



St. Johns River Water Management District Instructions for Completing Water Audit Form



INTRODUCTION

All consumptive use permit applicants requesting water for public supply type use must complete a water audit using the District's Water Audit Form pursuant to section 2.2.2.5.1.A.4 of the Applicant's Handbook: Consumptive Uses of Water. The purpose of this document is to supply instructions regarding completion of the water audit form. If the applicant has any questions regarding the water audit form, please contact the staff of the District's Division of Regulatory Services, located at the appropriate District Service Center.

Please note, the District will require submittal of documentation supporting the applicant's water audit form when necessary to complete the evaluation of the audit.

TASK 1: TREATMENT SYSTEM

Task 1 of the water audit is designed to identify water losses in the water treatment system. Systems not monitoring raw water production should not complete Task 1.

1A Raw Water Produced

Include the total volume of ground and/or surface water from withdrawal points owned and operated by the applicant that are used to supply the distribution system. This volume should be derived from meters located at each source prior to the water entering the treatment system.

1B Raw Water Purchased

Include the total volume of ground and/or surface water purchased from withdrawal points not owned or operated by the applicant that are used to supply or supplement the distribution system. This volume should be obtained from metered interconnections with other utilities or suppliers prior to the water entering the treatment system.

1C Finished Water Purchased

Include the total volume of purchased treated water that is used to supply or supplement the distribution system. This volume may be obtained from metered interconnections with other utilities or suppliers placed into the system prior to the plant master meter.

1D Total Water Produced and Purchased

Sum of the lines 1A through 1C.

1E Metered Uses in Treatment

This line is the metered water used during the treatment process. For example, metered uses in treatment may include water used in membrane treatment or equipment washdown.

1F *Unmetered but Known Uses in Treatment*

This line is unmetered, but monitored, water used during the treatment process. An example is water placed into tanker trucks.

1G *Total Water Used in Treatment*

Sum of lines 1E and 1F.

1H *Total Water Produced and Purchased for Distribution*

This line is the amount of water produced and purchased minus the amount of water used in treatment.

1I *Metered Finished Water Entering the Distribution System*

This line is the volume of treated water entering the distribution system. This amount is typically obtained from the water treatment plant master meter.

1J *Change in Reservoir and Tank Storage*

If source meters are located up-distribution of reservoirs, storage tanks, or underground storage facilities (ASR), then the stored water must be accounted for in the audit.

- If the reservoirs have more water at the end of the study period than at the beginning, then the increased storage was measured by source meters, but not delivered to customers. These increases in storage must be subtracted from the metered supply.
- If there is a net reduction in storage, the decreased amount of stored water must be added to the metered supply.

1K *Total Water Unaccounted for in the Treatment Process*

This line is the total amount of unaccounted for water lost during treatment. This value can be either positive or negative.

TASK 2: DISTRIBUTION SYSTEM – METERED USES

Task 2 is designed to account for water uses from the distribution system as determined by metered sales records.

2A *Small and Medium Meter Use (5/8 inch – 3 inches)*

Record monthly totals for entire study period for all meter sizes within the 5/8 – 3-inch range. Calculate total water sold for this size range of meters.

2B *Large Meter Use (greater than 3 inches)*

Record monthly totals for entire study period for all meter sizes greater than 3 inches. Calculate total water sold for this size range of meters.

2C Adjustments due to Meter Lag Time

Corrections should be made to metered water use data when the source-meter reading dates and the customer-meter reading dates do not coincide with the beginning and ending dates of the audit study period.

Example:

Adjusting for one meter route

A utility is studying one calendar year, 1/1 – 12/31
Source meters are read on the 1st day of each month
Customers' meters are read on the tenth day of each month
Calculate the amount of water supplied and consumed for the calendar year

Source Meters – no correction is made for source meters because their reading usually occurs on the days that the study period begins and ends. If the last reading (taken on 1/1) was a day late (end of audit period = 12/31), the water supplied for 1/1 should be subtracted from the total water used.

Customer Meters – since the readings do not coincide neatly with the study period, a correction must be made. To account for changes in the number of customers and in use patterns, water use for the first and last billing periods within the study period should be prorated.

2D Sum of Lines 2A-2C

Total of metered sales for audit period.

TASK 3: DISTRIBUTION SYSTEM – METERED USES NOT COVERED IN TASK 2 AND UNMETERED USES

Task 3 documents miscellaneous system uses not addressed in Task 2. Items 3A-3K list common miscellaneous uses found in a typical public supply system. Item 3K provides space for additional uses not listed. Items 3A-3K may represent a very small component in the overall water use or records documenting the use may not be available to estimate use. In these instances, including an estimate of use may not be useful and the negligible box should be checked.

