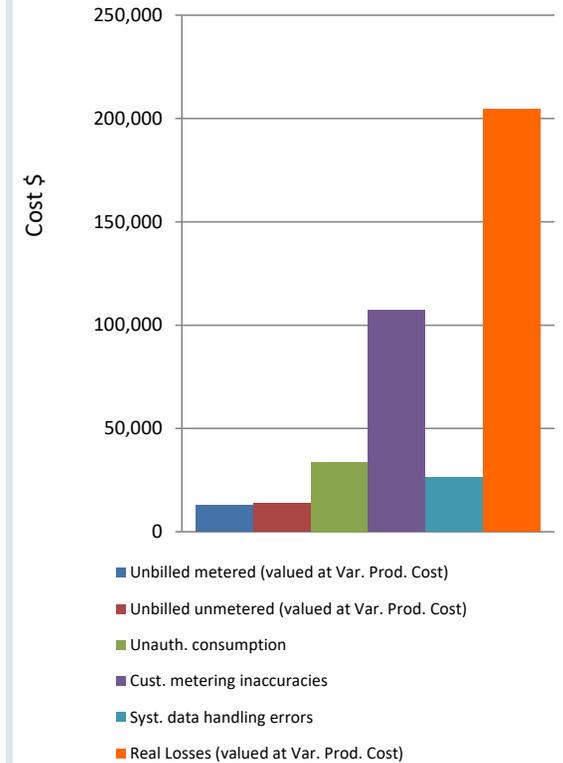
Reporting Year: **2019** **1/2019 - 12/2019**

Data Validity Score: **80**

- Show me the VOLUME of Non-Revenue Water
- Show me the COST of Non-Revenue Water



Total Cost of NRW = \$398,055



Appendix A

AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

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The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		<u>to qualify for 2:</u> Organize and launch efforts to collect data for determining volume from own sources	<u>to qualify for 4:</u> Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		<u>to qualify for 6:</u> Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		<u>to qualify for 8:</u> Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		<u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/plot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system; tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		<u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	<u>to qualify for 4:</u> Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		<u>to qualify for 6:</u> Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		<u>to qualify for 8:</u> Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		<u>to qualify for 10:</u> Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		<u>to maintain 10:</u> Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
<p>Improvements to attain higher data grading for "Water Imported Volume" component:</p> <p><i>(Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.)</i></p>		<p><u>to qualify for 2:</u> Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.</p>	<p><u>To qualify for 4:</u> Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.</p>		<p><u>to qualify for 6:</u> Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.</p>		<p><u>to qualify for 8:</u> Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.</p>		<p><u>to qualify for 10:</u> Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.</p>		<p><u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.</p>
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Importer. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		<p><u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.</p>	<p><u>to qualify for 4:</u> Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.</p>		<p><u>to qualify for 6:</u> Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.</p>		<p><u>to qualify for 8:</u> Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.</p>		<p><u>to qualify for 10:</u> Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.</p>		<p><u>to maintain 10:</u> Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.</p>
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
<p>Improvements to attain higher data grading for "Water Exported Volume" component:</p> <p><i>(Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.)</i></p>		<p><u>to qualify for 2:</u> Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.</p>	<p><u>To qualify for 4:</u> Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters</p>		<p><u>to qualify for 6:</u> Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.</p>		<p><u>to qualify for 8:</u> Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.</p>		<p><u>to qualify for 10:</u> Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.</p>		<p><u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.</p>

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		<u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	<u>to qualify for 4:</u> Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		<u>to qualify for 6:</u> Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		<u>to qualify for 8:</u> Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		<u>to qualify for 10:</u> Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		<u>to maintain 10:</u> Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted with less than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records exist, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducted by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	<u>to qualify for 2:</u> Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	<u>to qualify for 4:</u> Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		<u>to qualify for 6:</u> Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		<u>to qualify for 8:</u> Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		<u>to qualify for 10:</u> Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		<u>to maintain 10:</u> Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter, i.e. no intentionally unmetered accounts exist	Water utility policy does <u>not</u> require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does <u>not</u> require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy <u>does</u> require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy <u>does</u> require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy <u>does</u> require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy <u>does</u> require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		<u>to qualify for 2:</u> Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	<u>to qualify for 4:</u> Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		<u>to qualify for 6:</u> Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		<u>to qualify for 8:</u> Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated "meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		<u>to qualify for 10:</u> Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		<u>to maintain 10:</u> Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		<u>to qualify for 2:</u> Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	<u>to qualify for 4:</u> Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping the number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		<u>to qualify for 6:</u> Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		<u>to qualify for 8:</u> Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		<u>to qualify for 10:</u> Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		<u>to maintain 10:</u> Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		<p><u>to qualify for 5:</u> Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use.</p> <p><u>to qualify for 2:</u> Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushing).</p>	<p><u>to qualify for 5:</u> Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use.</p> <p><u>to qualify for 4:</u> Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).</p>		<p><u>to qualify for 5:</u> Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, unmetered consumption is usually a relatively small quantity component, and other larger-quantity components should take priority.</p>	<p><u>to qualify for 6 or greater:</u> Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.</p>	<p><u>to qualify for 8:</u> Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.</p>		<p><u>to qualify for 10:</u> Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.</p>	<p><u>to maintain 10:</u> Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.</p>	
APPARENT LOSSES											
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	Conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters), but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		<p><u>to qualify for 5:</u> Use accepted default of 0.25% of volume of water supplied.</p> <p><u>to qualify for 2:</u> Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)</p>	<p><u>to qualify for 5:</u> Use accepted default of 0.25% of system input volume</p> <p><u>to qualify for 4:</u> Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)</p>		<p><u>to qualify for 5:</u> Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.</p>	<p><u>to qualify for 6 or greater:</u> Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.</p>	<p><u>to qualify for 8:</u> Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.</p>		<p><u>to qualify for 10:</u> Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.</p>	<p><u>to maintain 10:</u> Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.</p>	
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embracing to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	<u>to qualify for 2:</u> Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	<u>to qualify for 4:</u> Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		<u>to qualify for 6:</u> Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		<u>to qualify for 8:</u> Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		<u>to qualify for 9:</u> Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	<u>to qualify for 10:</u> Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	<u>to maintain 10:</u> Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		<u>to qualify for 2:</u> Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	<u>to qualify for 4:</u> Finalize written policy and procedures for activation of new billing accounts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		<u>to qualify for 6:</u> Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		<u>to qualify for 8:</u> Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		<u>to qualify for 10:</u> Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		<u>to maintain 10:</u> Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		<u>to qualify for 2:</u> Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	<u>to qualify for 4:</u> Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		<u>to qualify for 6:</u> Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		<u>to qualify for 8:</u> Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		<u>to qualify for 10:</u> Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		<u>to maintain 10:</u> Continue with standardization and random field validation to improve the completeness and accuracy of the system.

