



**VIA E-FILING**

Utility Code: 210104

April 29, 2021

Rosemary Chiavetta, Secretary  
Pennsylvania Public Utility Commission  
Commonwealth Keystone Building  
400 North Street  
Harrisburg, PA 17120

**RE: Aqua Pennsylvania, Inc.  
2020 Water Audit Summary  
Docket No. M-2021-3023555**

Dear Secretary Chiavetta:

Enclosed for filing are Aqua Pennsylvania, Inc.'s 2020 Annual Water Audit Summaries for the following divisions: (1) Honesdale, (2) Roaring Creek, (3) Southeast Pennsylvania, (4) Shenango, (5) Susquehanna, and (6) Whitehaven. The electronic files of the water audit summaries are being sent via email to the Secretary's Bureau, and hard copies will not be provided.

If you have any questions regarding this filing, please contact me at 610-645-1130.

Sincerely,

A handwritten signature in blue ink that reads "Alex Stahl".

Alexander R. Stahl  
Regulatory Counsel

Enclosures

cc: Clinton McKinley, Bureau of Technical Utility Services (via Email)  
Brennan T. Kelly, P.E., Aqua Pennsylvania, Inc. (via Email)



# AWWA Free Water Audit Software: Worksheet

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

Water Audit Report for: **Aqua Pennsylvania - Honesdale Division**  
Audit Year: **2020** **Jan 01 2020 - Dec 31 2020** **2020**

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

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

**Water Supplied Error Adjustments**

choose entry option:

|     |                          |  |                                      |       |  |                                    |                                      |   |       |
|-----|--------------------------|--|--------------------------------------|-------|--|------------------------------------|--------------------------------------|---|-------|
| VOS | Volume from Own Sources: | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/>   | <input type="text" value="781.108"/> | MG/Yr | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/> | <input type="text" value="2.00%"/> | <input type="text" value="percent"/> | <input type="text" value="under-registration"/> | VOSEA |
| WI  | Water Imported:          | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> | <input type="text" value="0.000"/>   | MG/Yr |  |                                    |                                      |   | WIEA  |
| WE  | Water Exported:          | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> | <input type="text" value="0.000"/>   | MG/Yr |  |                                    |                                      |   | WEEA  |

**WATER SUPPLIED:**  MG/Yr

## AUTHORIZED CONSUMPTION

|      |                     |  |                                      |       |  |  |  |  |  |
|------|---------------------|--|--------------------------------------|-------|--|--|--|--|--|
| BMAC | Billed Metered:     | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/>   | <input type="text" value="508.857"/> | MG/Yr |  |  |  |  |  |
| BUAC | Billed Unmetered:   | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> | <input type="text" value="0.000"/>   | MG/Yr |  |  |  |  |  |
| UMAC | Unbilled Metered:   | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/>   | <input type="text" value="15.226"/>  | MG/Yr |  |  |  |  |  |
| UUAC | Unbilled Unmetered: | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>   | <input type="text" value="1.272"/>   | MG/Yr |  |  |  |  |  |

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

**AUTHORIZED CONSUMPTION:**  MG/Yr

## WATER LOSSES

MG/Yr

### Apparent Losses

|      |                                  |  |                                     |       |  |  |  |  |  |
|------|----------------------------------|--|-------------------------------------|-------|--|--|--|--|--|
| SDHE | Systematic Data Handling Errors: | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> | <input type="text" value="1.272"/>  | MG/Yr |  |  |  |  |  |
| CMI  | Customer Metering Inaccuracies:  | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/> | <input type="text" value="10.696"/> | MG/Yr |  |  |  |  |  |
| UC   | Unauthorized Consumption:        | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> | <input type="text" value="1.272"/>  | MG/Yr |  |  |  |  |  |

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

**Apparent Losses:**  MG/Yr

### Real Losses

**Real Losses:**  MG/Yr

**WATER LOSSES:**  MG/Yr

## NON-REVENUE WATER

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

## SYSTEM DATA

|     |  |  |                                     |                 |  |
|-----|--|--|-------------------------------------|-----------------|--|
| Lm  | Length of mains:                                   | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> | <input type="text" value="264.0"/>  | 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="11.835"/> |                 | (active and inactive)                              |
|     | Service connection density:                        |  | <input type="text" value="45"/>     | conn./mile main |  |
| Lp  | Average length of (private) customer service line: | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="1"/> | <input type="text" value="35.0"/>   | ft              | (average distance between property line and meter) |
| AOP | Average Operating Pressure:                        | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> | <input type="text" value="60.0"/>   | psi             |  |

## COST DATA

|      |                              |  |                                       |                      |   |
|------|------------------------------|--|---------------------------------------|----------------------|---|
| CRUC | Customer Retail Unit Charge: | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/> | <input type="text" value="\$11.46"/>  | \$/1000 gallons (US) | <b>Total Annual Operating Cost</b>                            |
| VPC  | Variable Production Cost:    | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> | <input type="text" value="\$370.00"/> | \$/Million gallons   | <input type="text" value="\$430,000"/> \$/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. \*\*\*

[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 Metered (BMAC)
- 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 <sup>A</sup> : | <input type="text"/> | gal/conn/day |
| Unit Real Losses <sup>B</sup> : | <input type="text"/> | gal/mile/day |

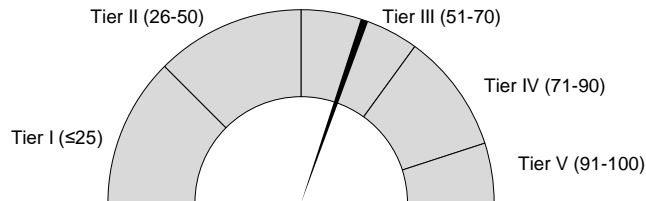
If entered above by user, targets will display on KPI gauges (see Dashboard)



## Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

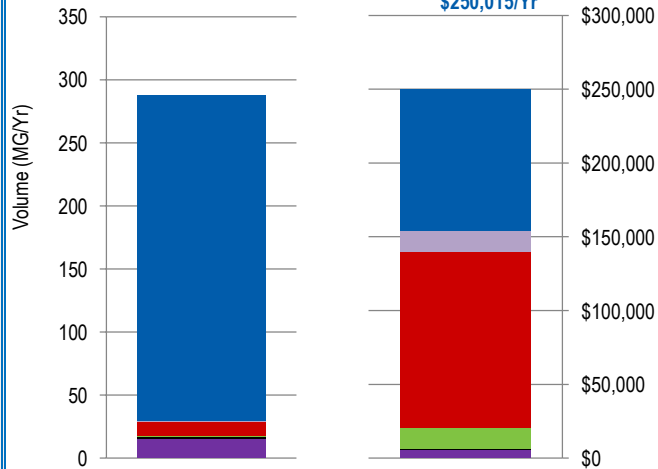
See [Loss Control Planning](#) for Tier Details



## NRW Components Summary

Total Volume of NRW = 288 MG/Yr

Total Cost of NRW = \$250,015/Yr



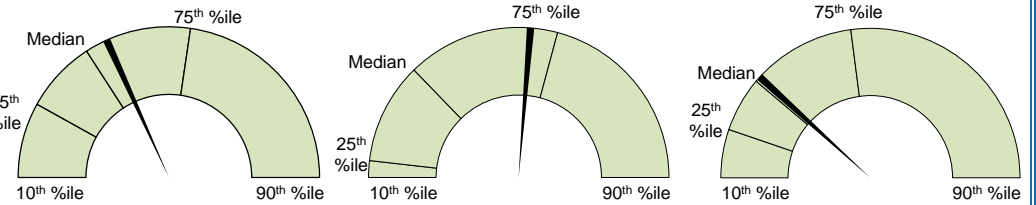
|                                  | Volume<br>MG/Yr | Value<br>\$/Yr | Basis of Valuation |
|----------------------------------|-----------------|----------------|--------------------|
| Real Losses                      | 258.5           | \$95,628       | VPC                |
| Systematic Data Handling Errors  | 16.5            | \$6,104        | VPC                |
| Customer Metering Inaccuracies   | 13.2            | \$148,283      | CRUC               |
| Unauthorized Consumption         | 288.2           | \$250,015      | Blended            |
| Unbilled Metered Authorized Cons |                 |                |                    |
| Unbilled Unmetered Auth Cons     |                 |                |                    |

Actual KPI result

## Key Performance Indicators

Target (see Worksheet)

gauge %iles per validated industry ranges<sup>2</sup>



**Total Loss Cost Rate**

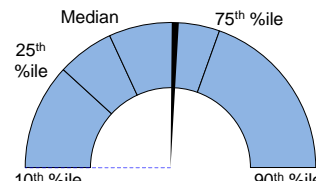
20.61 \$/conn/year

**Apparent Loss Cost Rate**

12.53 \$/conn/year

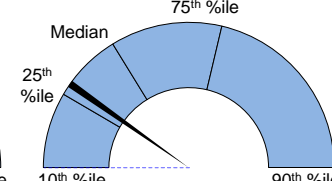
**Real Loss Cost Rate**

8.08 \$/conn/year



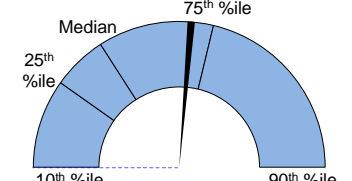
**Unit Total Losses**

62.9 gal/conn/day



**Unit Apparent Losses**

3.1 gal/conn/day

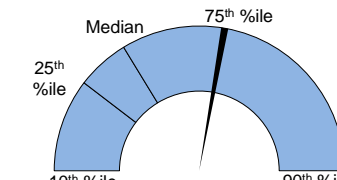
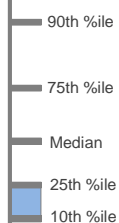


**Unit Real Losses<sup>A</sup>**

59.8 gal/conn/day

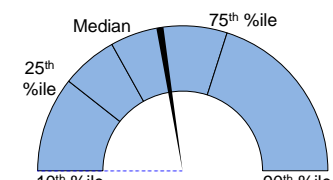
## Average Operating Pressure

60 psi



**Infrastructure Leakage Index (ILI)**

3.1 dimensionless



**Unit Real Losses<sup>B</sup>**

2,682 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **83.0** MG/Yr

**19.2** gal/conn/day

## Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs<sup>1</sup>.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)<sup>1</sup>, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)<sup>2</sup>.
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)<sup>3</sup>.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.

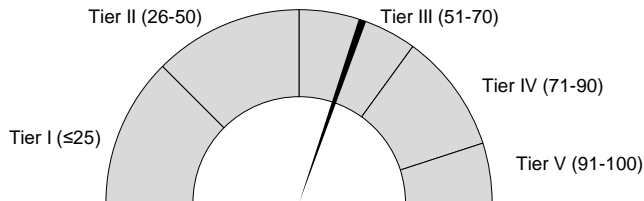




## Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

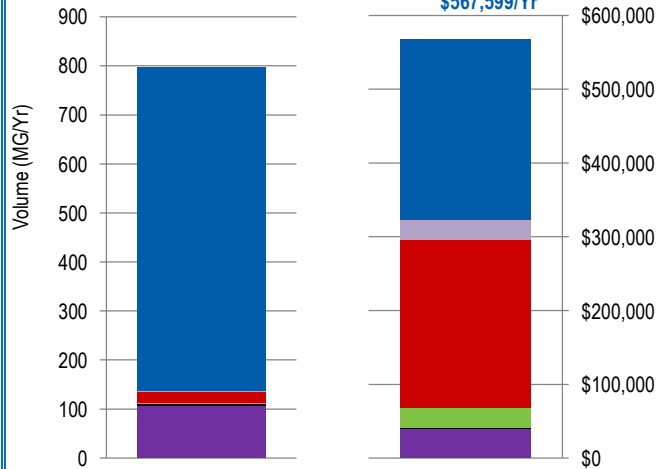
See [Loss Control Planning](#) for Tier Details