It is recommended that all uses be metered to improve accountability even if the customer is not billed for the use.

If the water use in items 3A-3K represents a significant portion of the overall use and can be reasonably documented, provide an estimate and indicate how the estimate was determined. No method is more accurate than direct metering; however, the following are common procedures for estimating usage:

3A – 3J Miscellaneous Water Uses – Procedures for Estimating Usage

1. Batch Procedure

When water is transported in a tank truck or container of some sort, use the batch procedure.

Multiply the volume of the tank or other container by the number of times it is filled from the distribution system. This yields the volume of water delivered from the distribution system. For future estimating, it is essential that reporting forms and procedures are provided to known batch users (i.e. fire departments, construction or road crews, etc.).

Examples:

Fire Fighting and Training

To estimate this use, check fire department records on training, flushing, and fire suppression. Many fire departments use more water for training and hydrant flushing than for fighting fires. Fire departments should keep records of hydrant flushing (flow and duration), fire calls (duration of fire), and tanker fills. In preparation for future audits, all fire departments should be supplied with adequate water use recording forms and meters for hydrant flushing.

Street Cleaning

Water used to clean roadways, parking lots, boat ramps, bus stops and bike paths.

1. Determine the number of trucks or other equipment used daily and each vehicle's water holding capacity.
2. Calculate number of days used during study period.
3. Calculate number of times filled/day.
4. $\text{Volume/vehicle/year} = \text{Vehicle Capacity} \times \text{No. Refills/day} \times \text{No. days used.}$
5. Total the water use for each vehicle for the year.

2. Discharge Procedure

When water is applied directly from a pipe, as in a sprinkler system or line flushing, use the discharge procedure. This method might be used to estimate sewer or construction flushing.

Multiply the rate of water discharged (gpm) by the total time water flows (#minutes). This yields the volume of water delivered from the distribution system.

Caution – The discharge rate may vary and the application period may vary in length and frequency. Careful record keeping of each instance is necessary to obtain accurate estimates.

Examples:

Main Flushing

Water lost from the distribution system due to contaminant and debris cleaning, chlorine residual maintenance, storm drain flushing, etc.

To estimate the volume used for each location flushed, multiply the flow rate by the discharge duration.

In preparation for future audits, all personnel in charge of main flushing should be equipped with water use recording forms.

Irrigation

Use of the discharge method

Discharge rate to each irrigated area x Total time water applied to area (i.e. 20,000 gpd x 100 days/yr = 2.0 mgy)

3. Comparison Procedure

If metered similar facilities such as schools, construction sites, golf courses, parks, pools etc. exist, then estimates can be made for unmetered similar sites. The sites must be alike in size, number of students, irrigated acreage, irrigation methodologies and most other details. Any differences must be accounted for.

Examples:

Irrigation

Use of the comparison method

Site A is a 20-acre sports complex irrigating 15 acres of turf and 5 acres of landscape. Site B is a city park irrigating 5 acres of turf. Site A is metered and using 18 mgy. By comparison, site B should use about ¼ the amount as site A or an estimated 4.5 mgy.

Construction Sites

Water delivered, primarily through hydrants, to trucks for controlling road dust, site preparation, landscaping, temporary domestic use, and materials processing.

Use the comparison procedure. Estimate use by taking data from similar metered construction sites. It is recommended that all contractors be required to use a portable meter in the future.

3L Sums up the miscellaneous uses

This is the sum of all the miscellaneous uses.

TASK 4: SUMMARY OF WATER USE

Task 4 summarizes the utility's water use and losses associated with both the treatment and distribution systems.

4A Total Water from Distribution System

This is a summary of all water uses within the distribution system.

4B Total Finished Water Pumped into the Distribution System

Water pumped into the distribution system as recorded by the plant master meter.

4C Finished Water Purchased after water treatment plant master meter

This is the total volume of purchased treated water that enters the distribution system after the plant master meter. This volume may be obtained from metered interconnections with other utilities or suppliers and is not previously accounted for in Tasks 1, 2, and 3.

4D Sum of Finished Water going into the Distribution System

This is the sum of all water placed into the distribution system.

4E Total Unaccounted for Water Loss from Distribution System

This represents the amount of water that is not accounted for in distribution.

4F Total Unaccounted for Water from Treatment and Distribution Systems

Represents the total difference between what was pumped and what was distributed to customers.

4G Percentage Total Unaccounted for Water From Treatment and Distribution Systems

Shows line 4F as percentage of the total water produced and purchased.

