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September 24, 2007

Luly E. Massaro
Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

Re: PUC Docket No. 3832
Kent County Water Authority/
Providence Water Supply Board
Application to Change Rate Schedules

Dear Luly:

Enclosed herewith is spreadsheet related to derivation of water losses which was requested to be produced in connection with hearings on September 12, 2007 and September 13, 2007. If you have any questions, please contact me.

Very truly yours,

Joseph J. McGair, Esq.

LJP:dd
Enc.
Cc: Service List

SERVICE LIST - RIPUC DOCKET NO. 3832 **Updated: 9/4/07**
Providence Water Supply Board – Rate Filing

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September 24, 2007

Michael McElroy, Esq.
Schacht and McElroy
P.O. Box 6721
Providence, RI 02940-6721

Re: PUC Docket No. 3832
Kent County Water Authority/
Providence Water Supply Board
Application to Change Rate Schedules

Dear Mr. McElroy:

Enclosed herewith is spreadsheet related to derivation of water losses which was requested to be produced in connection with hearings on September 12, 2007 and September 13, 2007. Please note that the Providence Water Supply Board has yet to produce records requested in Kent County Water Authority Third Set of Data Requests 3-3(d) which Mr. Bebyn had testified on September 13, 2007 that he would look into producing as quickly as possible. Please forward the records requested in Kent County Water Authority Request 3-3(d) as soon as possible.

Very truly yours,

Joseph J. McGair, Esq.

LJP:dd
Enc.
Cc: Service List

PROVIDENCE WATER SUPPLY BOARD
Docket No. 3832
Data Requests of the Kent County Water Authority
Set 3

KCWA 3-3 Regarding the response to Div 3-4, is it correct that the past sales values are all based on revenue divided by the applicable rate? If so,

a. Is this true for all wholesale and retail sales or just some? If just some, which ones?

b. How were past sales calculated in years where there was a rate change?

c. Are the revenues used in these calculations actual receipts or amounts billed or committed?

d. Are actual metered sales volumes available for some or all of the customers and/or classes: If so, please provide.

Answer: a. This is true from FY 02 forward, for **retail** sales only. Wholesale are based on actual readings.

b. For retail sales a pro rata of the retail rate in effect at the time was calculated. For example, the July billed revenue was assumed to be consumed in April, May and June, etc. In the year when a rate increase was implemented on January 1, July through January billing was divided by the old rate, February was divided by a pro rata (2/3 old, 1/3 new) rate, March was divided by a pro rate (1/3 old, 2/3 new) rate and April through June was divided by the new rate.

c. The revenues used were amounts billed.

d. It is available and is being compiled into classes. It will be provided when available.

Prepared by: J. Bondarevskis, 7/20/07

AWWA Water Loss Control Committee (WLCC) Water Audit Software v2.0

PURPOSE: This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery

USE: The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons on the left below. Descriptions of each sheet are also given below.

THE FOLLOWING KEY APPLIES THROUGHOUT:

- Value must be entered by user
- Value may be entered by user
- Value calculated based on input data

Please begin by providing the following information, then proceed through each sheet in the workbook:

NAME OF CITY OR UTILITY: COUNTRY:

REPORTING YEAR: START DATE(MM/YYYY): END DATE(MM/YYYY):

NAME OF CONTACT PERSON: E-MAIL: TELEPHONE: Ext.

PLEASE SELECT PREFERED REPORTING UNITS FOR WATER VOLUME:

Click to advance to sheet…

Instructions	The current sheet
Reporting Worksheet	Enter the required data on this worksheet to calculate the water balance
Water Balance	The values entered in the Reporting Worksheet are used to populate the water balance
Definitions	Use this sheet to understand terms used in the audit process
Water Loss Standing	Use this sheet to help interpret the results of the performance indicators

AWWA WLCC Water Audit Software: Reporting Worksheet

Back to Instructions

Click to access definition

Water Audit Report for:

Reporting Year:

Please enter data in the white cells below. Where possible, metered values should be used; if metered values are unavailable please estimate a value. Indicate this by selecting a choice from the gray box to the left, where M = measured (or accurately known value) and E = estimated.

ALL VOLUMES TO BE ENTERED AS ANNUAL QUANTITIES

WATER SUPPLIED		Please choose reporting units from the instructions sheet
Volume from own sources:		
Master meter error adjustment:		
Water Imported:		
Water Exported:		
WATER SUPPLIED:	0.0	

AUTHORIZED CONSUMPTION	
Billed metered:	
Billed unmetered:	
Unbilled metered:	
Unbilled unmetered:	
AUTHORIZED CONSUMPTION:	0.0

WATER LOSSES (Water Supplied - Authorized Consumption)	0.0
Apparent Losses	
Unauthorized consumption:	
Customer metering inaccuracies:	
Data handling errors:	
Apparent Losses:	0.0
Real Losses	
Real Losses (Water Losses - Apparent Losses):	0.0
WATER LOSSES:	0.0