## NRW Components Summary

Total Volume of NRW = 795 MG/Yr

Total Cost of NRW = \$567,599/Yr



|                                 |                                  |
|---------------------------------|----------------------------------|
| Real Losses                     | Unauthorized Consumption         |
| Systematic Data Handling Errors | Unbilled Unmetered Auth Cons     |
| Customer Metering Inaccuracies  | Unbilled Metered Authorized Cons |

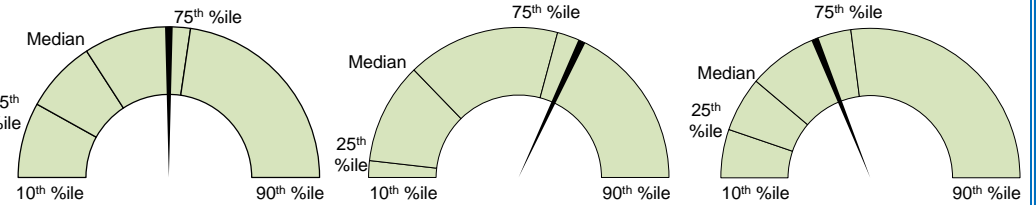
|                          | Volume<br>MG/Yr | Value<br>\$/Yr | Basis of Valuation |
|--------------------------|-----------------|----------------|--------------------|
| Apparent Losses          | 26.8            | \$282,578      | CRUC               |
| Real Losses              | 660.0           | \$244,184      | VPC                |
| Unbilled Authorized Cons | 110.4           | \$40,837       | VPC                |
| Non-Revenue Water        | 797.1           | \$567,599      | Blended            |

Actual KPI result

## Key Performance Indicators

Target (see Worksheet)

gauge %iles per validated industry ranges<sup>2</sup>



**Total Loss Cost Rate**

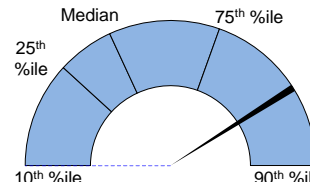
28.45 \$/conn/year

**Apparent Loss Cost Rate**

15.26 \$/conn/year

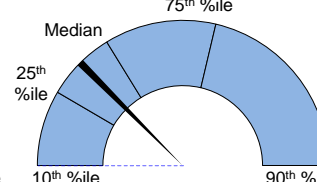
**Real Loss Cost Rate**

13.19 \$/conn/year



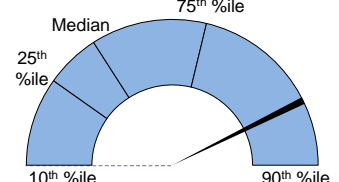
**Unit Total Losses**

101.6 gal/conn/day



**Unit Apparent Losses**

4.0 gal/conn/day

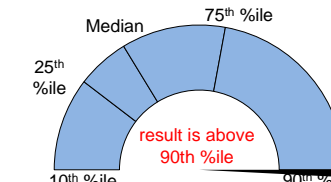
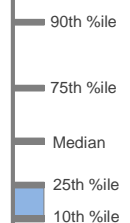


**Unit Real Losses<sup>A</sup>**

97.7 gal/conn/day

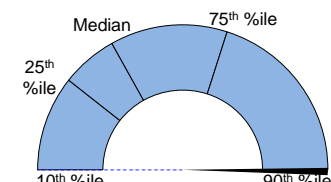
## Average Operating Pressure

60 psi



**Infrastructure Leakage Index (ILI)**

6.0 dimensionless



**Unit Real Losses<sup>B</sup>**

6,049 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **110.6** MG/Yr

**16.4** gal/conn/day

## Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs<sup>1</sup>.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)<sup>1</sup>, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)<sup>2</sup>.
- KPI %iles shown above are not segregated by cohorts. Limited
- KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)<sup>3</sup>.
- Actual KPI results that fall below 10<sup>th</sup> %ile or above 90<sup>th</sup> %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.



# AWWA Free Water Audit Software: Worksheet

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

Water Audit Report for: **Aqua Pennsylvania - Shenango Division**  
 Audit Year: **2020** **Jan 01 2020 - Dec 31 2020** **2020**

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

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

Water Supplied Error Adjustments

choose entry option:

|                       |   |           |       |  |       |                                      |   |  |
|-----------------------|---|-----------|-------|--|-------|--------------------------------------|---|--|
| <b>WATER SUPPLIED</b> | Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/> | 3,624.268 | MG/Yr | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/> | 2.00% | <input type="text" value="percent"/> | <input type="text" value="under-registration"/> |  |
| VOS                   | Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>        | 0.000     | MG/Yr |  |       |                                      | <input type="text" value="VOSEA"/>              |  |
| WI                    | Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>        | 0.000     | MG/Yr |  |       |                                      | <input type="text" value="WIEA"/>               |  |
| WE                    |   |           |       |  |       |                                      | <input type="text" value="WEEA"/>               |  |

**WATER SUPPLIED:** 3,698.233 MG/Yr

**AUTHORIZED CONSUMPTION**

|      |  |           |       |  |  |  |  |
|------|--|-----------|-------|--|--|--|--|
| BMAC | Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/>     | 2,656.365 | MG/Yr |  |  |  |  |
| BUAC | Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> | 0.000     | MG/Yr |  |  |  |  |
| UMAC | Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/>   | 41.815    | MG/Yr |  |  |  |  |
| UUAC | Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> | 6.641     | MG/Yr |  |  |  |  |