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
Average length of customer service line:	Note: if customer water meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Gratings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gratings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10: a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Worksheet asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet. b) Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breach pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breach pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Average Operating Pressure" component:		<p><u>to qualify for 2:</u> Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics</p>	<p><u>to qualify for 4:</u> Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.</p>		<p><u>to qualify for 6:</u> Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.</p>		<p><u>to qualify for 8:</u> Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.</p>		<p><u>to qualify for 10:</u> Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.</p>		<p><u>to maintain 10:</u> Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.</p>

Appendix A

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		<u>to qualify for 2:</u> Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		<u>to qualify for 8:</u> Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		<u>to qualify for 2:</u> Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	<u>to qualify for 4:</u> Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		<u>to qualify for 6:</u> Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	<u>Launch effort to fully meter the customer population and charge rates based upon water volumes</u>	<u>to qualify for 8:</u> Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to qualify for 10:</u> Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to maintain 10:</u> Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable production cost.
Improvements to attain higher data grading for "Variable Production Cost" component:		<u>to qualify for 2:</u> Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		<u>to qualify for 8:</u> Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgeable third-party at least once every three years.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively



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March 10th, 2020

Mr. Keith Haas
General Manager
Racine Water Utility
800 Center Street, Room 227
Racine, WI 53403
Phone: 262.497.4611
Email: Keith.Haas@cityofracine.org

Subject: Proposal for 2020 Leak Detection Survey Services for the Racine Water Utility

Dear Mr. Haas,

AECOM is pleased to have this opportunity to submit proposal to conduct a leak detection survey for the Racine Water Utility in 2020. AECOM values the work afforded us by the Water Utility. Please find attached our proposal in the sum of \$68,400.00 for completion of leak detection survey on approximately one-half of the existing water system.

Should you have any additional questions concerning this proposal or contract agreement, please do not hesitate to contact me at (262) 389-2194 or (414) 944-6114.

Sincerely,

AECOM Technical Services, Inc.

A handwritten signature in blue ink, appearing to read "Eric Bartlein".

Eric Bartlein
Project Manager

Enclosure



CONSULTING SERVICES AGREEMENT

This Consulting Services Agreement ("Agreement") effective this _____, 2020, is by and between Racine Water Utility, a quasi-independent division of the City of Racine, and Wisconsin municipal corporation, ("Racine Water Utility"), and AECOM Technical Services, Inc., a California corporation, ("AECOM"); each also referred to individually as ("Party") and collectively as ("Parties").

In consideration of the mutual covenants and promises contained herein, the Parties agree as follows:

1. SCOPE OF SERVICES

1.1 AECOM shall perform the services set forth in **EXHIBIT A** ("Services"), incorporated herein by reference.

1.2 AECOM will provide the work products ("Deliverables") in accordance with the schedule ("Project Schedule"), if applicable, as set forth in **EXHIBIT A**.

2. **TERM OF AGREEMENT** Upon execution by the Parties, this Agreement shall have the effective date set forth above. This Agreement shall remain in force until all obligations related to the Services, other than those obligations which survive termination of this Agreement under Article 22, have been fulfilled, unless this Agreement is sooner terminated as set forth herein.

3. **COMPENSATION AND PAYMENT** AECOM shall be paid for the performance of the Services in accordance with **EXHIBIT B** ("Compensation and Payment"), incorporated herein by reference.

4. **NOTICE** All notices, requests, claims, demands and other official communications herein shall be in writing. Such notices shall be given (i) by delivery in person, (ii) by a nationally recognized commercial courier service; or (iii) by United States Postal Service, registered mail, postage prepaid and return receipt requested. Notices shall be effective upon actual delivery to the other Party at the following addresses:

TO RACINE WATER UTILITY:

City Hall Annex
800 Center Street, Room 227
Racine, WI 53403
Attn: Keith Haas

TO AECOM:

1555 N. RiverCenter Drive, Suite 214
Milwaukee, WI 53212
Attn: Eric Bartlein

Claims-related notices shall be copied to:
Chief Counsel, Americas Design and Consulting Services
515 South Flower Street, Suite 1050
Los Angeles, CA 90071

or to which address the receiving Party may from time to time give notice to the other Party. Rejection or other refusal to accept, or the inability to deliver because of changed address for which no notice was given, shall be deemed to be receipt of the notice as of the date of such rejection, refusal to accept, or inability to deliver.



5. AECOM'S RESPONSIBILITIES

AECOM shall perform the Services in accordance with the degree of professional skill, quality and care ordinarily exercised by members of the same profession currently practicing in the same location under comparable circumstances and as expeditiously as is consistent with professional skill and the orderly progress of the Project. The full extent of AECOM's responsibility with respect to the Services shall be to perform in accordance with the above standards and to remedy any material deficiencies or defects in the Deliverables at AECOM's own expense, provided that AECOM is notified by Racine Water Utility, in writing, of any such deficiency or defect within a reasonable period after discovery thereof, but in no event later than two years after AECOM's completion or termination of the Services. AECOM MAKES NO OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFORMATIONAL CONTENT OR OTHERWISE.

5.2 AECOM will endeavor in good faith, as needed, to obtain from the appropriate authorities their interpretation of applicable codes and standards and will apply its professional judgment in interpreting the codes and standards as they apply to the Project at the time of performance of the Services. Notwithstanding the above, the Parties agree that, as the Project progresses, such codes or standards may change or the applicability of such codes or standards may vary from AECOM's original interpretation through no fault of AECOM and that additional costs necessary to conform to such changes or interpretations during or after execution of the Services will be subject to an equitable adjustment in the Compensation and Project Schedule. AECOM shall not be entitled to such additional costs unless AECOM provides reasonable notice to Racine Water Utility prior to the execution of services deemed by AECOM to be subject to such equitable adjustment in the Compensation and Project Schedule.