TASK 5: METER SURVEY

A correction to account for meter error is required if the initial unaccounted for water result (in line 4F) is 10% or greater (see attached water audit form). The applicant must perform a meter survey and use the information to correct the amounts listed in Task 2. The purpose of this survey is to determine a potential correction factor for metered water use by testing a representative sampling of meters of various ages. The survey also helps to determine the appropriateness for a meter change-out program. The permit applicant is required to randomly test 5% or 100 meters whichever is less. The sampling must be a selection of meters representing an even distribution of type and age or cumulative lifetime flow. This requirement may be replaced by a documented meter change-out program that can provide an estimate of the overall meter accuracy. This survey will likely be less productive if greater than 80% of the small/medium meters are less than 5 years in age.

TASK 6: LEAK DETECTION EVALUATION

If the total unaccounted for loss of the system from line 4F is greater than 10%, the applicant is required to evaluate the feasibility of performing a leak detection survey by completing the leak detection evaluation found on the water audit form. The applicant has the option to perform the leak detection immediately or to propose a one-year program to improve water use accountability to below 10%. The applicant must implement the leak detection program where feasible.

For the purpose of the leak detection evaluation, it is assumed that 50% of the unaccounted-for water may be recovered. The cost of the leak detection survey can be estimated from past surveys or calculated from estimates. It is suggested that the smaller systems check with the Florida Rural Water Association for guidance on cost estimates.

6A Potential Water System Leakage

This is the potential system leakage shown as the total unaccounted for water as calculated in Task 4 (4F).

6B Annual Potential System Leakage

This is the potential system leakage shown as the total unaccounted for water as calculated in Task (4F) modified to reflect an annual basis.

6C Recoverable Leakage

Assumes 50% of the amount shown in 6B is recoverable.

6D Production Cost per Million Gallons

The applicant's cost to produce water per million gallons.

6E Recoverable Savings

The cost that can be achieved if the lost water is recovered.

6F Estimated Cost of Leak Detection Survey

Cost to perform a leak detection survey.

6G Estimated Recovery Period

How many years it would take to recover the cost of performing a leak detection survey based on the amount of water cost recovered.



St. Johns River Water Management District Water Audit Form



GENERAL AUDIT INFORMATION

Utility Name:	
CUP Number:	
Audit Study Period (beginning and ending mo/dy/yr):	

The water audit is designed to provide assurances of water accountability within the treatment and water distribution systems. The information provided below must reflect volumes covering a period of at least 12 consecutive months.

TASK 1: TREATMENT SYSTEM		
Line	Treatment System	Million Gallons
1A	Raw water produced	
1B	Raw water purchased	
1C	Finished water purchased	
1D	Total water produced and purchased <i>(sum of lines 1A – 1C)</i>	
1E	Metered uses in treatment	
1F	Unmetered but known uses in treatment	
1G	Total water used in treatment <i>(line 1E plus line 1F)</i>	
1H	Total water produced and purchased for distribution <i>(line 1D minus line 1G)</i>	
1I	Metered finished water entering the distribution system	
1J	Change in reservoir and tank storage <i>(If increase, subtract) (If decrease, add)</i>	
1K	Total water unaccounted for in the treatment process <i>(line 1H minus line 1I, plus or minus line 1J)</i>	

TASK 2: DISTRIBUTION SYSTEM – METERED USES ¹		
Line	Metered Use	Million Gallons
2A	Small and medium meter use (<i>5/8 inch – 3 inches</i>)	
2B	Large meter use (<i>greater than 3 inches</i>)	
2C	Adjustment due to meter lag time	
2D	Sum of lines 2A – 2C	

¹ The applicant must perform a meter survey (see instructions and the attached survey form) if the initial unaccounted for water loss is 10% or greater (as listed in line 4F). When a meter survey is performed, the information submitted in Task 2 must be corrected pursuant to the meter survey.

TASK 3: DISTRIBUTION SYSTEM – METERED USES NOT COVERED IN TASK 2 AND UNMETERED USES				
Line	Unmetered or Other Use	Million Gallons	Documented ¹	Undocumented/ Negligible ²
3A	Irrigation		<input type="checkbox"/>	<input type="checkbox"/>
3B	Swimming pools		<input type="checkbox"/>	<input type="checkbox"/>
3C	Sewer cleaning		<input type="checkbox"/>	<input type="checkbox"/>
3D	Water quality flushing		<input type="checkbox"/>	<input type="checkbox"/>
3E	Firefighting		<input type="checkbox"/>	<input type="checkbox"/>
3F	Construction flushing		<input type="checkbox"/>	<input type="checkbox"/>
3G	Main breaks		<input type="checkbox"/>	<input type="checkbox"/>
3H	Schools		<input type="checkbox"/>	<input type="checkbox"/>
3I	Decorative fountains		<input type="checkbox"/>	<input type="checkbox"/>
3J	Allowable line loss		<input type="checkbox"/>	<input type="checkbox"/>
3K	Other uses (attach list)		<input type="checkbox"/>	<input type="checkbox"/>
3L	Total (<i>sum of lines 3A-3K</i>)			

¹ Check if the water use estimate is documented. Only documented use estimates will be accepted for items 3A-3K. Documentation must take the form of metered reports, journal entries or other records. Attach all documentation for these uses.

