



Indian Health Service

Water Loss Program:

AWWA M36 Workshop

Day 1

March 15, 2022

Agenda – Day 1

Introduction

Learning Objectives
Workshop Format

M36 Methodology

Water Balance 101



Breakout Exercise

Water Audit Boundary



Break



AWWA Free Water Audit Software

Overview

Summary Review & Wrap-Up



Introduction

Learning Objectives

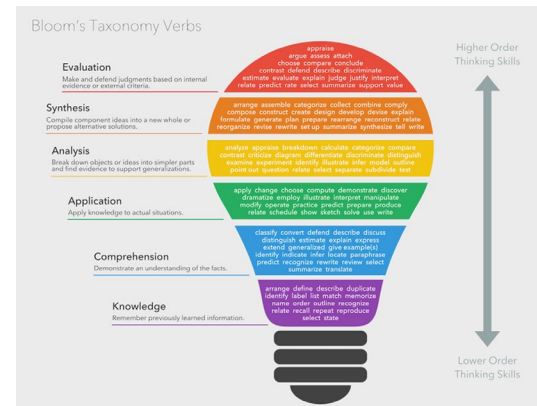
Workshop Format

Learning Objectives

At the end of the program, participants will.....

- Understand key concepts of the American Water Works Association (AWWA) M36 Methodology;
- Know how to navigate and populate the new version 6 of the AWWA Water Audit Software using system-specific data and apply each year moving forward;
- Understand the Importance of Water Audit Validation and how to evaluate system-specific data validity;
- Learn how to interpret and identify next steps.

Program Task Levels



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Website & Reporting

Introductory Session

AWWA M36 Workshop Session

Coaching

Lessons Learned

Close Out Training

Task 1

Task 2

Task 3

Task 4

Task 5

Task 6

Knowledge

Knowledge
Comprehension

Knowledge
Comprehension
Application

Knowledge
Comprehension
Application
Analysis
Synthesis

Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

Workshop Approach

AWWA M36 Workshop Session

Task 3

Knowledge
Comprehension
Application

Bloom's Taxonomy Verbs

Evaluation

Make and defend judgments based on internal evidence or external criteria.

appraise
argue assess attach
choose compare conclude
contrast defend describe discriminate
estimate evaluate explain judge justify interpret
relate predict rate select summarize support value

Synthesis

Compile component ideas into a new whole or propose alternative solutions.

arrange assemble categorize collect combine comply
compose construct create design develop devise explain
formulate generate plan prepare rearrange reconstruct relate
reorganize revise rewrite set up summarize synthesize tell write

Analysis

Break down objects or ideas into simpler parts and find evidence to support generalizations.

analyze appraise breakdown calculate categorize compare
contrast criticize diagram differentiate discriminate distinguish
examine experiment identify illustrate infer model outline
point out question relate select separate subdivide test

Application

Apply knowledge to actual situations.

apply change choose compute demonstrate discover
dramatize employ illustrate interpret manipulate
modify operate practice predict prepare produce
relate schedule show sketch solve use write

Comprehension

Demonstrate an understanding of the facts.

classify convert defend describe discuss
distinguish estimate explain express
extend generalized give example(s)
identify indicate infer locate paraphrase
predict recognize rewrite review select
summarize translate

Knowledge

Remember previously learned information.

arrange define describe duplicate
identify label list match memorize
name order outline recognize
relate recall repeat reproduce
select state

Higher Order
Thinking Skills

Lower Order
Thinking Skills

Evaluation

Evaluation

Presentation



Knowledge
Comprehension
Application



Large Group Interaction

Kahoot!