5.3 AECOM shall be responsible for its performance and that of all AECOM's lower-tier subcontractors and vendors. However, AECOM shall not be responsible for health or safety programs or precautions related to Racine Water Utility's activities or operations or those of Racine Water Utility's other contractors and consultants or their respective subcontractors and vendors ("Contractors"). AECOM shall have no responsibility for (i) construction means, methods, techniques, sequences or procedures; (ii) for the direction of Contractors' personnel; (iii) selection of construction equipment; (iv) coordination of Contractors' work; (v) for placing into operation any plant or equipment; or (vi) for Contractors' failure to perform the work in accordance with any applicable construction contract. AECOM shall not be responsible for Racine Water Utility's pre-existing site conditions or the aggravation of those preexisting site conditions to the extent not caused by the negligence or willful misconduct of AECOM. AECOM shall not be responsible for inspecting, observing, reporting or correcting health or safety conditions or deficiencies of Racine Water Utility, Contractors or others at the project site ("Project Site") other than AECOM's employees, subcontractors, subconsultants and vendors. So as not to discourage AECOM from voluntarily addressing health or safety issues while at the Project Site, in the event AECOM does identify such issues by making observations, reports, suggestions or otherwise, AECOM shall have no authority to direct the actions of others not under AECOM's responsibility and control and shall have no liability, responsibility, or affirmative duty arising on account of AECOM's actions or forbearance.

5.4 Notwithstanding anything contained in this Agreement, AECOM shall have no responsibility for the discovery, presence, handling, removal, transportation, storage or disposal of, or exposure of persons to hazardous materials in any form related to the Project.

6. RACINE WATER UTILITY'S RESPONSIBILITIES

6.1 Racine Water Utility shall provide in writing any specific Racine Water Utility requirements or criteria for the Project.

6.2 Racine Water Utility shall furnish to AECOM all information and technical data in Racine Water Utility's possession or control reasonably required for the proper performance of the Services. AECOM shall be entitled to reasonably rely without independent verification upon the information and data provided by Racine Water Utility or obtained from generally accepted sources within the industry, except to the extent such verification by AECOM is expressly required as a defined part of the Services.



6.3 Racine Water Utility shall arrange for access and make all provisions necessary for AECOM to enter upon public and/or private property as required for AECOM to properly perform the Services. Racine Water Utility shall disclose to AECOM any known or suspected hazards at the Project Site which may pose a threat to human health, property or the environment.

6.4 If any document or inquiry requires Racine Water Utility to approve, comment, or to provide any decision or direction with regard to the Services, such approval, comment, decision or direction shall be provided within a reasonable time within the context of the Project Schedule, or if not identified in the Project Schedule, within a reasonable time to facilitate the timely performance of the Services.

7. INDEPENDENT CONTRACTOR Nothing contained in this Agreement shall be construed to create a partnership, joint venture, or create a relationship of employer/employee or principal/agent between Racine Water Utility or Racine Water Utility's Contractors and AECOM or any of AECOM's employees, subcontractors, subconsultants and vendors.

8. CONFIDENTIALITY

8.1 AECOM shall treat as confidential information and data delivered to it by Racine Water Utility or developed in the performance of the Services that are specified in writing by Racine Water Utility to be confidential ("Confidential Information"). Confidential Information shall not be reproduced, transmitted, disclosed or used by AECOM without the consent of Racine Water Utility, except in the proper performance of the Services.

8.2 Notwithstanding the above, these restrictions shall not apply to Confidential Information which (i) is already known to AECOM at the time of its disclosure; (ii) becomes publicly known through no wrongful act or omission of AECOM; (iii) is communicated to a third party with the express written consent of Racine Water Utility and not subject to restrictions on further use or disclosure; (iv) is independently developed by AECOM; or, (v) to the extent such Confidential Information is required by Law to be disclosed to any governmental agency or authority; provided that before making such disclosure, AECOM shall promptly provide Racine Water Utility with written notice of such requirement and a reasonable opportunity for Racine Water Utility to object to the disclosure or to take action that Racine Water Utility deems appropriate to maintain the confidentiality of the Confidential Information.

8.3 Upon termination of this Agreement or upon Racine Water Utility's written request, AECOM shall return the Confidential Information to Racine Water Utility or destroy the Confidential Information in AECOM's possession or control. Notwithstanding the above, AECOM shall be entitled to retain a copy of such Confidential Information relating to the Services or this Agreement for its archives, subject to AECOM's continued compliance with this Article 8.

8.4. Notwithstanding anything else contained herein, the Parties acknowledge the applicability of the Wisconsin Public Records Law to all records, as defined by that law, held or maintained in AECOM's possession and control on behalf of Racine Water Utility.

9. DATA RIGHTS

9.1 All Deliverables set forth in **Exhibit A** shall become the property of Racine Water Utility upon proper payment for the Services. AECOM shall bear no liability or responsibility for Deliverables that have been modified post-delivery or used for a purpose other than that for which it was prepared under this Agreement.

9.2 Notwithstanding Section 9.1 above, AECOM's proprietary information, including without limitation, work papers, drawings, specifications, processes, procedures, software, interim or draft documents, methodologies, know-how, software and other instruments of service belonging to or licensed by AECOM and used to develop the Work Product ("AECOM Data"), shall remain the sole property of AECOM. To the extent the Deliverables contain or require the use of AECOM Data, AECOM hereby grants to Racine Water Utility, upon proper payment for the Services, a non-exclusive, non-transferable and royalty-free license to use such AECOM Data solely for the purposes for which the Deliverables were developed.



9.3 Nothing in this Article shall be construed to prohibit AECOM from using skills, knowledge or experience gained by AECOM in the performance of the Services for other purposes, provided that AECOM does not use Racine Water Utility's Confidential Information.

10. COMPLIANCE The Parties shall comply with applicable treaties, compacts, statutes, ordinances, codes, regulations, consent decrees, orders, judgments, rules, and other requirements of governmental or judicial entities that have jurisdiction over the Services ("Law").