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

**AUTHORIZED CONSUMPTION:** 2,704.821 MG/Yr

**WATER LOSSES**

993.412 MG/Yr

**Apparent Losses**

|      |   |        |       |  |  |  |  |
|------|---|--------|-------|--|--|--|--|
| SDHE | Systematic Data Handling Errors: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> | 6.641  | MG/Yr |  |  |  |  |
| CMI  | Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/>  | 55.065 | MG/Yr |  |  |  |  |
| UC   | Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>        | 6.641  | MG/Yr |  |  |  |  |

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

**Apparent Losses:** 68.347 MG/Yr

**Real Losses**

**Real Losses:** 925.065 MG/Yr

**WATER LOSSES:** 993.412 MG/Yr

**NON-REVENUE WATER**

**NON-REVENUE WATER:** 1,041.868 MG/Yr

**SYSTEM DATA**

|     |   |                                 |                 |  |  |
|-----|---|---------------------------------|-----------------|--|--|
| Ln  | Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>                                   | 506.0                           | 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"/>                     | 30,790                          |                 | (active and inactive)                              |  |
|     | Service connection density:   | 61                              | conn./mile main |  |  |
|     | Are customer meters typically located at the curbstop/property line?  | <input type="text" value="No"/> |                 |  |  |
| Lp  | Average length of (private) customer service line: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="1"/> | 25.0                            | ft              | (average distance between property line and meter) |  |
| AOP | Average Operating Pressure: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>                        | 60.0                            | psi             |  |  |

**COST DATA**

|      |   |          |                      |   |                        |
|------|---|----------|----------------------|---|------------------------|
| CRUC | Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/> | \$11.46  | \$/1000 gallons (US) |   |                        |
| VPC  | Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>    | \$370.00 | \$/Million gallons   |   |                        |
|      |   |          |                      | <b>Total Annual Operating Cost</b>  |                        |
|      |   |          |                      | <span style="background-color: #f4a460; padding: 2px;">\$1,950,000</span> | \$/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. \*\*\***

[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 Metered (BMAC)              |
| 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 <sup>A</sup> : | <input type="text"/> | gal/conn/day |
| Unit Real Losses <sup>B</sup> : | <input type="text"/> | gal/mile/day |

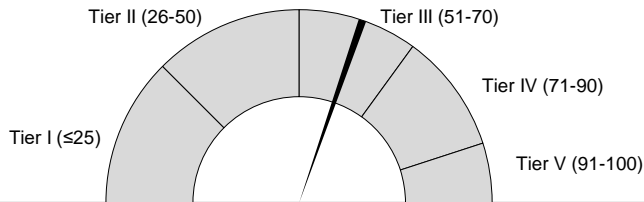
If entered above by user, targets will display on KPI gauges (see Dashboard)



## Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

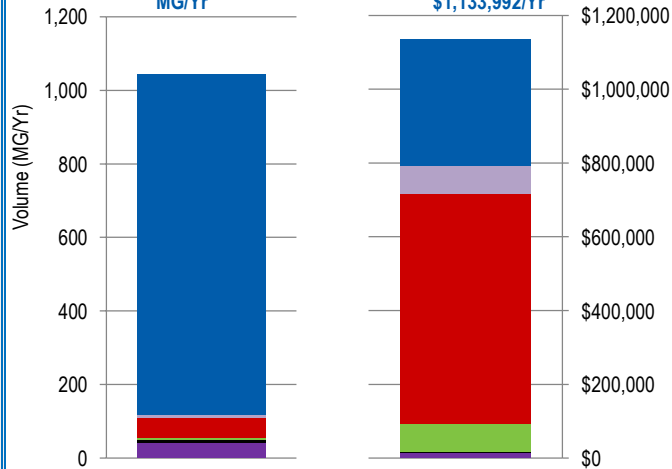
See [Loss Control Planning](#) for Tier Details



## NRW Components Summary

Total Volume of NRW = **1,041**  
MG/Yr

Total Cost of NRW =  
**\$1,133,992**/Yr



|                                 |                                  |
|---------------------------------|----------------------------------|
| Real Losses                     | Unauthorized Consumption         |
| Systematic Data Handling Errors | Unbilled Unmetered Auth Cons     |
| Customer Metering Inaccuracies  | Unbilled Metered Authorized Cons |

