

February 2, 2021

Ms. Linda C. Bridwell
Executive Director
Kentucky Public Service Commission
P.O. Box 615, 211 Sower Blvd.
Frankfort, KY 40602-0615

RE: Case No. 2021-00050
Request for Approval of Continuing Education Credits

Dear Ms. Bridwell:

The Kentucky Water Resources Research Institute (KWRRRI) is respectfully requesting approval for 6 hours of continuing education credit for commissioners of water districts as referenced in 807 KAR 5:070 for the water audit training program. More specifically, approval is being requested to satisfy the annual training requirements of KRS 74.020(6). This module is based upon the AWWA M36 Water Audit software using the version 6 protocols released December 4, 2020. Additionally, the Kentucky Division of Compliance Assistance has approved this training program for certified drinking water operators through September 2022.

The six-hour workshop includes regulatory background information, detailed instruction on the AWWA Water Audit tool, and the use of the free software for better management of their system. This includes the associated data needs, confidence levels, and extensive hands-on learning where participants complete an example audit as well as an audit of their system (data is provided by the utility prior to the workshop). A three-hour workshop is included within the six-hour module that provides detailed information on changes from the AWWA Water Audit version 5 to the version 6 protocols.

Participants will attend the training event in-person, prepare a preliminary water audit for their utility to the satisfaction of the instructors, and complete a post workshop survey. Our goal is to provide participants with hands-on experience and interaction with instructors in:

- Understanding the need for analyzing water loss and financial impacts on the system.
- Knowledge of the difference between water loss and a water audit.
- Knowledge of the components contained in the water audit.
- Acknowledgement of who is responsible in their utility to collect and maintain the data used in the water audit.
- Conducting a preliminary water audit of their utility.

This training module was conducted with staff at the Big Sandy Water District on December 11, 2020, for which training approval is not being requested. However, KWRRRI plans to schedule additional water audit events beginning in February 2021 with various utilities over the next two years. We are currently working with officials at the Martin County Water District and Estill County Water District to schedule events soon. Additional events are anticipated for Bath County Water District and Letcher County Water District. The workshops are being offered at no cost to the participants through financial support provided by USDA.

Enclosed are the following materials in support of this application:

- 1) The name and address of the application (included in this transmittal letter).
- 2) The name and sponsor of the program and the subject matter covered by the program (included in this transmittal letter).
- 3) A summary of the content of the program (training summary/timed agendas are attached for the six-hour and three-hour programs).
- 4) Up to six hours of credit hours is requested for this program.
- 5) The name and relevant qualifications and credentials of each instructor presenting the program: Dr. Scott Yost (credentials are attached).
- 6) A copy of written materials given to attendees (class PowerPoint slides are attached).
The material will be customized to each individual utility's infrastructure.

KWRRI anticipants submitting a sworn statement and copies of an additional written materials provided to water district commissioners to the Commission upon completion of each training event. If you have any questions or require any further documentation, please do not hesitate to contact me.

Sincerely,



Donna McNeil, Research Engineer
Kentucky Water Resources Research Institute

AWWA FREE WATER AUDIT INSTRUCTION WORKSHOP AGENDA

Date

Location

8:30 am – 3:30 pm

FACILITATOR(S): Dr. Scott Yost, Ms. Katie Emmett
Department of Civil Engineering and KY Water Resources Research Institute

Time	Session
8:30	Sign-in/Registration/Welcome (15 minutes)
8:45	Session: Introduction Overview, Terms and Definitions
9:00	Session: Conducting the Water Audit (part 1)
10:00	Session: Example Walkthrough (Start Page and Worksheet)
10:15	Break (15 minutes)
10:30	Session: Conducting the Water Audit (part 2)
11:45	Session: Completing your Utility's Audit (beginning)
12:00	Lunch Break on site (30 min)
12:30	Session: Data grading and Completing your Utility's Audit (completion)
2:15	Break (15 minutes)
2:30	Session: Results discussion and Practical Consideration
3:20	Wrap-up and Survey
3:30	Adjourn

AWWA FREE WATER AUDIT UPDATE TO VERSION 6 INSTRUCTION WORKSHOP AGENDA

Date

Location

8:30 am – 11:45 am

FACILITATOR(S): Dr. Scott Yost, Ms. Katie Emmett
Department of Civil Engineering and KY Water Resources Research Institute


Time	Session
8:30	Sign-in/Registration/Welcome (10 minutes)
8:40	Session: Overview, Summary of changes AWWA Water Audit V6
9:00	Session: Software Updates, New Tabs and Review Utility's Current Information
9:30	Session: Interactive Data Grading walkthrough
10:15	Break (15 minutes)
10:30	Session: Interactive Data Grading walkthrough (continued), Results Discussion
11:30	Session: Math for Water Audits and Other Resources
11:45	Adjourn

Scott Yost joined the faculty of the University of Kentucky in 1995 and serves as the Director of Undergraduate Studies and is an Associate Professor in Civil Engineering. He has been actively engaged in research, teaching, and consulting in civil and environmental engineering with numerous technical papers and reports published on various topics in this field. Dr. Yost has participated in several workshops in the past and has provided one-on-one consultations to individual utilities on topics ranging from water loss, water audits, and network modeling.

Dr. Yost received his Bachelor of Science, Master of Science, and Ph.D. in Civil Engineering from the University of Michigan. He also has a Bachelor of Arts in Mathematics from Asbury College in Wilmore, Kentucky. Additionally, he is a licensed Professional Engineer in Kentucky.

AWWA Water Auditing: The Free Water Audit

January 18, 2020 (8:30am-3:30pm)
by Scott Yost and Katie Emmett

 Kentucky Water
Resources Research
Institute

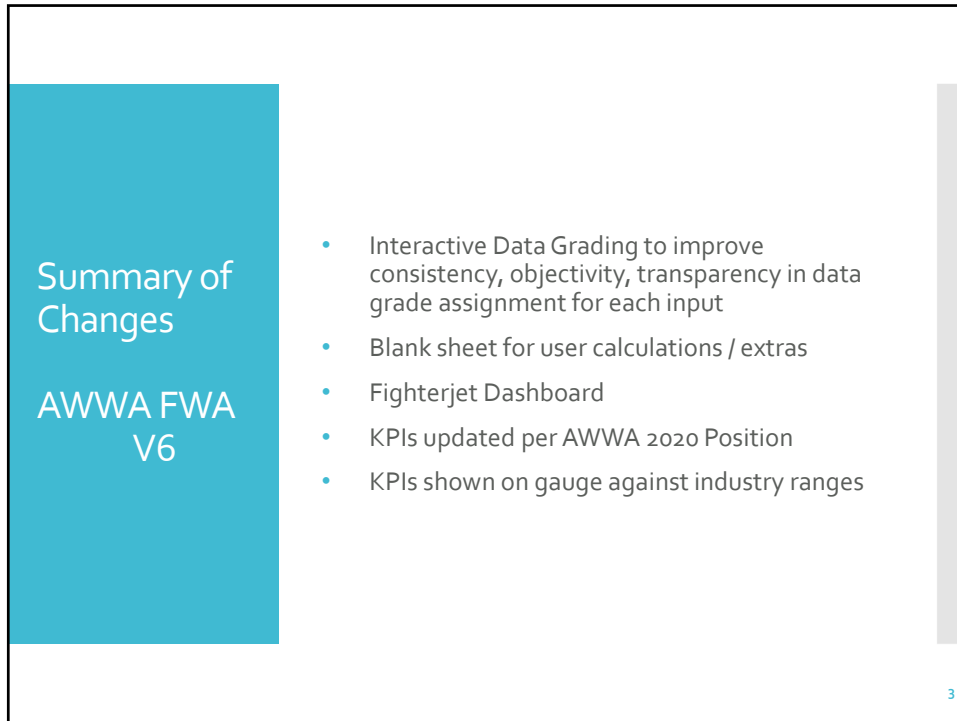
1

Discussion Outline

- Summary of Changes to AWWA FWA v6
- Updated and New Tabs
 - Worksheet
 - Interactive Data Grading
 - Blank Sheet
 - Performance Indicators Tab Removed
- Interactive Data Grading Walkthrough
- Math for Water Audits
 - Straight Average
 - Weighted Average
- Free Software and Other Resources
- Questions

2

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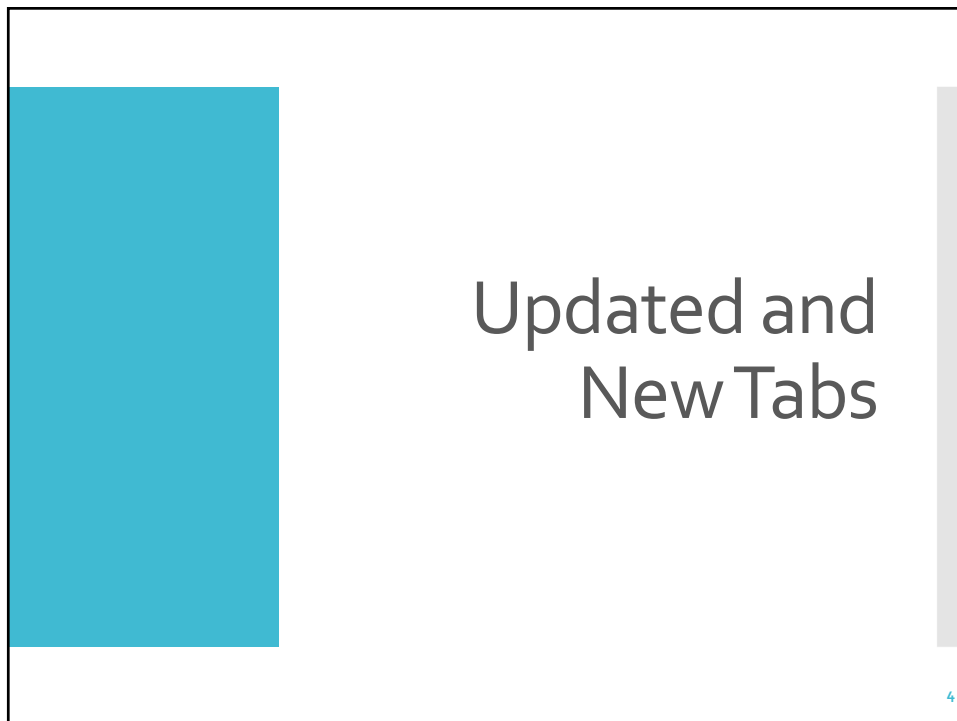
Summary of Changes

AWWA FWA
V6

- Interactive Data Grading to improve consistency, objectivity, transparency in data grade assignment for each input
- Blank sheet for user calculations / extras
- Fighterjet Dashboard
- KPIs updated per AWWA 2020 Position
- KPIs shown on gauge against industry ranges

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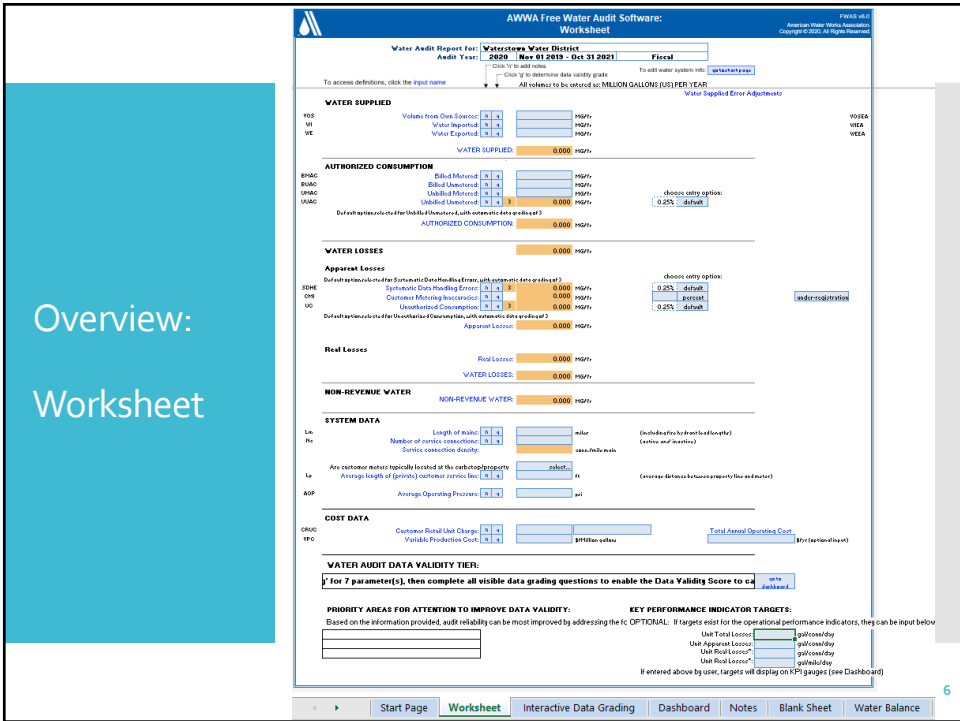
Updated and
New Tabs

4

4



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AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association
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Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** | **Nov 01 2019 - Oct 31 2020** | Fiscal

To access definitions, click the **input name** Click 'Y' to add notes Click 'g' to determine data validity grade To edit water system info: [go to start page](#)

All volumes to be entered as: **MILLION GALLONS (US) PER YEAR** Water Supplied Error Adjustments

WATER SUPPLIED

VOS Volume from Own Sources MG/Yr
 WI Water Imported MG/Yr
 WE Water Exported MG/Yr

VOSEA
WIEA
WEEA

WATER SUPPLIED: **0.000** MG/Yr

AUTHORIZED CONSUMPTION

BMAG Bill of Material MG/Yr
 BMAG Bill of Material MG/Yr
 UMAG Unbilled Material MG/Yr
 UMAG Unbilled Material MG/Yr

Default parameters for Unbilled Material with automatic data grading? choose entry option: 0.25% default

AUTHORIZED CONSUMPTION: **0.000** MG/Yr

WATER LOSSES

Apparent Losses

OSM Dynamic Data Reading Error MG/Yr choose entry option: 0.25% default
 OMB Customer Metering Inaccuracy MG/Yr 0.25% default
 UIC Unbilled Consumption MG/Yr 0.25% default

Default parameters for Unbilled Consumption with automatic data grading? Apparent Losses: 0.000 MG/Yr

Real Losses

Real Losses MG/Yr

WATER LOSSES: **0.000** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **0.000** MG/Yr

SYSTEM DATA

L Length of main miles (including fire hydrant to street)
 Nc Number of service connections (within area of service)
 Sc Service connection density (connections per mile)

Are customer meter hydrants located at the curb? (coverage between hydrant property line and meter)

L Average length of (private) customer service line ft

AOP Average Operating Pressure psi

COST DATA

CRUC Customer Retail Unit Charge Total Annual Operating Cost: \$0.000
 RUC Variable Production Cost \$/MG (\$/MG (estimated))

WATER AUDIT DATA VALIDITY TIER:

For 7 parameter(s), then complete all visible data grading questions to enable the Data Validity Score to be calculated.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY: **KEY PERFORMANCE INDICATOR TARGETS:**

Based on the information provided, audit reliability can be most improved by addressing the IC. OPTIONAL: If targets exist for the operational performance indicators, they can be input below.

Use Total Losses gal/conday
 Use Apparent Losses gal/conday
 Use Real Losses gal/conday
 Use Real Losses gal/conday

If entered above by user, targets will display on KPI gauges (see Dashboard)

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Words in blue are "input names" and are linked to a separate page in the audit that gives specific definitions and assistance for each input

AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association
Copyright © 2020. All Rights Reserved.

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** | **Nov 01 2019 - Oct 31 2020** | Fiscal

To access definitions, click the **input name** Click 'Y' to add notes Click 'g' to determine data validity grade To edit water system info: [go to start page](#)

All volumes to be entered as: **MILLION GALLONS (US) PER YEAR** Water Supplied Error Adjustments

WATER SUPPLIED

VOS [Volume from Own Sources](#) MG/Yr
 WI Water Imported MG/Yr
 WE Water Exported MG/Yr

VOSEA
WIEA
WEEA

WATER SUPPLIED: **0.000** MG/Yr


8

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<p>Volume from Own Sources (VOS)</p> <p>Find</p>	<p>The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of treated drinking water that entered the distribution system. Often the volume of water measured as treated effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. Water treatment plants are also often supplied potable drinking water and therefore are a "customer" of the water utility. If the service connection line serving the water treatment plant is downstream of treated water effluent flowmeters, this water should be metered and billed as billed authorized consumption. In this case, this volume of water does not enter into any calculations for Volume from Own Sources. If the service connection line supplying potable water to the treatment plant is upstream of treated water effluent flowmeters, then this water is considered "process" water and included with calculations accounting for process water use.</p> <p>If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, plant potable water consumption (if the supply is drawn upstream of effluent flowmetering,) and similar uses. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.</p>
<p>Volume from own sources: error adjustment</p> <p>Find</p>	<p>An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common. Enter a positive percentage or volume, then select 'under-registration' or 'over-registration' from the drop-down immediately adjacent. See Water Supplied Error Adjustments definition for guidance on how to calculate this input.</p>
	<p>The Water Exported volume is the bulk water conveyed or sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling or transferring the water: i.e. the exporter. If the water utility who is compiling the annual water audit sells or transfers bulk water in this manner, they are an exporter of water.</p>

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AWWA Free Water Audit Software:
Worksheet

PWAS v8.0
American Water Works Association
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Water Audit Report for: **Waterstown Water District**

Audit Year: **2020** **Nov 01 2019 - Oct 31 2020** **Fiscal**

To access definitions, click the **Input name** To edit water system info: [go to start page](#)

Click 'n' to add notes Click 'g' to determine data validity grade

All volumes to be entered as: **MILLION GALLONS (US) PER YEAR**

WATER SUPPLIED [Water Supplied Error Adjustments](#)

VOS	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/>	MG/Yr	
WI	Water Imported: <input type="text" value="n"/> <input type="text" value="g"/>	MG/Yr	
WE	Water Exported: <input type="text" value="n"/> <input type="text" value="g"/>	MG/Yr	

VOSEA
WIEA
WEEA

WATER SUPPLIED: 0.000 MG/Yr

The boxes containing an "n" are linked to a separate Notes Tab in the audit that allows you to leave comments about a specific input

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AWWA Free Water Audit Software: User Notes

FWAS v6.0
American Water Works Association
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Water Audit Report for: Waterstown Water District
Audit Year: 2020

Fiscal
Nov 01 2019 - Oct 31 2020

General Notes:		
Audit Item	Notes on Input Derivation	Notes on Data Validity Grading
Volume from Own Sources (VOS)		
Volume from Own Sources Error Adjustment (VOSEA)		
Water Imported		