Small Group Interaction

Breakout Rooms



Knowledge
Comprehension
Application



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Test Your Knowledge

Kahoot! Practice Run



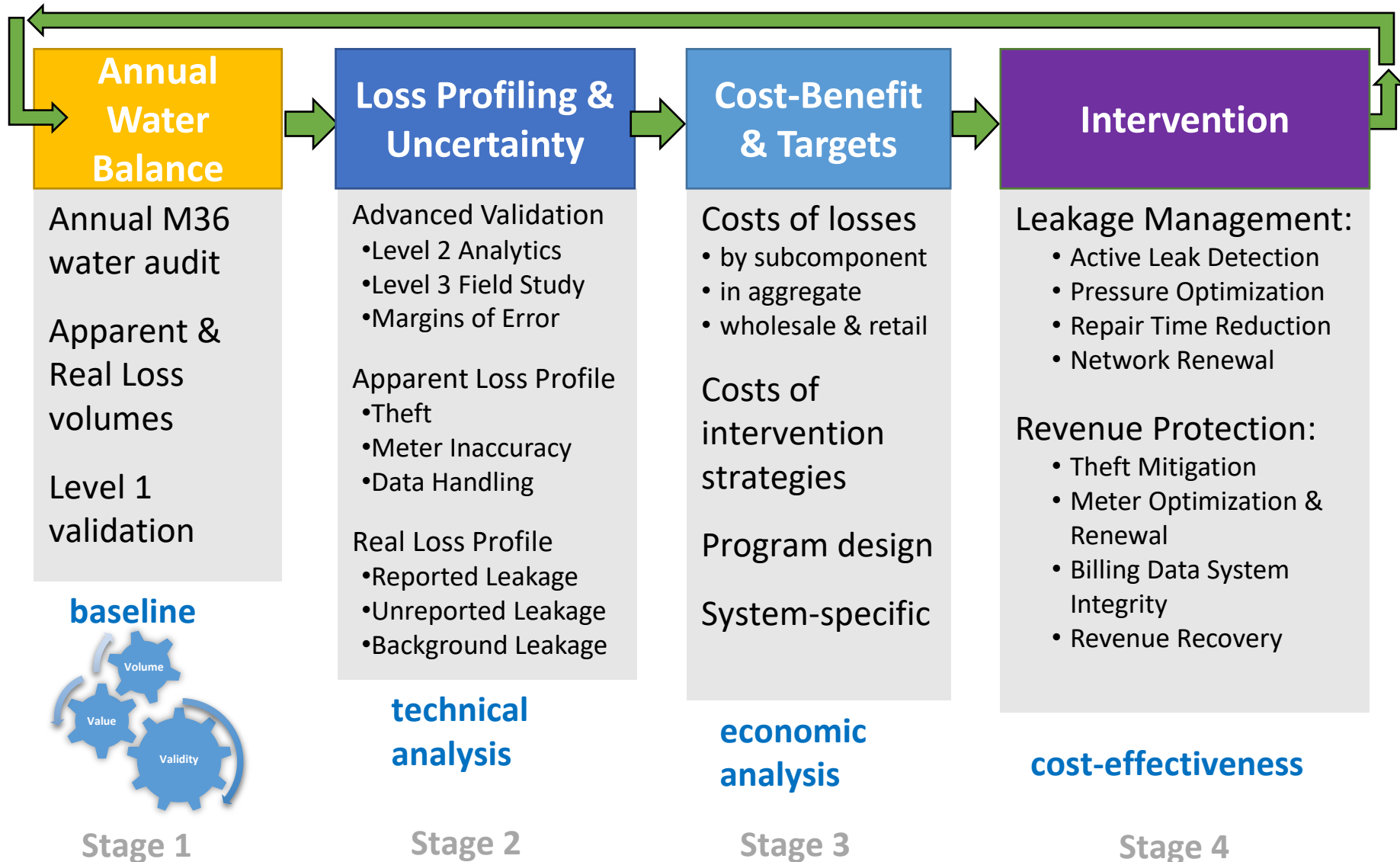
M36

Methodology

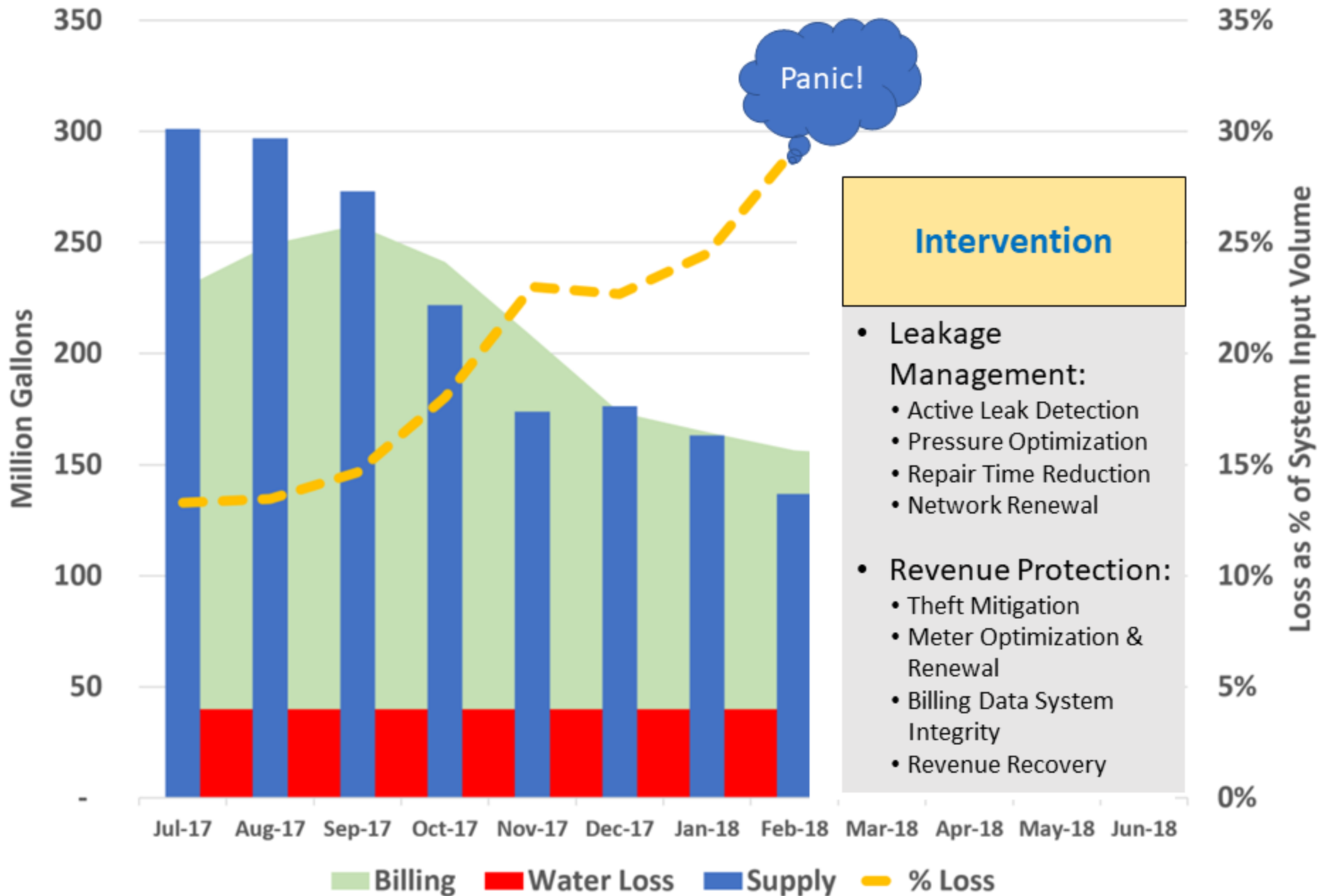


Water Balance 101

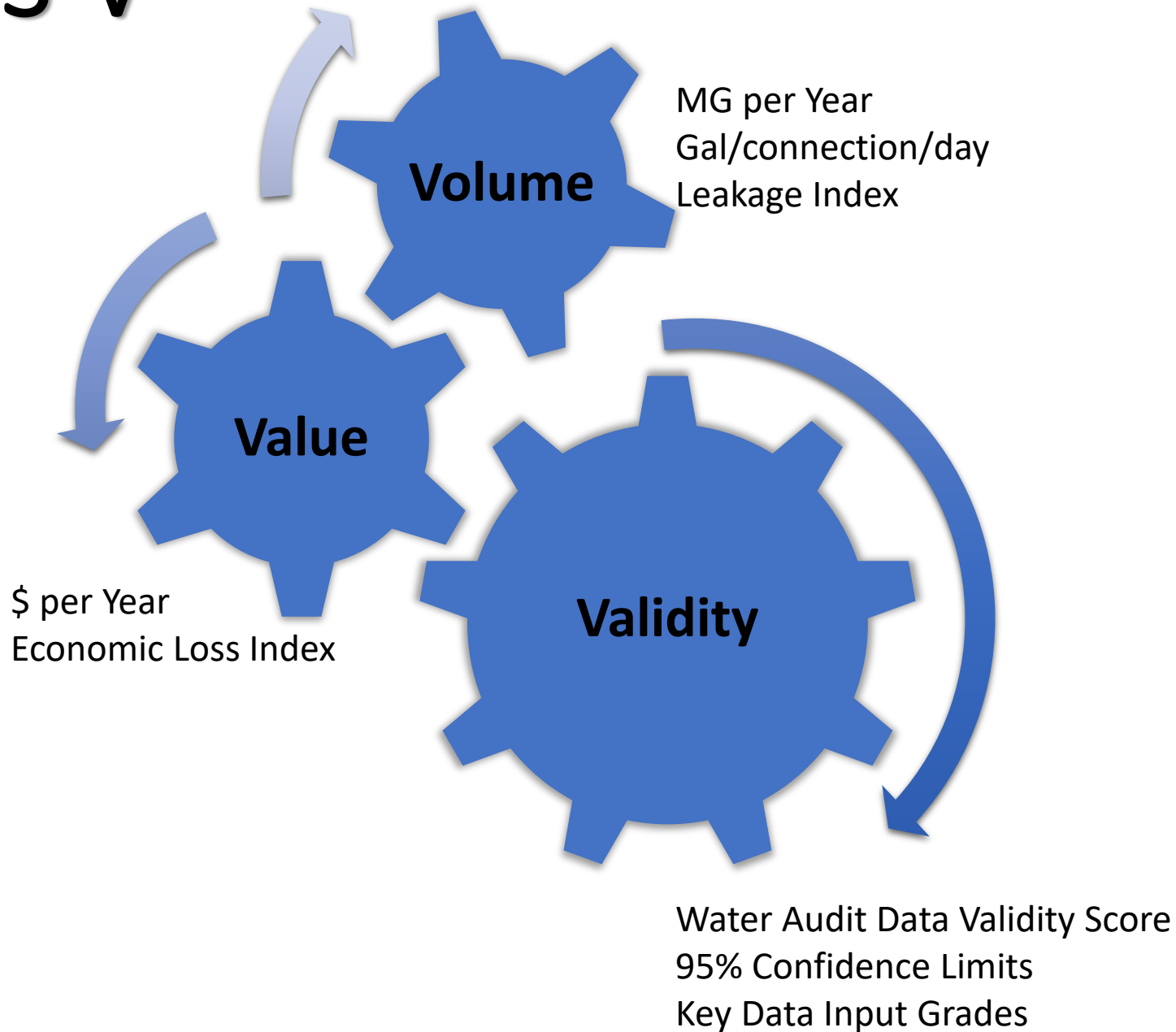
The Big Picture



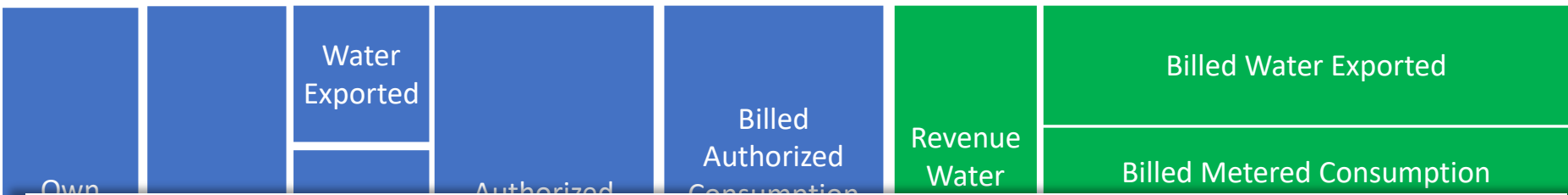
Loss as % of SIV



3-V



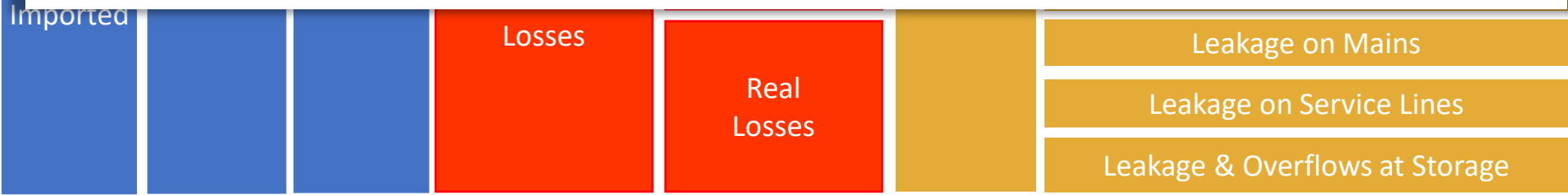
The Water Balance & Water Auditing



Water balance

The summary of key water audit data that shows water management from source to customer, with the sum of quantities in all columns equal and thus balancing.

M36 Water Auditing and Loss Control Programming, 4th Ed.



Water Supplied

Water Supplied

Volume of treated and delivered (pressurized as needed) water supplied to the retail water distribution system of the water utility. It is equal to the Volume From Own Sources, plus the volume of water imported or purchased and supplied from a neighboring water utility or regional wholesale water authority, minus the volume of water exported or sold in bulk to other water utilities during the audit period.

M36 Water Auditing and Loss Control Programming, 4th Ed.

Water Supplied

Volume from Own Sources (VOS)

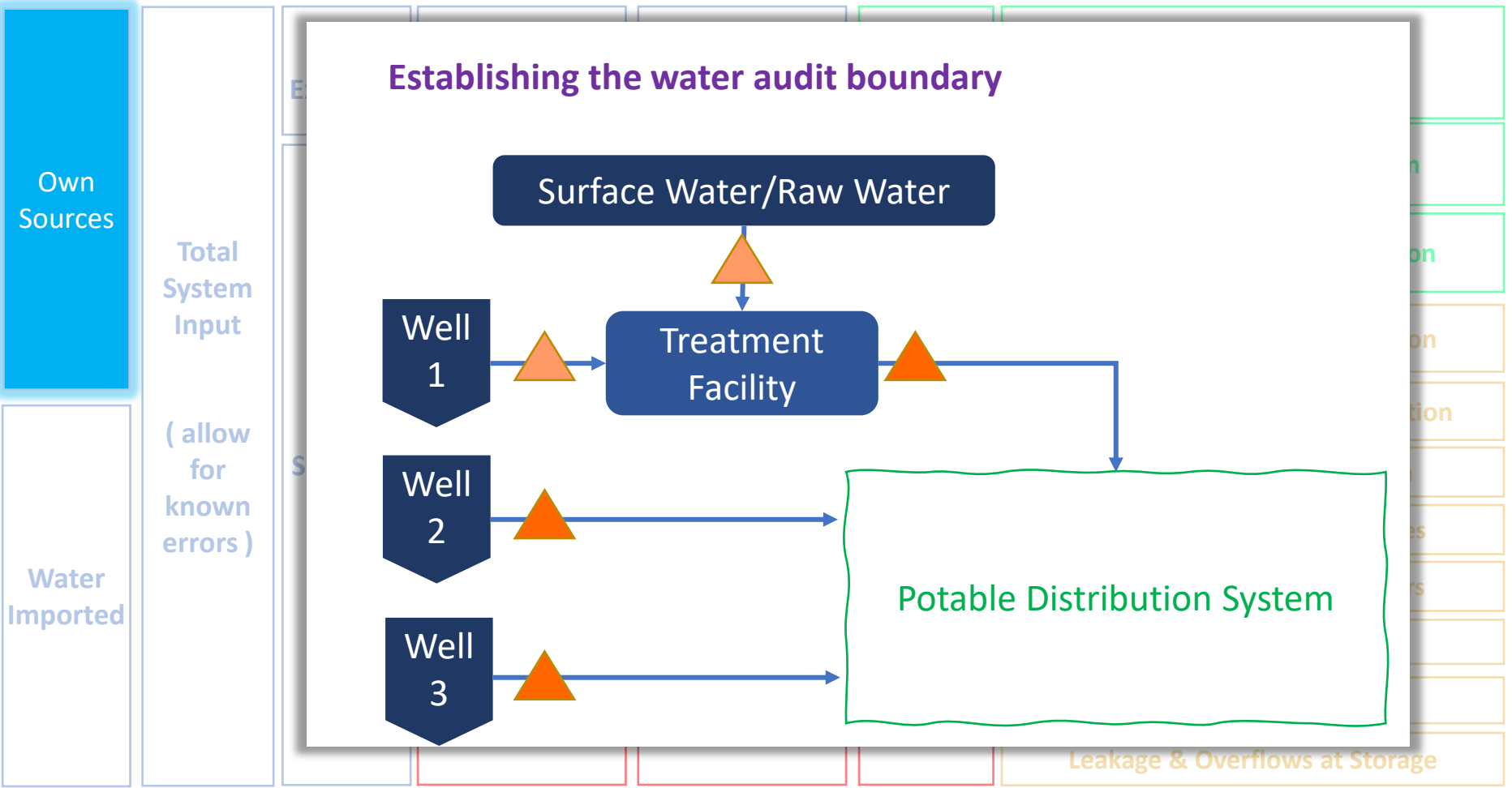
Volume from Own Sources

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.

M36 Water Auditing and Loss Control Programming, 4th Ed.

Where are the meters?

The Water Balance & Water Auditing



Water Supplied

Water Imported (WI)

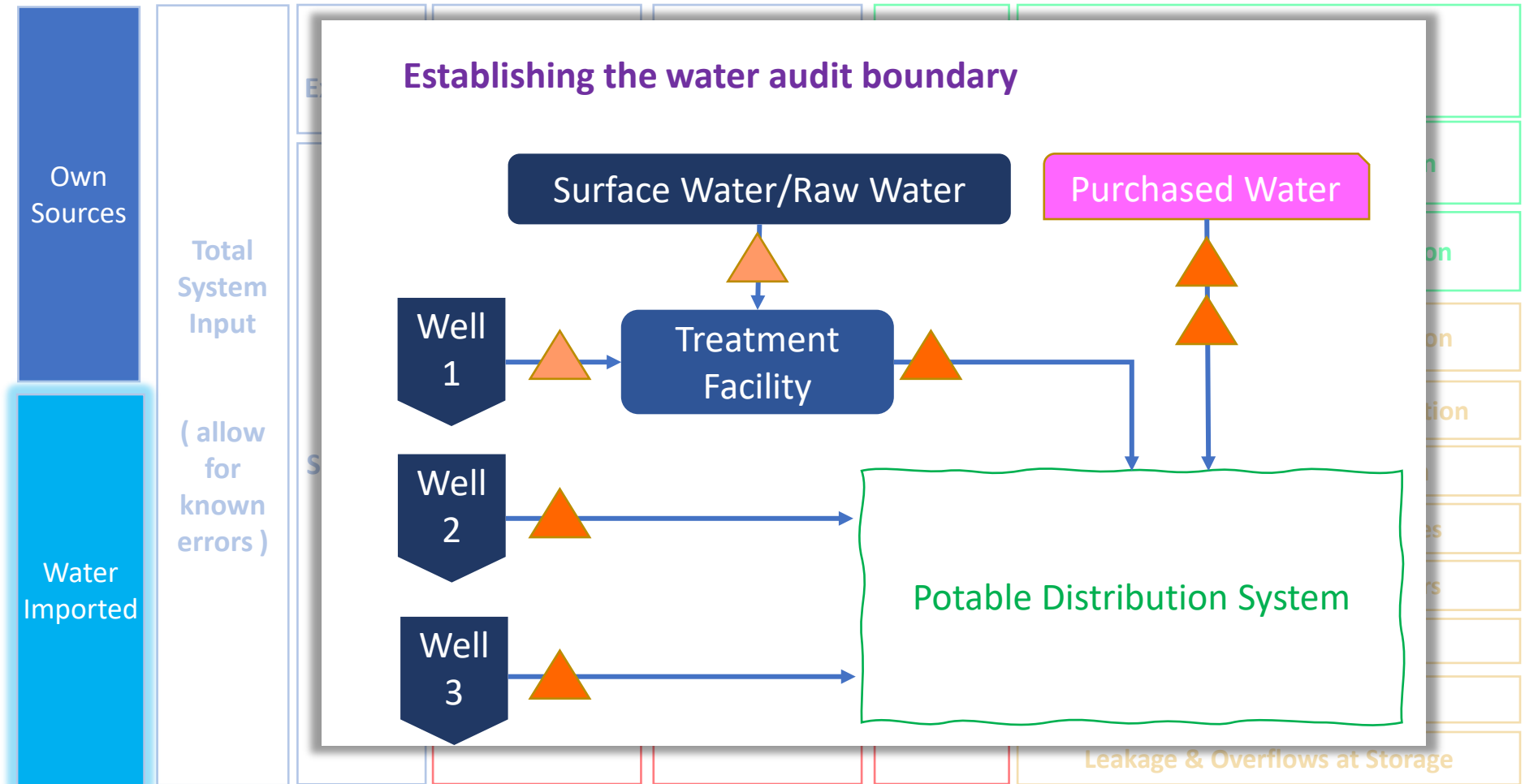
Water Imported

The bulk water purchased by a water utility to become part of the Water Supplied volume. Typically, this is water purchased from a neighboring water utility or regional water authority and is metered at the custody transfer point of interconnection between the two utilities.

M36 Water Auditing and Loss Control Programming, 4th Ed.

How is the water tracked?