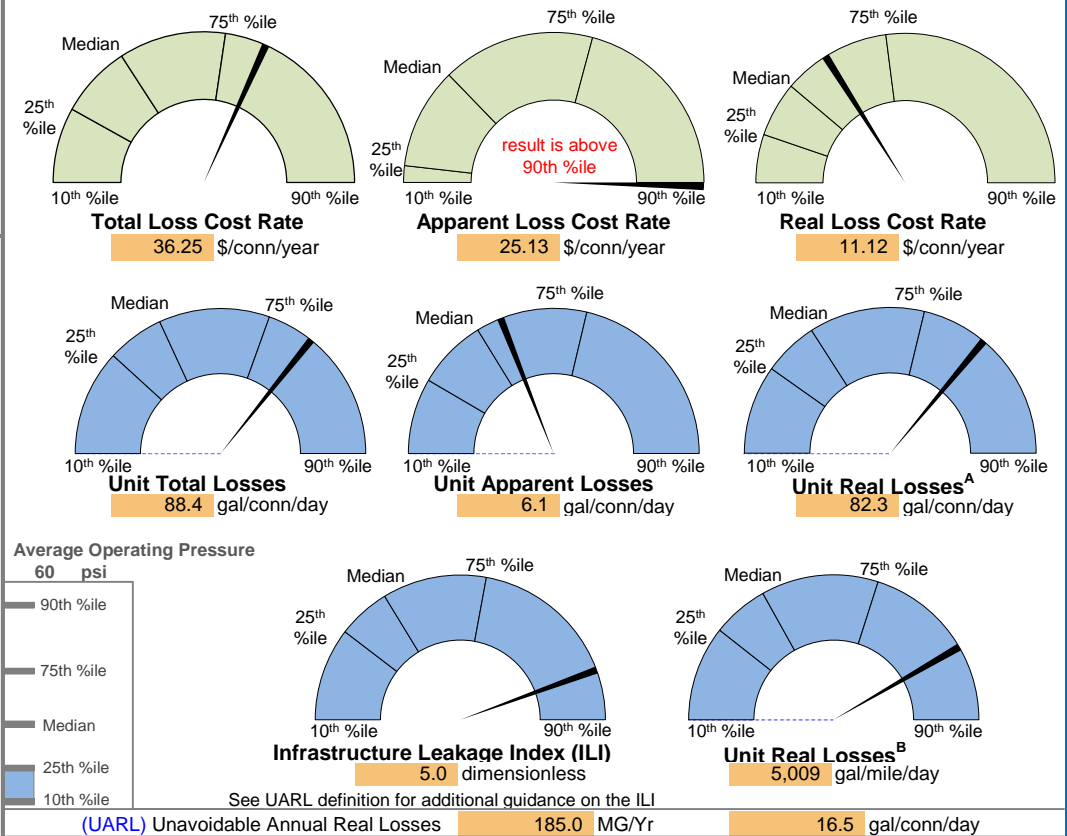
|                          | Volume<br>MG/Yr | Value<br>\$/Yr | Basis of Valuation |
|--------------------------|-----------------|----------------|--------------------|
| Apparent Losses          | 68.3            | \$773,790      | CRUC               |
| Real Losses              | 925.1           | \$342,274      | VPC                |
| Unbilled Authorized Cons | 48.5            | \$17,929       | VPC                |
| Non-Revenue Water        | 1,041.9         | \$1,133,992    | Blended            |

Actual KPI result

## Key Performance Indicators

Target (see Worksheet)

gauge %iles per validated industry ranges<sup>2</sup>



### Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs<sup>1</sup>.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)<sup>1</sup>, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)<sup>2</sup>.
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)<sup>3</sup>.
- Actual KPI results that fall below 10<sup>th</sup> %ile or above 90<sup>th</sup> %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.

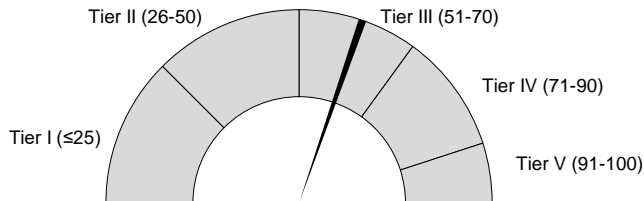




## Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

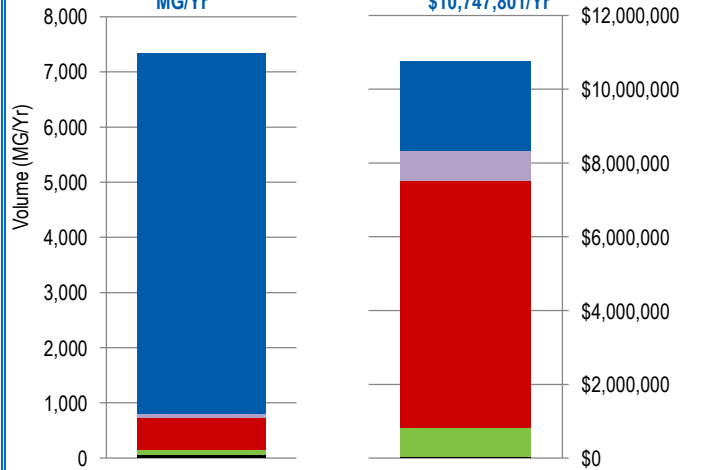
See [Loss Control Planning](#) for Tier Details



## NRW Components Summary

Total Volume of NRW = **7,338**  
MG/Yr

Total Cost of NRW =  
**\$10,747,801/Yr**



|                                 |                                  |
|---------------------------------|----------------------------------|
| Real Losses                     | Unauthorized Consumption         |
| Systematic Data Handling Errors | Unbilled Unmetered Auth Cons     |
| Customer Metering Inaccuracies  | Unbilled Metered Authorized Cons |

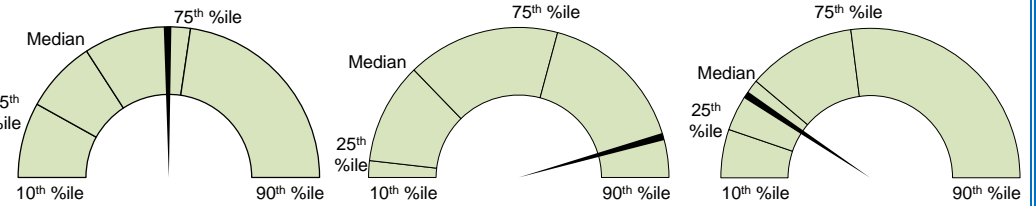
|                          | Volume<br>MG/Yr | Value<br>\$/Yr | Basis of Valuation |
|--------------------------|-----------------|----------------|--------------------|
| Apparent Losses          | 724.3           | \$8,300,820    | CRUC               |
| Real Losses              | 6,542.2         | \$2,420,611    | VPC                |
| Unbilled Authorized Cons | 71.3            | \$26,370       | VPC                |
| Non-Revenue Water        | 7,337.8         | \$10,747,801   | Blended            |