[Start Page](#) | [Worksheet](#) | [Interactive Data Grading](#) | [Dashboard](#) | [Notes](#) | [Blank Sheet](#) | [Water Balance](#) | [Loss Control Planning](#) | [Definitions](#) | [Service Connection Diagram](#) | [Acknowledgements](#)

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AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association
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Water Audit Report for: Waterstown Water District
Audit Year: 2020 Fiscal: Nov 01 2019 - Oct 31 2020

To access definitions, click the input name

PLEASE CHOOSE REPORTING UNITS FOR EACH OF THE FOLLOWS. ENTERING DATA

Value Supplied Error Adjustment

WATER SUPPLIED			
VOS	Volts from Own Sources	<input type="text" value="0.000"/>	VOSEA
WR	Water Reported	<input type="text" value="0.000"/>	WRSA
WE	Water Exported	<input type="text" value="0.000"/>	WEA
WATER SUPPLIED:		<input type="text" value="0.000"/>	
AUTHORIZED CONSUMPTION			
BMAC	Billed Material	<input type="text" value="0.000"/>	
UBMAC	Unbilled Material	<input type="text" value="0.000"/>	
UBMAC	Unbilled Material	<input type="text" value="0.000"/>	
UBMAC	Unbilled Material	<input type="text" value="0.000"/>	
UBMAC	Unbilled Material	<input type="text" value="0.000"/>	
Default option selected for Unbilled Unmetered, with automatic data grading of 3		<input type="text" value="0.000"/>	
AUTHORIZED CONSUMPTION:		<input type="text" value="0.000"/>	
WATER LOSSES			
Apparent Losses		<input type="text" value="0.000"/>	
Default option selected for Systematic Data Reading Errors, with automatic data grading of 3			
SDRE	Systematic Data Reading Errors	<input type="text" value="0.000"/>	
CMR	Customer Metering Inaccuracy	<input type="text" value="0.000"/>	
UC	Unmetered Consumption	<input type="text" value="0.000"/>	
Default option selected for Unmetered Consumption, with automatic data grading of 3		<input type="text" value="0.000"/>	
Apparent Losses:		<input type="text" value="0.000"/>	
Real Losses			
Real Losses:		<input type="text" value="0.000"/>	
WATER LOSSES:		<input type="text" value="0.000"/>	
NON-REVENUE WATER			
NON-REVENUE WATER:		<input type="text" value="0.000"/>	
SYSTEM DATA			
Ln	Length of main	<input type="text" value="0.000"/>	(including fire hydrant lead lengths)
Nc	Number of service connections	<input type="text" value="0.000"/>	(noting roof booms)
Service connection density		<input type="text" value="0.000"/>	
Are customer meters typically located at the curbage property			
Lp	Average length of (private) customer service line	<input type="text" value="0.000"/>	(average distance between property line and meter)
AOP	Average Operating Pressure	<input type="text" value="0.000"/>	
COST DATA			
CRUC	Customer Retail Unit Charge	<input type="text" value="0.000"/>	Total Asset Operating Cost
VPC	Variable Production Cost	<input type="text" value="0.000"/>	\$/yr (optional input)
WATER AUDIT DATA VALIDITY TIER:			
If 7 or 7 parameter(s), then complete all visible data grading questions to enable the Data Validity Score to call			
PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:			
Based on the information provided, audit reliability can be most improved by addressing the following:			
KEY PERFORMANCE INDICATOR TARGETS:			
OPTIONAL: If targets exist for the operational performance indicators, they are:			
Use Total Losses		<input type="text" value="0.000"/>	
Use Apparent Losses		<input type="text" value="0.000"/>	
Use Real Losses		<input type="text" value="0.000"/>	
Use Real Losses		<input type="text" value="0.000"/>	
Use Real Losses		<input type="text" value="0.000"/>	
If entered above by user, targets will display on KPI gauge (see Dashboard)			

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AWWA Free Water Audit Software: Worksheet

Water Audit Report For: **Waterstone Water District** Fiscal Year: **2020** Base Yr: **2019** - Oct 31 2020

WATER SUPPLIED

WGS	Values from Own Sources	254,551	Hm³/yr
WIS	Water Imported	0,000	Hm³/yr
WES	Water Exported	56,000	Hm³/yr
WATER SUPPLIED:		200,551	Hm³/yr

Water Supplied Error Adjustments

choose entry option:

percent
volume

AUTHORIZED CONSUMPTION

AWAG	Allowed Metered	143,530	Hm³/yr
AWAD	Disinfectant	5,300	Hm³/yr
AWAC	Unallowed Metered	22,250	Hm³/yr
AWAU	Unallowed Unmetered	0,368	Hm³/yr
AUTHORIZED CONSUMPTION:		171,338	Hm³/yr

WATER LOSSES

Apparent Losses

AWDL	Systematic Data Reading Errors	0,000	Hm³/yr
AWDM	Customer Metering Inaccuracies	0,000	Hm³/yr
AWDU	Unmetered Casing Leaks	0,368	Hm³/yr
Apparent Losses:		0,368	Hm³/yr

Real Losses

Real Losses:		20,736	Hm³/yr
WATER LOSSES:		21,104	Hm³/yr

NON-REVENUE WATER

NON-REVENUE WATER:		45,100	Hm³/yr
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SYSTEM DATA

LS	Length of main	24.2	miles
NS	Number of service connections	642	
SC	Service connection density	10	connections/mile
LC	Are customer meters typically located at the curbstop/property	Yes	
AC	Average length of customer service lines has been measured and a data product % has been applied		
AO	Average Operating Pressure	102.0	psi

COST DATA

CRUC	Customer Retail Unit Charge	\$5.75	per 1000 gallons (100)
CRVC	Variable Production Cost	\$5,060.00	per million gallons
Total Annual Operating Cost:		\$20,200,000	per (national input)

WATER AUDIT DATA VALIDITY TIER:

1 for 11 parameter(s), then complete all visible data grading questions to enable the Data Validity Score to calculate.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following OPTIONAL: If targets exist for the operational performance indicators, they are:

KEY PERFORMANCE INDICATOR TARGETS:

Use Total Losses: gal/conn/day
 Use Apparent Losses: gal/conn/day
 Use Real Losses: gal/conn/day
 Use Real Losses: gal/conn/day

If entered above by user, targets will display on KPI gauges (See Dashboard)

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Water Supplied Error Adjustments

choose entry option:

n	g	percent
n	g	percent
n	g	percent

VOSEA
WIEA
WEEA

Use these buttons to toggle between percent and volume of water

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Water Supplied Error Adjustments

choose entry option:

n g

0.50% percent

n g

1.00% percent

over-registration VOSEA

under-registration WIEA

select.... :EA

under-registration

over-registration

Once data is entered in for Error Adjustment, a dropdown box will appear to select over- or under-registration

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterworks Water District**

Audit Year: **2020** | **May 31 2019 - Oct 31 2020** | Fiscal

To access definitions, click the input name

PLEASE CHOOSE REPORTING UNITS FROM THE START PAGE BEFORE ENTERING DATA.

WATER SUPPLIED

YOS Volume from Own Sources

WV Water Reported

WE Water Exported

WATER SUPPLIED: 0.000

AUTHORIZED CONSUMPTION

EMAC Billed Metered

EMUC Billed Unmetered

UMAC Unbilled Metered

UMUC Unbilled Unmetered

Default option selected for Unbilled Unmetered, with automatic data grading of 3

AUTHORIZED CONSUMPTION: 0.000

WATER LOSSES

Apparent Losses

SDME Systematic Data Handling Errors

CMR Customer Metering Inaccuracies

UC Unauthorized Consumption

Default option selected for Unauthorized Consumption, with automatic data grading of 3

Apparent Losses: 0.000

Real Losses

WATER LOSSES: 0.000

NON-REVENUE WATER

NON-REVENUE WATER: 0.000

SYSTEM DATA

Lm Length of mains

Nc Number of service connections

Lp Average length of (primary) customer service lines

AOP Average Operating Pressure

COST DATA

CRUC Customer Retail Unit Charge

VPC Variable Production Cost

Yearly Annual Operating Cost

Myr (optional input)

WATER AUDIT DATA VALIDITY TIER:

0 for 7 parameter(s), then complete all visible data grading questions to enable the Data Validity Score to call

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

KEY PERFORMANCE INDICATOR TARGETS:

Based on the information provided, audit reliability can be most improved by addressing the following: **OPTIONAL:** If targets exist for the operational performance indicators, they should be entered above by user, targets will display on KPI gauges (see Dashboard)

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AWWA Free Water Audit Software: FWAS v6.0
American Water Works Association
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Worksheet

Water Audit Report for: **Waterstown Water District**
Audit Year: **2020** | **Nov 01 2019 - Oct 31 2020** | **Fiscal**

To access definitions, click the [input name](#) | Click 'n' to add notes | Click 'g' to determine data validity grade | To edit water system info: [go to start page](#)
All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER AUDIT DATA VALIDITY TIER:
*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. *** [go to dashboard](#)

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:
Based on the information provided, audit reliability can be most improved by addressing the following components:

1: Volume from Own Sources (VOS)
2: Billed Unmetered (BUAC)
3: Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:
OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

Target losses for performance indicators can be input here and will be displayed on the Dashboard

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Interactive Data Grading Tab

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AWWA Free Water Audit Software v6.0

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. It provides a "top-down" summary water audit format and is not meant to take the place of a full-scale, comprehensive water audit format. Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targeting loss reduction levels. This tool contains several separate worksheets. Sheets can be accessed using the tabs at the bottom of the screen, or by clicking the TOC link below.

Blank Sheet - The world is your canvas.

Water Balance - The values entered in the Worksheet automatically populate the Water Balance.

Loss Control Planning - Use this sheet to interpret the results of the audit validity score and performance indicators.

Definitions - Use this sheet to understand the terms used in the audit process.

Service Connection Diagram - Diagrams depicting possible customer service connection line configurations.

Acknowledgements - Acknowledgements for development of the AWWA Free Water Audit Software v6.0.

AWWA Web Resources for Water Loss Control
<https://www.awwa.org/Resources/Tools/Resource/Topics/Water-Loss-Control>
Items referenced in the Free Water Audit Software v6.0 on the web:
Data Grading Matrix v6.0
Example Water Audit v6.0
Water Audit Compiler v6.0
AWWA Reports on Performance Indicators
MSE Manual

If you have questions or comments regarding this software please contact us at: info@awwa.org

Color Key User input (blue) Calculated (orange) Optional default (grey)

Guidance for the Interactive Data Grading
Use acronym buttons in IDG header to navigate among inputs. Acronym Key below. White = needs answers, orange = complete, clear = not required. Example below:
VOS VOSEA WI WEA WE WEA BMAC NUAC UMAC UMAC
SCHE CMI UC Lin Ni Lp ADP CRUC VPC
After clicking an acronym button, answer all visible questions in the order they're presented, choosing best-fit answer.
Grade will populate when all visible questions are complete for an input.
The limiting criteria will be labeled along the right. If only 1 limiting criterion is shown, improving on that criterion will achieve a higher data grade. If multiple limiting criteria are shown, improving on each limiting criterion is necessary to achieve a higher data grade. A complete inventory of data grading criteria is available in the Data Grading Matrix v6.0 (see web-resources)

Navigation: Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram | Acknowledgements

The "Start Page" tab has guidance for Interactive Data Grading

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterworks Water District**

Audit Year: **2020** (Max 01 2019 - Oct 31 2021) Fiscal

To access definitions, click the input name. Click 'I' to determine data validity grade. To edit water system data, click the parameter name. All references to be entered on INFLUX GALLONS DURING YEAR. Water Supplied Error Adjustment

WATER SUPPLIED
VOS Volumes from Own Sources 0.000 Mgd
VOSEA Water Reported 0.000 Mgd
WI Water Expended 0.000 Mgd
WEA WATER SUPPLIED 0.000 Mgd

AUTHORIZED CONSUMPTION
BMAC Billing Metered 0.000 Mgd
UMAC Unbilled Metered 0.000 Mgd
UMAC Unbilled Unmetered 0.000 Mgd
UAC Unbilled Unmetered 0.000 Mgd
AUTHORIZED CONSUMPTION 0.000 Mgd

WATER LOSSES
Apparent Losses 0.000 Mgd
Real Losses 0.000 Mgd
WATER LOSSES 0.000 Mgd

NON-REVENUE WATER
NON-REVENUE WATER 0.000 Mgd

SYSTEM DATA
Ls Length of main 0.000 miles
Nc Number of service connections 0.000 (includes fire hydrants and fire pumps)
Lc Average length of (private) customer service line 0.000 feet
ADP Average Operating Pressure 0.000 psi

COST DATA
CRUC Customer Retail Unit Charge \$/1000 gal
VPC Variable Production Cost \$/1000 gal
Total Annual Operating Cost \$/1000 gal

WATER AUDIT DATA VALIDITY TIER:
For 7 parameter(s), then complete all visible data grading questions to enable the Data Validity Score to be calculated.

KEY PERFORMANCE INDICATOR TARGETS:
Unit Total Losses gal/1000 gal day
Unit Apparent Losses gal/1000 gal day
Unit Real Losses gal/1000 gal day
Unit Real Losses gal/1000 gal day
If entered above by user, targets will display on KPI gauges (see Dashboard)

Navigation: Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** **Nov 01 2019 - Oct 31 2020** **Fiscal**

To access definitions, click the **input name** To edit water system info: [go to start page](#)

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

[Water Supplied Error Adjustments](#)

WATER SUPPLIED

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	MS/Yr	VOSEA
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	MS/Yr	WIEA
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	MS/Yr	WEEA
WATER SUPPLIED:				0.000 MS/Yr	

The boxes containing a "g" are linked to a separate page in the audit for Interactive Data Grading

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AWWA Free Water Audit Software: Interactive Data Grading

Waterstown Water District
2020

White = incomplete
Orange = complete

Use acronyms for navigation

Volume from Own Sources (VOS) - Data Grading Criteria

vos	Criteria Question	Select Best-Fit Answers to All Visible Questions	Limiting criteria (see Start Page for details)
vos.0	Did the water utility supply any water from its own sources during the audit year?	Yes	Limiting
vos.1	What percent of own supply volume is metered?	>99%	
For questions 2.10 below, Choose the answer that applies for those meters that measure >90% of the finished water volume. In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume. Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s). Secondary device can include conversion to mA, meter transmitter or similar instrumentation. Tertiary device can include SCADA, historian or other computerized archival system.			
vos.2	What is the frequency of electronic calibration?	Less than annual but within last 5 years	
vos.3	What level of data transfer errors are checked as part of the electronic calibration process?	Data transfer errors are not checked, or not sure	
vos.4	Is the most recent electronic calibration documentation available for review?	No	
vos.5	What is the frequency of in-situ flow accuracy testing?	Annually	
vos.6	Is the most recent in-situ flow accuracy testing documentation available for review?	Yes	
vos.7	What are the total volume-weighted average results of in-situ flow accuracy testing (during or closest to audit year)?	Between ±3% to ±6%	
vos.8	Have testing and calibration procedures been closely scrutinized for compliance with procedures described in the AWWA M36 and/or M33 Manual(s)?	No	
vos.9	Which best describes the frequency of finished water meter readings?	Daily	Limiting
vos.10	Which best describes the frequency of data review for anomalies/errors? These can include numbers that are outside of typical patterns, and zero or null values that may reflect a gap in data recording.	Less frequently than monthly	
FINAL DATA GRADE FOR THIS AUDIT INPUT:		4	

Start Page | Worksheet | **Interactive Data Grading** | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Serv

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**

Audit Year: **2020** **Nov 01 2019 - Oct 31 2020** **Fiscal**

To access definitions, click the [input name](#)

Click 'h' to add notes | Click 'g' to determine data validity grade | To edit water system info: [go to start page](#)

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

Source	n	g	L	S	MG/yr	n	g	percent	Registration
VOS					254,581			0.50%	over-registration VOSEA
WI					0.000				WEEA
WE					54,023			1.00%	under-registration WEEA
WATER SUPPLIED:					198,746				

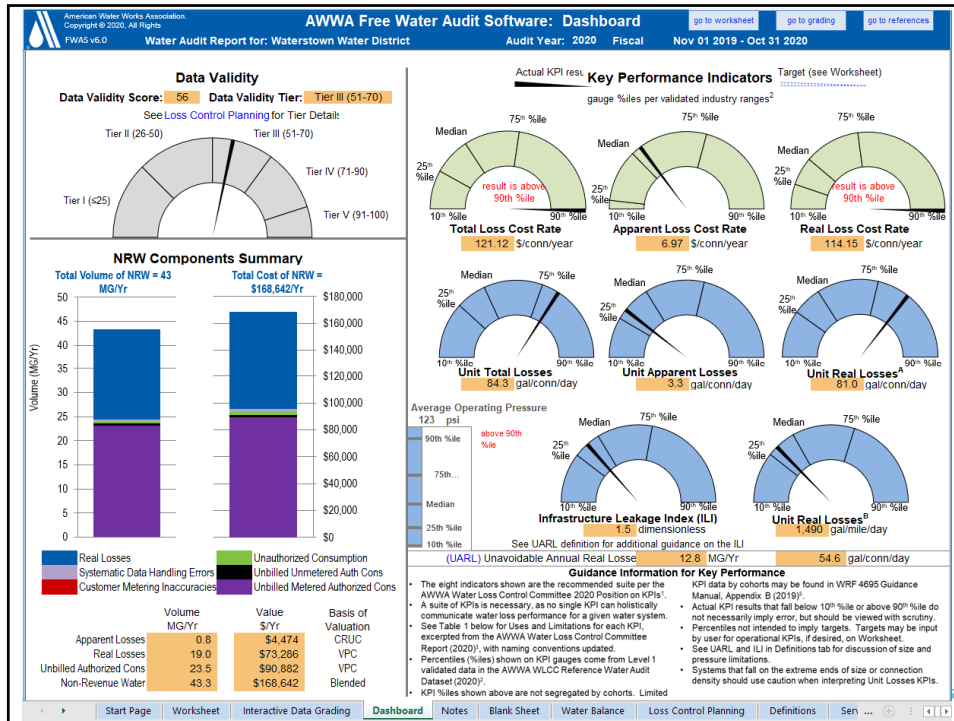
The calculated grade will appear here in orange on the Worksheet tab for all completed sections