The Water Balance & Water Auditing



Water Supplied

Water Exported (WE)

Water Exported

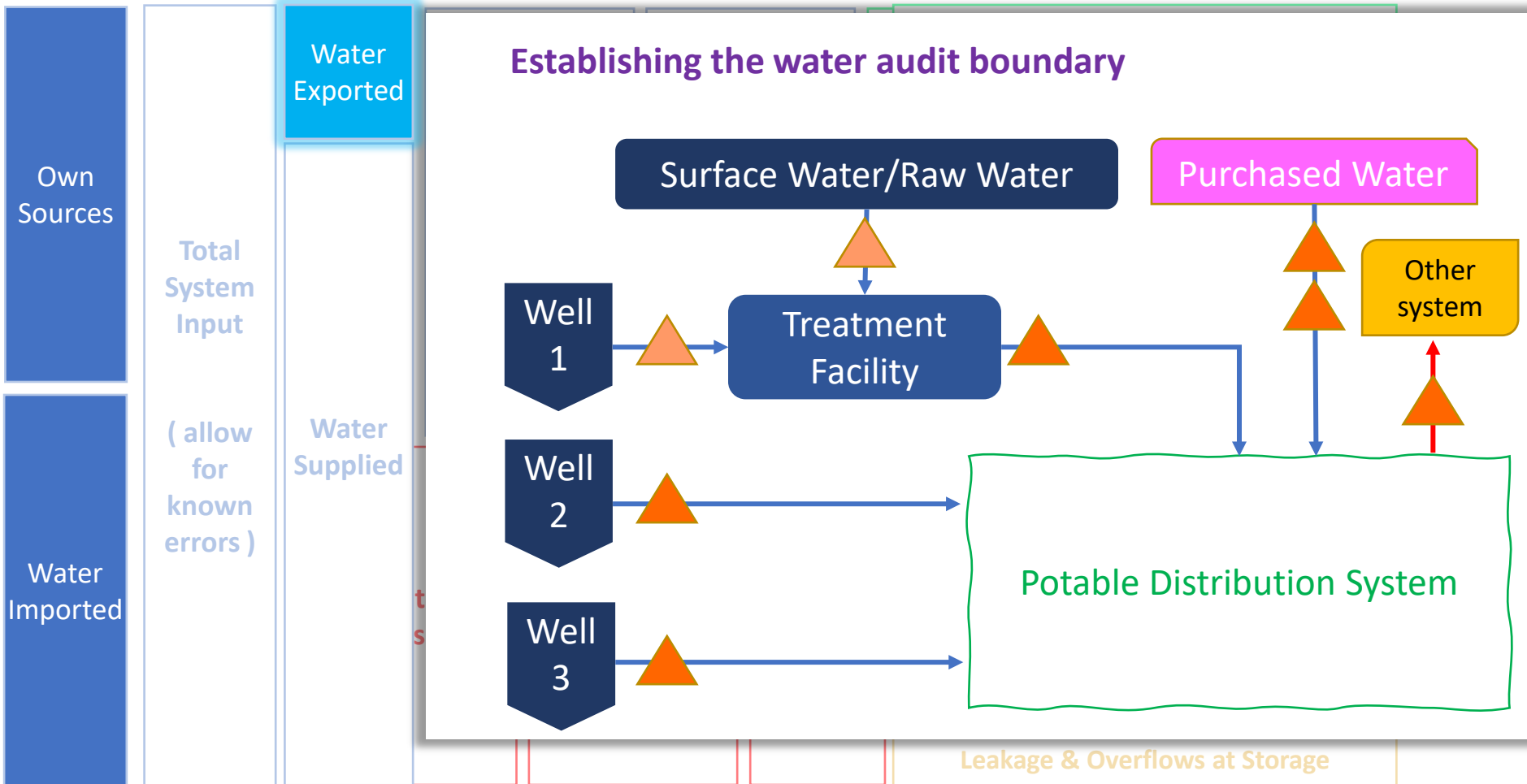
The bulk water purchased by a water utility to become part of the Water Supplied volume. Typically, this is water purchased from a neighboring water utility or regional water authority and is metered at the custody transfer point of interconnection between the two utilities.

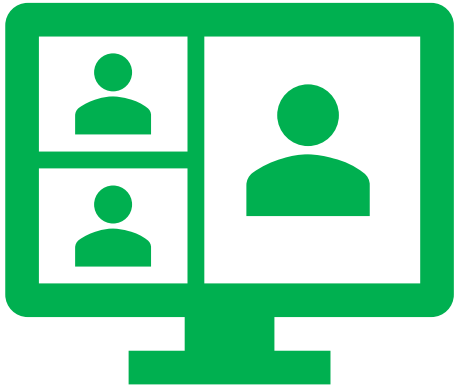
M36 Water Auditing and Loss Control Programming, 4th Ed.

Which meters?

How is Water Exported tracked?

The Water Balance & Water Auditing





Breakout Exercise

Water Audit Boundary



Water Supplied Error Adjustment

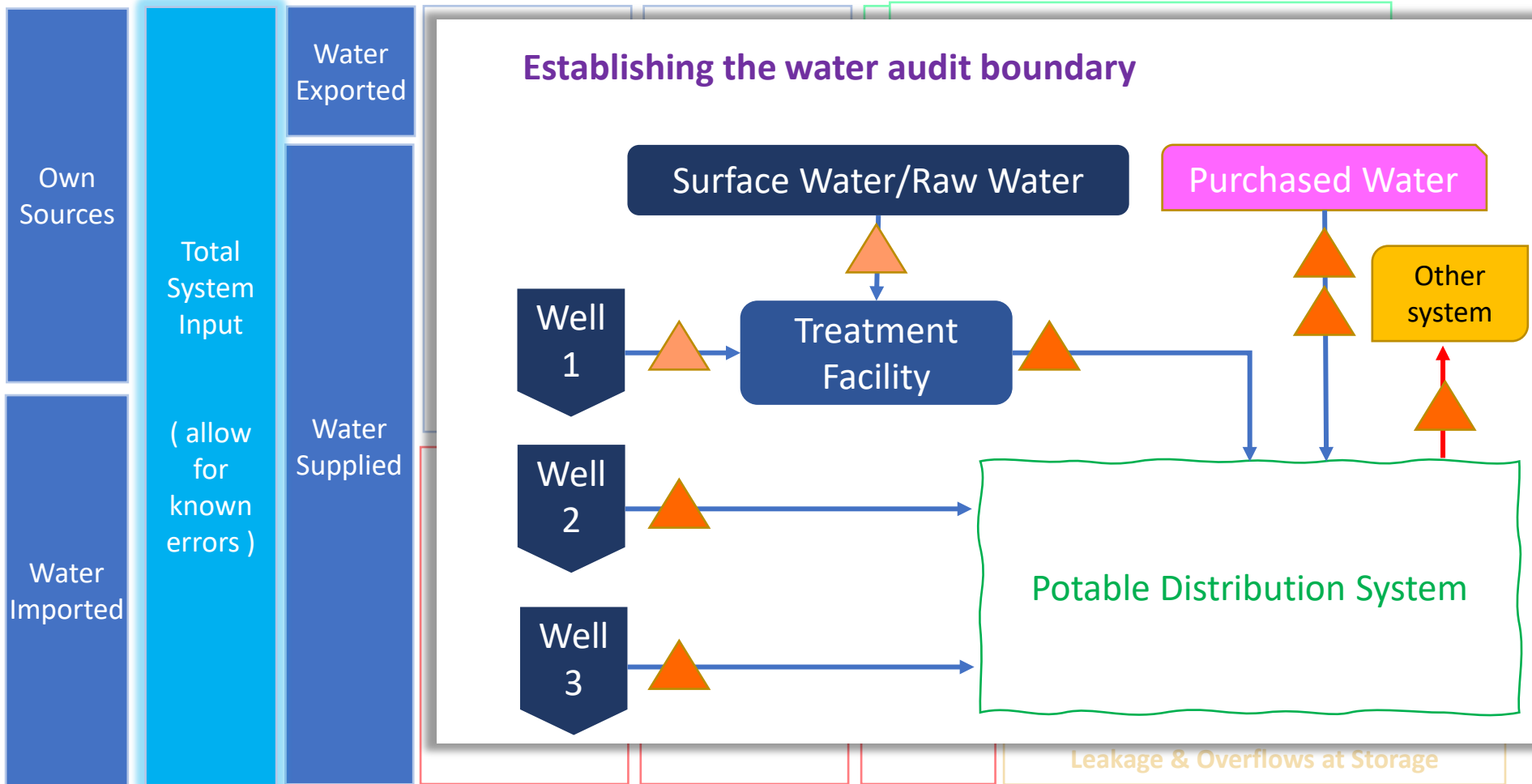
(VOSEA, WIEA, WEEA)

Master Meter Error Adjustment

An estimate or measure of the degree of inaccuracy that exists in the master meters measuring the annual volume (production, imported, or exported), 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.

AWWA Free Water Audit Software – Version 6.0

The Water Balance & Water Auditing



Source Meter Testing

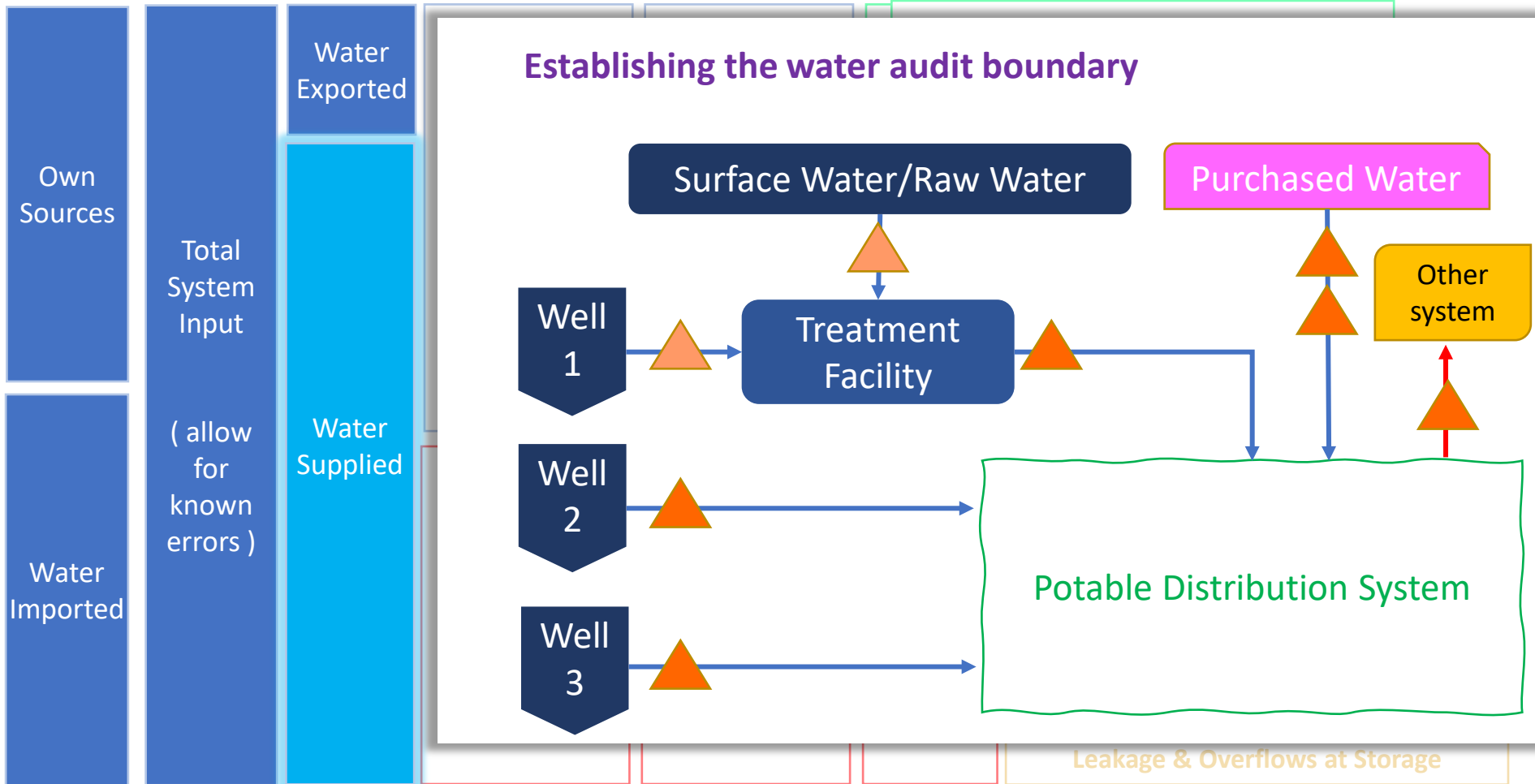
Insertion type



Meter	Volume (MG)	Meter Accuracy (%)
1	5,857.831	6.30
2	1,914.064	-1.3
3	478.516	-15.10



The Water Balance & Water Auditing





Test Your Knowledge

Water Supplied

Authorized Consumption

Is it an authorized use?

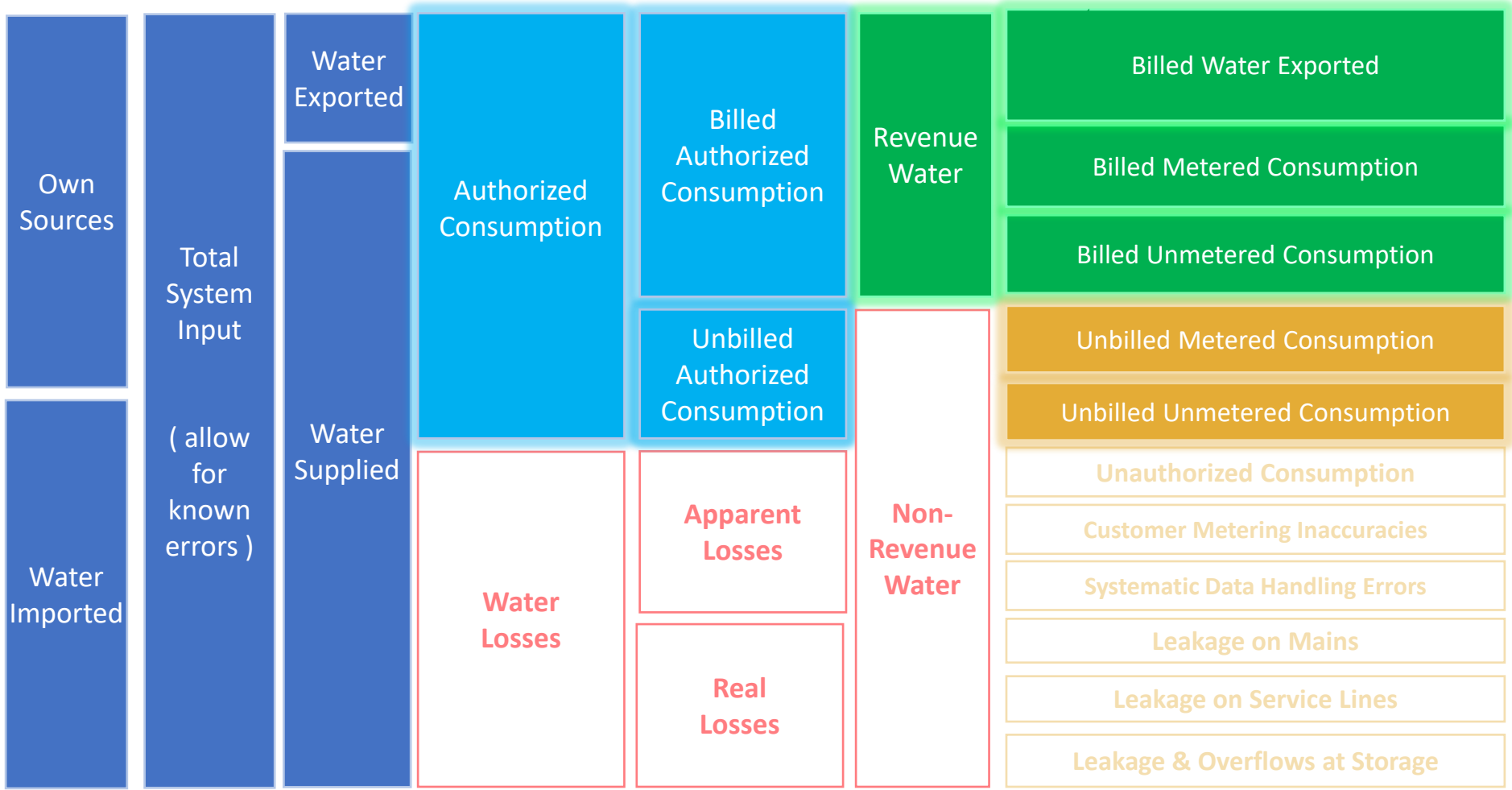
Authorized Consumption

Volume of water taken by registered customers, the water supplier, and others who are implicitly or explicitly authorized to do so by the water supplier for residential, commercial, industrial, or agricultural purposes.