NON_REVENUE WATER	
NON-REVENUE WATER:	0.0

SYSTEM DATA		
Length of mains:		
Number of active AND inactive service connections:		
Connection density:		
Average length of private pipe:		(pipe length between curbstop and customer meter or property
Average operating pressure:		

COST DATA		
Total annual cost of operating water system:		$/Year
Customer retail unit cost (applied to apparent losses):		
Variable production cost (applied to real losses):		

DATA REVIEW - Please review the following information and make changes above if necessary:

- Input values should be indicated as either measured or estimated. You have entered:
  - **0 as measured values**
  - **0 as estimated values**
  - **18 without specifying measured or estimated**
- It is important to accurately measure the master meter - you have entered the measurement type as: unspecified
- Cost Data: None to evaluate

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume:	
Non-revenue water as percent by cost:	
Annual cost of Apparent losses:	
Annual cost of Real Losses:	

Operational Efficiency Indicators

Apparent losses per service connection per day:	
Real losses per service connection per day*:	
Real losses per length of main per day*:	
Real losses per service connection per day per meter (head) pressure:	
Unavoidable Annual Real Losses (UARL):	
Infrastructure Leakage Index (ILI) [Real Losses/UARL]:	

* only the most applicable of these two indicators will be calculated

AWWA WLCC Water Audit Software: Water Balance

Water Audit Report For:	Report Yr:

Own Sources (Adjusted for known errors) 0.0	Water Exported 0.0		Billed Water Exported		
	Water Supplied 0.0	Authorized Consumption 0.0	Billed Authorized Consumption 0.0	Billed Metered Consumption (inc. water exported) 0.0	Revenue Water 0.0
				Billed Unmetered Consumption 0.0	
			Unbilled Authorized Consumption 0.0	Unbilled Metered Consumption 0.0	Non-Revenue Water (NRW) 0.0
				Unbilled Unmetered Consumption 0.0	
		Water Losses 0.0	Apparent Losses 0.0	Unauthorized Consumption 0.0	
				Customer Metering Inaccuracies 0.0	
				Data Handling Errors 0.0	
Water Imported 0.0			Real Losses 0.0	Leakage on Transmission and/or Distribution Mains *Not broken down*	
				Leakage and Overflows at Utility's Storage Tanks *Not broken down*	
				Leakage on Service Connections *Not broken down*	

AWWA WLCC Water Audit Software: Definitions

Back to Instructions

Item Name		Description
Volume from Own Sources	Find	The volume of treated water input to system from own production facilities
Master meter error adjustment	Find	An estimate or measure of the degree of any inaccuracy that exists in the master meters measuring the Volume from Own Sources. Please also indicate if this adjustment is because the master meters under-registered (did not capture all the flow) or over-registered (overstated the actual flow)
Water Imported	Find	Bulk water purchased to become part of the water supplied. Typically this is water purchased from a neighboring water utility or regional water authority. Be sure to account for any import meter inaccuracy in reporting this volume
Water Exported	Find	Bulk water sold and conveyed out of the water distribution system. Typically this is water sold to a neighboring water utility. Be sure to account for any export meter inaccuracy in reporting this volume
Authorized Consumption		= billed metered + billed unmetered + unbilled metered + unbilled unmetered The volume of metered and/or unmetered water taken by registered customers, the water supplier and others who are implicitly or explicitly authorized to do so by the water supplier, for residential, commercial and industrial purposes. This does NOT include water sold to neighboring utilities (water exported). Authorized consumption may include items such as fire fighting and training, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, frost protection, building water, etc. These may be billed or unbilled, metered or unmetered.
Billed Authorized Consumption		All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.
Unbilled Authorized Consumption		All consumption that is unbilled, but still authorized by the utility. See "Authorized Consumption" for more information.
Billed Metered Consumption	Find	All metered consumption which is billed. This includes all groups of customers such as domestic, commercial, industrial or institutional. It does NOT include water sold to neighboring utilities (water exported) which is metered and billed.
Billed unmetered Consumption	Find	All billed consumption which is calculated based on estimates or norms but is not metered. This might be a very small component in fully metered systems (for example billing based on estimates for the period a customer meter is out of order) but can be the key consumption component in systems without universal metering. It does NOT include water sold to neighboring utilities (water exported) which is unmetered but billed.
Unbilled Metered Consumption	Find	Metered consumption which is for any reason unbilled. This might for example include metered consumption of the utility itself or water provided to institutions free of charge. It does NOT include water sold to neighboring utilities (water exported) which is metered but unbilled.
Unbilled Unmetered Consumption	Find	Any kind of Authorized Consumption which is neither billed nor metered. This component typically includes items such as fire fighting, flushing of mains and sewers, street cleaning, frost protection, etc. In a well run utility it is a small component which is very often substantially overestimated. It does NOT include water sold to neighboring utilities (water exported) which is unmetered and unbilled - an unlikely case.
Water Losses		= apparent losses + real losses The difference between System Input and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission or distribution systems, or individual zones. Water Losses consist of Real Losses and Apparent Losses.
Apparent Losses		= unauthorized consumption + meter under-registration + data handling errors Includes all types of inaccuracies associated with customer metering as well as data handling errors (meter reading and billing), plus unauthorized consumption (theft or illegal use). NOTE: Over-registration of customer meters, leads to under-estimation of *Real Losses*. Under-registration of customer meters, leads to over-estimation of *Real Losses*.
Unauthorized Consumption	Find	Includes water illegally withdrawn from hydrants, illegal connections, bypasses to consumption meter or meter/meter reading equipment tampering.
Customer Metering Inaccuracies	Find	Apparent water losses caused by customer meter inaccuracies.
Data Handling Errors	Find	Apparent water losses caused by data handling errors in the meter reading and billing system.