11. FORCE MAJEURE Neither Party shall be responsible for a delay in its respective performance under this Agreement, other than a delay in payment for Services already performed, if such delay is caused by extraordinary weather conditions or other natural catastrophes, war, terrorist attacks, sabotage, computer viruses, riots, strikes, lockouts or other industrial disturbances, acts of governmental agencies or authorities, discovery of Hazardous Materials or differing and unforeseeable site conditions, or other events beyond the reasonable control of the claiming Party. AECOM shall be entitled to an equitable adjustment to the Project Schedule in the foregoing circumstances. Racine Water Utility shall be entitled to an equitable adjustment to the Compensation Schedule in the foregoing circumstances.

12. INSURANCE

12.1 AECOM shall not commence work on contract until proof of insurance required has been provided to the applicable department before the contract or purchase order is considered for approval by the Racine Water Utility.

12.2 It is hereby agreed and understood that the insurance required hereunder by the Racine Water Utility is primary coverage and that any insurance or self-insurance maintained by the City of Racine, the Racine Water Utility, their elected and appointed officials, officers, employees, or authorized representatives or volunteers, and each of them, will not contribute to a loss. All insurance shall be in full force prior to commencing work and remain in force until the entire job is completed and the length of time that is specified, if any, as listed below, whichever is longer.

12.3 AECOM will maintain the following insurance coverages and amounts:

12.3.1 PROFESSIONAL LIABILITY

A. Limits

- (1) \$1,000,000 each claim
- (2) \$1,000,000 annual aggregate

B. Must continue coverage for 2 years after final acceptance for service/job.

12.3.2 GENERAL LIABILITY COVERAGE

A. Commercial General Liability

- (1) \$1,000,000 each occurrence limit
- (2) \$1,000,000 personal liability and advertising injury
- (3) \$2,000,000 general aggregate
- (4) \$2,000,000 products - completed operations aggregate

B. Claims made form of coverage is not acceptable.

C. Insurance must include:

- (1) Premises and Operations Liability
- (2) Contractual Liability
- (3) Personal Injury



- (4) Explosion, collapse and underground coverage
- (5) Products/Completed Operations must be carried for two years after acceptance of completed work
- (6) The general aggregate must apply separately to this project/location

12.3.3 BUSINESS AUTOMOBILE COVERAGE

- A. \$1,000,000 combined single limit for Bodily Injury and Property Damage each accident
- B. Must cover liability for Symbol #1 - "Any Auto" - including Owned, Non-Owned, and Hired Automobile Liability.

12.3.4 WORKERS COMPENSATION AND EMPLOYERS LIABILITY – As required by Wisconsin State Statute or any Workers Compensation Statutes of a different state for work performed in such state.

- A. Must carry coverage for Statutory Workers Compensation and an Employers Liability limit of:

- (1) \$100,000 Each Accident
- (2) \$500,000 Disease Policy Limit
- (3) \$100,000 Disease - Each Employee

12.3.5 UMBRELLA LIABILITY – If exposure exists, provide coverage at least as broad as the underlying Commercial General Liability, Automobile Liability and Employers Liability, with a minimum limit of \$2,000,000 each occurrence and \$2,000,000 aggregate, and a maximum self-insured retention of \$10,000.

12.3.6 ADDITIONAL PROVISIONS

- A. Primary and Non-contributory requirement - all insurance must be primary and noncontributory to any insurance or self-insurance carried by City of Racine and/or the Racine Water Utility.
- B. Acceptability of Insurers - Insurance is to be placed with insurers that have an A. M. *Best* rating of no less than A- and a Financial Size Category of no less than Class VII, and who are authorized as an admitted insurance company in the State of Wisconsin.
- C. Additional Insured Requirements - The following must be named as additional insureds on the General Liability and Business Automobile liability coverage arising out of project work:

The City of Racine, the Racine Water Utility, their elected and appointed officials, officers, employees, authorized representatives, and volunteers.

On the Commercial General liability Policy, the additional insured coverage must be ISO form CG 20 10 0704 and also include Products - Completed Operations additional insured coverage per ISO form CG 20 37 07 04 or their equivalents for a minimum of two years after acceptance of work. This does not apply to Workers Compensation Policies.

- D. Deductibles and Self-Insured Retentions - Any deductible or self-insured retention must be declared to the Racine Water Utility.

E. Evidences of Insurance - Prior to execution of the agreement, the Contractor shall file with the Racine Water Utility a certificate of insurance (Accord Form 25-S or equivalent) signed by the insurer's representative evidencing the coverage required by this agreement.



In addition form CG 20 10 07 04 for ongoing work exposure and form CG 20 37 07 04 for products-completed operations exposure must also be provided or their equivalent.

13. INDEMNITY

13.1 To the fullest extent allowable by law, AECOM hereby indemnifies and shall defend and hold harmless the City of Racine and the Racine Water Utility, their elected and appointed officials, officers, employees or authorized representatives or volunteers and each of them from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, reasonable attorneys' fees, costs, and expenses whether arising before, during, or after completion of the work hereunder and to the extent caused, occasioned, or contributed to or claimed to be caused, occasioned, or contributed to, by reason of any negligent act, error, or omission, whether active or passive, of AECOM or of anyone acting under its direction or control or on its behalf in connection with or incident to the performance of this Agreement. AECOM's aforesaid indemnity and hold harmless agreement shall not be applicable to any liability to the extent caused by the negligence or willful misconduct of the City of Racine, the Racine Water Utility, or their elected and appointed officials, officers, employees or authorized representatives or volunteers. This indemnity provision shall survive the termination or expiration of this Agreement.

In any and all claims against the City of Racine, the Racine Water Utility, their elected and appointed officials, officers, employees or authorized representatives or volunteers by an employee of AECOM, any subcontractor, or anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for AECOM or any of AECOM's employees, subcontractors, subconsultants and vendors under Worker's Compensation Acts, Disability Benefit Acts, or other employee benefit acts.