M36 Water Auditing and Loss Control Programming, 4th Ed.

Is it metered?

The Water Balance & Water Auditing



Authorized Consumption

Billed Authorized Consumption

Billed Authorized Consumption

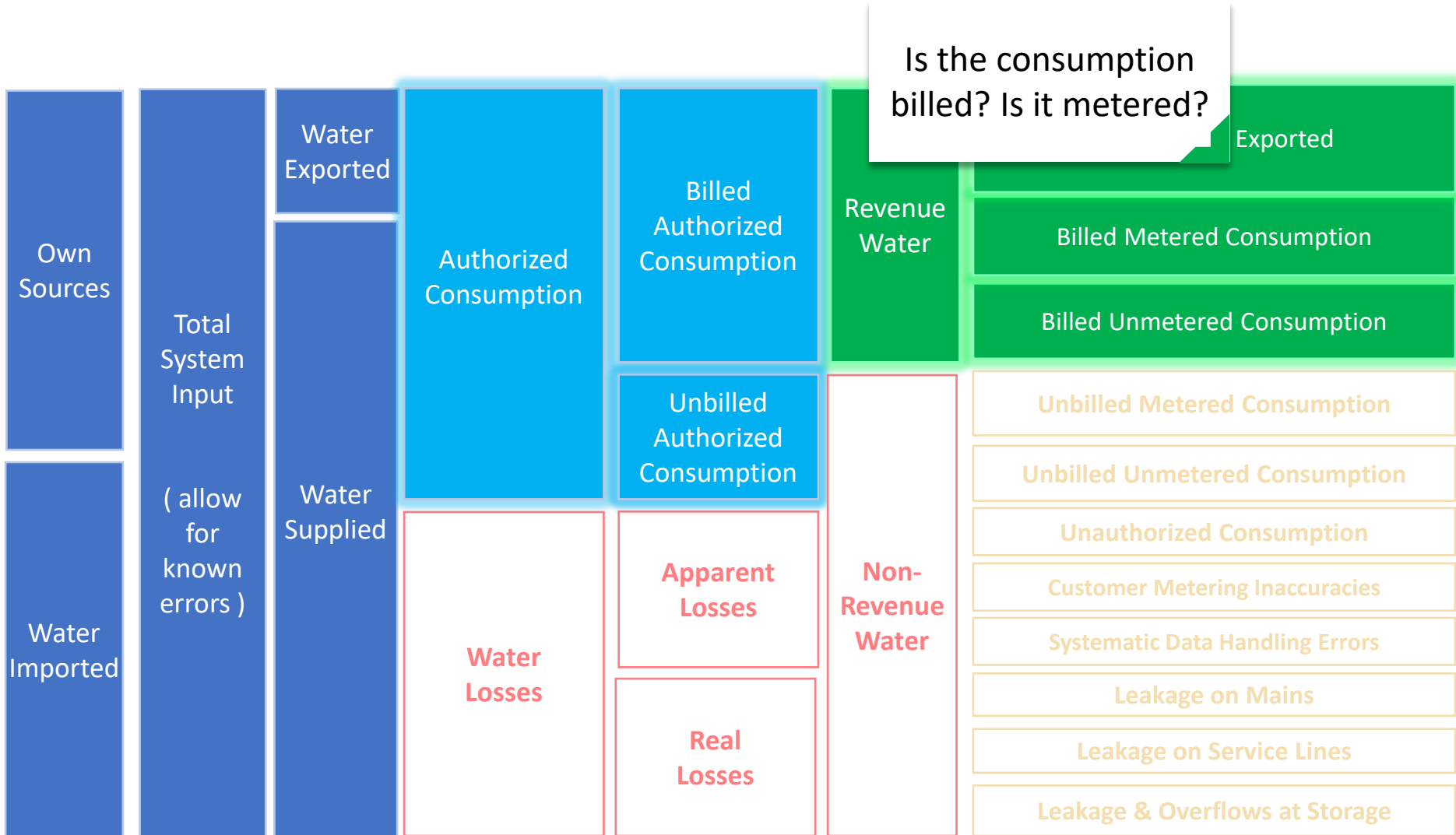
Water consumption that is billed and authorized by the water utility. This includes both metered and unmetered consumption.

M36 Water Auditing and Loss Control Programming, 4th Ed.

Is it metered?

Is it unmetered?

The Water Balance & Water Auditing



Authorized Consumption

Billed Metered Authorized Consumption (BMAC)

Billed Metered Authorized Consumption

Part of billed authorized consumption that is metered and billed to retail customers, including all groups of customers such as domestic, commercial, industrial, or institutional.

Authorized Consumption

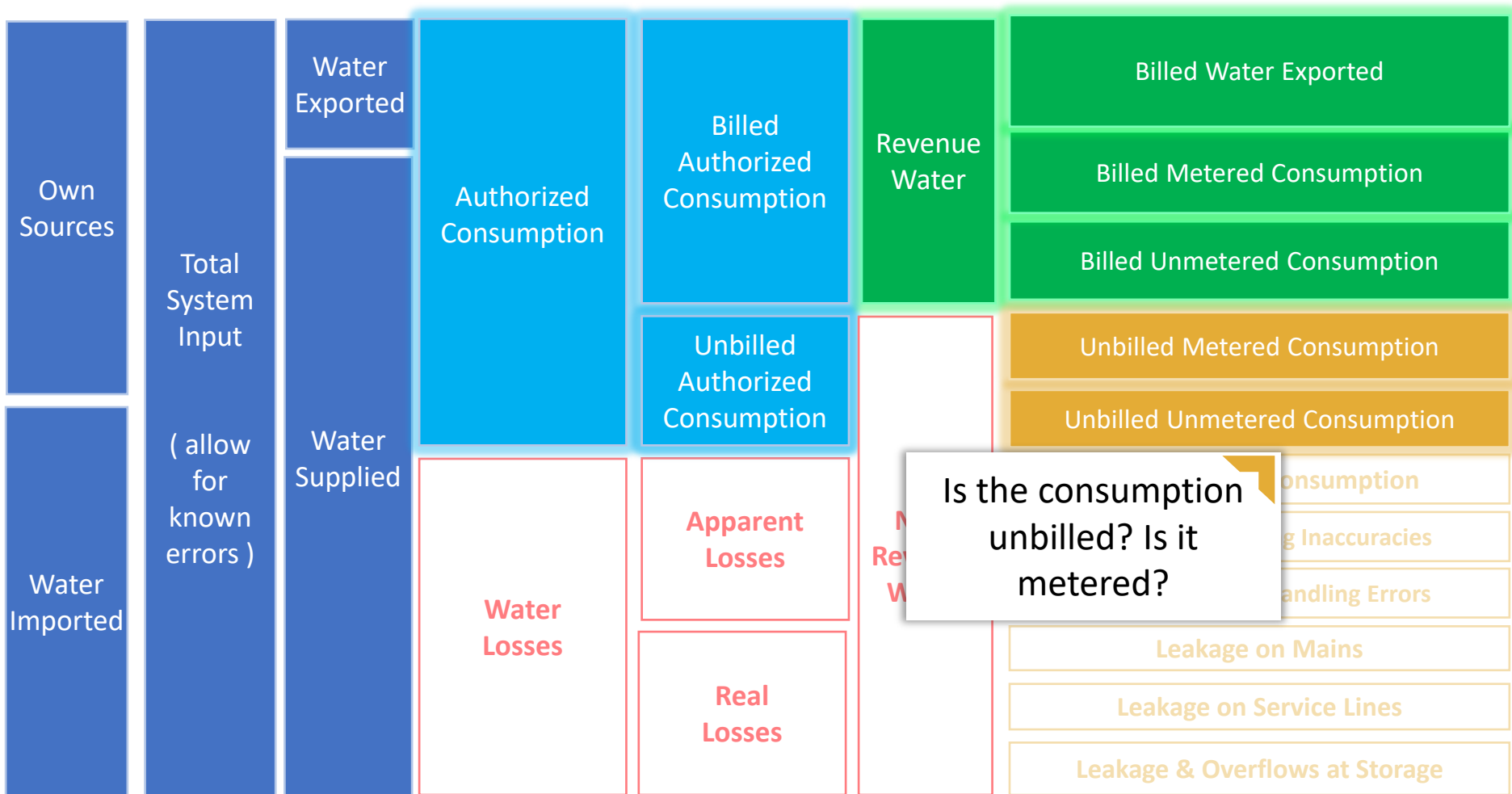
Billed Unmetered Authorized Consumption (BUAC)

Billed Unmetered Authorized Consumption

The part of billed authorized consumption volumes that are calculated based on estimates or norms from water usage sites that have been determined by utility policy to be left unmetered.

M36 Water Auditing and Loss Control Programming, 4th Ed.

The Water Balance & Water Auditing



Authorized Consumption

Unbilled Metered Authorized Consumption (UMAC)

Unbilled Metered Authorized Consumption

Metered consumption that is authorized by the water utility, but, for any reason, is deemed by utility policy to be unbilled.

M36 Water Auditing and Loss Control Programming, 4th Ed.

Authorized Consumption

Unbilled Unmetered Authorized Consumption (UUAC)

Unbilled Unmetered Authorized Consumption

Any kind of authorized consumption that is neither billed nor metered. This component will typically include water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, and so forth.