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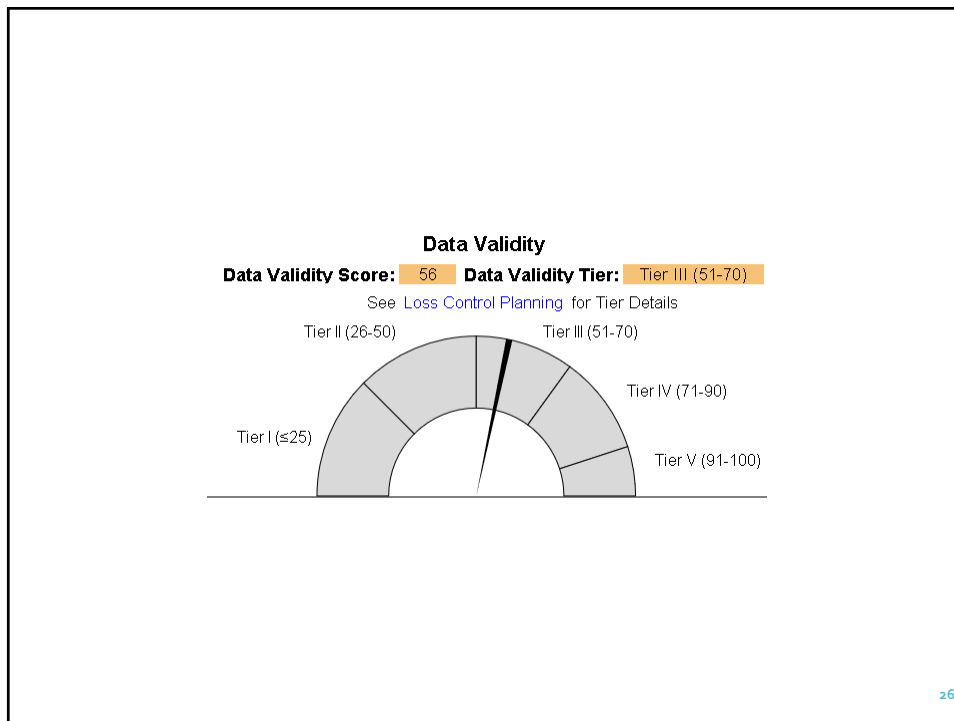
23

Dashboard Tab

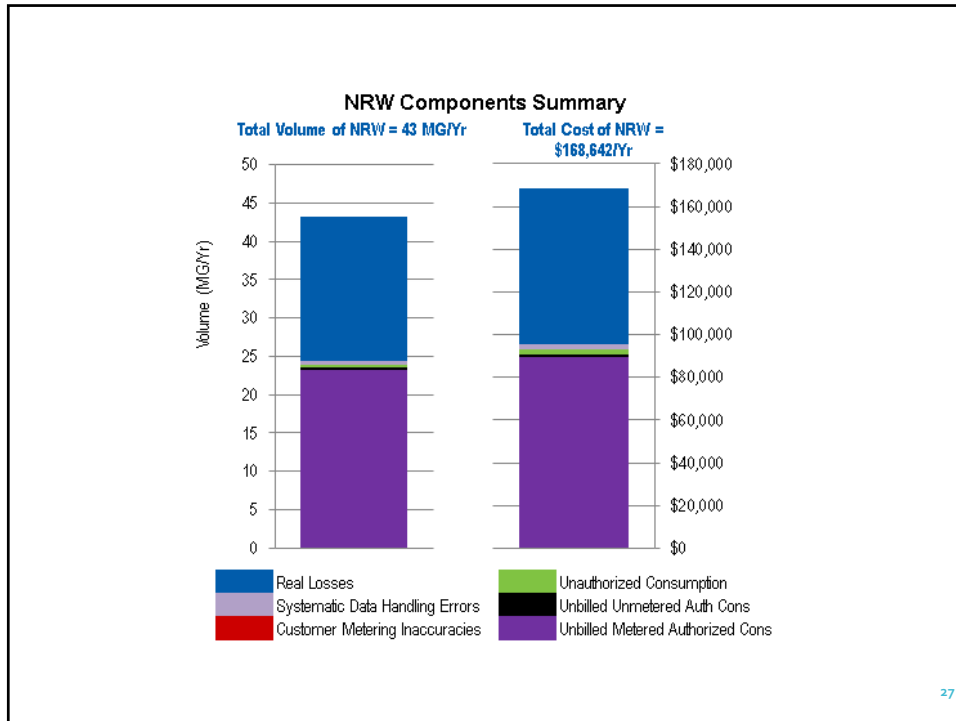
24



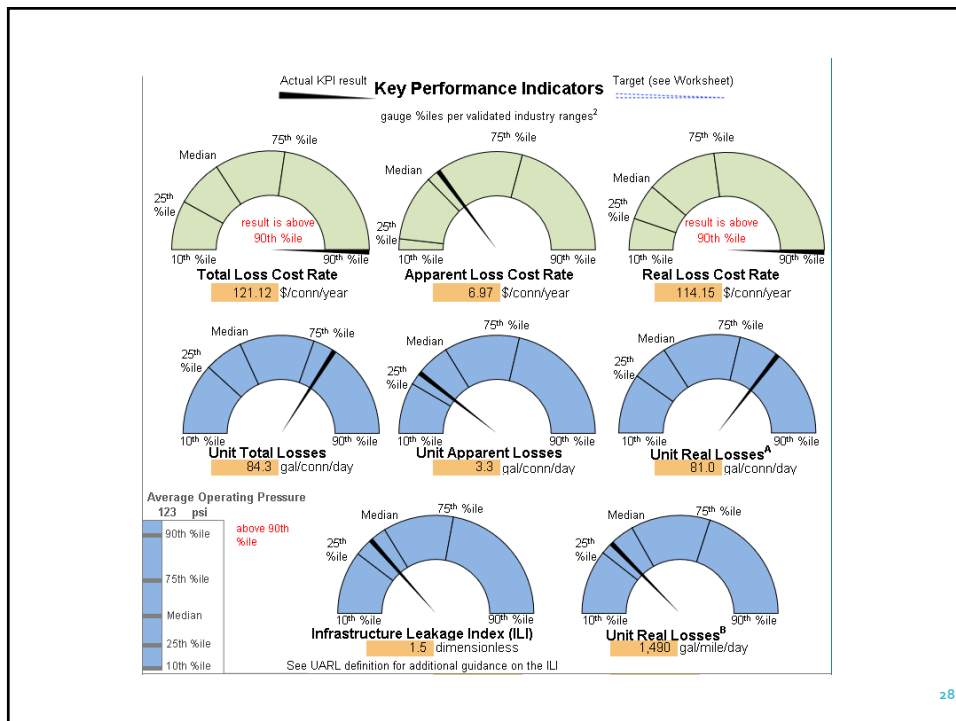
25



26



27

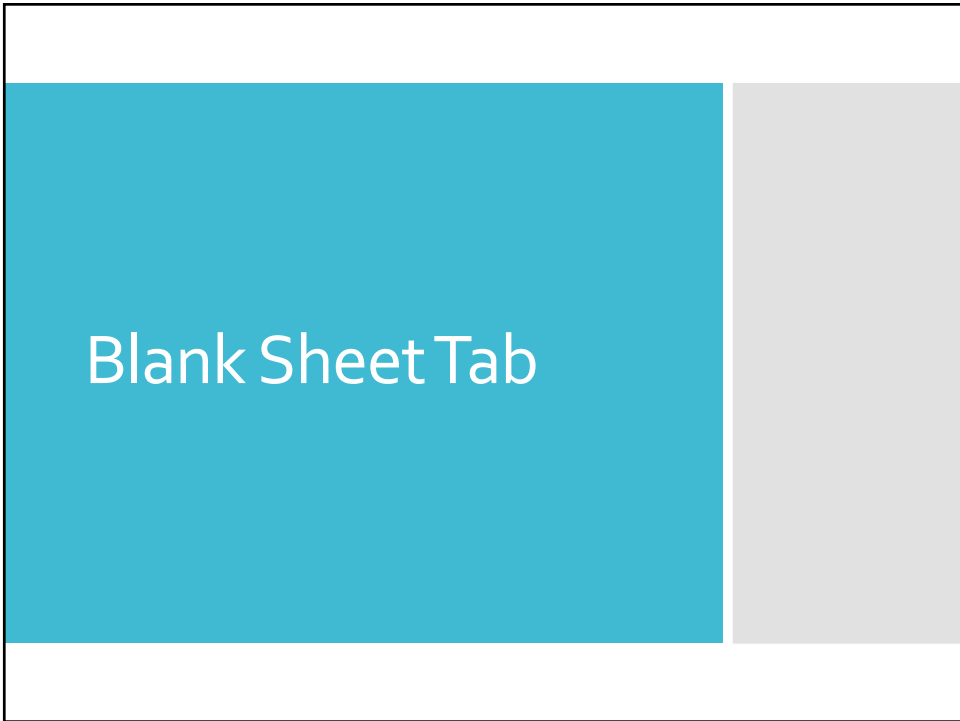


28

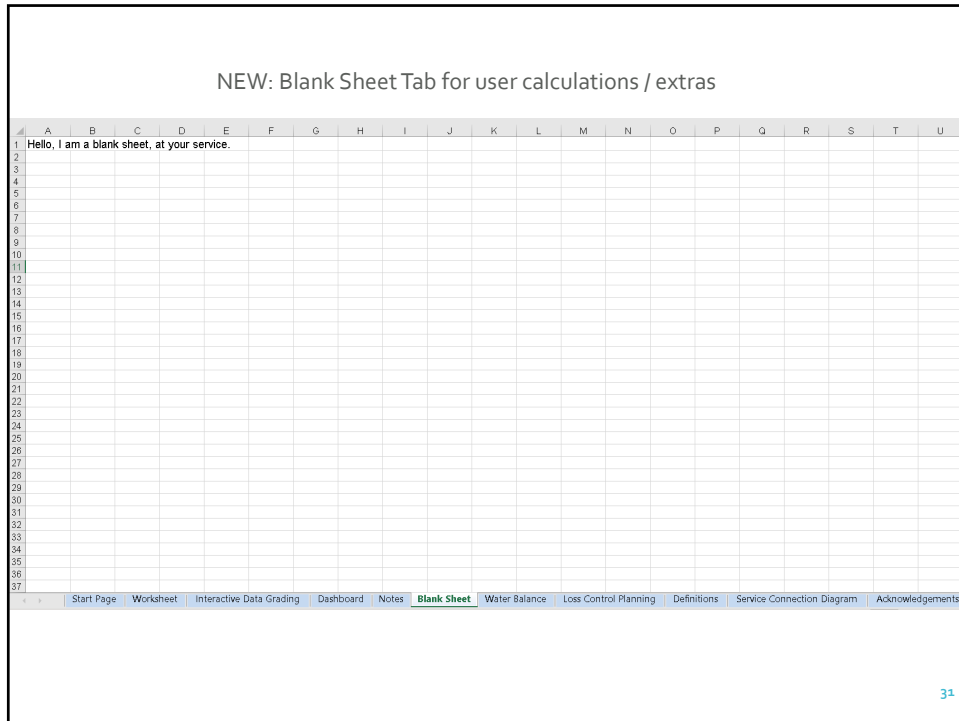
Table 1 2020 AWWA Water Audit Method – Water Audit Outputs and Key Performance Indicators: Uses and Limitations									
Type	Indicator	Description	Suitable Purposes				Uses and Limitations	Principal Users	
			Assessment	Bench-Marking	Target-Setting	Planning			Tracking
Attribute	Apparent Loss Volume	Calculated by Free Water Audit Software	✓				✓	Assess loss level	Utility, Regulators
	Apparent Loss Cost	Calculated by Free Water Audit Software	✓				✓	Assess cost loss level	Utility, Regulators
	Real Loss Volume	Calculated by Free Water Audit Software	✓				✓	Assess loss level	Utility, Regulators
	Real Loss Cost	Calculated by Free Water Audit Software	✓				✓	Assess loss cost level	Utility, Regulators
Volume	Unavoidable Annual Real Loss (UARL)	Calculated by Free Water Audit Software	✓				✓	Reveal theoretical technical low level of leakage	Utility, Regulators
	Unit Apparent Losses (vol/conn/day)	Strong and understandable indicator for multiple users.	✓	✓	✓	✓	✓	Used for performance tracking and target-setting	Utility, Regulators
	Unit Real Losses* (vol/conn/day)	Strong and understandable indicator for multiple users.	✓	✓	✓	✓	✓	Used for performance tracking and target-setting	Utility, Regulators, Policy Makers
	Unit Real Losses* (vol/pipeline length/day)	Strong and understandable indicator for use by utilities with low connection density.	✓	✓	✓	✓	✓	Data collection and assessment of systems with "low" connection density	Utility, Regulators, Policy Makers
	Unit Total Losses (vol/conn/day)	Strong and understandable indicator, suitable for high-level performance measurement.	✓				✓	High level indicator for trending analysis. Not appropriate for target-setting or benchmarking	Utilities, Customers
Value	Infrastructure Leakage Index (ILI)	Robust, specialized ratio KPI, can be influenced by pressure and connection density.	✓	✓			✓	Benchmarking after pressure management is implemented	Utilities
	Apparent Loss Cost Rate (value/conn/year)	Indicators with sufficient technical rigor. Provide the unit financial value of each type of loss, which is useful for planning and assessment of cost efficiency of water loss reduction and control interventions and programs.	✓			✓	✓	Data collection and assessment on AWWA indicators or contextual parameters to use in conjunction with Loss Cost Rates	Utilities, Regulators, Customers
Validity	Real Loss Cost Rate (value/conn/year)	Strong indicator of water loss audit data quality, if data has been validated. Tier provides guidance on priority areas of activity.	✓			✓	✓	Assess caliber of data inputs of the water audit	Utilities, Regulators, Customers
	Data Validity Tier (DVT)		✓	✓		✓	✓		

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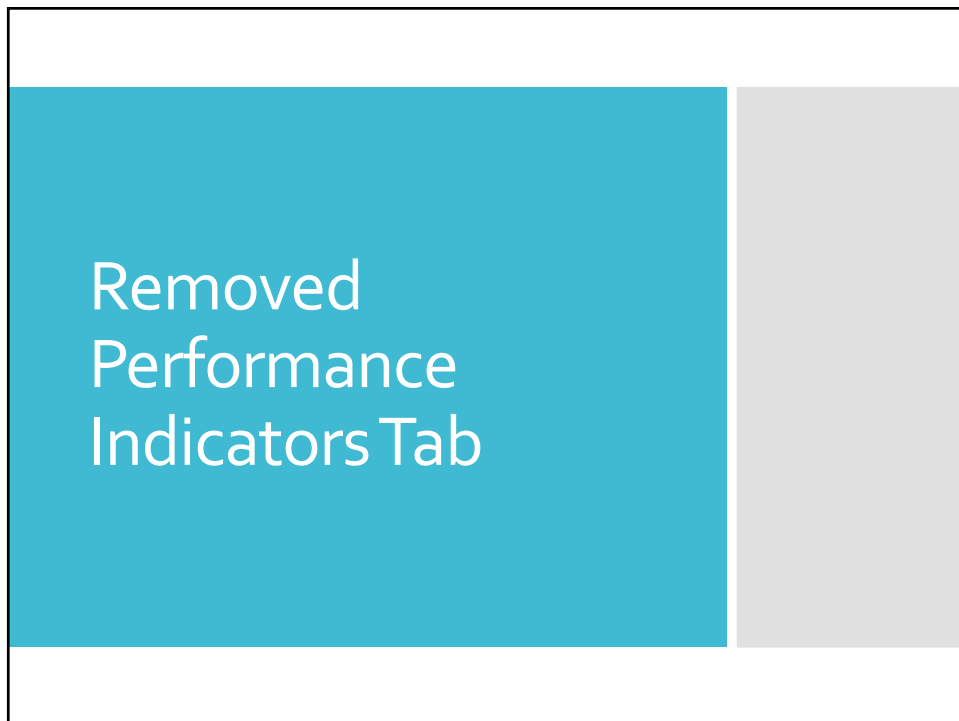
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AWWA Free Water Audit Software:
System Attributes and Performance Indicators

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Water Audit Report for: << Please enter system details and contact information on the Instructions tab >>
Reporting Year: 2020 1/2020 - 12/2020

***** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 67 out of 100 *****

System Attributes:

Apparent Losses:	0.875	MGYr
+ Real Losses:	18.592	MGYr
= Water Losses:	19.467	MGYr
Unrecoverable Annual Real Losses (UARL):	See Units in definition	MGYr
Annual Cost of Apparent Losses:	\$5,039	
Annual Cost of Real Losses:	\$71,726	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: 22.5%
- Non-revenue water as percent by cost of operating system: 0.7% Real Losses valued at Variable Production Cost

Operational Efficiency:

- Apparent Losses per service connection per day: 0.74 gallons/connection/day
- Real Losses per service connection per day: N/A gallons/connection/day
- Real Losses per length of main per day*: 1,459.71 gallons/m/day
- Real Losses per service connection per day per psi pressure: N/A gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): 18.59 million gallons/year

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

Instructions Reporting Worksheet **Performance Indicators** Comments Water Balance Dashboard Grading Matrix Service Connection Diagram

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Biggest Change

NO MORE PERCENT NON-REVENUE WATER

Non-revenue water versus Volume of Water Supplied:

$$\frac{(\text{UMAC} + \text{UUAC} + \text{SDHE} + \text{CMI} + \text{UC} + \text{Real Losses})}{\text{Water Supplied}}$$

or

$$\frac{(\text{UMAC} + \text{UUAC} + \text{Apparent Losses} + \text{Real Losses})}{\text{Water Supplied}}$$

Non-revenue water as percent by volume of Water Supplied:	21.8%	
Non-revenue water as percent by cost of operating system:	0.7%	Real Losses valued at Variable Production Cost

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterworks Water District**

Audit Year: **2020** (Nov 01 2019 - Oct 31 2021) Fiscal

Water Supplied Error Adjustments

WATER SUPPLIED

WATER SUPPLIED: 0.000 MGD

AUTHORIZED CONSUMPTION

UMAC: 0.000 MGD
 UUAC: 0.000 MGD
 SDHE: 0.000 MGD
 CMI: 0.000 MGD
 UC: 0.000 MGD

WATER LOSSES

Apparent Losses: 0.000 MGD
 Real Losses: 0.000 MGD

NON-REVENUE WATER

NON-REVENUE WATER: 0.000 MGD

SYSTEM DATA

COST DATA

WATER AUDIT DATA VALIDITY TIER:

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

KEY PERFORMANCE INDICATOR TARGETS:

Use Total Losses: gal/conn/day
 Use Apparent Losses: gal/conn/day
 Use Real Losses: gal/conn/day
 Use Real Losses: gal/conn/day

(UMAC + UUAC + SDHE + CMI + UC + Real Losses)
 Water Supplied

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Interactive Data Grading Walkthrough

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

WATER SUPPLIED

VOS	Volume from Own Sources	254,900	MG/yr	0.1%	0.950%	percent	over-registration	VOSEA
VE	Water Expended	54,023	MG/yr	0.1%	1.000%	percent	under-registration	VEEA
WATER SUPPLIED		190,776	MG/yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	183,530	MG/yr					
BUAC	Billed Unmetered	6,500	MG/yr					
UMAC	Unbilled Metered	2,150	MG/yr					
UWAC	Unbilled Unmetered	0,398	MG/yr					
AUTHORIZED CONSUMPTION		192,578	MG/yr					

WATER LOSSES

WATER LOSSES		19,763	MG/yr					
---------------------	--	---------------	--------------	--	--	--	--	--

Apparent Losses

SDHE	Systematic Data Handling Errors	0.388	MG/yr	0.25%	Default			
CMR	Customer Metering Inaccuracies	0.008	MG/yr	0.25%	percent			under-registration
UC	Unauthorized Consumption	0.398	MG/yr	0.25%	Default			
Apparent Losses		0.777	MG/yr					

Real Losses

Real Losses		19,966	MG/yr					
WATER LOSSES		19,763	MG/yr					

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/yr					
--------------------------	--	---------------	--------------	--	--	--	--	--

SYSTEM DATA

Ln	Length of main	243	also	(including the hydro-pneum. tank lengths)
Nc	Number of service connections	642		(retic. and building)
Lp	Service connection length	18	con./mil. main	
Lp	Are customer meters typically located at the	Yes		
AOP	Average length of customer service lines has been set to zero and a data grading of 10 has been applied			
AOP	Average Operating Pressure	92.0	psi	

COST DATA

CRUC	Customer Rental Unit Charge	\$5.70	\$/MG/1000 gal/yr (US)	Total Annual Operating Co.
VPC	Variable Production Cost	\$3,860.00	\$/MG/1000 gal/yr	\$23,950,000

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

- Volume from Own Sources (VOS)
- Billed Unmetered (BUAC)
- Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/conn/day
Unit Apparent Losses	gal/conn/day
Unit Real Losses*	gal/conn/day
Unit Real Losses*	gal/mile/day

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Waterstown Water District AWWA Free Water Audit Software: Interactive Data Grading

2020

White = incomplete
Orange = complete

Use acronyms for navigation

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC
 SDHE CMI Ltm Nc Lp AOP CRUC VPC

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Volume from Own Sources (VOS) - Data Grading Criteria

Criteria Question Select Best-Fit Answers to All Visible Questions

vos.0	Did the water utility supply any water from its own sources during the audit year?	
vos.1	What percent of own supply volume is metered?	
For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the finished water volume.		
In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume.		
Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s).		
Secondary device can include conversion to mA, meter transmitter or similar instrumentation.		
Tertiary device can include SCADA, historian or other computerized archival system.		
vos.2	What is the frequency of electronic calibration?	
vos.3	What level of data transfer errors are checked as part of the electronic calibration process?	
vos.4	Is the most recent electronic calibration documentation available for review?	
vos.5	What is the frequency of in-situ flow accuracy testing?	
vos.6	Is the most recent in-situ flow accuracy testing documentation available for review?	
vos.7	What are the total volume-weighted average results of in-situ flow accuracy testing (during or closest to audit year)?	
vos.8	Have testing and calibration procedures been closely scrutinized for compliance with procedures described in the AWWA M36 and/or M33 Manual(s)?	
vos.9	Which best describes the frequency of finished water meter readings?	
vos.10	Which best describes the frequency of data review for anomalies/errors? These can include numbers that are outside of typical patterns, and zero or null values that may reflect a gap in data recording.	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC
 SDHE CMI UC Lm Nc Lp AOP CRUC VPC

Whites = incomplete
 Orange = complete

Use acronyms for navigation

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Limiting criteria (see Start Page for details)

go to input

Volume from Own Sources (VOS) - Data Grading Criteria

go to notes

vos	Criteria Question	Select Best-Fit Answers to All Visible Questions	
vos.0	Did the water utility supply any water from its own sources during the audit year?	Yes	
vos.1	What percent of own supply volume is metered?	>99%	
<p>For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the finished water volume. In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume. Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s). Secondary device can include conversion to mA, meter transmitter or similar instrumentation. Tertiary device can include SCADA, historians or other computerized archival system.</p>			
vos.2	What is the frequency of electronic calibration?	Less than annual but within last 5 years	
vos.3	What level of data transfer errors are checked as part of the electronic calibration process?	Data transfer errors are not checked, or not sure	Limiting
vos.4	Is the most recent electronic calibration documentation available for review?	No	
vos.5	What is the frequency of in-situ flow accuracy testing?	Annually	
vos.6	Is the most recent in-situ flow accuracy testing documentation available for review?	Yes	
vos.7	What are the total volume-weighted average results of in-situ flow accuracy testing (during or closest to audit year)?	Between ±3% to ±6%	
vos.8	Have testing and calibration procedures been closely scrutinized for compliance with procedures described in the AWWA M36 and/or M33 Manual(s)?	No	
vos.9	Which best describes the frequency of finished water meter readings?	Daily	
vos.10	Which best describes the frequency of data review for anomalies/errors? These can include numbers that are outside of typical patterns, and zero or null values that may reflect a gap in data recording.	Less frequently than monthly	Limiting
FINAL DATA GRADE FOR THIS AUDIT INPUT:		4	

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connec ...

WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

Water Supplied Error Adjustments choose entry option

WATER SUPPLIED				
VOS	Volume from Own Sources	29,950	MG/yr	0.50% percent over-registration
WI	Water Imported	0.000	MG/yr	
VE	Water Exported	54,023	MG/yr	1.00% percent under-registration
WATER SUPPLIED		188,746	MG/yr	

AUTHORIZED CONSUMPTION				
BMAC	Billed Unmetered	14,975	MG/yr	
BUAC	Billed Unmetered	0.000	MG/yr	
UMAC	Unbilled Unmetered	27.950	MG/yr	0.25% default
UUAC	Unbilled Unmetered	0.308	MG/yr	
AUTHORIZED CONSUMPTION		15,003	MG/yr	

WATER LOSSES				
Apparent Losses		19,763	MG/yr	
SGE	Systematic Data Reading Errors	0.000	MG/yr	0.25% default
CMR	Customer Metering Inaccuracies	0.000	MG/yr	percent under-registration
UC	Unauthorized Consumption	0.000	MG/yr	0.25% default
Apparent Losses		0.777	MG/yr	
Real Losses		19,996	MG/yr	
WATER LOSSES		19,763	MG/yr	

NON-REVENUE WATER			
NON-REVENUE WATER		43,208	MG/yr

SYSTEM DATA			
Ln	Length of main	343	mile (including fire hydrant lead lengths)
Nc	Number of service connections	642	(civic and business)
	Service connection density	1.87	connections/mile
Lp	Are customer meters typically located at the	Yes	
AOP	Average length of customer service lines from the end of the main to the meter	820	ft
	Average Operating Pressure		psi

COST DATA			
CRUC	Customer Retail Unit Charge	\$5.76	\$/1000 gallons (US)
VPC	Variable Production Cost	\$3,800.00	\$/MGA-year
Total Annual Operating Co		\$23,950,000	\$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

Priority Areas for Attention to Improve Data Validity:

- Volume from Own Sources (VOS)
- Billed Unmetered (BUAC)
- Number of Service Connections (No)

Key Performance Indicator Targets:

Unit Total Losses	gal/conn/day
Unit Apparent Losses	gal/conn/day
Unit Real Losses*	gal/conn/day
Unit Real Losses**	gal/conn/day

Entered above by user; targets will display on KPI gauges (see Dash)

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet ...

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Waterstown Water District 2020 AWWA Free Water Audit Software: Interactive Data Grading

White = incomplete Orange = complete

Use acronyms for navigation

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Volume from Own Sources Error Adjustment (VOSEA) - Data Grading Criteria

vosea	Criteria Question	Select Best-Fit Answers to All Visible Questions
vosea.1	Are tank levels monitored automatically & recorded daily?	
vosea.2	Are daily changes of stored water volumes in distribution system tanks included in the tabulation of the daily "Volume from Own Sources" quantity?	
vosea.3	Is the annual net distribution storage change included in either the VOS input or the VOSEA input?	
vosea.4	Are the flow accuracy test and/or electronic calibration results included in the VOSEA input in the water audit?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

4.1

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Waterstown Water District 2020 AWWA Free Water Audit Software: Interactive Data Grading

White = incomplete Orange = complete

Use acronyms for navigation

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Volume from Own Sources Error Adjustment (VOSEA) - Data Grading Criteria

vosea	Criteria Question	Select Best-Fit Answers to All Visible Questions
vosea.1	Are tank levels monitored automatically & recorded daily?	Yes
vosea.2	Are daily changes of stored water volumes in distribution system tanks included in the tabulation of the daily "Volume from Own Sources" quantity?	Not sure
vosea.3	Is the annual net distribution storage change included in either the VOS input or the VOSEA input?	No
vosea.4	Are the flow accuracy test and/or electronic calibration results included in the VOSEA input in the water audit?	Yes, results are analyzed and incorporated

FINAL DATA GRADE FOR THIS AUDIT INPUT: 8

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagramr ...

Limiting criteria (see Start Page for details)

WATERSTOWN EXAMPLE

4.2

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

To access definitions, click the input name

WATER SUPPLIED

WS	Volume from Own Sources (VOS)	76,620	MG/yr	0.1%	0.95%	percent	over-registration	VOSEA
WI	Water Imported (WI)	9,000	MG/yr	0.1%	1.00%	percent	under-registration	WIEA
WV	Water Supplied (VOS + WI)	85,620	MG/yr					WVSEA

WATER SUPPLIED: 85,620 MG/yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	18,530	MG/yr					
BUAC	Billed Unmetered	6,500	MG/yr					
UMAC	Unbilled Metered	23,950	MG/yr					
UWAC	Unbilled Unmetered	0,980	MG/yr					

AUTHORIZED CONSUMPTION: 49,960 MG/yr

WATER LOSSES

19,760 MG/yr

Apparent Losses

CODE	Systematic Data Handling Errors	0.388	MG/yr	0.25%	default		
CMR	Customer Metering Inaccuracies	0.008	MG/yr	0.25%	percent		under-registration
UC	Unauthorized Consumption	0.988	MG/yr	0.25%	default		

Apparent Losses: 0.777 MG/yr

Real Losses

18,983 MG/yr

NON-REVENUE WATER

43,308 MG/yr

SYSTEM DATA

Lm	Length of main	243	also	(including the hydrant lead lengths)
Nc	Number of service connections	642		(retic and building)
Lp	Service connection length	18	con./mi./main	

COST DATA

CRUC	Customer Rental Unit Charge	\$5.70	\$1950.00/yr/line (US)	Total Annual Operating Co.
VPC	Variable Production Cost	\$3,860.00	\$1446/yr/line	\$23,950,000 (yr optional input)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)
2. Billed Unmetered (BUAC)
3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/conn/day
Unit Apparent Losses	gal/conn/day
Unit Real Losses ^a	gal/conn/day
Unit Real Losses ^b	gal/mile/day

If entered above by user, targets will display on KPI gauges (See Dash

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet

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Waterstown Water District 2020 AWWA Free Water Audit Software: Interactive Data Grading

White = incomplete
Orange = complete

Use acronyms for navigation

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Water Imported (WI) - Data Grading Criteria

Criteria Question	Select Best-Fit Answers to All Visible Questions
wi.0	Did the water utility import any water during the audit year?
wi.1	What percent of water imported is metered? For questions 2.10 below: Choose the answer that applies for those meters that measure >90% of the water imported volume. In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume. Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s). Secondary device can include conversion to mA, meter transmitter or similar instrumentation. Tertiary device can include SCADA, historian or other computerized archival system.
wi.2	What is the frequency of electronic calibration?
wi.3	What level of data transfer errors are checked as part of the electronic calibration process?
wi.4	Is the most recent electronic calibration documentation available?
wi.5	What is the frequency of in-situ flow accuracy testing?
wi.6	Is the most recent in-situ flow accuracy testing documentation available?
wi.7	What are the total volume-weighted average results of in-situ flow accuracy testing (during or closest to audit year)?
wi.8	Have testing and calibration procedures been closely scrutinized for compliance with procedures described in the AWWA M36 and/or M33 Manual(s)?
wi.9	Which best describes the frequency of meter readings (data collection frequency as opposed to billing frequency)?
wi.10	What is the frequency of data review & correction by Exporting or Importing Utility for data gaps and/or anomalies? These can include numbers that are outside of typical patterns, and zero or 'null' values that may reflect a gap in data recording.

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

Limiting criteria (see Start Page for details)

White = incomplete
Orange = complete

Use acronyms for navigation

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Water Imported (WI) - Data Grading Criteria

go to input

go to notes

Criteria Question

Select Best-Fit Answers to All Visible Questions

wi.0 Did the water utility import any water during the audit year? No

wi.1

For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the water imported volume.
In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume.
Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s).
Secondary device can include conversion to mA, meter transmitter or similar instrumentation.
Tertiary device can include SCADA, historian or other computerized archival system.

wi.2

wi.3

wi.4

wi.5

wi.6

wi.7

wi.8

wi.9

wi.10

FINAL DATA GRADE FOR THIS AUDIT INPUT: n/a

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram ...

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG)/YEAR

Water Supplied Error Adjustments

choose entry options

WATER SUPPLIED

VOS Volume from Own Sources 29.958 MG/yr

WI Water Imported 0.000 MG/yr

VE Water Exported 54.023 MG/yr

WATER SUPPLIED 184.746 MG/yr

AUTHORIZED CONSUMPTION

BMAC Billed Unmetered 143.958 MG/yr

BUAC Billed Unmetered 0.900 MG/yr

UMAC Unbilled Unmetered 27.958 MG/yr

UOAC Unbilled Unmetered 0.300 MG/yr

AUTHORIZED CONSUMPTION 173.868 MG/yr

WATER LOSSES

Apparent Losses

SGE Systematic Data Handling Errors 0.000 MG/yr

CMR Customer Metering Inaccuracies 0.000 MG/yr

UC Unaccounted Consumption 0.200 MG/yr

Apparent Losses 0.200 MG/yr

Real Losses

Real Losses 0.998 MG/yr

WATER LOSSES 0.998 MG/yr

NON-REVENUE WATER 43.200 MG/yr

SYSTEM DATA

Ln Length of main 343 miles (including the hydrant lead length)

Nc Number of service connections 642 (civic and business)

Service connection density 1.87 connections/mile

Are customer meters typically located at the ... Yes

Lp Average length of customer service lines from the top and a data grading of 0 has been applied

Average Operating Pressure 82.00 psi

COST DATA

CRUC Customer Retail Unit Charge \$5.76 \$1000 gallon (US)

YPC Variable Production Cost \$3,800.00 \$1Million gallon

Total Annual Operating Co \$23,950,000 \$yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

Weighted score for the components of energy consumption and water loss is included in the calculation of the Water Audit Data Validity Score.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)

2. Billed Unmetered (BUAC)

3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses gal/conn/day

Unit Apparent Losses gal/conn/day

Unit Real Losses* gal/conn/day

Unit Real Losses** gal/conn/day

If entered above by user, targets will display on KPI gauges (see Dash)

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet ...

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

White = incomplete
Orange = complete

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Water Imported Error Adjustment (WIEA) - Data Grading Criteria

go to notes

wiea	Criteria Question	Select Best-Fit Answers to All Visible Questions
wiea.1	Is an agreement in place between Exporting and Importing Utility for the purchase of water?	
wiea.2	Are meter accuracy testing or electronic calibration requirements stipulated in the water purchase agreement?	
wiea.3	Are flow accuracy test and/or electronic calibration results used to inform the error adjustment input in the water audit?	
wiea.4	Who has access to the import meter readings including current and archived data?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

Water Imported Error Adjustments

choose entry option:

over-registered VOSA
under-registered VSEA

WATER SUPPLIED

VOS	Volume from Own Sources	29.958	MG/yr	0.99%	percent	
WE	Water Exported	54.023	MG/yr	1.00%	percent	
WATER SUPPLIED		184.746	MG/yr			

AUTHORIZED CONSUMPTION

BMAC	Billed Unmetered	18.938	MG/yr			
BUAC	Billed Unmetered	0.500	MG/yr			
UMAC	Unbilled Unmetered	0.250	MG/yr			
UUAC	Unbilled Unmetered	0.388	MG/yr	0.25%	default	
AUTHORIZED CONSUMPTION		19.988	MG/yr			

WATER LOSSES

Apparent Losses

SGE	Systematic Data Handling Errors	0.008	MG/yr	0.25%	default	
CMR	Customer Metering Inaccuracies	0.000	MG/yr			
UC	Unauthorized Consumption	0.288	MG/yr	0.25%	default	
Apparent Losses		0.778	MG/yr			

Real Losses

Real Losses		0.998	MG/yr			
WATER LOSSES		0.768	MG/yr			

NON-REVENUE WATER

NON-REVENUE WATER		43.208	MG/yr			
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SYSTEM DATA

Ln	Length of main	343	feet	(including fire hydrant lead lengths)
Nc	Number of service connections	642		(excise and basins)
	Service connection density	1.87	connections/acre	
Lp	Are customer meters typically located at the	Yes		
AOP	Average length of customer service lines from the tap and a data grading of 0 has been applied	820	feet	
	Average Operating Pressure	820	psi	

COST DATA

CRUC	Customer Retail Unit Charge	\$5.76	\$/1000 gallons (US)	Total Annual Operating Co
VPC	Variable Production Cost	\$3,800.00	\$/Mkwh gallon	\$23,950,000 \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

Weighted scale for the components of supply, consumption and water losses is included in the calculation of the Water Audit Data Validity Score.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)
2. Billed Unmetered (BUAC)
3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/conn/day
Unit Apparent Losses	gal/conn/day
Unit Real Losses*	gal/conn/day
Unit Real Losses**	gal/conn/day

If entered above by user, targets will display on KPI gauges (see Dash)

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

Limiting criteria (see Start Page for details)

White = incomplete
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Use acronyms for navigation