No provision of this Indemnification clause shall give rise to any duties not otherwise provided for by this Agreement or by operation of law. No provision of this Indemnity clause shall be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity that would otherwise exist as to the City of Racine, their elected and appointed officials, officers, employees or authorized representatives or volunteers under this or any other contract. This clause is to be read in conjunction with all other indemnity provisions contained in this Agreement. Any conflict or ambiguity arising between any indemnity provisions in this Agreement shall be construed in favor of indemnified parties except when such interpretation would violate the laws of the state in which the job site is located. Notwithstanding anything else contained in this agreement, AECOM shall reimburse the City of Racine, the Racine Water Utility, their elected and appointed officials, officers, employees or authorized representatives or volunteers for any and all reasonable legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided. AECOM's obligation to indemnify shall not be restricted to insurance proceeds, if any, received by the City of Racine, the Racine Water Utility, their elected and appointed officials, officers, employees or authorized representatives or volunteers.

13.2 If the Services include AECOM's performance during the construction phase of the Project, Racine Water Utility shall require Racine Water Utility's Contractors working on the Project Site to include AECOM, its directors, officers and employees in any indemnity that the Racine Water Utility requires such Contractors to provide to the Racine Water Utility.

14. CONSEQUENTIAL DAMAGES WAIVER IN NO EVENT SHALL EITHER PARTY, THEIR PARENTS, AFFILIATES AND SUBSIDIARIES OR THEIR RESPECTIVE DIRECTORS OFFICERS OR EMPLOYEES BE LIABLE TO THE OTHER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, LOST PROFITS, LOSS OF REVENUE, LOSS OF USE OR INTERRUPTION OF BUSINESS) ARISING OUT OF OR RELATED TO THIS AGREEMENT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

15. RISK ALLOCATION AND RESTRICTION OF REMEDIES THE PARTIES HAVE EVALUATED THE RESPECTIVE RISKS AND REMEDIES UNDER THIS AGREEMENT AND AGREE TO ALLOCATE THE RISKS AND RESTRICT THE REMEDIES TO REFLECT THAT EVALUATION. RACINE WATER UTILITY



AGREES TO RESTRICT ITS REMEDIES UNDER THIS AGREEMENT AGAINST AECOM, ITS PARENTS, AFFILIATES AND SUBSIDIARIES, AND THEIR RESPECTIVE DIRECTORS, OFFICERS, SHAREHOLDERS AND EMPLOYEES, ("AECOM COVERED PARTIES"), SO THAT THE TOTAL AGGREGATE LIABILITY OF THE AECOM COVERED PARTIES SHALL NOT EXCEED THE ACTUAL PAID COMPENSATION FOR THE SERVICES. THIS RESTRICTION OF REMEDIES SHALL APPLY TO ALL SUITS, CLAIMS, ACTIONS, LOSSES, COSTS (INCLUDING ATTORNEY FEES) AND DAMAGES OF ANY NATURE ARISING FROM OR RELATED TO THIS AGREEMENT WITHOUT REGARD TO THE LEGAL THEORY UNDER WHICH SUCH LIABILITY IS IMPOSED. CLAIMS MUST BE BROUGHT WITHIN TWO CALENDAR YEARS FROM PERFORMANCE OF THE SERVICES UNLESS A LONGER PERIOD IS REQUIRED BY LAW.

16. DISPUTES RESOLUTION

16.1 Either Party may initiate a dispute resolution by providing written notice to the other Party setting forth the subject of the claim, dispute or controversy ("Claim") and the requested relief. The recipient of such notice shall respond within 30 business days with a written statement of its position and a recommended solution to the Claim.

16.2 If the Parties cannot resolve the dispute through negotiation, either Party may refer the Claim to a panel ("Panel") consisting of a designated senior representative from each Party ("Representative"), who shall have the authority to resolve such Claim. The Representatives shall not have been directly involved in the Services and shall negotiate in good faith. No written or verbal representation made by either Party in the course of any Panel proceeding or other settlement negotiations shall be deemed to be a party admission. The Parties acknowledge that any resolution hereunder shall require the ratification of the Racine Water Commission. If the representatives are unable to resolve the dispute within 90 days, either Party may pursue its respective legal and equitable remedies.

17. GOVERNING LAW This Agreement shall be governed by and interpreted under the laws of the State of Wisconsin, excluding the conflict of law provisions.

18. TERMINATION

18.1 This Agreement may be terminated for convenience by either Party upon 30 days advance written notice. On termination, AECOM will be paid for all Services performed up through the termination date.

18.2 This Agreement may be terminated for cause by either Party if the other Party materially fails to perform its obligations under this Agreement, does not commence correction of such non-performance within 10 business days of receipt of written notice and/or fails to diligently complete such correction thereafter. The respective rights and obligations of the Parties predating such termination shall survive termination of this Agreement.

19. ASSIGNMENT

19.1 Neither Party may assign this Agreement without the written consent of the other Party.

19.2 Notwithstanding Section 19.1 above, the Parties recognize that AECOM has affiliated companies who have specialized expertise, necessary certifications/registrations or other capabilities that may make use of such affiliates more suitable for the performance of all or part of the Services. AECOM shall be entitled without additional consent to assign this Agreement or performance of the Services, in whole or in part, to any of AECOM's subsidiaries or affiliates upon written notice to Racine Water Utility; provided, however, that AECOM shall remain liable for the performance, obligations and responsibilities of such Affiliates under this Agreement.

20. PARTIES IN INTEREST Nothing in this Agreement, expressed or implied, is intended to confer on any person or entity other than the Parties any right or remedy under or by reason of this Agreement. The provisions of this Agreement shall bind and inure solely to the benefit of the Parties and their respective



successors and permitted assigns. The Parties acknowledge that the City of Racine is a party by virtue of it being the Racine Water Utility's parent organization.

21. WAIVER Either Party may in writing waive any provisions of this Agreement to the extent such provision is for the benefit of the waiving Party. No waiver by any Party of a breach of any provision of this Agreement shall be construed to be a waiver of any subsequent or different breach.