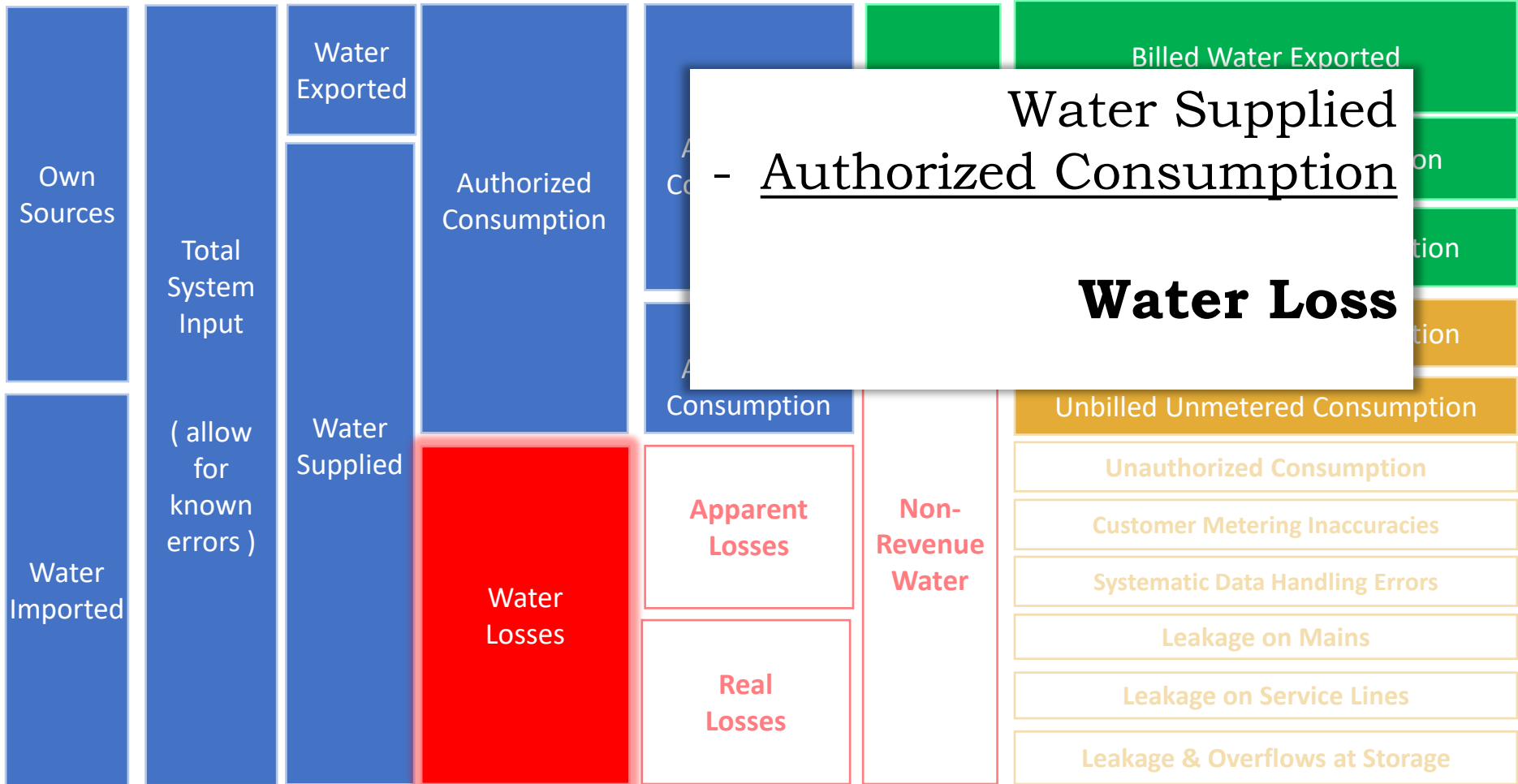
Test Your Knowledge

Authorized Consumption

Break



The Water Balance & Water Auditing

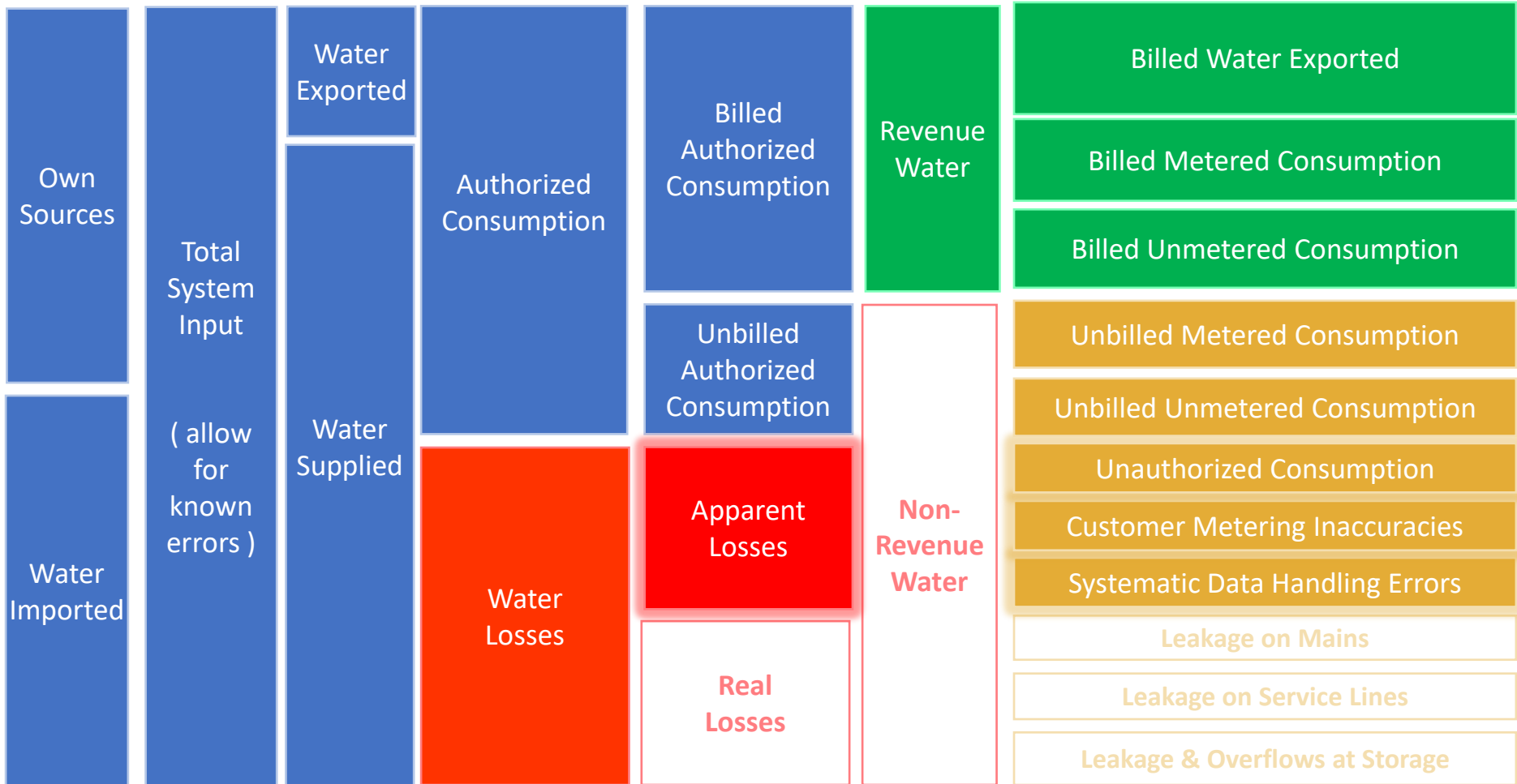


Water Loss

Water Loss

The difference between the Water Supplied volume and Authorized Consumption, also equal to the sum of apparent and real losses.

The Water Balance & Water Auditing



Water Loss

Apparent Loss (AL)

Apparent Loss

Losses in customer consumption attributed to inaccuracies associated with customer metering, systematic data handling errors, plus unauthorized consumption (theft or illegal use of water). Apparent losses represent nonphysical (paper) losses that result in uncaptured revenue for the water utility and distortion of customer consumption data.

M36 Water Auditing and Loss Control Programming, 4th Ed.

Apparent Loss

Unauthorized Consumption (UAC)

Unauthorized Consumption

Any water taken from the water distribution system without the authorization of the water utility.

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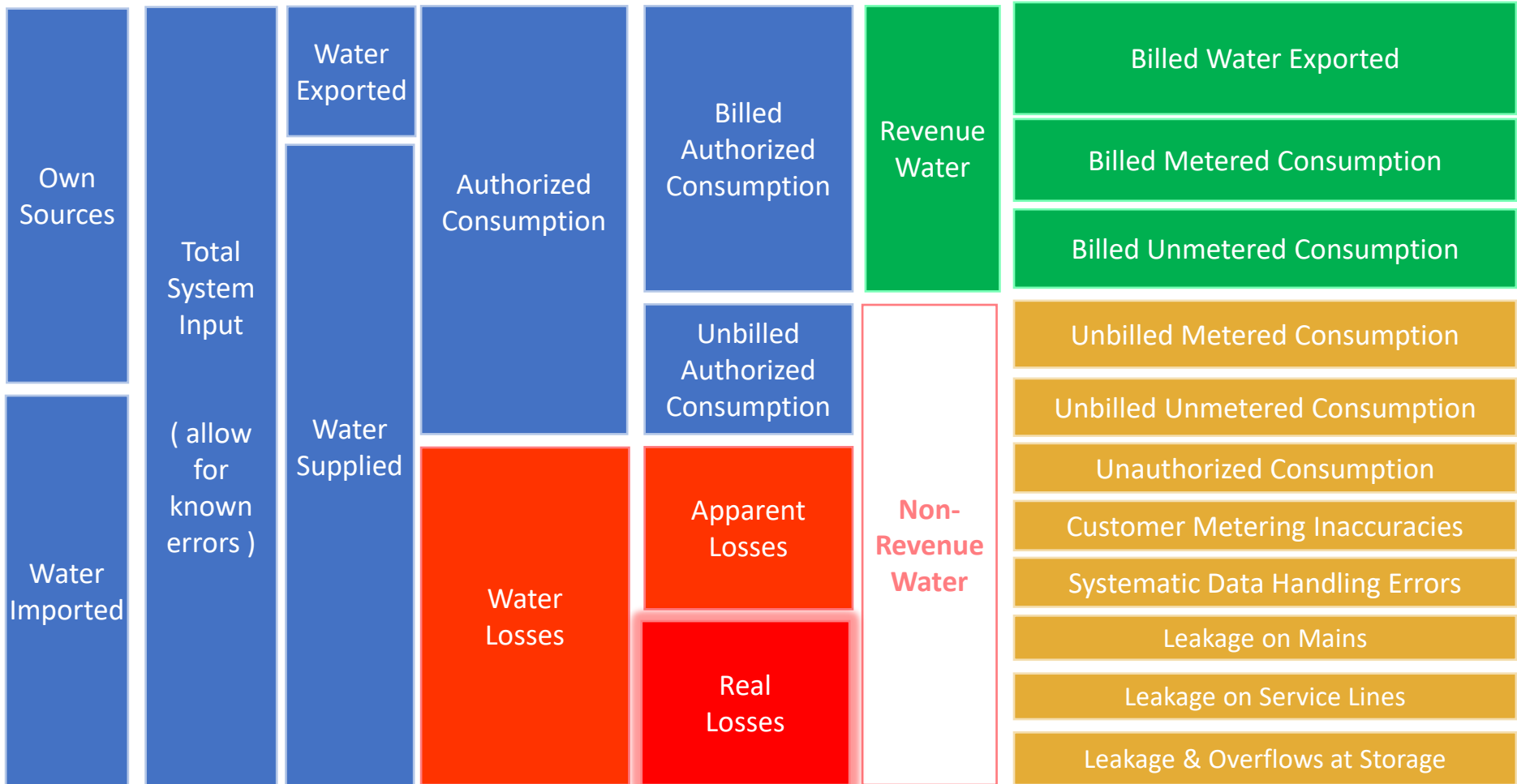
Apparent Loss

Customer Metering Inaccuracies (CMI)

Customer Metering Inaccuracies

Apparent losses caused by the collective under-registration or malfunction of customer water meters. Customer metering inaccuracies are a major component of apparent losses.

The Water Balance & Water Auditing



Water Loss

Real Loss

Real Losses

The physical water losses from the pressurized system and the utility's storage tanks, up to the point of customer consumption, which is the customer meter in those utilities that meter their customers.

M36 Water Auditing and Loss Control Programming, 4th Ed.

The Water Balance & Water Auditing

$$\begin{array}{r}
 \text{Unbilled Authorized Consumption} \\
 \text{Apparent Losses} \\
 \text{Real Losses} \\
 \hline
 +
 \end{array}$$

Billed Water Exported

Billed Metered Consumption

Billed Unmetered Consumption

Non-Revenue Water

Unbilled Metered Consumption

Unbilled Unmetered Consumption

Unauthorized Consumption

Customer Metering Inaccuracies

Systematic Data Handling Errors

Leakage on Mains

Leakage on Service Lines

Leakage & Overflows at Storage



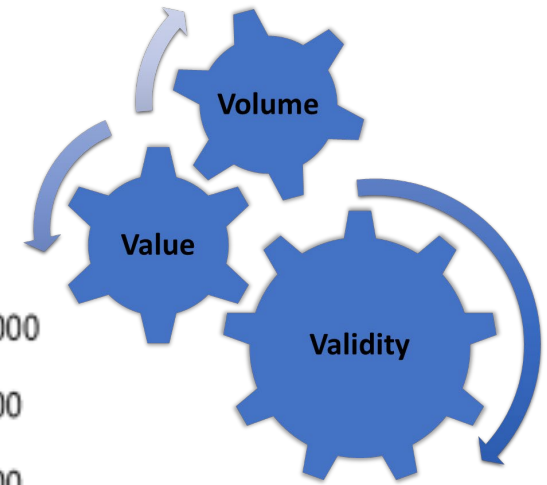
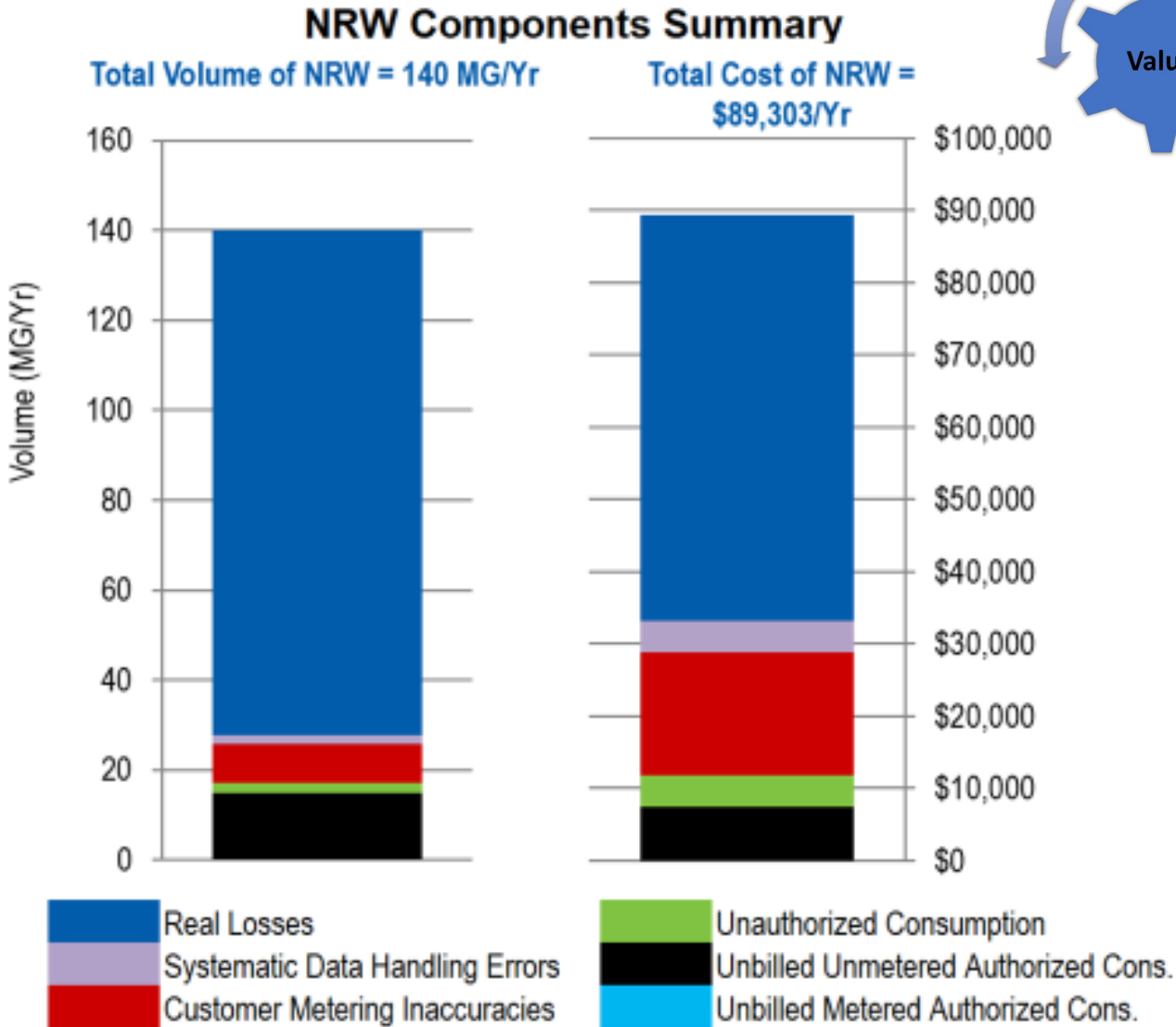
Non-Revenue Water

Non-Revenue Water

Those components of system input volume that are not billed and produce no revenue. NRW equals unbilled authorized consumption plus apparent and real losses.