Actual KPI result

## Key Performance Indicators

Target (see Worksheet)

gauge %iles per validated industry ranges<sup>2</sup>



**Total Loss Cost Rate**

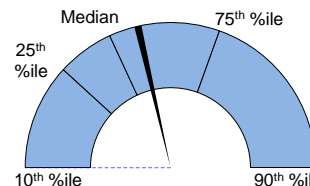
**28.29** \$/conn/year

**Apparent Loss Cost Rate**

**21.90** \$/conn/year

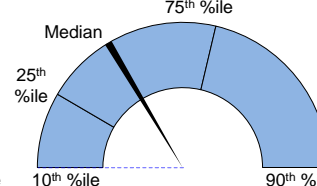
**Real Loss Cost Rate**

**6.39** \$/conn/year



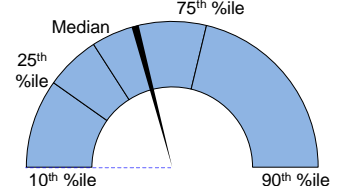
**Unit Total Losses**

**52.5** gal/conn/day



**Unit Apparent Losses**

**5.2** gal/conn/day

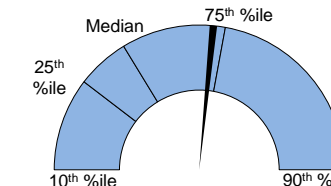
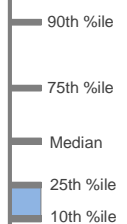


**Unit Real Losses<sup>A</sup>**

**47.3** gal/conn/day

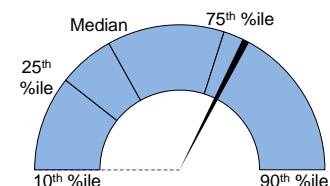
## Average Operating Pressure

**60** psi



**Infrastructure Leakage Index (ILI)**

**3.0** dimensionless



**Unit Real Losses<sup>B</sup>**

**3,904** gal/mile/day

See UARL definition for additional guidance on the ILI

**(UARL) Unavoidable Annual Real Losses** **2,201.6** MG/Yr

**15.9** gal/conn/day

## Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs<sup>1</sup>.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)<sup>1</sup>, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)<sup>2</sup>.
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)<sup>3</sup>.
- Actual KPI results that fall below 10<sup>th</sup> %ile or above 90<sup>th</sup> %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.

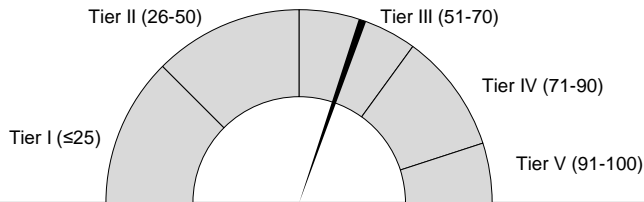




## Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

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

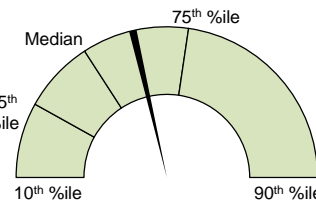


Actual KPI result

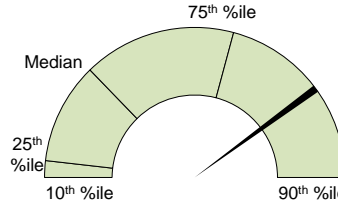
## Key Performance Indicators

Target (see Worksheet)

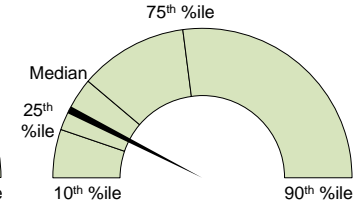
gauge %iles per validated industry ranges<sup>2</sup>



**Total Loss Cost Rate**  
24.24 \$/conn/year



**Apparent Loss Cost Rate**  
19.15 \$/conn/year

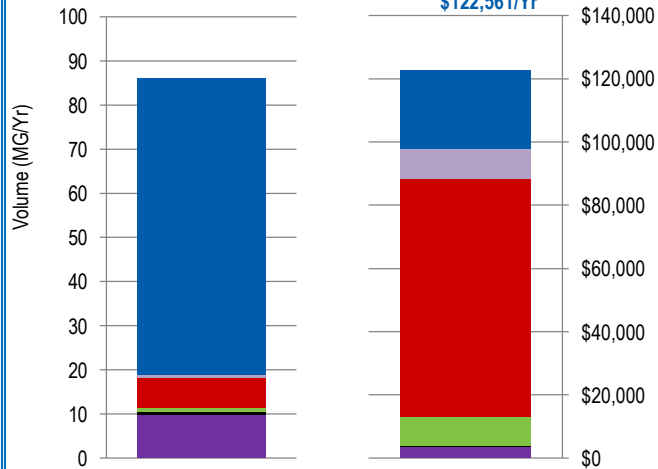


**Real Loss Cost Rate**  
5.08 \$/conn/year

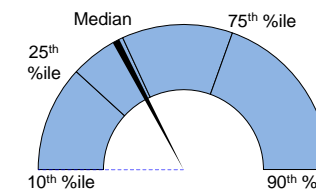
## NRW Components Summary

Total Volume of NRW = 86 MG/Yr

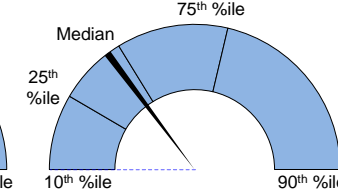
Total Cost of NRW = \$122,561/Yr



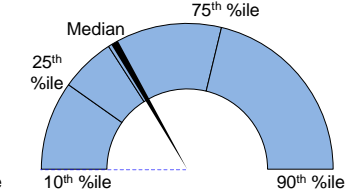
|                                  | Volume<br>MG/Yr | Value<br>\$/Yr | Basis of Valuation |
|----------------------------------|-----------------|----------------|--------------------|
| Real Losses                      | 8.4             | \$93,782       | CRUC               |
| Systematic Data Handling Errors  | 67.2            | \$24,879       | VPC                |
| Customer Metering Inaccuracies   | 10.5            | \$3,899        | VPC                |
| Unauthorized Consumption         | 86.2            | \$122,561      | Blended            |
| Unbilled Unmetered Auth Cons     |                 |                |                    |
| Unbilled Metered Authorized Cons |                 |                |                    |