22. SEVERABILITY AND SURVIVAL The invalidity or unenforceability of any particular provision of this Agreement shall not affect the other provisions, and this Agreement shall be construed in all respects as if any invalid or unenforceable provision were omitted. Articles 4 (Notice), 5 (AECOM's Responsibilities), 6.2 (Reliance on Data), 8 (Confidentiality), 9 (Data Rights), 12 (Insurance), 13 (Indemnity), 14 (Consequential Damages Waiver), 15 (Risk Allocation), 16 (Disputes Resolution), 17 (Governing Law), 19 (Assignment), 20 (Parties in Interest) or 22 (Survival) shall survive termination of this Agreement.

23. PREPARATION OF AGREEMENT Each Party has had the opportunity to avail itself of legal advice and counsel. Neither Party shall be deemed to be the drafter or author of this Agreement. In the event this Agreement is subject to interpretation or construction by a court of law or panel of arbitration, such court or panel shall not construe this Agreement, or any portion hereof, against either Party as the drafter of this Agreement.

24. SIGNATURES Each person executing this Agreement warrants that he/she has the necessary authority to do so on behalf of the respective Party. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute a single agreement. Signatures sent by telefax or email shall be deemed to have the same effect as original signatures.

25. ORDER OF PRECEDENCE

EXHIBIT C	Change Orders
Consulting Services Agreement	Article 26
Consulting Services Agreement	Articles 1 through 25 and 27
EXHIBIT B	Compensation and Payment
EXHIBIT A	Services
Other contract documents	

26. SPECIAL TERMS AND CONDITIONS.



27. **ENTIRE AGREEMENT** This Agreement contains all of the promises, representations and understandings of the Parties and supersedes any previous understandings, commitments, proposals or agreements, whether oral or written. This Agreement shall not be altered, changed, or amended except as set forth in a written amendment to this Agreement, duly executed by both Parties. The attached **EXHIBIT C** ("Change Order"), incorporated herein by reference, is the preferred form for such use.

AECOM Technical Services, Inc.:

RACINE WATER UTILITY:



Signature

Signature

Thomas J. Holtan, PE

Printed Name

Printed Name

Associate Vice President

Printed Title

Printed Title

Address
1555 N. RiverCenter Drive, Suite 214
Milwaukee, WI 53212

Address
City Hall Annex
800 Center Street, Room 227
Racine, WI 53403

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EXHIBIT A

SERVICES

BACKGROUND SUMMARY

AECOM is pleased to submit this proposal to conduct a Leak Detection Survey on approximately 241 miles of water main on the Racine Water Utility distribution system in 2020. This work is a critical part of actively reducing the non-revenue water. This work is an important part of the water management best practice procedures as expected by the Public Service Commission. Our extensive experience and understanding of the importance of this work allows AECOM to provide the service in a cost effective and efficient manner.

The proposed services represent the first half of investigation of leak detection activities to be completed on the Racine Water Utility Water Supply system. The 2020 scope of work area is generally bounded by everything east of Hwy 31 and north of 21st Street (Caron Butler Drive). The 2020 survey will not include the watermain on HWY 31 but will include the watermain on 21st Street. The second half of this investigation is anticipated for completion in 2021. The purpose of the annual surveys is to identify specific points of leakage such that system rehabilitation can be undertaken, and lost water reduced.

SCOPE OF SERVICES

Services to be provided are as follows:

- Review existing water distribution systems maps (GIS mapping) and the schedule for conducting the leak detection field services.
- Conduct a leak detection and location survey with sonic detection and computer correlation equipment on approximately 241 miles (231.5 miles of metal water main and 9.5 of plastic watermain) of the water distribution system. Physical contact will be made with the system at exposed valves and fire hydrants on metal watermain. On plastic watermain, physical contact will also be made at exposed curb-stops. After the initial sonic leak survey of a portion of the system is completed, indications of leaks will be verified a second time, after which leaks will be located with a computer programmed leak correlator designed to identify leak locations without drill holes or excavations. All equipment used will be non-intrusive. Valves and hydrants will not normally require operation during the survey and locating operations. This survey will be conducted primarily during normal working hours, with additional leak detection being conducted during late evening and/or early morning hours in areas of high traffic volume areas.
- Prepare an inventory of defective system components such as valves, hydrants, meters and curb-stops, which are noted in the course of carrying out field activities.
- AECOM will furnish a fully equipped vehicle, including all sonic leak detection equipment, tools and safety equipment for the duration of the project. Our Fluid Conservation System computer leak correlators will be utilized to locate leaks.
- Prepare a final report and submit three (3) copies of the report showing the results of the investigations. The report shall include a summary of the project and a list of leakage located by type, location, and estimated quantity of leakage. The final report will contain recommendations for future work based on the results of this survey.

ASSUMPTIONS

1. Services will be provided at the direction of the Racine Water Utility.
2. Communication with other communities or other firms will be coordinated with the Racine Water Utility.



SCHEDULE

Services are anticipated to be started by late March 2020. Actual completion time will be dependent on weather conditions encountered during operations.

Field Investigations	12 to 16 weeks
Final Report	3 to 4 weeks after field work

(End of page)



EXHIBIT B

COMPENSATION AND PAYMENT

1 COMPENSATION The Services set forth in **EXHIBIT A** will be compensated on the following basis:

Advance retainer of [\$ NA] The advance retainer is to be applied to the final invoice. Any remainder will be returned to Racine Water Utility within 30 days of receipt of final payment.

Time & Material – Based on AECOM’s standard rates at the time the services are performed.

Time and Materials with a ceiling amount of (\$50,000.00). Should that amount be reached, AECOM will stop services and request additional funding.

Lump Sum [\$]:

Milestone/Deliverable & Date	Payment Amount
Completion of the field work and submittal of the project report.	\$ 68,400.00

Cost Plus Fixed Fee: [Cost \$ and Fee \$]

Other:

2. RATE SCHEDULE Compensation shall be based on standard rates at the time services are performed.

2.1 HOURLY LABOR RATE SCHEDULE

“INTENTIONALLY OMITTED”	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$
	\$

2.2 OTHER HOURLY LABOR RATE CATAGORIES If additional labor categories are authorized during the performance of this Agreement, compensation for each additional category will be negotiated at the time the additional Services are authorized.