M36 Water Auditing and Loss Control Programming, 4th Ed.

Non-Revenue Water





Test Your Knowledge

Non-Revenue Water

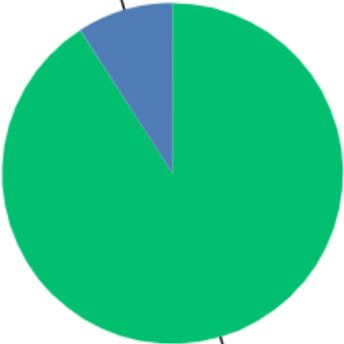
AWWA Free Water Audit Software

Overview

How would you describe your experience with the AWWA Water Audit Methodology? Please select one.

Answered: 11 Skipped: 0

Beginner: beginning to use the AWWA Water Audit Software a...



Unfamiliar: the AWWA Water Audit Software and Methodology are new

Why a Water Audit?



Yang Villa
@YangPYWP

Follow

Water audit is the pillar of efficiency: we cannot manage what we do not know or cannot measure. Will Jernigan speaks about California's experience with water balance. #Efficient2019



11:36 PM - 13 Jan 2019

2 Retweets 12 Likes



2



2



12





AWWA'S FREE WATER AUDIT SOFTWARE: Updates and Improvements

Will Jernigan and David Sayers

Key Takeaways

AWWA's Water Loss Control Committee's Software Subcommittee has announced the release of a new version of the Free Water Audit Software.

The new release has nearly 1,000 updates and is intended to improve the user experience and increase the value of the software's data outputs.

With substantial enhancements that include interactive data grading and dashboard outputs for benchmarking, utilities that conduct top-down water audits are advised to use the newest software.

Layout imagery by Rawpixel.com/Shutterstock.com



COVER STORY Water Audit Software Enhancements

AWWA's Free Water Audit Software (FWAS) has been recognized in North America as the industry standard tool for conducting the top-down water audit following AWWA Manual M-9, *Water Audits and Loss Control Programs*. FWAS was first published in 2006, with approximately 200 downloads during the first four years (Figure 1). The version before 2020 (v5.0) was released in 2014; it was downloaded more than 1,000 times, reflecting significant interest in the topic of water audits and water loss control in North America over the past decade (Sayers & Jernigan 2020).

Released in 2020, the latest FWAS v6.0.0 was the culmination of approximately three years of development activity by AWWA Water Loss Control Committee's (WLCC)'s Software Subcommittee, which incorporated a review of nearly 1,000 user comments and included the dedicated development period of testing.

Besides general enhancements, the Software Subcommittee established the following design objectives for FWAS v6.0:

- Accommodate a range of water system sites, designs, and auditor experience levels.
- Include enough water audit parameters and system details to be effective, but streamline the program to be user-friendly and time-efficient.
- Remove subjective elements in the Data Grading Matrix.
- Minimize variability between FWAS v5.0 and FWAS v6.0 scores for the same input conditions.

Many decisions in the development of v6.0 came down to weighing different objectives and determining the

best balance that would accurately serve the user. While nearly 1,000 updates were incorporated into v6.0, the following sections detail the most important improvements, which are categorized as input grading, and outputs.

Input Enhancements
The major water balance principles and core AWWA Manual M-9 remains unchanged from previous versions of the FWAS. But refinements were in water audit Worksheets to make it easier to use promote consistency.

User Interface Updates
Accessories and localizations for 19 audit inputs are rated into FWAS v6.0 to be efficient with text to encourage distinct recognition of each input associated water balance components or derived performance indicators (KPIs). It is recognized that syntax and notations will take some getting used to, but will come with experience, and they are all ideas or units consistently used in practice. A handbook for reference on the software start page.

On the Worksheet, conventions for over- and under-registration on error adjustments are a made clear with drop-down menu design shown in Figure 3. Pre-FWAS v5.0, this convention was inconsistently applied.

Also, on the Worksheet Annual Operating been moved from a required to an optional input. It is no longer necessary to input KPIs, per the WLCC position (AWWA WLCC).

Finally, a Blank Sheet provided and can be used whatever reason the user. Anticipated uses include calculations and an supporting documents is not convenient to include Notes tab.

Updates to Defaults
Previous defaults for 19



Figure 1

Below, 1,000 were assigned the 1.0 value to default, with the exception that default of 0.0 was applied to a specific audit parameter (AWWA Manual M-9, Table 10.1.1). Default values used to represent the FWAS v6.0.0 were the same as the values used in the previous version of the software.



Figure 3



Figure 4

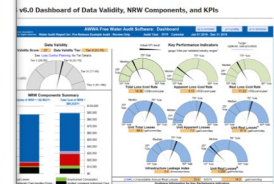


Figure 5

Enhancements
When to update data grading scores and KPIs will be the next iterations of the software, but are specifically highlighted in the following sections.

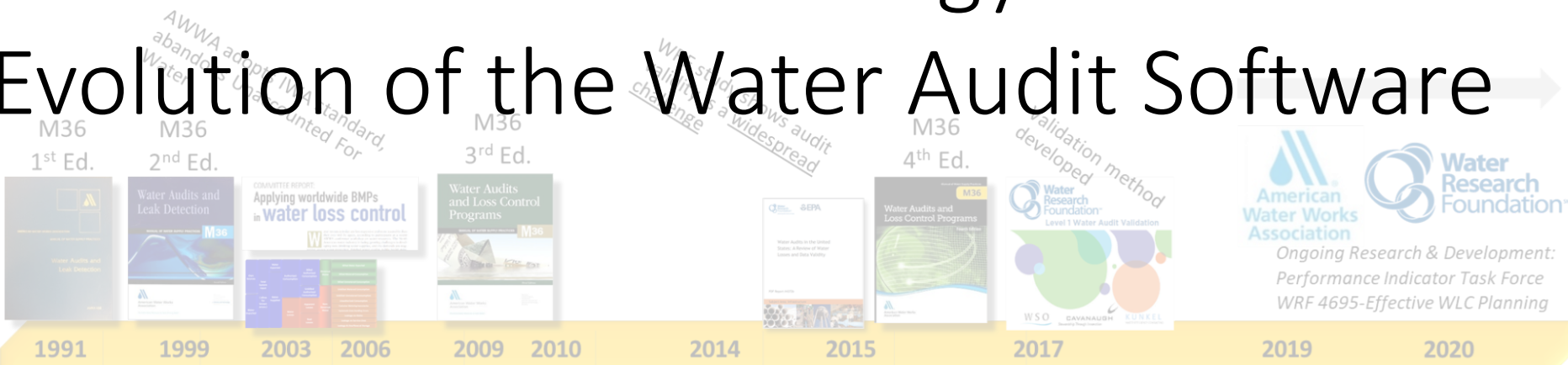
Data grading assignment is now iterative and requires a series of data points to be entered into the software. This iterative process is designed to be user-friendly and time-efficient. The process is designed to be user-friendly and time-efficient. The process is designed to be user-friendly and time-efficient.

For most users, the audit process for FWAS v6.0 should be a smooth transition. The software is designed to be user-friendly and time-efficient. The process is designed to be user-friendly and time-efficient.

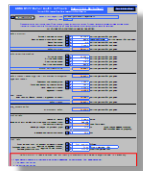
Finally, a Blank Sheet provided and can be used whatever reason the user. Anticipated uses include calculations and an supporting documents is not convenient to include Notes tab.

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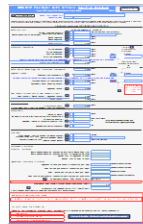
AWWA M36 Methodology – Evolution of the Water Audit Software



AWWA Audit Software v1



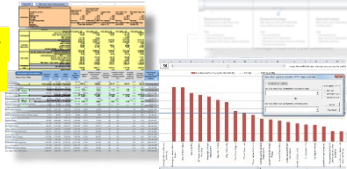
AWWA Audit Software v4



AWWA Audit Software v5



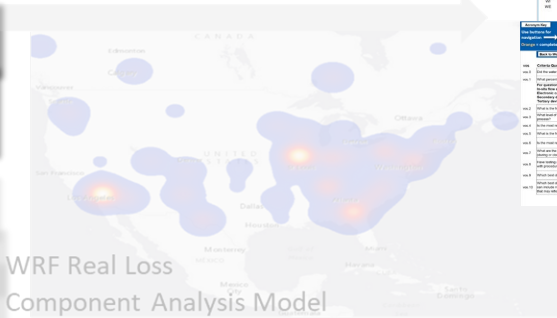
AWWA Compiler developed for large audit sets



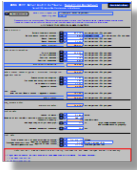
AWWA Audit Software v6



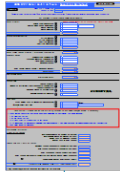
WRF Real Loss Component Analysis Model



FWAS v1 (200)



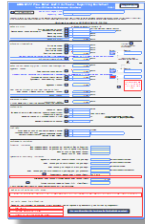
FWAS v2 – v3



MG volumes only
Data grading:
either 'measured'
or 'estimated'

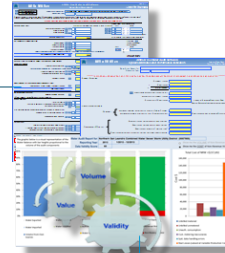
- Megaliters added
- Two financial performance indicators added (cost of real and apparent losses)
- Acre-ft added
- Example audits included
- Two default values
- Data checks / instant feedback added

FWAS v4 (2,000)



Data grading matrix (1-10)
Service connection diagram
French language version available

FWAS v5 (13,000)

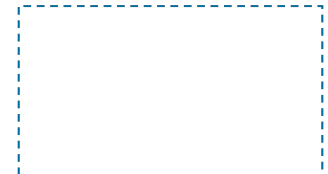
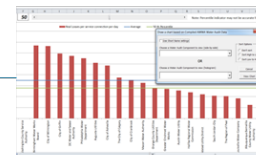
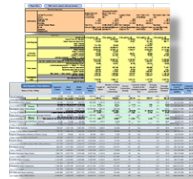


- Separate data input/output tabs
- Dashboard
- Volume weighted data grading
- Comments page
- Meter error adjustment for all water supplied components

FWAS v6



AWWA Compiler developed for large audit sets



SUMMARY OF MAJOR V6 IMPROVEMENTS

- 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

Worksheet

Water Audit Report for: **Pre-Release Example Audit - Review Only**
 Audit Year: **2019** Jan 01 2019 - Dec 31 2019 **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	<input type="text" value="1,000.000"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/>	<input type="text" value="1.00%"/>	<input type="text" value="percent"/>	<input type="text" value="over-registration"/>	VOSEA
WI	Water Imported:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value=""/>	MG/Yr					WIEA
WE	Water Exported:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value=""/>	MG/Yr					WEEA
WATER SUPPLIED:				<input type="text" value="990.099"/>	MG/Yr				

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	<input type="text" value="850.000"/>	MG/Yr					
BUAC	Billed Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value=""/>	MG/Yr					
UMAC	Unbilled Metered:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value=""/>	MG/Yr					
UUAC	Unbilled Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/>	<input type="text" value="15.000"/>	MG/Yr					
AUTHORIZED CONSUMPTION:				<input type="text" value="865.000"/>	MG/Yr				

WATER LOSSES

				<input type="text" value="125.099"/>	MG/Yr				
Apparent Losses									
Default option selected for Systematic Data Handling Errors, with automatic data grading of 3									
SDHE	Systematic Data Handling Errors:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	<input type="text" value="2.125"/>	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>			
CMI	Customer Metering Inaccuracies:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="1"/>	<input type="text" value="8.586"/>	MG/Yr	<input type="text" value="1.00%"/>	<input type="text" value="percent"/>			<input type="text" value="under-registration"/>
UC	Unauthorized Consumption:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	<input type="text" value="2.125"/>	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>			
Default option selected for Unauthorized Consumption, with automatic data grading of 3									
Apparent Losses:				<input type="text" value="12.836"/>	MG/Yr				

Real Losses

Real Losses:				<input type="text" value="112.263"/>	MG/Yr				
WATER LOSSES:				<input type="text" value="125.099"/>	MG/Yr				