**Unit Total Losses**  
42.3 gal/conn/day



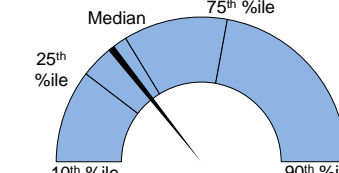
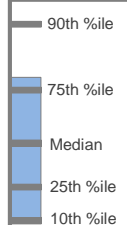
**Unit Apparent Losses**  
4.7 gal/conn/day



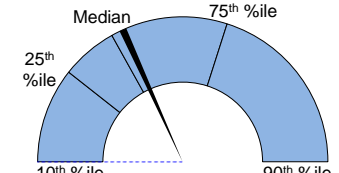
**Unit Real Losses<sup>A</sup>**  
37.6 gal/conn/day

## Average Operating Pressure

85 psi



**Infrastructure Leakage Index (ILI)**  
1.6 dimensionless



**Unit Real Losses<sup>B</sup>**  
2,167 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses 42.4 MG/Yr

23.8 gal/conn/day

## Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs<sup>1</sup>.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)<sup>1</sup>, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)<sup>2</sup>.
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)<sup>3</sup>.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.



# AWWA Free Water Audit Software: Worksheet

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

Water Audit Report for: **Aqua Pennsylvania - Whitehaven Division**  
Audit Year: **2020** **Jan 01 2020 - Dec 31 2020** **2020**

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

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

### Water Supplied Error Adjustments

choose entry option:

|                       |  |  |  |   |   |
|-----------------------|--|--|--|---|---|
| <b>WATER SUPPLIED</b> |  | Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/> <input type="text" value="469.041"/> MG/Yr |  | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/> <input type="text" value="2.00%"/> percent | <input type="text" value="under-registration"/> VOSEA |
| VOS                   |  | Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/> <input type="text" value="18.381"/> MG/Yr           |  | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/> <input type="text" value="2.00%"/> percent | <input type="text" value="under-registration"/> WIEA  |
| WI                    |  | Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/> <input type="text" value="0.204"/> MG/Yr            |  | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/> <input type="text" value="2.00%"/> percent | <input type="text" value="under-registration"/> WEEA  |
| WE                    |  |  |  |   |   |

**WATER SUPPLIED:**  MG/Yr

### AUTHORIZED CONSUMPTION

|      |                     |   |   |
|------|---------------------|---|---|
| BMAC | Billed Metered:     | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="346.318"/> MG/Yr |   |
| BUAC | Billed Unmetered:   | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="11.363"/> MG/Yr |   |
| UMAC | Unbilled Metered:   | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input type="text" value=""/> MG/Yr      |   |
| UUAC | Unbilled Unmetered: | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/> <input type="text" value="8.631"/> MG/Yr   | choose entry option: <input type="text" value="custom"/> <input type="text" value="8.631"/> MG/Yr |

**AUTHORIZED CONSUMPTION:**  MG/Yr

### WATER LOSSES

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="0.894"/> MG/Yr | choose entry option: <input type="text" value="0.25%"/> default |
| CMI  | Customer Metering Inaccuracies:  | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/> <input type="text" value="7.068"/> MG/Yr | <input type="text" value="2.00%"/> percent                      |
| UC   | Unauthorized Consumption:        | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="0.894"/> MG/Yr | <input type="text" value="0.25%"/> default                      |

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

**Apparent Losses:**  MG/Yr

### Real Losses

**Real Losses:**  MG/Yr

**WATER LOSSES:**  MG/Yr

### NON-REVENUE WATER

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

### SYSTEM DATA

|     |  |   |  |
|-----|--|---|--|
| Lm  | Length of mains:   | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="243.0"/> 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="8,960"/>           | (active and inactive)                              |
|     | Service connection density:  | <input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/> <input type="text" value="37"/> conn./mile main |  |
| Lp  | Are customer meters typically located at the curbstop/property line? | <input type="text" value="No"/>   |  |
|     | Average length of (private) customer service line:                   | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="1"/> <input type="text" value="35.0"/> ft         | (average distance between property line and meter) |
| AOP | Average Operating Pressure:  | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="60.0"/> psi        |  |

### COST DATA

|      |                              |  |   |
|------|------------------------------|--|---|
| CRUC | Customer Retail Unit Charge: | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/> <input type="text" value="\$11.46"/> \$/1000 gallons (US) | <b>Total Annual Operating Cost</b>                            |
| VPC  | Variable Production Cost:    | <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="\$370.00"/> \$/Million gallons  | <input type="text" value="\$250,000"/> \$/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. \*\*\*

[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 Metered (BMAC)
- 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" value=""/> | gal/conn/day |
| Unit Apparent Losses:           | <input type="text" value=""/> | gal/conn/day |
| Unit Real Losses <sup>A</sup> : | <input type="text" value=""/> | gal/conn/day |
| Unit Real Losses <sup>B</sup> : | <input type="text" value=""/> | gal/mile/day |