2.3 ANNUAL HOURLY LABOR RATE ADJUSTMENTS The Hourly Labor Rate Schedule is adjusted each calendar year to reflect updated labor cost categories. Labor cost of Services authorized in subsequent calendar years will be based on the applicable Hourly Labor Rate Schedule for those years.



- 3. REIMBURSEABLE EXPENSES** Reimbursable expenses are expenditures made by AECOM for goods, travel expenses and vendor services in support of the performance of the Services. Such expenditures will be billed at the actual cost to AECOM plus ten percent (10%) to cover related administrative costs.
- 4. CHANGE ORDERS** The Parties may at any time and by written agreement make changes in the Services, Project Schedule, Deliverables, Compensation or other terms and conditions in this Agreement. The Parties shall effect such change through the use of a written Change Order. **EXHIBIT C** is the preferred form for such use.
- 5. INVOICING** AECOM will invoice Racine Water Utility on a monthly basis unless otherwise set forth herein. If Racine Water Utility disagrees with any portion of an invoice, it shall notify AECOM in writing of the amount in dispute and the specific reason for Racine Water Utility's objection within 10 days of receipt of invoice. Racine Water Utility shall pay the undisputed portion of the invoice as set forth below. Documentation supporting the invoice will be made available upon request.

6 PAYMENT

6.1 If payment is based on Time and Materials with a NTE, once AECOM reaches the NTE, AECOM will stop further Services pending a Change Order to adjust the budget and schedule for the continued performance of the Services.

6.2 Timely payment is a material term of this Agreement. Racine Water Utility shall pay all undisputed portions of AECOM's invoices within 30 days of receipt without holdback or retention. Amounts remaining unpaid 30 days after the invoice date shall bear interest at the rate of 1.5% per month on the unpaid balance and AECOM may suspend the Services pending receipt of such payment. In addition, AECOM retains its unrestricted rights under Article 18 (Termination) of the Agreement.

6.3 If the Project is suspended by Racine Water Utility for more than 30 days, AECOM shall be paid for all Services performed prior to the effective date of suspension within 30 days of such suspension. Upon resumption of the Project, AECOM shall be entitled to an equitable adjustment in cost and schedule to compensate AECOM for expenses incurred as a result of the interruption and resumption of the Services.

6.4 To the extent that completion of the Services is delayed beyond the original scheduled completion date and such delay is not the fault of AECOM, an equitable adjustment shall be made to AECOM's Compensation and Project Schedule.

6.5 Except as otherwise specifically provided herein, Racine Water Utility shall pay or reimburse AECOM, as appropriate, for all categories of taxes other than income tax, including without limitation, sales, consumer, use, value added, gross receipts, privilege, and local license taxes related to the Services.

6.6 Racine Water Utility shall make payments to AECOM using one of the following methods:

6.6.1 AECOM LOCKBOX:

AECOM Technical Services, Inc.
1178 Paysphere Circle
Chicago, IL 60674

6.6.2 ELECTRONIC FUNDS TRANSFER/ACH PAYMENT:

Account Name: AECOM Technical Services, Inc.
Bank Name: Bank of America
Address1: Building D
Address2: 2000 Clayton Road
City/State/Zip: Concord, CA 94520-2425
Account Number: 5800937020
ABA Routing Number: 071000039



6.6.3 WIRE TRANSFER:

Account Name: AECOM Technical Services, Inc.
Bank Name: Bank of America
Address: 100 West 33rd St
City/State/Zip: New York, NY 10001
Account Number: 5800937020
ABA Routing Number: 026009593
SWIFT Code: BOFAUS3N

6.6.4 Questions related to payment can be sent to:

AECOM Cash Applications Supervisor by phone at (804) 515-8490 or by email at cashappsremittance@aecom.com

(End of page)



AECOM Project Name: _____
 AECOM Project No.: _____
 Change Order No.: _____

EXHIBIT C

CHANGE ORDER FORM

In accordance with the Consulting Services Agreement dated , 20__ between (“Racine Water Utility”), and AECOM Technical Services, Inc., a California corporation, (“AECOM”), this Change Order, with an effective date of _____, 20____ modifies that Agreement _____ as follows:

1. Changes to the Services:

2. Change to Deliverables:

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3. Change in Project Schedule (attach schedule if appropriate):

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4. Change in CONSULTANT’s Compensation:

The Services set forth in this Change Order will be compensated on the following basis:

No change to Compensation

Time & Material (See **Exhibit B** for the Hourly Labor Rate Schedule)

Time and Materials with a Not- to-Exceed amount of (\$ _____). The Hourly Labor Rate Schedule is set forth in **EXHIBIT B** (if applicable). Reimbursable expenses are included in the overall Not to Exceed cap.

Lump Sum [\$ _____]

Milestone/Deliverable & Date	Payment Amount
	\$ _____

Cost Plus Fixed Fee: [Cost \$ _____ and Fee \$ _____]

Therefore, the total authorized Compensation, inclusive of this Change Order is \$ _____.

5. Project Impact:

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6. Other Changes (including terms and conditions):

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- 7. All other terms and conditions of the Agreement remain unchanged.
- 8. Each Party represents that the person executing this Change Order has the necessary legal authority to do so on behalf of the respective Party.