NON-REVENUE WATER

NON-REVENUE WATER:				<input type="text" value="140.099"/>	MG/Yr				
---------------------------	--	--	--	--------------------------------------	-------	--	--	--	--

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="1"/>	<input type="text" value="200.0"/>	miles	(including fire hydrant lead lengths)				
Nc	Number of service connections:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/>	<input type="text" value="5,000"/>		(active and inactive)				
		Service connection density:	<input type="text" value="25"/>	conn./mile main					
Are customer meters typically located at the curbstop/property				<input type="text" value="Yes"/>					
Lp	Average length of customer service line has been set to zero and a data grading of 10 has been applied								
AOP	Average Operating Pressure:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	<input type="text" value="50.0"/>	psi					

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	<input type="text" value="\$2.00"/>	\$/1000 gallons (US)	Total Annual Operating Cost	
VPC	Variable Production Cost:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	<input type="text" value="\$500.00"/>	\$/Million gallons	<input type="text" value="\$2,500,000"/>	\$/yr (optional input)

Worksheet

Water Audit Report for: **Pre-Release Example Audit - Review Only**

Audit Year: **2019** | **Jan 01 2019 - Dec 31 2019** | **Calendar**

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

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

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

WATER SUPPLIED

Water Supplied Error Adjustments

choose entry option:

VOS
 WI
 WE

Volume from Own Sources: MG/Yr

Water Imported: MG/Yr

Water Exported: MG/Yr

VOSEA
 WIEA
 WEEA

WATER SUPPLIED: MG/Yr

Worksheet

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	n	g	9	850.000	MG/Yr
BUAC	Billed Unmetered:	n	g			MG/Yr
UMAC	Unbilled Metered:	n	g			MG/Yr
UUAC	Unbilled Unmetered:	n	g	4	15.000	MG/Yr

choose entry option:

custom	15.000	MG/Yr
--------	--------	-------

AUTHORIZED CONSUMPTION: 865.000 MG/Yr

WATER LOSSES

125.099 MG/Yr

Apparent Losses

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

SDHE	Systematic Data Handling Errors:	n	g	3	2.125	MG/Yr
CMI	Customer Metering Inaccuracies:	n	g	1	8.586	MG/Yr
UC	Unauthorized Consumption:	n	g	3	2.125	MG/Yr

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

Apparent Losses: 12.836 MG/Yr

choose entry option:

0.25%	default
1.00%	percent
0.25%	default

under-registration

Worksheet

SYSTEM DATA

Lm	Length of mains:	n	g	1	200.0	miles	(including fire hydrant lead lengths)
Nc	Number of service connections:	n	g	5	5,000		(active and inactive)
	Service connection density:				25	conn./mile main	
Lp	Are customer meters typically located at the curbsto/property				Yes		
		n	g	10			
AOP	Average length of customer service line has been set to zero and a data grading of 10 has been applied						
	Average Operating Pressure:	n	g	3	50.0	psi	

COST DATA

CRUC	Customer Retail Unit Charge:	n	g	7	\$2.00	\$/1000 gallons (US)	Total Annual Operating Cost
VPC	Variable Production Cost:	n	g	3	\$500.00	\$/Million gallons	\$2,500,000 \$/yr (optional input)

Worksheet

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: Water Imported (WI)
2: Billed Metered (BMAC)
3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

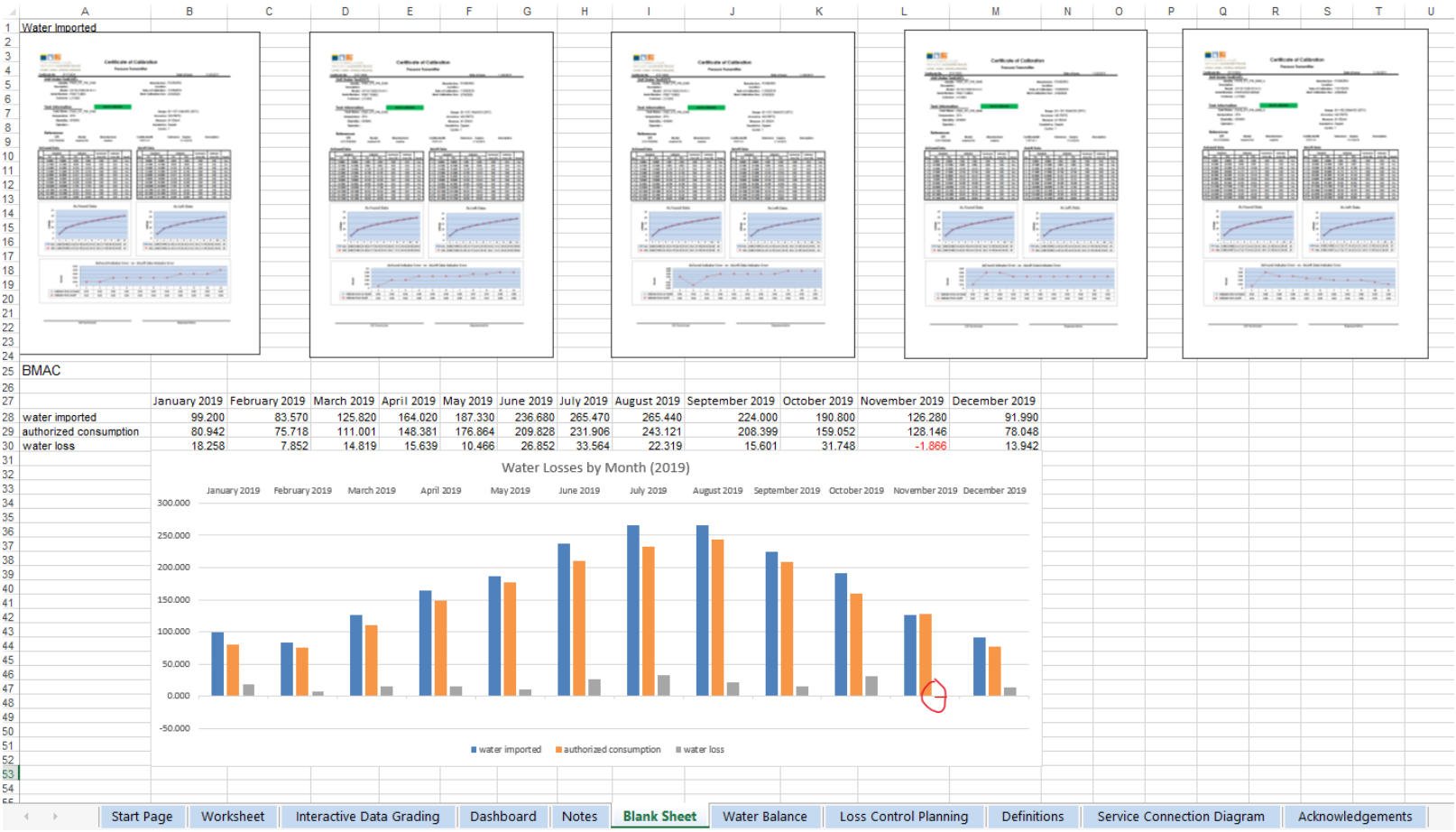
Unit Total Losses:	<input type="text" value="45.0"/>	gal/conn/day
Unit Apparent Losses:	<input type="text" value="5.0"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text" value="40.0"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text" value="1,000"/>	gal/mile/day

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

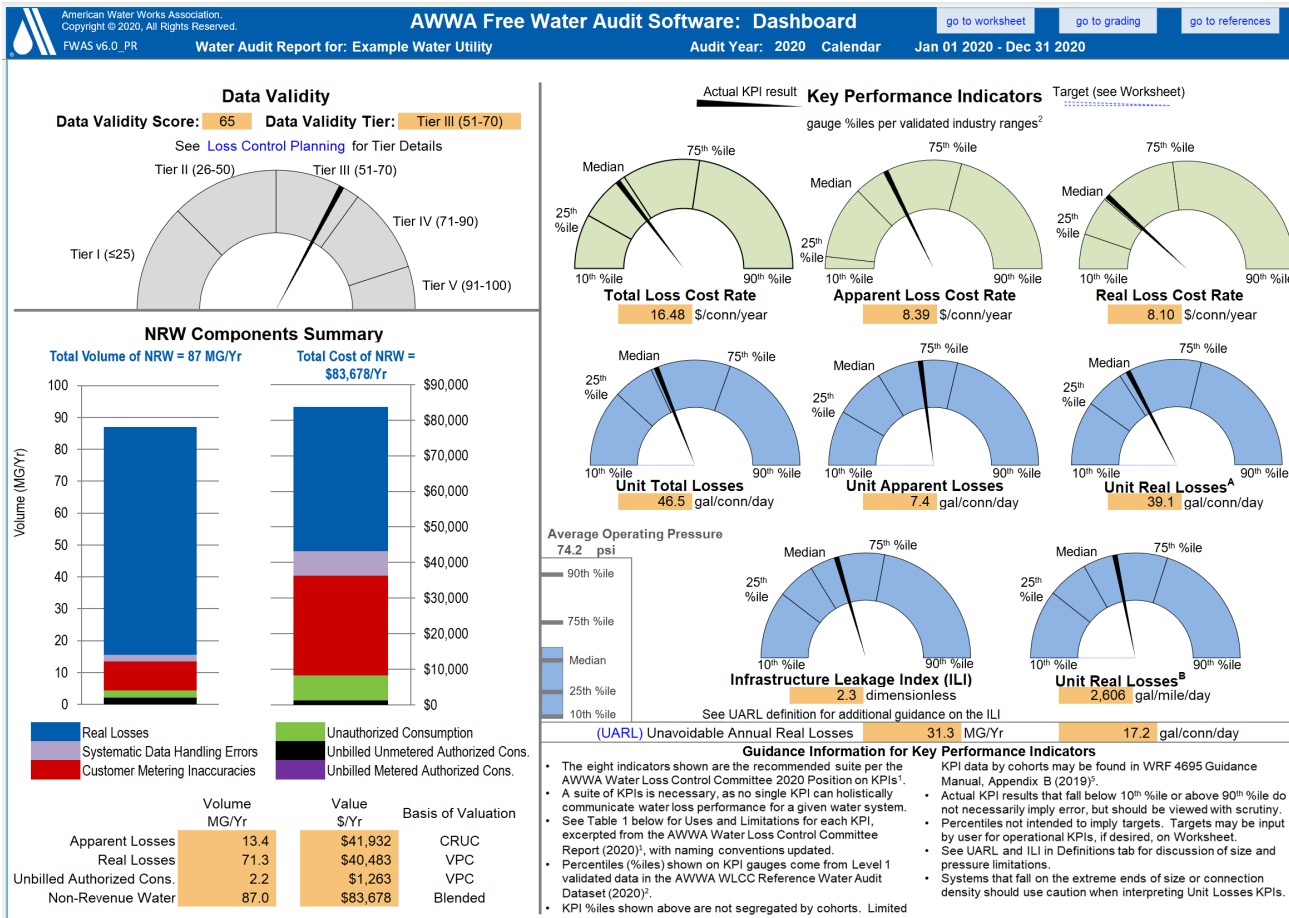
Blank Sheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Hello, I am a blank sheet, at your service.																		
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3																			
4																			
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49																			

v6 Blank Sheet



Dashboard

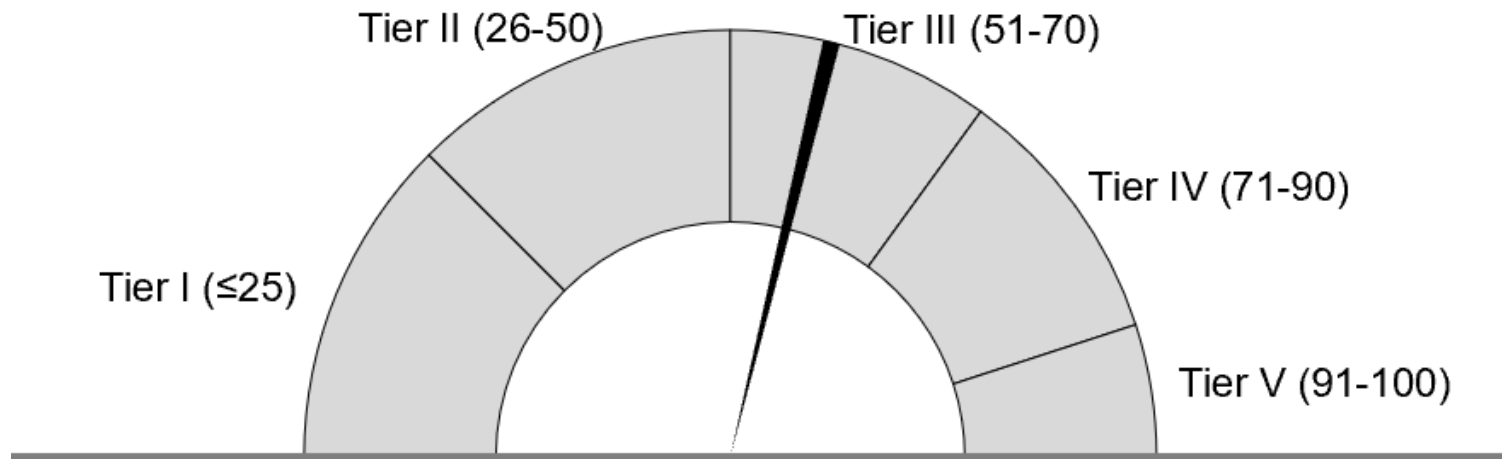


Dashboard

Data Validity

Data Validity Score: **57** Data Validity Tier: **Tier III (51-70)**

See [Loss Control Planning](#) for Tier Details



Water Loss Control Planning Guide

Water Audit Data Validity Tier (Score Range)