Real Losses		Physical water losses from the pressurized system and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.
Non-Revenue Water		= Apparent Losses + Real Losses + Unbilled Metered + Unbilled Unmetered Water which does not provide any revenue to the utility
Revenue Water		Water which is charged to customers to provide revenue to the utility.
Length of mains	Find	Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant).
Number of active AND inactive service connections	Find	Number of service connections, main to curb stop. Please note that this includes the actual number of distinct piping connections whether active or inactive. This may differ substantially from the number of Customers (or number of accounts)
Connection density		=number of connections / length of mains
Average length of private pipe	Find	This is the distance between the curbstop and the customer meter, or from the curbstop to the building line (first point of customer consumption) if customers are unmetered.
Average Operating Pressure	Find	The average pressure may be approximated when compiling the preliminary water audit. Once routine water auditing has been established, a more accurate assessment of average pressure should be pursued. If the water utility infrastructure is recorded in a Geographical Information System (GIS) the average pressure at many locations in the distribution system can be readily obtained. If a GIS does not exist, a weighted average of pressure data can be calculated from water pressure measured at various fire hydrants scattered across the water distribution system.
Total Annual Cost of Operating the Water System	Find	These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the system, such as repayment of captial bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. These costs should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.
Customer Retail Unit Cost	Find	The Customer Retail Unit Cost represents the charge that customers pay for water service. This unit cost is applied to the components of apparent loss, since these losses represent water reaching customers but not (fully) paid for. It is important to compile these costs per the same unit cost basis as the volume measure included in the water audit. For example, if all water volumes are measured in million gallons, then the unit cost should be dollars per million gallon ($/mil gal). The software allows the user to select the units that are charged to customers (either $/1,000 gallons, $/hundred cubic feet or $/1,000 liters) and automatically converts these units to the units that appear in the "WATER SUPPLIED" box. Since most water utilities have a rate structure that includes a variety of different costs based upon class of customer, a weighted average of individual costs and number of customer accounts in each class can be calculated to determine a single composite cost that should be entered into this cell.
Variable Production Cost (applied to Real Losses)	Find	The cost to produce and supply the next unit of water. (E.g., $/million gallons) This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It should also include the unit cost of bulk water purchased as an import if applicable.
Unavoidable Annual Real Losses (UARL)	Find	UARL (gallons/day) = (5.41Lm + 0.15Nc + 7.5Lp) xP, or UARL (litres/day) = (18.0Lm + 0.8Nc + 25.0Lp) xP where: Lm = length of mains, (miles or kilometers) Nc = number of service connections Lp = total length of private pipe, (miles or km) = Nc x average distance of private pipe The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). It is not necessary that water utilities set this level as the target level of leakage, unless water is unusually expensive, scarce or both. NOTE: The UARL calculation has not yet been fully proven as effective for very small water distribution systems. If, (Lm x 32) + Nc < 3000 (gallons per day) or (Lm x 20) + Nc < 3000 (liters per day) then the the calculated UARL value may not be valid. The software does not display a value of UARL or ILI if either of these conditions is true.
Infrastructure Leakage Index (ILI)	Find	The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). The ILI is a highly effective performance indicator for comparing (benchmarking) the performance of utiliites in operational management of real losses.

AWWA WLCC Water Audit Software: Determining Water Loss Standing?

Back to Instructions

Once data has been entered into the Reporting Worksheet, the performance indcators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI (without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and intregrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

AWWA Water Audit Software Version 2.0 Developed by the Water Loss Control Committee of the American Water Works Association October 2005

ACKNOWLEDGMENTS

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REFERENCES:

- *Alegre, H., Hirner, W., Baptista, J. and Parena, R. Performance Indicators for Water Supply Services. IWA Publishing 'Manual of Best Practice' Series, 2000. ISBN 1 900222 272*
- *Kunkel, G. et al, 2003. Water Loss Control Committee Report: Applying Worldwide Best Management Practices in Water Loss Control. Journal AWWA, 95:8:65*