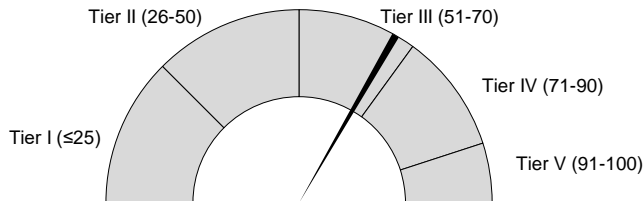
If entered above by user, targets will display on KPI gauges (see Dashboard)



## Data Validity

Data Validity Score: **66** Data Validity Tier: **Tier III (51-70)**

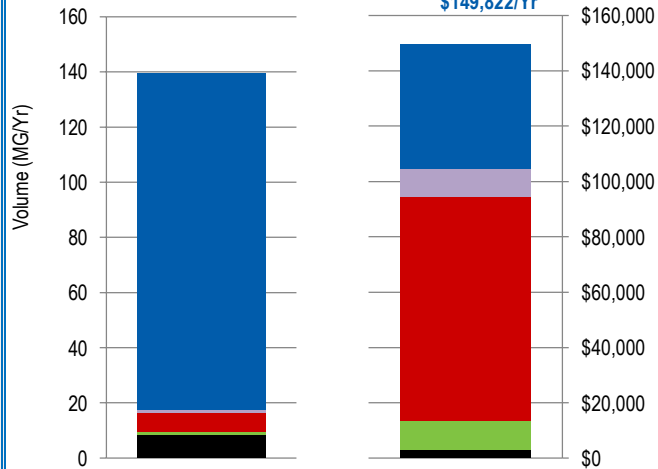
See [Loss Control Planning](#) for Tier Details



## NRW Components Summary

Total Volume of NRW = 139 MG/Yr

Total Cost of NRW = \$149,822/Yr



|                                 |                                  |
|---------------------------------|----------------------------------|
| Real Losses                     | Unauthorized Consumption         |
| Systematic Data Handling Errors | Unbilled Unmetered Auth Cons     |
| Customer Metering Inaccuracies  | Unbilled Metered Authorized Cons |

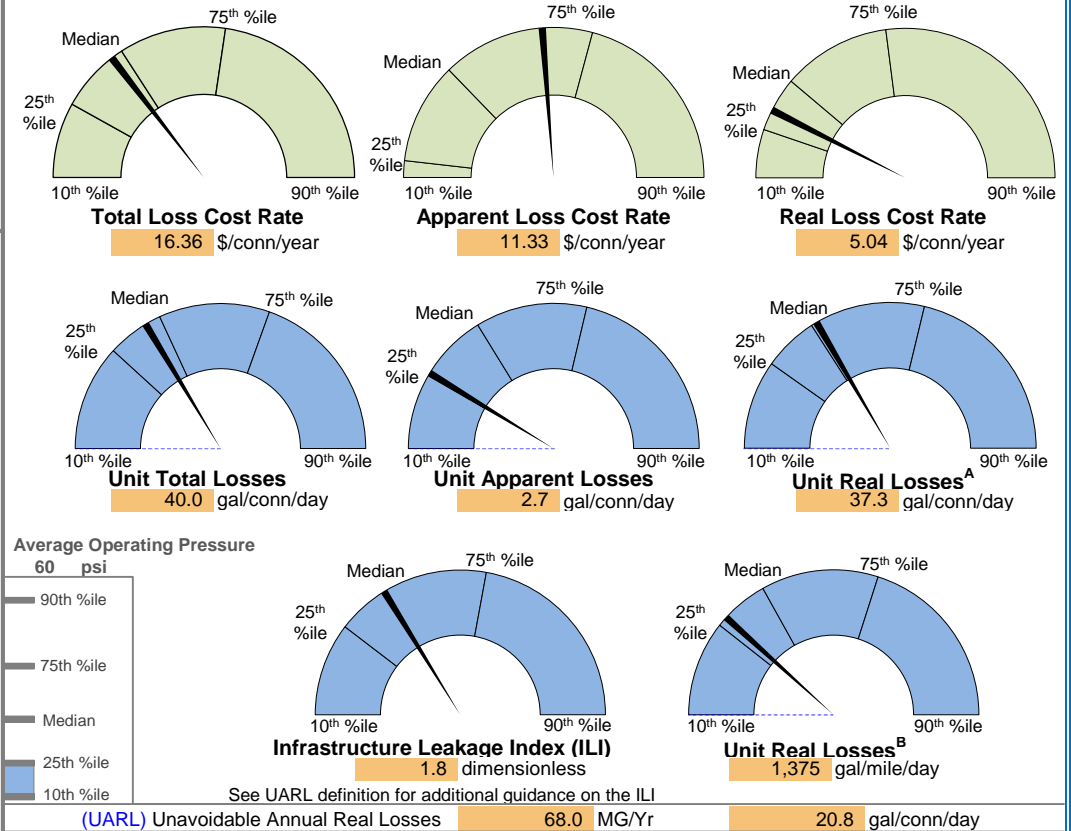
|                          | Volume<br>MG/Yr | Value<br>\$/Yr | Basis of Valuation |
|--------------------------|-----------------|----------------|--------------------|
| Apparent Losses          | 8.9             | \$101,491      | CRUC               |
| Real Losses              | 122.0           | \$45,137       | VPC                |
| Unbilled Authorized Cons | 8.6             | \$3,193        | VPC                |
| Non-Revenue Water        | 139.5           | \$149,822      | Blended            |

Actual KPI result

## Key Performance Indicators

Target (see Worksheet)

gauge %iles per validated industry ranges<sup>2</sup>



See UARL definition for additional guidance on the ILI

## Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs<sup>1</sup>.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)<sup>1</sup>, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)<sup>2</sup>.
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)<sup>3</sup>.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.