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Water Exported (WE) - Data Grading Criteria

go to input

we	Criteria Question	Select Best-Fit Answers to All Visible Questions
we.0	Did the water utility export any water during the audit year?	
we.1	What percent of water exported is metered?	
<p>For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the water exported volume.</p> <p>In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume.</p> <p>Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s). Secondary device can include conversion to mA, meter transmitter or similar instrumentation. Tertiary device can include SCADA, historian or other computerized archival system.</p>		
we.2	What is the frequency of electronic calibration?	
we.3	What level of data transfer errors are checked as part of the electronic calibration process?	
we.4	Is the most recent electronic calibration documentation available?	
we.5	What is the frequency of in-situ flow accuracy testing?	
we.6	Is the most recent in-situ flow accuracy testing documentation available?	
we.7	What are the total volume-weighted average results of in-situ flow accuracy testing (during or closest to audit year)?	
we.8	Have testing and calibration procedures been closely scrutinized for compliance with procedures described in the AWWA M36 and/or M33 Manual(s)?	
we.9	Which best describes the frequency of meter readings (data collection frequency as opposed to billing frequency)?	
we.10	What is the frequency of data review & correction by Exporting or Importing Utility for data gaps and/or anomalies? These can include numbers that are outside of typical patterns, and zero or 'null' values that may reflect a gap in data recording.	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

Limiting criteria (see Start Page for details)

White = incomplete
Orange = complete

Use acronyms for navigation

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Water Exported (WE) - Data Grading Criteria

go to input

we	Criteria Question	Select Best-Fit Answers to All Visible Questions
we.0	Did the water utility export any water during the audit year?	Yes
we.1	What percent of water exported is metered?	>95 - 99%
<p>For questions 2-10 below: Choose the answer that applies for those meters that measure >90% of the water exported volume.</p> <p>In-situ flow accuracy testing = a test process that confirms the flow measuring accuracy of the primary device (the flowmeter), in its installed location, using an independent reference volume.</p> <p>Electronic calibration = a process that checks for error in the metering secondary device(s) and/or the tertiary device(s). Secondary device can include conversion to mA, meter transmitter or similar instrumentation. Tertiary device can include SCADA, historian or other computerized archival system.</p>		
we.2	What is the frequency of electronic calibration?	Less than annual but within last 5 years
we.3	What level of data transfer errors are checked as part of the electronic calibration process?	Data transfer errors are checked at secondary device(s), but not to tertiary device(s)
we.4	Is the most recent electronic calibration documentation available?	Yes
we.5	What is the frequency of in-situ flow accuracy testing?	Annually
we.6	Is the most recent in-situ flow accuracy testing documentation available?	Yes
we.7	What are the total volume-weighted average results of in-situ flow accuracy testing (during or closest to audit year)?	At or within ±3%
we.8	Have testing and calibration procedures been closely scrutinized for compliance with procedures described in the AWWA M36 and/or M33 Manual(s)?	No
we.9	Which best describes the frequency of meter readings (data collection frequency as opposed to billing frequency)?	Once per month
we.10	What is the frequency of data review & correction by Exporting or Importing Utility for data gaps and/or anomalies? These can include numbers that are outside of typical patterns, and zero or 'null' values that may reflect a gap in data recording.	More frequently than monthly, but not every day

FINAL DATA GRADE FOR THIS AUDIT INPUT: 6

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram ...

WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

To access definitions, click the input name

WATER SUPPLIED

VOS	Volume from Own Sources	29,500	MG/yr	0.5%	percent	over-registered	VOSEA
VI	Water Imported	0.000	MG/yr				
VE	Water Exported	54,023	MG/yr	1.00%	percent	under-registered	WEEA
WATER SUPPLIED		188,748	MG/yr				

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	18,533	MG/yr				
BUAC	Billed Unmetered	6,500	MG/yr				
UMAC	Unbilled Metered	23,956	MG/yr				
UWAC	Unbilled Unmetered	0.988	MG/yr				
AUTHORIZED CONSUMPTION		179,989	MG/yr				

WATER LOSSES

WATER LOSSES		9,763	MG/yr				
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Apparent Losses

SDHE	Systematic Data Handling Errors	0.388	MG/yr	0.25%	percent		
CM	Customer Metering Inaccuracies	0.000	MG/yr				
UC	Unauthorized Consumption	0.988	MG/yr	0.25%	percent		
Apparent Losses		0.777	MG/yr				

Real Losses

Real Losses		10,966	MG/yr				
WATER LOSSES		9,763	MG/yr				

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/yr				
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SYSTEM DATA

Lm	Length of mains	243	also	(including the loop-net head lengths)
Nc	Number of service connections	642		(optic and buried)
Lp	Service connection length	18	con./mils./m	
AOP	Average length of customer service lines has been set to zero and a data grade of 10 has been applied			
AOP	Average Operating Pressure	92.0	psi	

COST DATA

CRUC	Customer Rental Unit Charge	\$5.70	\$1000.00/mo. (US)	Total Annual Operating Co.
VPC	Variable Production Cost	\$3,860.00	\$1/Mkwh. year	\$23,950,000.00 (yr optional input)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)
2. Billed Unmetered (BUAC)
3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/conn/day
Unit Apparent Losses	gal/conn/day
Unit Real Losses*	gal/conn/day
Unit Real Losses*	gal/mile/day

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet

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Waterstown Water District 2020 AWWA Free Water Audit Software: Interactive Data Grading

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UAC
SDHE CM UC Lm Nc Lp AOP CRUC VPC

Water Exported Error Adjustment (WEEA) - Data Grading Criteria

weea	Criteria Question	Select Best-Fit Answers to All Visible Questions
weea.1	Is an agreement in place between Exporting and Importing Utility?	
weea.2	Are meter accuracy testing or electronic calibration requirements stipulated in the water purchase agreement?	
weea.3	Are flow accuracy test and/or electronic calibration results used to inform the error adjustment input in the water audit?	
weea.4	Who has access to the import meter readings including current and archived data?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUC

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Water Exported Error Adjustment (WEEA) - Data Grading Criteria

go to notes

weea	Criteria Question	Select Best-Fit Answers to All Visible Questions
weea.1	Is an agreement in place between Exporting and Importing Utility?	Yes, but not written
weea.2	Are meter accuracy testing or electronic calibration requirements stipulated in the water purchase agreement?	Yes, and stipulated frequency as annual
weea.3	Are flow accuracy test and/or electronic calibration results used to inform the error adjustment input in the water audit?	No
weea.4	Who has access to the import meter readings including current and archived data?	Exporting and Importing Utility
FINAL DATA GRADE FOR THIS AUDIT INPUT:		4

Limiting

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagr ...

WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG)/PER YEAR

Water Supplied Error Adjustments choose entry option:

over-registered VOSEA under-registered VEEA

WATER SUPPLIED

VOS Volume from Own Sources 29.958 MG/yr 0.992% percent

WI Water Imported 0.000 MG/yr

VE Water Exported 54.022 MG/yr 1.000% percent

WATER SUPPLIED 184.746 MG/yr

AUTHORIZED CONSUMPTION

BMAC Billed Metered 93.538 MG/yr

UMAC Unbilled Metered 0.000 MG/yr

UUC Unbilled Unmetered 0.308 MG/yr 0.25% default

Default option selected for Unbilled Unmetered, with automatic data grading of 3

AUTHORIZED CONSUMPTION 93.846 MG/yr

WATER LOSSES

Apparent Losses

SGE Default option selected for Systematic Data Reading Errors, with automatic data grading of 3

Customer Metering Inaccuracies 0.000 MG/yr 0.25% default

UC Unaccounted Consumption 0.208 MG/yr 0.25% default

Default option selected for Unaccounted Consumption, with automatic data grading of 3

Apparent Losses 0.778 MG/yr

Real Losses

Real Losses 0.998 MG/yr

WATER LOSSES 0.978 MG/yr

NON-REVENUE WATER

NON-REVENUE WATER 43.208 MG/yr

SYSTEM DATA

Ln Length of main 343 miles (including the hydrant lead length)

Nc Number of service connections 642 (civic and business)

Service connection density 3.8 connections/mile

Lp Are customer meters typically located at the Yes

AOP Average length of customer service lines from the tap and a data grading of 0 has been applied

Average Operating Pressure 820 psi

COST DATA

CRUC Customer Retail Unit Charge \$5.76 \$1000 gallons (US)

VPC Variable Production Cost \$3,800.00 \$1Million gallon

Total Annual Operating Co \$23,950,000 \$yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

weighted scale for the component of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)

2. Billed Unmetered (BMAC)

3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses gal/conn/day

Unit Apparent Losses gal/conn/day

Unit Real Losses* gal/conn/day

Unit Real Losses** gal/conn/day

If entered above by user, targets will display on KPI gauges (see Dash)

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet ...

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Billed Metered Authorized Consumption (BMAC) - Data Grading Criteria

go to notes

bmac	Criteria Question	Select Best-Fit Answers to All Visible Questions
bmac.0	Were any customers metered in the audit year?	
bmac.1	For billed metered accounts, what % of bills are estimated in a typical billing cycle?	
bmac.2	How often does the utility read its customer meters? For systems with multiple read frequencies, select the reading frequency that describes the majority of your customers.	
bmac.3	Is the BMAC volume pro-rated to represent consumption occurring exactly during the audit period?	
bmac.4	How frequently does internal review by utility staff of the BMAC volumes occur?	
bmac.5	What level of detail is examined in the internal review of BMAC volumes?	
bmac.6	When was the most recent billing data review by someone who is independent of the utility billing process?	
bmac.7	What level of detail was examined in the review by someone who is independent of the utility billing process?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Billed Metered Authorized Consumption (BMAC) - Data Grading Criteria

go to notes

bmac	Criteria Question	Select Best-Fit Answers to All Visible Questions	
bmac.0	Were any customers metered in the audit year?	Yes	
bmac.1	For billed metered accounts, what % of bills are estimated in a typical billing cycle?	5% or less	
bmac.2	How often does the utility read its customer meters? For systems with multiple read frequencies, select the reading frequency that describes the majority of your customers.	Bi-Monthly	Limiting
bmac.3	Is the BMAC volume pro-rated to represent consumption occurring exactly during the audit period?	No	Limiting
bmac.4	How frequently does internal review by utility staff of the BMAC volumes occur?	Annually	Limiting
bmac.5	What level of detail is examined in the internal review of BMAC volumes?	Totals grouped by use type or customer class and specific accounts flagged for anomalous consumption	
bmac.6	When was the most recent billing data review by someone who is independent of the utility billing process?	Between 3 and 5 years ago	
bmac.7	What level of detail was examined in the review by someone who is independent of the utility billing process?	Third party review includes a check on a sample of accounts	

FINAL DATA GRADE FOR THIS AUDIT INPUT: 8

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WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

To access definitions, click the input name

WATER SUPPLIED

VOS	Volume from Own Sources	29,500	MG/yr	0.00%	percent	over-registration	VOSEA
WI	Water Imported	0.000	MG/yr	0.00%	percent		WIEA
WE	Water Exported	54,023	MG/yr	100%	percent	under-registration	WEEA
WATER SUPPLIED		188,748	MG/yr				

AUTHORIZED CONSUMPTION

BMAC	Billed Unmetered	5,500	MG/yr				
BUAC	Billed Unmetered	5,500	MG/yr				
UMAC	Unbilled Unmetered	0.000	MG/yr				
AUTHORIZED CONSUMPTION		10,500	MG/yr				

WATER LOSSES

Apparent Losses		9,763	MG/yr				
SDHE	Systematic Data Handling Errors	0.000	MG/yr	0.25%	percent		
CMR	Customer Metering Inaccuracies	0.000	MG/yr	0.25%	percent		under-registration
UC	Unauthorized Consumption	0.000	MG/yr	0.25%	percent		
Apparent Losses		0.777	MG/yr				
Real Losses		30,966	MG/yr				
WATER LOSSES		30,966	MG/yr				

NON-REVENUE WATER

NON-REVENUE WATER		43,300	MG/yr				
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SYSTEM DATA

Lm	Length of mains	243	also	(including the hydrant lead lengths)
Nc	Number of service connections	642		(retic and building)
Lp	Service connection length	10	con./mils./m	
AOP	Average length of customer service lines has been set to zero and a data grade of 10 has been applied			
CRUC	Average Operating Pressure	92.0	psi	

COST DATA

Customer Retail Unit Charge	\$5.70	\$1000.00/m ³ (US)	Total Annual Operating Co.	
Variable Production Cost	\$3,860.00	\$1/Mile-year	\$23,950,000	\$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

...weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY: KEY PERFORMANCE INDICATOR TARGETS:

Based on the information provided, audit reliability can be most improved by addressing: CRITICAL. If targets exist for the operational performance indicators:

1. Volume from Own Sources (VOS)	Unit Total Losses	gal/conn/day
2. Billed Unmetered (BUAC)	Unit Apparent Losses	gal/conn/day
3. Number of Service Connections (Nc)	Unit Real Losses ^a	gal/conn/day
	Unit Real Losses ^b	gal/mile/day

If entered above by user, targets will display on KPI gauges (See Dash

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Waterstown Water District 2020 **AWWA Free Water Audit Software: Interactive Data Grading**

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UAC

SDHE CMR UC Lm Nc Lp AOP CRUC VPC

White = incomplete Orange = complete

Use acronyms for navigation

Billed Unmetered Authorized Consumption (BUAC) - Data Grading Criteria

go to input go to notes

buac **Criteria Question** **Select Best-Fit Answers to All Visible Questions**

buac.0	Was there any billed consumption on unmetered accounts in the audit year?	
buac.1	What portion of billed accounts are unmetered (% by number of accounts)?	
buac.2	Methodology to quantify consumption for unmetered accounts?	
buac.3	How frequently is unmetered customer consumption estimated?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

Limiting criteria (see Start Page for details)

White = incomplete
Orange = complete

Use acronyms for navigation

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go to input

Billed Unmetered Authorized Consumption (BUAC) - Data Grading Criteria

go to notes

buac	Criteria Question	Select Best-Fit Answers to All Visible Questions	
buac.0	Was there any billed consumption on unmetered accounts in the audit year?	Yes	
buac.1	What portion of billed accounts are unmetered (% by number of accounts)?	5% or less	
buac.2	Methodology to quantify consumption for unmetered accounts?	Extrapolated from similar customer groups in the utility's metered population, but limited is sample sizes	Limiting
buac.3	How frequently is unmetered customer consumption estimated?	Quarterly	
FINAL DATA GRADE FOR THIS AUDIT INPUT:		5	

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagr ...

WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

Water Supplied Error Adjustments

choose entry option:

over-registration VOSEA
under-registration VCEA

WATER SUPPLIED

VOS Volume from Own Sources 29.953 MGR/yr 0.992% percent

WV Water Reported 0.000 MGR/yr

VE Water Expired 54.023 MGR/yr 1.000% percent

WATER SUPPLIED 184.746 MGR/yr

AUTHORIZED CONSUMPTION

BMAC Billed Metered 18.953 MGR/yr

UBMAC Unbilled Metered 6.500 MGR/yr

UBMAC Unbilled Metered 6.500 MGR/yr

UBMAC Unbilled Metered 6.500 MGR/yr

UBMAC Unbilled Metered 6.500 MGR/yr

Default option selected for Unbilled Metered, with automatic data grading of 3

AUTHORIZED CONSUMPTION 19.953 MGR/yr

WATER LOSSES

Apparent Losses

SGME Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

SGME Systematic Data Handling Errors 0.000 MGR/yr 0.000% percent

CMR Customer Metering Inaccuracies 0.000 MGR/yr

UC Unaccounted Consumption 0.000 MGR/yr

Default option selected for Unaccounted Consumption, with automatic data grading of 3

Apparent Losses 0.777 MGR/yr

Real Losses

Real Losses 0.996 MGR/yr

WATER LOSSES 0.976 MGR/yr

NON-REVENUE WATER

NON-REVENUE WATER 43.208 MGR/yr

SYSTEM DATA

Ln Length of main 343 m (including the hydrant lead length)

Nc Number of service connections 642 (civic and business)

Service connection density 1.86 connections/m

Are customer meters typically located at the Yes

Lp Average length of customer service lines from the tap and a data grading of 0 has been applied

AOP Average Operating Pressure 820 psi

COST DATA

CRUC Customer Retail Unit Charge \$5.76 \$1000 gallons (US)

VPC Variable Production Cost \$3,800.00 \$1Million gallon

Total Annual Operating Co \$23,950,000 \$yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

...weighted scale for the components of energy consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)

2. Billed Unmetered (BUAC)

3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses gal/conn/day

Unit Apparent Losses gal/conn/day

Unit Real Losses* gal/conn/day

Unit Real Losses** gal/conn/day

If entered above by user, targets will display on KPI gauges (see Dash

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet ...

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Unbilled Metered Authorized Consumption (UMAC) - Data Grading Criteria

go to notes

umac	Criteria Question	Select Best-Fit Answers to All Visible Questions
umac.0	Did the water utility have any unbilled-metered consumption in the audit year?	
umac.1	Does the water utility policy articulate which accounts are exempt from billing?	
umac.2	How many unbilled metered accounts exist?	
umac.3	How often is each unbilled customer meter read? For systems with multiple read frequencies, select the reading frequency that describes the majority of your customers.	
umac.4	How often are unbilled metered volumes reviewed for error?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Unbilled Metered Authorized Consumption (UMAC) - Data Grading Criteria

go to notes

umac	Criteria Question	Select Best-Fit Answers to All Visible Questions
umac.0	Did the water utility have any unbilled-metered consumption in the audit year?	Yes
umac.1	Does the water utility policy articulate which accounts are exempt from billing?	Policy broadly addresses and there exists a collective understanding
umac.2	How many unbilled metered accounts exist?	Estimated total available
umac.3	How often is each unbilled customer meter read? For systems with multiple read frequencies, select the reading frequency that describes the majority of your customers.	Quarterly
umac.4	How often are unbilled metered volumes reviewed for error?	More than annually, but less than every billing cycle

FINAL DATA GRADE FOR THIS AUDIT INPUT: 4

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagramr ...