AECOM Technical Services, Inc.:

RACINE WATER UTILITY:

Signature

Thomas Holtan

Printed Name

Printed Title

Address

Signature

Printed Name

Printed Title

Address

[End of Agreement]



Racine Water & Wastewater Utilities
 800 Center Street, Rm. 227
 Racine, WI 53403
 (262) 636-9181

WATER/SEWER BILL

ACCT. NO	INVOICE
10110520	1818692

AMOUNT DUE	DUE DATE
193.24	11/21/2019

Occupant
 1014 Grand Ave
 Racine, WI 53403-1835

BILLED TO	FOR SERVICE AT	BILL DATE
Occupant	1014 Grand Ave	11/01/2019

METER NUMBER	SERVICE FROM	SERVICE TO	PREVIOUS READING	PRESENT READING	USAGE - CCF	NO. DAYS
10356538	06/24/2019	09/25/2019	629	651	22	93

INFORMATION & MESSAGES

DETAIL	SUMMARY
Past Due Invoice Charges	0.00
Accumulated Late Charges	11.69
Water Usage	56.76
Water Service Charge	20.88
Sewer Usage	60.94
Sewer Service Charge	20.00
HHW Charge	1.10
Summer Sewer Credit	-19.39
Storm Water Charge	41.26
AMOUNT DUE	193.24

Return this portion with your check payable to **"Racine Water Utility"**

ACCT. NO	INVOICE
10110520	1818692

AMOUNT DUE	DUE DATE
193.24	11/21/2019

Racine Water & Wastewater
 P.O. Box 080948
 Racine, WI 53408-0948

1014 Grand Ave

Appendix C

For payment information visit:

www.cityofracine.org/water/paymentoptions

Payments can be made at any of the following locations:

Tri City National Banks

Water & Wastewater Utilities - 800 Center St. Room 227

Payments can be made by mail to:

Water & Wastewater Utilities

P.O. Box 080948

Racine, WI 53408-0948

Online Payment Options:

PSN

Pay by credit card, a 2.6% processing fee will be applied

Pay by checking or savings account, zero processing fees

Visit www.PaymentServiceNetwork.com/login.aspx?acc=RT24143

Or call 1-877-390-7368 for credit card payments only.

Official Payments

Pay by credit card only, a \$4.95 processing fee will be applied

Visit www.officialpayments.com or call 1-800-272-9829

Jurisdiction Code [5894](#)

Rates for General Sewer Service 01/01/2019

\$2.77 per 100 cubic feet – City of Racine

\$2.76 per 100 cubic feet – Village of Elmwood

Quarterly service charge – \$20.00

Summer sewer rates are based on winter usage.

Quarterly Residential Hazardous Waste Charge – \$1.10

Rates for General Water Service 09/25/2017

Service Charge

5/8" meter	\$ 20.88	3" meter	\$ 123.00
3/4" meter	\$ 20.88	4" meter	\$ 186.00
1" meter	\$ 33.60	6" meter	\$ 324.00
1 1/4" meter	\$ 45.00	8" meter	\$ 489.00
1 1/2" meter	\$ 56.40	10" meter	\$ 708.00
2" meter	\$ 85.50	12" meter	\$ 927.00

Volume Charge

First 150 CCF per quarter = \$2.58 per 100 cubic feet

Next 1,850 CCF per quarter = \$2.19 per 100 cubic feet

Over 2,000 CCF per quarter = \$1.75 per 100 cubic feet

A 25% surcharge is added to water customers outside the corporate limits of the City of Racine.

For storm water utility information please call 262-636-9192

A \$30 charge will be made to a customer account when a check rendered for service is returned for any reason.

A late payment charge of 1% per month will be added to bills not paid by the due date.

Failure to receive bill does not exempt customer from late charge. This charge is applicable to all customers.

All water passing through meter will be charged, whether used, wasted, or lost by leakage.

Failure to make payment or allow access to meter may result in disconnection of service.

1 CCF (Hundred Cubic Feet) = 748 Gallons

Example: A usage of 10 CCF = 7,480 Gallons of water used.

Water Utility Website cityofracine.org/water.aspx

Emergency 24hr # (262) 636-9185

Wastewater Utility Website cityofracine.org/wastewater.aspx

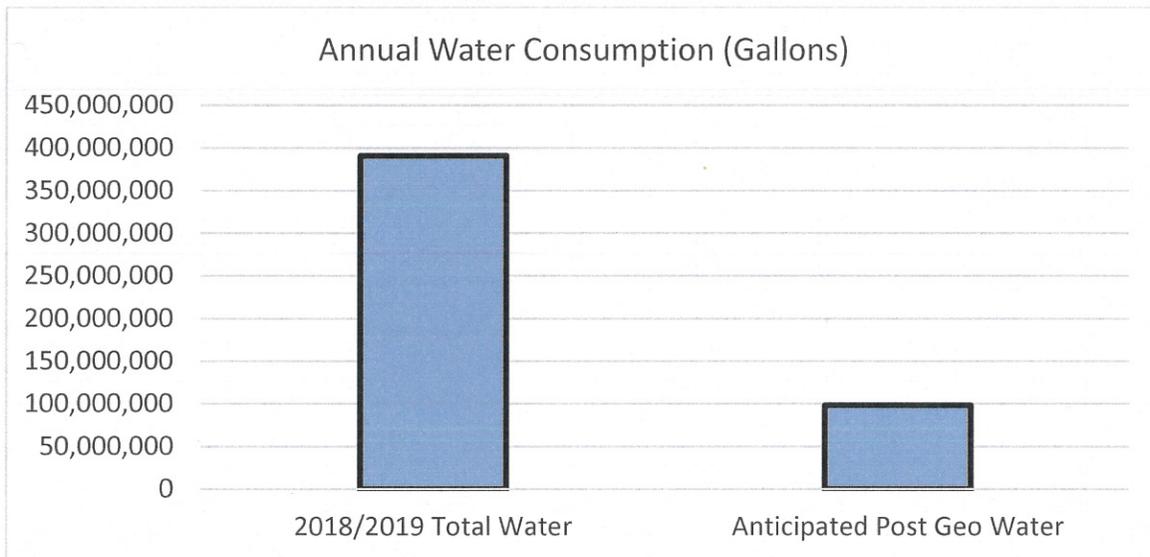
Emergency 24hr # (262) 636-9550

Howe Street Campus Consumption Only

(Excludes consumption from all other campuses)

2018/2019 Total Water*	Anticipated Post Geo Water	Campus Water Use Reduction
(Gallons)	(Gallons)	(%)
390,634,567	98,388,346	74.8%

*2018/2019 Total Water consumption is based on a rolling twelve months from March 2018 - February 2019.



- Decommissioning the existing chiller plant is driving the reduction in water usage. Once the new central plant comes online at the end of May 2020 we will be switching to using this plant to handle most of the Howe Street campus cooling loads.
- 2020's water consumption is heavily dependent on whether the new central plant comes online as anticipated in June 2020.