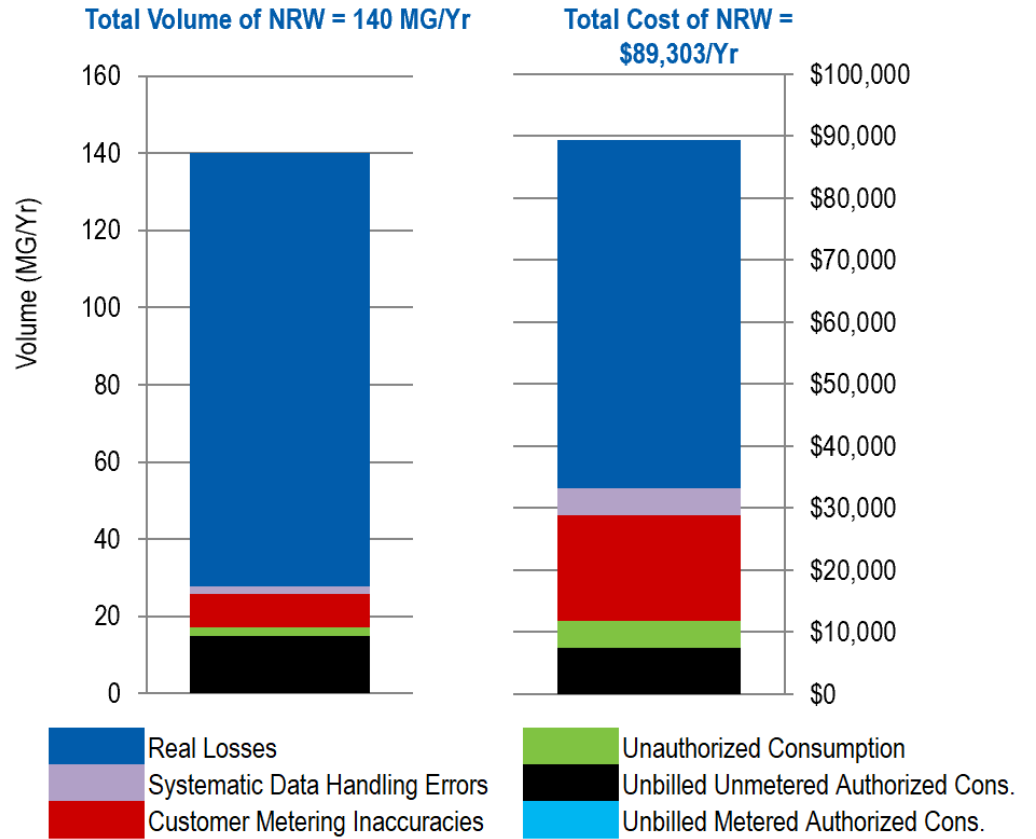
Functional Focus Area	Tier I (1-25)	Tier II (26-50)	Tier III (51-70)	Tier IV (71-90)	Tier V (91-100)
Audit Data Collection	Launch auditing and loss control team; address supply metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations; Identify data gaps; improve supply metering	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs; Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or AMR/AMI system	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon with PIs for performance comparisons for real losses	Performance Benchmarking with PIs is meaningful in comparing real loss standing	Identify Best Practices/ Best in class; PIs are very reliable as real loss performance indicators for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Dashboard

	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	12.8	\$25,672	CRUC
Real Losses	112.3	\$56,132	VPC
Unbilled Authorized Cons.	15.0	\$7,500	VPC
Non-Revenue Water	140.1	\$89,303	Blended

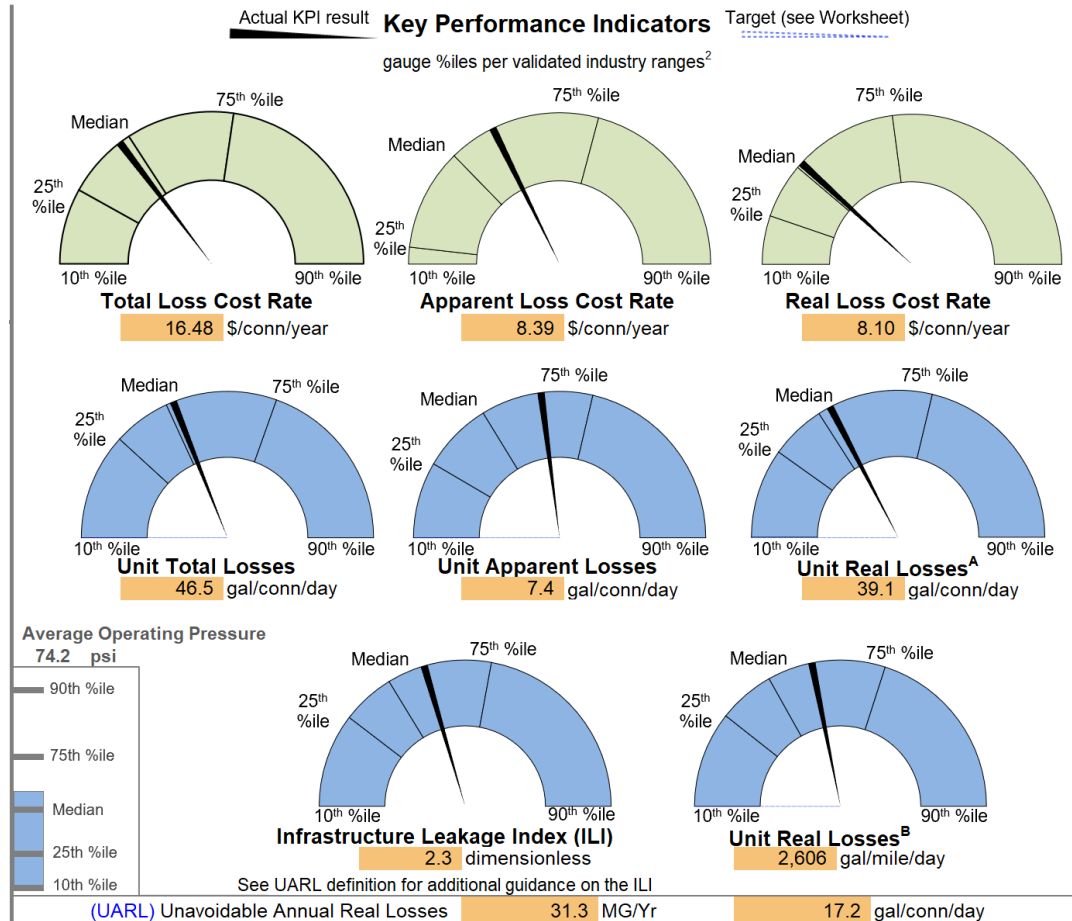
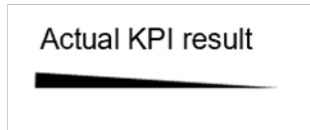
NRW Components Summary



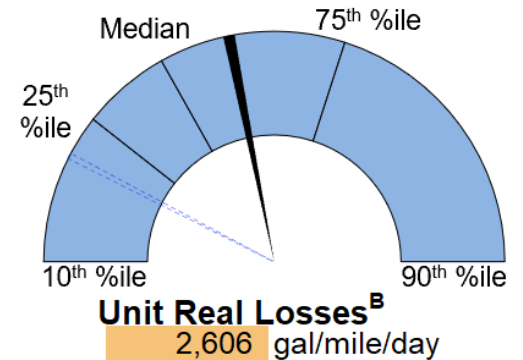
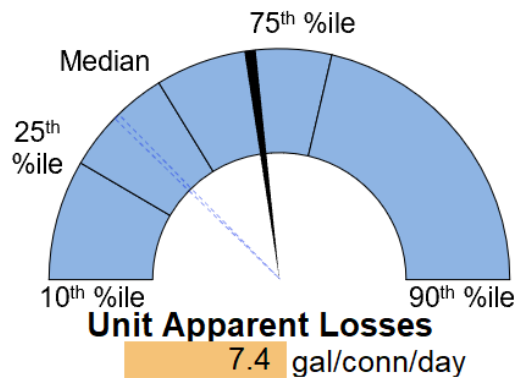
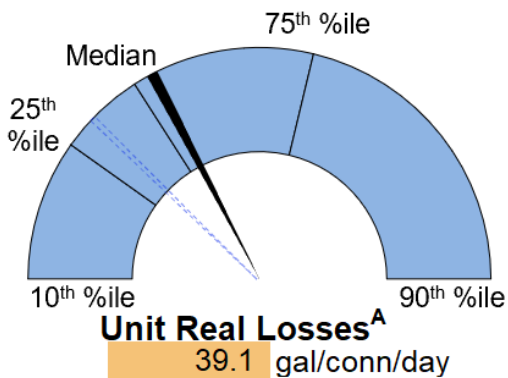
Dashboard

Key Performance Indicators

gauge %iles per validated industry ranges²



Dashboard – Key Performance Indicators



Key Performance Indicators

gauge %iles per validated industry ranges²

Actual KPI result



Target
(optional, user-provided)



KEY PERFORMANCE INDICATOR TARGETS:

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

Unit Total Losses:	32.0 gal/conn/day
Unit Apparent Losses:	4.0 gal/conn/day
Unit Real Losses ^A :	28.0 gal/conn/day
Unit Real Losses ^B :	900 gal/mile/day

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



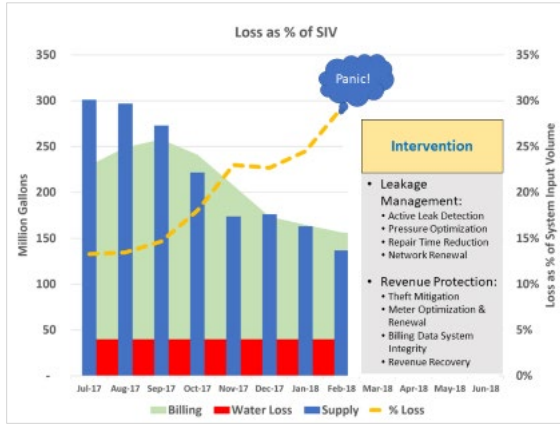
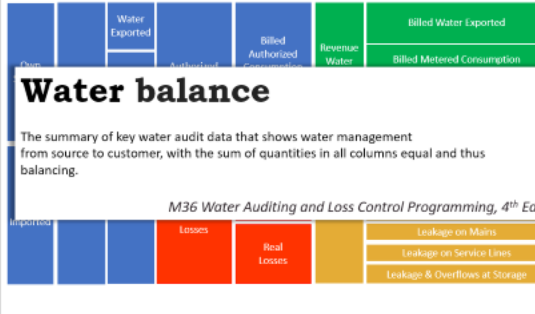
Test Your Knowledge

AWWA Free Water Audit Software

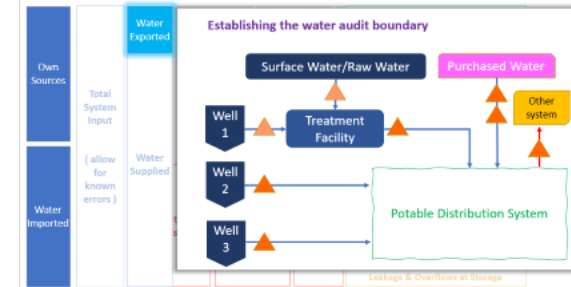


Summary Review & Wrap-Up

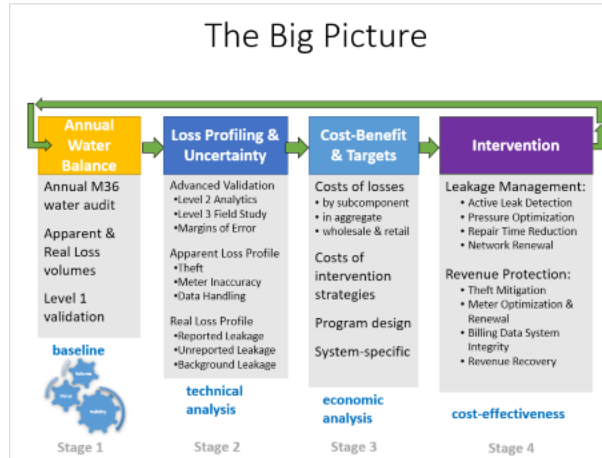
The Water Balance & Water Auditing



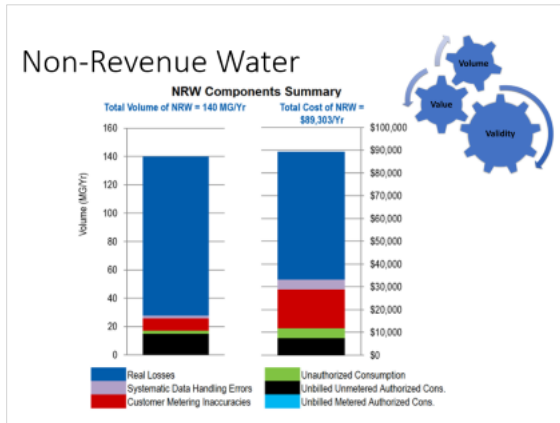
The Water Balance & Water Auditing



The Big Picture



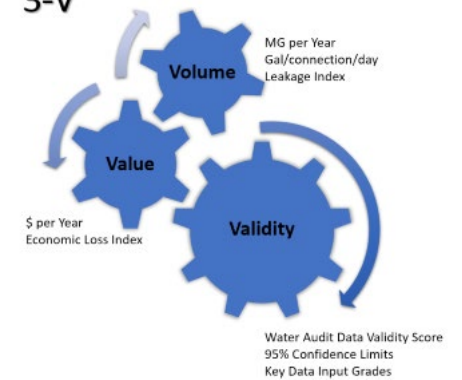
Non-Revenue Water



Dashboard



3-V





Workshop Evaluation