² Check if the amount represents a very small part of the overall total water use or if the amount is not documented.

TASK 4 – SUMMARY OF WATER USE		
Line	Water Use	Million Gallons
4A	Total water from distribution system <i>(line 2D plus line 3K)</i>	
4B	Total finished water pumped into distribution system <i>(line 1I)</i>	
4C	Finished water purchased after WTP master meter <i>(not previously accounted for in TASK 1)</i>	
4D	Sum of finished water going into the distribution system <i>(sum line 4B and 4C)</i>	
4E	Total unaccounted for water loss from distribution <i>(line 4D minus line 4A)</i>	
4F	Total unaccounted for water from treatment and distribution systems <i>(sum line 1K and line 4E)</i>	
4G	Percent total unaccounted for loss from treatment and distribution systems <i>(divide line 4F by the sum of lines 4C plus 1H, then multiply by 100)</i>	%

TASK 5: METER SURVEY

A correction to account for meter error is required if the initial unaccounted for water result (in line 4F) is 10% or greater. The applicant or permittee must perform a meter survey and use the information to correct the amounts listed in Task 2. The purpose of this survey is to determine a potential correction factor for metered water use by testing a representative sampling of meters of various ages. The survey also helps to determine the appropriateness of a meter change-out program. The permit applicant is required to randomly test 5% or 100 meters, whichever is less. The sampling must be from a selection of meters representing an even distribution of type and age or cumulative lifetime flow. This requirement may be replaced by a documented meter change-out program that can provide an estimate of the overall meter accuracy. This survey will likely be less productive if greater than 80% of the small/medium meters are less than 5 years in age.

Provide the following supplemental information:

SMALL AND MEDIUM METER SURVEY (Choose Method 1 or Method 2)

Small – 1 inch or less

Medium – 1 to 3 inches

Method 1 – Meter Age

Provide the age and type of small and medium sized meters in the system.

Meter age	Percent of system (%)
< 5 years	
5 to 10 years	
10 to 15 years	
> 15 years	
Total number of meters	

Estimate the average error of small and medium sized meters in the system.

Meter age	Estimated Error (%)
< 5 years	
5 to 10 years	
10 to 15 years	
> 15 years	
Total adjustment for meter survey	

Method 2 – Cumulative Lifetime Flow

Small Meters

Number of meters whose cumulative lifetime flow exceeds 0.75 mgals	
Percent of all small meters	%
Estimated error from testing sample (average or mean)	%
Total small meter adjustment for lifetime flow survey	%

Medium Meters

Number of meters whose cumulative lifetime flow exceeds 44.8 mgals	
Percent of all medium meters	%
Estimated error from testing sample (average or mean)	%
Total medium meter adjustment for lifetime flow survey	%

LARGE METER ADJUSTMENTS

A survey of all large meters (larger than 3-inches in size) must be completed. An average of the meter error or a cumulative gallon change is utilized to make this adjustment. Summarize the following:

Number of meters surveyed	
Average determined error	%
Cumulative gallon correction	%

TOTAL METER ADJUSTMENTS

Meter Size	Million Gallons
Small and medium (<i>line 2A</i>)	
Large (<i>line 2B</i>)	
Total (<i>sum small, medium, and large</i>)	

TASK 6: LEAK DETECTION EVALUATION

Determination required if final unaccounted for water is >10% as listed in line 4F

6A	Potential water system leakage <i>(total from line 4F)</i>	million gallons
6B	Annual potential water system leakage <i>(divide line 6A by the number of years of record used in the audit, i.e. 6A divided by 1.5 if 18 months of record in audit)</i>	million gallons
6C	Recoverable leakage <i>(multiply line 6B by 0.5)</i>	
6D	Annual production cost per million gallons <i>(includes O&M and production costs)</i>	\$
6E	Annual recoverable savings <i>(multiply line 6C and 6D)</i>	\$
6F	Estimated cost of leak detection survey*	\$
6G	Estimated recovery period <i>(line 6E divided by line 6F)</i>	years

Prepared by:

Name: _____

Title: _____

Date: _____