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WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

To access definitions, click the input name

WATER SUPPLIED

VOS	Volume from Own Sources	294,930	MG/Yr	0.1	0.950	percent	over-registration	VOSEA
VE	Water Expired	54,023	MG/Yr	0.1	1.000	percent	under-registration	VEEA
WATER SUPPLIED		348,953	MG/Yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	183,533	MG/Yr					
BUAC	Billed Unmetered	5,500	MG/Yr					
UMAC	Unbilled Unmetered	79,920	MG/Yr					
UMAC	Unbilled Unmetered	0.308	MG/Yr					
AUTHORIZED CONSUMPTION		198,969	MG/Yr					

Default option selected for Unbilled Unmetered, with automatic data grading of 3

WATER LOSSES

WATER LOSSES		39,763	MG/Yr					
---------------------	--	---------------	--------------	--	--	--	--	--

Apparent Losses

SDHE	Systematic Data Handling Errors	0.388	MG/Yr	0.25	default			
CMR	Customer Metering Inaccuracies	0.008	MG/Yr	0.25	percent	under-registration		
UC	Unauthorized Consumption	0.388	MG/Yr	0.25	default			
Apparent Losses		0.777	MG/Yr					

Default option selected for Unauthorized Consumption, with automatic data grading of 2

Real Losses

Real Losses		39,966	MG/Yr					
WATER LOSSES		39,763	MG/Yr					

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/Yr					
--------------------------	--	---------------	--------------	--	--	--	--	--

SYSTEM DATA

Lm	Length of mains	243	also	(including the hydrant lead lengths)				
Nc	Number of service connections	642		(notic user building)				
Lp	Service connection length	18	con./mi./mwh					
Lp	Are customer meters typically located at the	Yes						
AOP	Average length of customer service lines has been set to zero and a data grade of 10 has been applied							
AOP	Average Operating Pressure	92.0	psi					

COST DATA

CRUC	Customer Rental Unit Charge	\$5.70	\$1000.00/mo. (US)	Total Annual Operating Co.				
VPC	Variable Production Cost	\$3,860.00	\$1M/mo. year	\$23,950,000		/yr (optional input)		

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

Weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

- Volume from Own Sources (VOS)
- Billed Unmetered (BUAC)
- Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/con/da	
Unit Apparent Losses	gal/con/da	
Unit Real Losses*	gal/con/da	
Unit Real Losses*	gal/mi/da	

If entered above by user, targets will display on KPI gauges (See Dash

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

White = incomplete
Orange = complete

Use acronyms for navigation

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UAC
 SDHE CMI UC Lm Nc Lp AOP CRUC VPC

Unbilled Unmetered Authorized Consumption (UMAC) - Data Grading Criteria

This Data Grading Criteria is hidden when the 'default' input is used on the Worksheet

FINAL DATA GRADE FOR THIS AUDIT INPUT: 3

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC **UUAC** Limiting criteria (see Start Page for details)

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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go to input Unbilled Unmetered Authorized Consumption (UUAC) - Data Grading Criteria go to notes

uuac	Criteria Question	Select Best-Fit Answers to All Visible Questions
uuac.0	On the Worksheet, the status of the default option is:	A system specific volume has been entered
uuac.1	How well-understood is the extent of unbilled unmetered use?	
uuac.2	Which best describes the records that are kept for events of unbilled unmetered use?	
uuac.3	How is the majority of unbilled unmetered use estimated?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Not using the default value, must grade the data...

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

Water Supplied Error Adjustments

choose entry option:

over-registered VOSEA
under-registered VEEA

WATER SUPPLIED

VOS	Volume from Own Sources	29.958	MG/yr	0.99%	percent
WI	Water Imported	0.000	MG/yr		
VE	Water Exported	54.023	MG/yr	1.00%	percent
WATER SUPPLIED		186.746	MG/yr		

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	143.938	MG/yr		
BUAC	Billed Unmetered	0.500	MG/yr		
UMAC	Unbilled Metered	27.958	MG/yr		
UUAC	Unbilled Unmetered	0.308	MG/yr	0.25%	default
AUTHORIZED CONSUMPTION		173.688	MG/yr		

WATER LOSSES

Apparent Losses

UOE	Unbilled Unmetered Error	0.308	MG/yr	0.25%	default
UC	Unbilled Unmetered Consumption	0.308	MG/yr	0.25%	default
Apparent Losses		0.776	MG/yr		

Real Losses

Real Losses		0.996	MG/yr		
WATER LOSSES		0.768	MG/yr		

NON-REVENUE WATER

NON-REVENUE WATER		43.208	MG/yr		
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SYSTEM DATA

Ln	Length of main	343	ft	(including the hydrant lead length)
Nc	Number of service connections	642		(excise and basins)
Sc	Service connection density	1.87	con./mi. ave.	
Lp	Are customer meters typically located at the	Yes		
AOP	Average length of customer service lines from the app and a data grading of 0 has been applied	820	ft	
AOP	Average Operating Pressure	820	psi	

COST DATA

CRUC	Customer Retail Unit Charge	\$5.76	\$/1000 gallons (US)	Total Annual Operating Co
VPC	Variable Production Cost	\$3,800.00	\$/Mkwa year	\$23,950,000 \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

weighted scale for the components of energy consumption and water loss is included in the calculation of the Water Audit Data Validity Score.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

- Volume from Own Sources (VOS)
- Billed Unmetered (BUAC)
- Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/conn/100g
Unit Apparent Losses	gal/conn/100g
Unit Real Losses*	gal/conn/100g
Unit Real Losses**	gal/conn/100g

If entered above by user, targets will display on KPI gauges (see Dash)

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC **UUAC**

White = incomplete
Orange = complete

SDHE CMI **UC** Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Systematic Data Handling Error (SDHE) - Data Grading Criteria

go to notes

This Data Grading Criteria is hidden when the 'default' input is used on the Worksheet

FINAL DATA GRADE FOR THIS AUDIT INPUT: 3

Start Page Worksheet **Interactive Data Grading** Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC **UUAC**

White = incomplete
Orange = complete

SDHE CMI **UC** Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Systematic Data Handling Error (SDHE) - Data Grading Criteria

go to notes

sdhe	Criteria Question	Select Best-Fit Answers to All Visible Questions
sdhe.0	On the Worksheet, the status of the default option is:	A system specific volume has been entered
sdhe.1	Which best describes how the input was derived?	
sdhe.2	Which best describes validation performed in the billing software for multipliers (conversions between unit of meter reading and unit of billing)?	
sdhe.3	Which best describes the policy for new service accounts to ensure there is no lapse between start of customer water usage and start of measurement/billing?	
sdhe.4	Which best describes auditing that takes place on the billing process?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet **Interactive Data Grading** Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 Oct 31 2020 Fiscal

To access definitions, click the input name All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

WATER SUPPLIED

VOS	Volume from Own Sources	29,938	MG/Yr	0.1	0.95%	percent	over-registration	VOSEA
VOE	Water Expensed	0.000	MG/Yr	0.0	0.00%	percent	under-registration	VOSEA
WTE	Water Exported	54,023	MG/Yr	0.1	1.00%	percent	under-registration	WTEA
WATER SUPPLIED		84,961	MG/Yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	18,533	MG/Yr					
BUAC	Billed Unmetered	6,500	MG/Yr					
UMAC	Unbilled Metered	2,156	MG/Yr					
UWAC	Unbilled Unmetered	0.388	MG/Yr					
AUTHORIZED CONSUMPTION		27,579	MG/Yr					

WATER LOSSES

Apparent Losses		9,763	MG/Yr					
UC	Unauthorized Consumption	0.388	MG/Yr					
Real Losses		10,966	MG/Yr					
WATER LOSSES		10,966	MG/Yr					

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/Yr					
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SYSTEM DATA

Lm	Length of main	243	also	(including the hydrant lead lengths)
Nc	Number of service connections	642	also	(retic and building)
Lp	Service connection length	18	con./mi./mwh	
AOP	Average length of customer service lines has been set to zero and a data grading of 10 has been applied			
AOP	Average Operating Pressure	92.0	psi	

COST DATA

CRUC	Customer Rental Unit Charge	\$5.70	per 1000 gal/mo (US)	Total Annual Operating Co.
VPC	Variable Production Cost	\$3,860.00	per MG of water	\$23,950,000

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY: **KEY PERFORMANCE INDICATOR TARGETS:**

Based on the information provided, audit reliability can be most improved by addressing: **OPTIONAL:** If targets exist for the operational performance indicators, 0

1	Volume from Own Sources (VOS)	Unit Total Losses	gal/conn/day
2	Billed Unmetered (BUAC)	Unit Apparent Losses	gal/conn/day
3	Number of Service Connections (Nc)	Unit Real Losses ¹	gal/conn/day
		Unit Real Losses ²	gal/mile/day

If entered above by user, targets will display on KPI gauges (See Dash

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet

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Waterstown Water District AWWA Free Water Audit Software: Interactive Data Grading

2020 **VOS** **VOSEA** **WI** **WIEA** **WE** **WEEA** **BMAC** **BUAC** **UMAC** **UAC** **UUC**

White = incomplete Orange = complete **SDHE** **CMi** **UC** **Lm** **Nc** **Lp** **AOP** **CRUC** **VPC**

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go to input **Customer Metering Inaccuracies (CMI) - Data Grading Criteria** go to notes

cmi	Criteria Question	Select Best-Fit Answers to All Visible Questions
cmi.0	Was there any metered customer usage during the audit period?	
cmi.1	Do you test meters reactively (when triggered by customer complaint or billing/consumption flag)?	
cmi.2	For small size customer meters, which best describes the frequency of proactive testing (effort beyond when triggered by customer complaint or billing/consumption flags)?	
cmi.3	Which best describes what meters are included in the proactive small size customer meter testing activities?	
cmi.4	For mid and large size customer meters, which best describes the frequency of the proactive testing program?	
cmi.5	Which best describes what meters are included in the proactive mid- and large customer meter testing activities?	
cmi.6	Which best describes how the input was derived?	
cmi.7	Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?	
cmi.8	To what extent does meter replacement occur and for which meters?	
cmi.9	Which best describes the reliability of meter installation records?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet **Interactive Data Grading** Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC
 SDHE CMI UC Lm Nc Lp AOP CRUC VPC

White = incomplete
 Orange = complete

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Limiting criteria (see Start Page for details)

go to input go to notes

Customer Metering Inaccuracies (CMI) - Data Grading Criteria

cmi	Criteria Question	Select Best-Fit Answers to All Visible Questions	
cmi.0	Was there any metered customer usage during the audit period?	Yes	
cmi.1	Do you test meters reactively (when triggered by customer complaint or billing/consumption flag)?	Reactive testing conducted	
cmi.2	For small size customer meters, which best describes the frequency of proactive testing (effort beyond when triggered by customer complaint or billing/consumption flags)?	Not recurring, but conducted within 5 years prior to audit period	Limiting
cmi.3	Which best describes what meters are included in the proactive small size customer meter testing activities?	Testing targeted to subsets of meters in oldest meters	
cmi.4	For mid and large size customer meters, which best describes the frequency of the proactive testing program?	Recurring, within 5 years prior to audit period, but less frequently than annually	
cmi.5	Which best describes what meters are included in the proactive mid- and large customer meter testing activities?	Proactive - all large meters are on a testing schedule	
cmi.6	Which best describes how the input was derived?	Meter accuracy test results or manufacturer specs are referenced but not analyzed and used directly in calculation	Limiting
cmi.7	Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?	No	
cmi.8	To what extent does meter replacement occur and for which meters?	Replacement upon complete failure or special circumstance (as needed)	
cmi.9	Which best describes the reliability of meter installation records?	Records are kept for meter installations, but data is missing for installation date, type, size, or manufacturer	
FINAL DATA GRADE FOR THIS AUDIT INPUT:		6	

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram ...

WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name To edit water system info: go to start page

All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

WATER SUPPLIED

VOS	Volume from Own Sources	29.958	MG/yr	0.99%	percent	over-registration VOSEA
WI	Water Imported	0.000	MG/yr			WIEA
VE	Water Exported	54.023	MG/yr	1.00%	percent	under-registration VEEA
WATER SUPPLIED		186.746	MG/yr			

AUTHORIZED CONSUMPTION

BMAC	Billed Unmetered	14.939	MG/yr			
BUAC	Billed Unmetered	0.500	MG/yr			
UMAC	Unbilled Unmetered	0.250	MG/yr			
UUAC	Unbilled Unmetered	0.308	MG/yr	0.25%	default	
Default option selected for Unbilled Unmetered, with automatic data grading of 3						
AUTHORIZED CONSUMPTION		15.998	MG/yr			

WATER LOSSES

Apparent Losses

SGE	Systematic Data Handling Errors	0.000	MG/yr	0.25%	default	
CM	Customer Metering Inaccuracies	0.000	MG/yr			under-registration
UC	Unbilled Unmetered Consumption	0.308	MG/yr	0.25%	default	
Default option selected for Unbilled Unmetered Consumption, with automatic data grading of 3						
Apparent Losses		0.778	MG/yr			

Real Losses

Real Losses		0.998	MG/yr			
WATER LOSSES		0.778	MG/yr			

NON-REVENUE WATER

NON-REVENUE WATER		43.208	MG/yr			
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SYSTEM DATA

Ln	Length of main	343	feet	(including fire hydrant lead lengths)
Nc	Number of service connections	642		(excluding end basins)
	Service connection density	1.88	connections/acre	
Lp	Are customer meters typically located at the	Yes		
AOP	Average length of customer service lines between the tap and a data grading of 0 has been applied	820	feet	
	Average Operating Pressure	820	psi	

COST DATA

CRUC	Customer Retail Unit Charge	\$5.76	\$/1000 gallons (US)	Total Annual Operating Co
VPC	Variable Production Cost	\$3,800.00	\$/MGA/year	\$23,950,000 \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

Weighted scale for the components of input, consumption and water loss is included in the calculation of the Water Audit Data Validity Score.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY: KEY PERFORMANCE INDICATOR TARGETS:

Based on the information provided, audit reliability can be most improved by addressing: OPTIONAL: If targets exist for the operational performance indicators, if entered above by user, targets will display on KPI gauges (see Dash)

1. Volume from Own Sources (VOS)	Unit Total Losses	gal/conn/Day
2. Billed Unmetered (BUAC)	Unit Apparent Losses	gal/conn/Day
3. Number of Service Connections (No)	Unit Real Losses*	gal/conn/Day
	Unit Real Losses**	gal/mile/Day

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet ...

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

White = incomplete
Orange = complete

Use acronyms for navigation

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Limiting criteria (see Start Page for details)

Unauthorized Consumption (UC) - Data Grading Criteria

This Data Grading Criteria is hidden when the 'default' input is used on the Worksheet

FINAL DATA GRADE FOR THIS AUDIT INPUT: 3

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

WATERSTOWN EXAMPLE

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

White = incomplete
Orange = complete

Use acronyms for navigation

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Limiting criteria (see Start Page for details)

Unauthorized Consumption (UC) - Data Grading Criteria

uc	Criteria Question	Select Best-Fit Answers to All Visible Questions
uc.0	On the Worksheet, the status of the default option is:	A system specific volume has been entered
uc.1	Which best describes how the input was derived?	
uc.2	Which best describes the extent of unauthorized consumption tracking and oversight?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

To access definitions, click the input name

WATER SUPPLIED

VOS	Volume from Own Sources	294,930	MG/yr	0.1%	percent	over-registered	VOSEA
VOE	Water Expensed	0,000	MG/yr	0.0%	percent		VOSEA
WVE	Water Exported	54,023	MG/yr	0.1%	percent	under-registered	WVEEA
WATER SUPPLIED		188,748	MG/yr				

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	183,530	MG/yr				
BUAC	Billed Unmetered	6,500	MG/yr				
UMAC	Unbilled Metered	23,950	MG/yr				
UMAC	Unbilled Unmetered	0,388	MG/yr				
AUTHORIZED CONSUMPTION		198,868	MG/yr				

WATER LOSSES

WATER LOSSES		9,763	MG/yr				
---------------------	--	--------------	--------------	--	--	--	--

Apparent Losses

SDHE	Systematic Data Handling Errors	0,388	MG/yr	0.25%	percent		
CMR	Customer Metering Inaccuracies	0,000	MG/yr				under-registered
UC	Unauthorized Consumption	0,388	MG/yr	0.25%	percent		
Apparent Losses		0,777	MG/yr				

Real Losses

Real Losses		8,986	MG/yr				
WATER LOSSES		9,763	MG/yr				

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/yr				
--------------------------	--	---------------	--------------	--	--	--	--

SYSTEM DATA

Lm	Length of mains	24.3	mile				
Lp	Are customer meters typically located at the service connection bench?	Yes					
AOP	Average length of customer service lines has been set to zero and a data grading of 10 has been applied	10					

COST DATA

CRUC	Customer Rental Unit Charge	\$5.70	(\$/1000 gal/mo)				
VPC	Variable Production Cost	\$3,860.00	(\$/MG/yr)				
Total Annual Operating Co.		\$23,950,000	(\$/yr)				

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)
2. Billed Unmetered (BUAC)
3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/conn/day	
Unit Apparent Losses	gal/conn/day	
Unit Real Losses*	gal/conn/day	
Unit Real Losses*	gal/mile/day	

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet

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AWWA Free Water Audit Software: Interactive Data Grading

Waterstown Water District 2020

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UAC SDHE CMR UC Lm Nc Lp AOP CRUC VPC

Length of Mains (Lm) - Data Grading Criteria

Lm	Criteria Question	Select Best-Fit Answers to All Visible Questions
Lm.1	How was the input derived?	
Lm.2	Are hydrant laterals included in the input derivation?	
Lm.3	Which best describes how the Mains inventory (GIS, ledger, etc) is kept up to date?	
Lm.4	Which best describes how the Mains inventory (GIS, ledger, etc) is field validated to confirm field conditions match the inventory?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (See Start Page for details)

go to input go to notes

Length of Mains (Lm) - Data Grading Criteria

Lm	Criteria Question	Select Best-Fit Answers to All Visible Questions	
Lm.1	How was the input derived?	Derived directly from Mains inventory (GIS, ledger, etc)	
Lm.2	Are hydrant laterals included in the input derivation?	No	
Lm.3	Which best describes how the Mains inventory (GIS, ledger, etc) is kept up to date?	Additions or subtractions are updated in the mains inventory (GIS, ledger, etc), but less than annually	Limiting
Lm.4	Which best describes how the Mains inventory (GIS, ledger, etc) is field validated to confirm field conditions match the inventory?	No field validation is conducted	
FINAL DATA GRADE FOR THIS AUDIT INPUT:		6	

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagr ...

WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

To edit water system info: go to start page

All volumes to be entered as: MILLION GALLONS (MG)/YEAR

Water Supplied Error Adjustments

choose entry option:

over-registration VOSEA
under-registration VEEA

WATER SUPPLIED

VOS	Volume from Own Sources	29.958	MG/yr	0.99%	percent
VI	Water Reported	0.900	MG/yr		
VE	Water Expired	54.023	MG/yr	100%	percent
WATER SUPPLIED		186.746	MG/yr		

AUTHORIZED CONSUMPTION

BMAC	Billed Unmetered	143.938	MG/yr		
BUAC	Billed Unmetered	0.900	MG/yr		
UMAC	Unbilled Unmetered	27.958	MG/yr		
UUAC	Unbilled Unmetered	0.308	MG/yr	0.25%	default
AUTHORIZED CONSUMPTION		173.988	MG/yr		

WATER LOSSES

Apparent Losses

SGE	Systematic Data Handling Errors	0.008	MG/yr	0.35%	default
CMR	Customer Metering Inaccuracies	0.000	MG/yr		
UC	Unauthorized Consumption	0.208	MG/yr	0.25%	default
Apparent Losses:		0.777	MG/yr		

Real Losses

Real Losses:		0.998	MG/yr		
WATER LOSSES:		0.767	MG/yr		

NON-REVENUE WATER

NON-REVENUE WATER: 43.208 MG/yr

SYSTEM DATA

Lp	Length of mains (ft)	21.0	mile	(including the hydrant lead length)
Nc	Number of service connections	642	connections	(civic and business)
Are customer meters typically located at the _____?				
Yes				
Lp	Average length of customer service laterals per ft of main and a data grading of 0 has been applied			
AOP	Average Operating Pressure	82.0	psi	

COST DATA

CRUC	Customer Retail Unit Charge	\$5.76	\$1000 gallons (US)	Total Annual Operating Co
VPC	Variable Production Cost	\$3,800.00	\$1Million gallon	\$23,950,000 \$/yr (optimal input)

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

weighted scale for the components of input, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY: KEY PERFORMANCE INDICATOR TARGETS:

Based on the information provided, audit reliability can be most improved by addressing: OPTIONAL: If targets exist for the operational performance indicators, if entered above by user, targets will display on KPI gauges (see Dash

1. Volume from Own Sources (VOS)	Unit Total Losses	gal/conn/day
2. Billed Unmetered (BUAC)	Unit Apparent Losses	gal/conn/day
3. Number of Service Connections (Nc)	Unit Real Losses*	gal/mile/day
	Unit Real Losses**	gal/mile/day

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet ...

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

White = incomplete
Orange = complete

Use acronyms for navigation

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Limiting criteria (see Start Page for details)

Number of Service Connections (Nc) - Data Grading Criteria

go to input

go to notes

Nc	Criteria Question	Select Best-Fit Answers to All Visible Questions
Nc.1	How was the input derived?	
Nc.2	What is the count of services based on?	
Nc.3	Are inactive (but still pressurized) service lines included in the input? These may be metered or unmetered.	
Nc.4	Which best describes how the inventory of service connections (GIS, billing system, etc) is kept up to date?	
Nc.5	Which best describes how the inventory of service connections (GIS, billing system, etc) is field validated to confirm field conditions match the inventory?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

White = incomplete
Orange = complete

Use acronyms for navigation

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Limiting criteria (see Start Page for details)

Number of Service Connections (Nc) - Data Grading Criteria

go to input

go to notes

Nc	Criteria Question	Select Best-Fit Answers to All Visible Questions
Nc.1	How was the input derived?	Extracted from Services inventory (GIS, billing system, etc)
Nc.2	What is the count of services based on?	Premise based, i.e. service connection count, location ID count
Nc.3	Are inactive (but still pressurized) service lines included in the input? These may be metered or unmetered.	Yes
Nc.4	Which best describes how the inventory of service connections (GIS, billing system, etc) is kept up to date?	Additions or subtractions are updated in the service line inventory (GIS, billing system, etc), but less than annually
Nc.5	Which best describes how the inventory of service connections (GIS, billing system, etc) is field validated to confirm field conditions match the inventory?	No field validation is conducted

FINAL DATA GRADE FOR THIS AUDIT INPUT:

5

Limiting

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram ...

WATERSTOWN EXAMPLE

80

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

To access definitions, click the input name

WATER SUPPLIED

VOS	Volume from Own Sources	294,930	MG/Yr	0.1	0.95%	percent	over-registration	VOSEA
WI	Water Imported	0,000	MG/Yr					WIEA
WE	Water Exported	54,023	MG/Yr	0.1	1.00%	percent	under-registration	WEEA
WATER SUPPLIED		188,748	MG/Yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	183,533	MG/Yr					
BUAC	Billed Unmetered	6,500	MG/Yr					
UMAC	Unbilled Metered	23,956	MG/Yr					
UWAC	Unbilled Unmetered	0,989	MG/Yr					
AUTHORIZED CONSUMPTION		198,988	MG/Yr					

WATER LOSSES

WATER LOSSES		9,763	MG/Yr					
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Apparent Losses

SDHE	System Data Handling Errors	0.388	MG/Yr	0.25%	percent			
CM	Customer Metering Inaccuracies	0.008	MG/Yr				under-registration	
UC	Unauthorized Consumption	0.989	MG/Yr	0.25%	percent			
Apparent Losses		0.777	MG/Yr					

Real Losses

Real Losses		10,966	MG/Yr					
WATER LOSSES		9,763	MG/Yr					

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/Yr					
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SYSTEM DATA

Lp	Length of main	243	also	(including the hydrant lead lengths)
Nc	Number of service connections	642		(notic and basins)
	Service connection density	2.6	con./mi. main	
Lp	Are customer meters typically located at the	Yes		
AOP	Average Operating Pressure	82.0	psi	

COST DATA

CRUC	Customer Rental Unit Charge	\$5.70	\$/1000 gal/mo (US)	Total Annual Operating Co.
VPC	Variable Production Cost	\$3,860.00	\$/MGW yr	\$23,950,000

WATER AUDIT DATA VALIDITY TIER:

The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs.

Weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY: KEY PERFORMANCE INDICATOR TARGETS:
 Based on the information provided, audit reliability can be most improved by addressing: 1. VOLUME FROM OWN SOURCES (VOS)
 2. BILLED UNMETERED (BUAC)
 3. NUMBER OF SERVICE CONNECTIONS (Nc)

Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses: gal/mile/day

81

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

White = incomplete
 Orange = complete

Use acronyms for navigation

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

Average Length of (Private) Customer Service Line (Lp) - Data Grading Criteria

Criteria Question

Lp.0	Are customer meters typically located at the curbside or property line?	No
Lp.1	How was the input derived?	
Lp.2	Which best describes how the Customer Service Line and Meter Locations mapping is kept up to date?	
Lp.3	Which best describes how the Customer Service Line mapping is validated to what is in the field?	
Lp.4	Which best describes the policy to define where the utility's ownership of the service line ends, and the customer's ownership of the service line begins?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC
 SDHE CMI UC Lm Nc Lp AOP CRUC VPC

White = incomplete
 Orange = complete

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Limiting criteria (see Start Page for details)

go to input

Average Length of (Private) Customer Service Line (Lp) - Data Grading Criteria

go to notes

Lp	Criteria Question	Select Best-Fit Answers to All Visible Questions
Lp.0	Are customer meters typically located at the curbstop or property line?	Yes
Lp.1		
Lp.2		
Lp.3		
Lp.4		
FINAL DATA GRADE FOR THIS AUDIT INPUT:		10

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

To edit water system info: go to start page

WATER SUPPLIED

VOS	Volume from Own Sources	29,950 MGR/yr	0.99%	percent	over-registratio
WI	Water Imported	0.000 MGR/yr			VEEA
VE	Water Exported	54,020 MGR/yr	100%	percent	under-registratio
WATER SUPPLIED		188,746 MGR/yr			

AUTHORIZED CONSUMPTION

BMAC	Billed Unmetered	14,950 MGR/yr			
BUAC	Billed Unmetered	0.000 MGR/yr			
UMAC	Unbilled Unmetered	27.950 MGR/yr			
UAC	Unbilled Unmetered	0.300 MGR/yr			
AUTHORIZED CONSUMPTION		19,988 MGR/yr			

WATER LOSSES

Apparent Losses

SGE	Systematic Data Handling Errors	0.000 MGR/yr	0.25%	percent	
CMR	Customer Metering Inaccuracies	0.000 MGR/yr			under-registratio
UC	Unauthorized Consumption	0.000 MGR/yr	0.25%	percent	
Apparent Losses		0.777 MGR/yr			

Real Losses

Real Losses		0.996 MGR/yr			
WATER LOSSES		0.996 MGR/yr			

NON-REVENUE WATER

NON-REVENUE WATER		43,208 MGR/yr			
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SYSTEM DATA

Lm	Length of mains	343 miles	(including the hydrant lead lengths)
Nc	Number of service connections	642	(curbs and basins)
Lp	Service connections density	1.87	connections/mile

Are customer meters typically located at the curbstop or property line? Yes

Average Operating Pressure (AOP) 62.0 psi

COST DATA

CRUC	Customer Retail Unit Charge	\$5.76	\$1000 gallons (US)	Total Annual Operating Co
VPC	Variable Production Cost	\$3,800.00	\$1Million/year	\$23,950,000

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

Priority Areas for Attention to Improve Data Validity:

- Volume from Own Sources (VOS)
- Billed Unmetered (BUAC)
- Number of Service Connections (Nc)

Key Performance Indicator Targets:

Unit Total Losses	gal/conn/day
Unit Apparent Losses	gal/conn/day
Unit Real Losses*	gal/conn/day
Unit Real Losses**	gal/conn/day

Entered above by user; targets will display on KPI gauges (see Dash)

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet

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Waterstown Water District
2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

White = incomplete
Orange = complete

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC
SDHE CMI UC Lm Nc Lp AOP CRUC VPC

Limiting criteria (see Start Page for details)

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go to input

Average Operating Pressure (AOP) - Data Grading Criteria

go to notes

aop	Criteria Question	Select Best-Fit Answers to All Visible Questions
aop.1	Which best describes checks on the boundary integrity for the system's pressure zone(s)?	
aop.2	Which best describes how one-time pressure readings (i.e. from hydrants) are collected?	
aop.3	Which best describes where continuous pressure data (via temporary data loggers or permanent telemetry) is collected?	
aop.4	Which best describes how continuous pressure data is collected?	
aop.5	How was the input derived?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram

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Waterstown Water District
2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

White = incomplete
Orange = complete

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC
SDHE CMI UC Lm Nc Lp AOP CRUC VPC

Limiting criteria (see Start Page for details)

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go to input

Average Operating Pressure (AOP) - Data Grading Criteria

go to notes

aop	Criteria Question	Select Best-Fit Answers to All Visible Questions
aop.1	Which best describes checks on the boundary integrity for the system's pressure zone(s)?	Not applicable, the system operates as a single pressure zone
aop.2	Which best describes how one-time pressure readings (i.e. from hydrants) are collected?	Collected only if there are low pressure complaints, or new development requests
aop.3	Which best describes where continuous pressure data (via temporary data loggers or permanent telemetry) is collected?	At zone boundary conditions only (i.e. supply entry points, PRVs, booster stations)
aop.4	Which best describes how continuous pressure data is collected?	Temporary data logger(s) deployed, adequately capturing seasonal variation during the year
aop.5	How was the input derived?	Calculated from field data as a simple average

FINAL DATA GRADE FOR THIS AUDIT INPUT: 7

Limiting

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagram ...

WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** Nov 01 2019 - Oct 31 2020 Fiscal

To access definitions, click the input name

WATER SUPPLIED

VOS	Volume from Own Sources	294,930	MG/Yr	0.1	0.95%	percent	over-registration	VOSEA
WV	Water Imported	0,000	MG/Yr	0.1	0.00%	percent		WVIA
WVE	Water Exported	54,623	MG/Yr	0.1	1.00%	percent	under-registration	WVEA
WATER SUPPLIED		188,748	MG/Yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	183,530	MG/Yr					
BUAC	Billed Unmetered	6,500	MG/Yr					
UMAC	Unbilled Metered	23,950	MG/Yr					
UWAC	Unbilled Unmetered	0,968	MG/Yr					
AUTHORIZED CONSUMPTION		198,968	MG/Yr					

WATER LOSSES

Apparent Losses		9,768	MG/Yr					
SDHE	Systematic Data Handling Errors	0.388	MG/Yr	0.25%	percent			
CMR	Customer Metering Inaccuracies	0.008	MG/Yr	0.25%	percent		under-registration	
UC	Unauthorized Consumption	0.988	MG/Yr	0.25%	percent			
Apparent Losses		0.777	MG/Yr					
Real Losses		10,966	MG/Yr					
WATER LOSSES		10,966	MG/Yr					

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/Yr					
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SYSTEM DATA

Lm	Length of mains	243	also	(including the length of lead lengths)				
Nc	Number of service connections	642		(optic and buried)				
Lp	Service connection length	18	con./mi./m					
Lp	Are customer meters typically located at the	Yes						
AOP	Average length of customer service lines has been set to zero and a data grade of 10 has been applied							
AOP	Average Operating Pressure	92.0	psi					

COST DATA

CRUC	Customer Retail Unit Charge	\$7.70	(\$1000 adjust (0))	Total Annual Operating Co. \$25,950,000.00 (yr optional input)				
VPC	Variable Price per Service Connection	\$2,800,000	(\$1000 adjust)					

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)
2. Billed Unmetered (BUAC)
3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses	gal/conn/day
Unit Apparent Losses	gal/conn/day
Unit Real Losses ^a	gal/conn/day
Unit Real Losses ^b	gal/mile/day

Remember to choose your units

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet

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AWWA Free Water Audit Software: Interactive Data Grading

Waterstown Water District 2020

White = incomplete
Orange = complete

Use acronyms for navigation

Customer Retail Unit Charge (CRUC) - Data Grading Criteria

acronym key

Limiting criteria (see Start Page for details)

cruc	Criteria Question	Select Best-Fit Answers to All Visible Questions
cruc.0	Was any metered consumption billed on a volumetric basis in the audit period?	
cruc.1	Which best describes the use and reliability of the current rate structure?	
cruc.2	Choose the option that best describes how the input was derived	
cruc.3	Is there any additional volumetric revenue the utility receives that depends on water meter readings, such as sewer?	
cruc.4	Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

Start Page | Worksheet | Interactive Data Grading | Dashboard | Notes | Blank Sheet | Water Balance | Loss Control Planning | Definitions | Service Connection Diagram

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Waterstown Water District 2020

AWWA Free Water Audit Software: Interactive Data Grading

acronym key

VOS VOSEA WI WIEA WE WEEA BMAC BUAC UMAC UUAC

White = incomplete Orange = complete

SDHE CMI UC Lm Nc Lp AOP CRUC VPC

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Limiting criteria (see Start Page for details)

go to input

Customer Retail Unit Charge (CRUC) - Data Grading Criteria

go to notes

cruc	Criteria Question	Select Best-Fit Answers to All Visible Questions	
cruc.0	Was any metered consumption billed on a volumetric basis in the audit period?	Yes	
cruc.1	Which best describes the use and reliability of the current rate structure?	Customer bill calculations have been checked to confirm the rate structure is correctly implemented	
cruc.2	Choose the option that best describes how the input was derived	A volume-weighted average of all rates was calculated	
cruc.3	Is there any additional volumetric revenue the utility receives that depends on water meter readings, such as sewer?	Yes, and this has been incorporated into the volume-weighted average calculation	
cruc.4	Has the input derivation been reviewed by someone with expert knowledge in the MS6 methodology?	No	Limiting
FINAL DATA GRADE FOR THIS AUDIT INPUT:			9

Start Page Worksheet Interactive Data Grading Dashboard Notes Blank Sheet Water Balance Loss Control Planning Definitions Service Connection Diagn ...

WATERSTOWN EXAMPLE 89

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: Waterstown Water District

Audit Year: 2020 (Nov 01 2019 - Oct 31 2020) Fiscal

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

Water Supplied Error Adjustments

choose entry option:

over-registration VOSEA
under-registration VVEA

WATER SUPPLIED

VOS Volume from Own Sources 29.950 MGR/yr 0.990 percent

WI Water Reported 0.900 MGR/yr

VE Water Expired 54.020 MGR/yr 1.000 percent

WATER SUPPLIED 184.746 MGR/yr

AUTHORIZED CONSUMPTION

BMAC Billed Unmetered 143.930 MGR/yr

BUAC Billed Unmetered 0.900 MGR/yr

UMAC Unbilled Unmetered 27.950 MGR/yr

UUAC Unbilled Unmetered 0.300 MGR/yr

Default option selected for Unbilled Unmetered, with automatic data grading of 3

AUTHORIZED CONSUMPTION 173.080 MGR/yr

WATER LOSSES

Apparent Losses

Default option selected for Systemic Data Reading Errors, with automatic data grading of 3

SGE Systemic Data Reading Errors 0.900 MGR/yr 0.250 percent

CMR Customer Metering Inaccuracies 0.000 MGR/yr

UC Unaccounted Consumption 0.200 MGR/yr 0.250 percent

Default option selected for Unaccounted Consumption, with automatic data grading of 3

Apparent Losses 0.770 MGR/yr

Real Losses

Real Losses 0.996 MGR/yr

WATER LOSSES 0.766 MGR/yr

NON-REVENUE WATER

NON-REVENUE WATER 43.206 MGR/yr

SYSTEM DATA

Ln Length of main 343 miles (including the hydrant lead length)

Nc Number of service connections 642 (civic and business)

Service connection density 1.86 connections/mile

Are customer meters typically located at the Yes

Lp Average length of customer service lines used in this audit 100 feet

Average Operating Pressure 82.00 psi

COST DATA

Customer Owned Unit Charge 28.20 \$/month

Variable Production Cost 1,950.00 \$/Mgallon

Total Annual Operating Co \$23,950,000 \$/yr (optional input)

Watch your units

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

Weighted score for the components of energy consumption and water loss is included in the calculation of the Water Audit Data Validity Score.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)

2. Billed Unmetered (BUAC)

3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

Unit Total Losses gal/conn/day

Unit Apparent Losses gal/conn/day

Unit Real Losses* gal/conn/day

Unit Real Losses** gal/conn/day

If entered above by user, targets will display on KPI gauges (see Dash)

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Waterstown Water District 2020 AWWA Free Water Audit Software: Interactive Data Grading

White = incomplete Orange = complete

Use acronyms for navigation

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Variable Production Cost (VPC) - Data Grading Criteria

Criteria Question	Select Best-Fit Answers to All Visible Questions
<p>vp1 Choose the option that best describes how the input was derived</p> <p>vp2 Choose the option that best describes which short-run marginal costs have been included in the input, using the definitions below for reference. Short-run marginal costs can include the following:</p> <ul style="list-style-type: none"> - chemicals + power for treatment, typically applicable if the utility is producing/treating water - power for distribution, typically applicable if pumps exist in the distribution network - water acquisition costs, typically applicable if the utility is purchasing water or incurs any extraction costs for withdrawing from a source <p>Some short-run marginal costs may not be applicable. The auditor should analyze the system characteristics to determine which costs are applicable for inclusion in the VPC input derivation. See also the latest AWWA M36 Manual for further guidance.</p> <p>Choose the option that best describes which long-run marginal costs have been included in the input, using the definitions below for reference. Long-run marginal costs can include the following:</p> <ul style="list-style-type: none"> - water treatment residuals management, typically applicable if solids are produced from water treatment process - accelerated wear & tear on dynamic equipment, typically applicable if pumps exist for treatment and/or distribution, or any other equipment exists that wears out as a function of use instead of time (i.e. filter media, chemical dosing pumps, uv disinfection bulbs, etc) - payouts for damage claims from main and service line breaks, typically applicable if damage claims are paid by the utility - accelerated expansion of supply capacity, typically applicable if the utility is at or nearing supply capacity, or scarcity costs in water scarce areas - full cost pricing that includes all lifecycle costs and externalities (internalized or not) <p>Some long-run marginal costs may not be applicable. The auditor should analyze the system characteristics to determine which costs are applicable for inclusion in the VPC input derivation. See also the latest AWWA M36 Manual for further guidance.</p> <p>vp3 Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?</p>	

FINAL DATA GRADE FOR THIS AUDIT INPUT:

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Waterstown Water District 2020 AWWA Free Water Audit Software: Interactive Data Grading

White = incomplete Orange = complete

Use acronyms for navigation

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Variable Production Cost (VPC) - Data Grading Criteria

Criteria Question	Select Best-Fit Answers to All Visible Questions
<p>vp1 Choose the option that best describes how the input was derived</p> <p>vp2 Choose the option that best describes which short-run marginal costs have been included in the input, using the definitions below for reference. Short-run marginal costs can include the following:</p> <ul style="list-style-type: none"> - chemicals + power for treatment, typically applicable if the utility is producing/treating water - power for distribution, typically applicable if pumps exist in the distribution network - water acquisition costs, typically applicable if the utility is purchasing water or incurs any extraction costs for withdrawing from a source <p>Some short-run marginal costs may not be applicable. The auditor should analyze the system characteristics to determine which costs are applicable for inclusion in the VPC input derivation. See also the latest AWWA M36 Manual for further guidance.</p> <p>Choose the option that best describes which long-run marginal costs have been included in the input, using the definitions below for reference. Long-run marginal costs can include the following:</p> <ul style="list-style-type: none"> - water treatment residuals management, typically applicable if solids are produced from water treatment process - accelerated wear & tear on dynamic equipment, typically applicable if pumps exist for treatment and/or distribution, or any other equipment exists that wears out as a function of use instead of time (i.e. filter media, chemical dosing pumps, uv disinfection bulbs, etc) - payouts for damage claims from main and service line breaks, typically applicable if damage claims are paid by the utility - accelerated expansion of supply capacity, typically applicable if the utility is at or nearing supply capacity, or scarcity costs in water scarce areas - full cost pricing that includes all lifecycle costs and externalities (internalized or not) <p>Some long-run marginal costs may not be applicable. The auditor should analyze the system characteristics to determine which costs are applicable for inclusion in the VPC input derivation. See also the latest AWWA M36 Manual for further guidance.</p> <p>vp3 Has the input derivation been reviewed by someone with expert knowledge in the M36 methodology?</p>	<p>Only one source of water exists, which was the basis for the input derivation</p> <p>All applicable short-run marginal costs are included</p> <p>Long-run marginal costs have been evaluated for applicability, and some but not all applicable costs are included</p> <p>No</p>

FINAL DATA GRADE FOR THIS AUDIT INPUT: 9

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WATERSTOWN EXAMPLE

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AWWA Free Water Audit Software: Worksheet

Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** (Nov 01 2019 - Oct 31 2020) Fiscal

WATERSTOWN EXAMPLE

To access definitions, click the input name

All volumes to be entered as: MILLION GALLONS (MG) PER YEAR

WATER SUPPLIED

VOS	Volume from Own Sources	294,930	MG/Yr	0.1%	percent	over-registration	VOSA
VS	Water Supplied	5,000	MG/Yr				
VE	Water Exported	54,023	MG/Yr	0.1%	percent	under-registration	VEA
WATER SUPPLIED		188,748	MG/Yr				

AUTHORIZED CONSUMPTION

BMAC	Billed Metered	183,533	MG/Yr				
BUAC	Billed Unmetered	5,500	MG/Yr				
UMAC	Unbilled Metered	23,956	MG/Yr				
UMAC	Unbilled Unmetered	0,988	MG/Yr				
AUTHORIZED CONSUMPTION		193,988	MG/Yr				

WATER LOSSES

WATER LOSSES		9,763	MG/Yr				
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Apparent Losses

SDM	Systematic Data Handling Errors	0,388	MG/Yr	0.25%	percent		
CM	Customer Metering Inaccuracies	0,000	MG/Yr				
UC	Unauthorized Consumption	0,988	MG/Yr	0.25%	percent	under-registration	
Apparent Losses		0,777	MG/Yr				

Real Losses

Real Losses		8,986	MG/Yr				
WATER LOSSES		9,763	MG/Yr				

NON-REVENUE WATER

NON-REVENUE WATER		43,308	MG/Yr				
--------------------------	--	---------------	--------------	--	--	--	--

SYSTEM DATA

Lm	Length of main	243	also	(including the hydrant lead lengths)
Nc	Number of service connections	642		(retic and building)
	Service connection density	18	con./mi./main	
Lp	Are customer meters typically located at the	Yes		
ASP	Average length of customer service lines has been set to zero and a data grading of 10 has been applied			
	Average Operating Pressure	92.0	psi	

COST DATA

CRUC	Customer Retail Unit Charge	\$5.70	(\$1000 adjust (US))	Total Annual Operating Co.
VPC	Variable Production Cost	\$3,860.00	\$/MG-in place	\$23,950,000

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

Weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

1. Volume from Own Sources (VOS)
2. Billed Unmetered (BUAC)
3. Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, if entered above by user, targets will display on KPI gauges (See Dash

Start Page | **Worksheet** | Interactive Data Grading | Dashboard | Notes | Blank Sheet

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Waterstown Results

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AWWA Free Water Audit Software: Worksheet

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Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** | **Nov 01 2019 - Oct 31 2020** | **Fiscal**

To access definitions, click the **input name** | Click 'W' to add notes | Click 'g' to determine data validity grade | To edit water system info: [go to start page](#)

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

Volume from Own Sources: 254,550 mgm
 Water Reported: 5,000 mgm
 Water Exported: 54,920 mgm

WATER SUPPLIED: 198,746 mgm

AUTHORIZED CONSUMPTION

Billed Meters: 143,550 mgm
 Billed Unmetered: 5,900 mgm
 Unbilled Meters: 23,156 mgm
 Unbilled Unmetered: 0,388 mgm

AUTHORIZED CONSUMPTION: 178,988 mgm

WATER LOSSES

Apparent Losses

Systematic Data Handling Error: 0,388 mgm
 Customer Metering Inaccuracy: 0,000 mgm
 Unaccounted Consumption: 0,388 mgm

Apparent Losses: 0,776 mgm

Real Losses

Real Losses: 18,206 mgm

WATER LOSSES: 19,982 mgm

NON-REVENUE WATER: 43,308 mgm

SYSTEM DATA

Length of main: 54.3 miles
 Number of service connections: 642
 Service connection density: 36 connections/mile

Are customer meters typically located at the curbstop? **Yes**

Average length of customer service lines between the curb and a data grade of 10' or less applied: 95.0 feet

COST DATA

Customer Retail Unit Charge: \$7.76/gal (100 gal/100 gal)
 Variable Production Cost: \$5,860.00/100 gal (58.6¢/100 gal)

Total Annual Operating Cost: \$23,900,000 (10¢/gallon)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score.

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:
 Based on the information provided, audit reliability can be most improved by addressing the following components:

- 1: Volume from Own Sources (VOS)
- 2: Billed Unmetered (BUAC)
- 3: Number of Service Connections (Nc)

KEY PERFORMANCE INDICATOR TARGETS:
 OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses^A: gal/conn/day
 Unit Real Losses^B: gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

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AWWA Free Water Audit Software: Worksheet

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Water Audit Report for: **Waterstown Water District**
 Audit Year: **2020** | **Nov 01 2019 - Oct 31 2020** | **Fiscal**

To access definitions, click the **input name** | Click 'W' to add notes | Click 'g' to determine data validity grade | To edit water system info: [go to start page](#)

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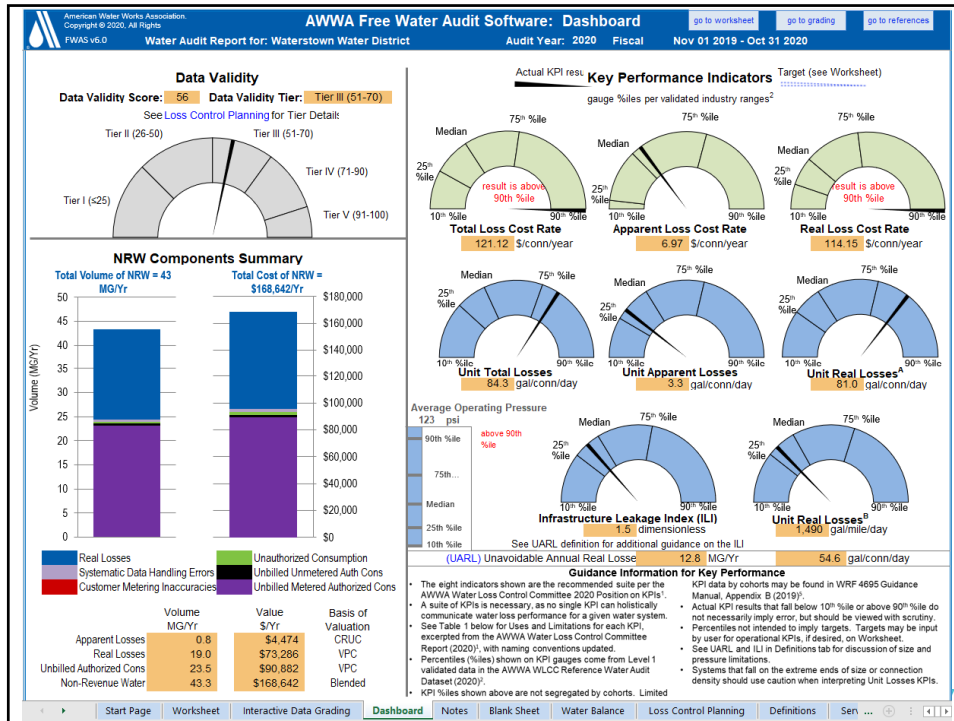
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Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses^A: gal/conn/day
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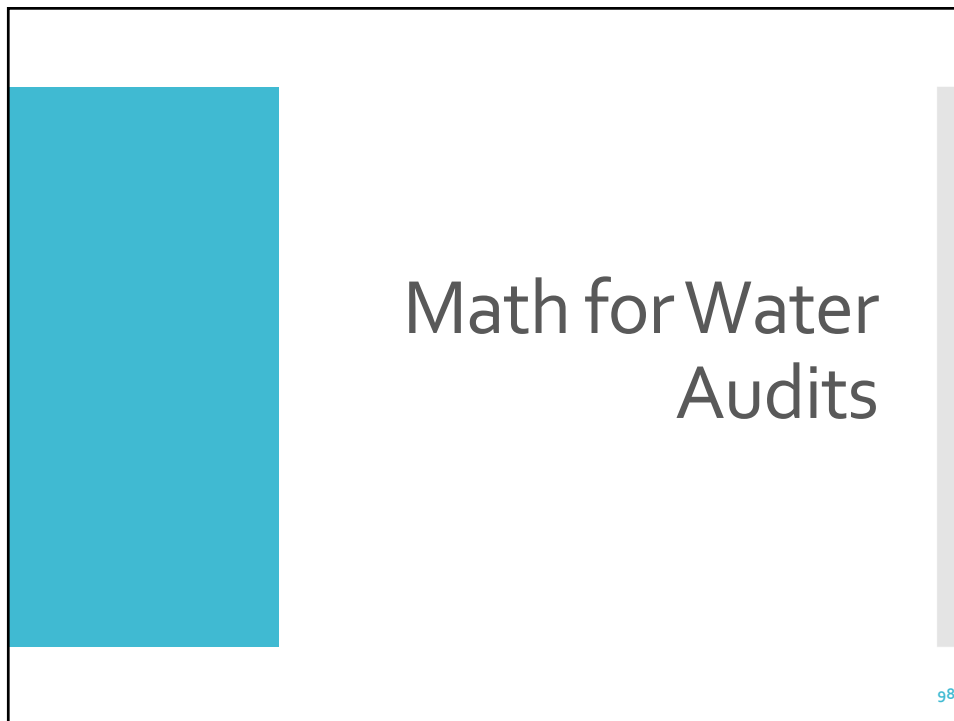
If entered above by user, targets will display on KPI gauges (see Dashboard)

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Straight Average

- $Average = \frac{Term\ 1 + Term\ 2 + Term\ 3 + \dots}{Number\ of\ Terms}$
- Example:
 - Meter 1: 55 MG/Yr
 - Meter 2: 30 MG/Yr
 - Meter 3: 35 MG/Yr
- Term₁ = 55, Term₂ = 30, Term₃ = 35
- $Average = \frac{55 + 30 + 35}{3} = \frac{120}{3} = 40\ MG/Yr$

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Weighted Average

- $Weighted\ Average = \frac{Term\ 1 * Weight\ 1 + Term\ 2 * Weight\ 2 + Term\ 3 * Weight\ 3 + \dots}{Weight\ 1 + Weight\ 2 + Weight\ 3 + \dots}$
- Example:
 - Meter 1: \$9.00/1000 gallons for 55 MG/Yr
 - Meter 2: \$7.00/1000 gallons for 30 MG/Yr
 - Meter 3: \$5.00/1000 gallons for 35 MG/Yr
- Term₁ = 9.00, Term₂ = 7.00, Term₃ = 5.00
- Weight₁ = 55, Weight₂ = 30, Weight₃ = 35
- $Weighted\ Average = \frac{9.00 * 55 + 7.00 * 30 + 5.00 * 35}{55 + 30 + 35} = \frac{880}{120}$
= \$7.33/1000 gallons

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Free Software and Other Resources

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<https://www.awwa.org/Resources-Tools/Resources/Water-Loss-Control>

M36 Audit Software (v6.0)

AWWA Free Water Audit Software v6.0
FWAS v6.0

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. It provides a "top-down" summary water audit format and is not meant to take the place of full-scale, comprehensive water audit format. Auditors are strongly encouraged to refer to the most current edition of AWWA's Manual for Water Audits for detailed guidance on the water auditing process and targeting loss reduction levels. This tool contains several separate worksheets. Sheets can be accessed using the tabs at the bottom of the screen, or by clicking the TOC links below.

Table of Contents (TOC)	Enter Basic Information	Key of Input Acronyms
Start Page The current sheet. Enter contact information and basic audit details. Worksheet Enter the required data on this worksheet to calculate the water balance and data grading. Interactive Data Grading Answer questions about operational practices for each audit input, and the data validity grades will automatically populate. Dashboard Review NRW components, performance indicators and graphical outputs to evaluate the results of the audit. Notes Enter notes to explain how values were calculated, document data sources, and related information about data management practices. Blank Sheet By popular demand a blank sheet. The world is your canvas. Water Balance The values entered in the Worksheet automatically populate the Water Balance. Loss Control Use this sheet to interpret the results of the audit. Planning, velocity score and performance indicators. Definitions Use this sheet to understand the terms used in the audit process. Service Connection Diagram Diagrams depicting possible customer service connection line configurations. Acknowledgments Acknowledgments for development of the AWWA Free Water Audit Software v6.0.	Name of Utility: Name of Contact Person: Email: Telephone (Ext.): City/Town/Municipality: State / Province: Country: Audit Preparation Date: Audit Year: Audit Period Start Date: Audit Period End Date: Volume Reporting Units: Water System Structure: Water Type: System ID Number: Validator Name/ID: Validator Email: Estimated Total Population Served by Water Utility:	In order of appearance in the Worksheet: VDS Volume from Own Sources VOSEA VSD Error Adjustment WI Water Imported WEA WE Error Adjustment WEC Water Exported WEE WE Error Adjustment BMAC Billed Metered Authorized Consumption UMAC Unbilled Metered Authorized Consumption UMAC Unbilled Unmetered Authorized Consumption SMC Systematic Data Handling Errors CM Customer Metering Inaccuracies UC Unauthorized Consumption Lm Length of main Nc Number of service connections Lp Average length of private customer service line ADP Average Operating Pressure CIRC Customer Retail Unit Charge VPC Variable Production Cost

Color Key
 User input Calculated Optional default

Guidance for the Worksheet
 Choosing to enter unit of percent or volume (applies to VOSEA, WEA, WEEA, CM)
 choose entry option:
 1.00% | percent | or | 25,000 | volume

Guidance for the Interactive Data Grading
 Use acronym buttons in IDG header to navigate among inputs. Acronym Key above.
 Choose to enter default or custom input grades to VPC, SMC, Lm, UC
 choose entry option:
 0.25% | default | or | 75,000 | custom

After clicking an acronym button, answer all visible questions in the order they're presented, choosing best-fit answer.
 Grade will populate when all visible questions are complete for an input.

The limiting criteria will be labeled along the right. If only 1 limiting criterion is shown, improving on that criterion will achieve a higher data grade. If multiple limiting criteria are shown, improving on each limiting criterion is necessary to achieve a higher data grade. A complete inventory of data grading criteria is available in the Data Grading Matrix v6.0 (see web resources).

If you have questions or comments regarding this software please contact us at: info@awwa.org

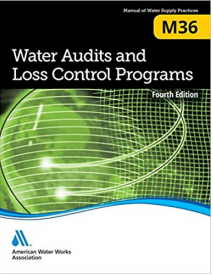
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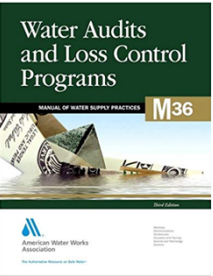
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AWWA M36 Manual

- 4th Edition (\$175 USD)
will be updated in the next 18 months

- 3rd Edition (FREE)
- <http://arco-hvac.ir/wp-content/uploads/2018/04/AWWA-M36-Water-Audits-and-Loss-Control-Programs-3rd-Ed-2009-1.pdf>





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Questions, Comments & Feedback

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