

# Summary Report

## 2013 Water Loss Control Audit for Town of Monument, Colorado

September 15, 2014

Funding Provided by Colorado Water Conservation Board

Water Efficiency Grant PO OE PDA 14000000114



Prepared by:



Water  
Matters!



## Introduction

The goal of this project was to use the IWA/AWWA Water Audit Method published in the AWWA Manual of Practice M36 to conduct the first “top down approach” desktop water audit for the Town of Monument, Colorado (Monument). The preliminary audit was developed by Monument staff in conjunction with WaterDM and Water Matters!. The results of the desktop audit were reviewed by international water loss expert Reinhard Sturm of WSO.

This summary report and the completed water audit spreadsheet constitute the final deliverables for this project.

## Town of Monument

An older town along the Front Range, Monument was established in 1879. It is located in El Paso County, bordered by National Forest on the west, the United States Air Force Academy to the south, foothills and rock outcroppings to the north and rolling plains to the east. It encompasses approximately 5 square miles. Monument has experienced similar growth patterns as its neighbors to the south have, accelerated during the 70s and 80s, slowing at the end of the 90s. It expects modest growth going forward. Its ability to acquire new sources of renewable water will impact its growth potential.

Monument has an annual supply of over 132 million gallons. All supply is groundwater, pumped from the Denver Basin and alluvium formation. This is accomplished through 9 wells, all metered.

The Town is close to completing the change out of transponders for its automated meter reading system.

Monument’s non-revenue water has typically averaged between 13 and 15 percent, with significantly higher occasional spikes.

Working with Linda Firth of Water Matters! and Peter Mayer, P.E. of WaterDM, Monument obtained a water efficiency implementation grant from the Colorado Water Conservation Board (CWCB) for conducting the water loss control audit and expert review.

## Water Loss Audit

Peter Mayer and Linda Firth met with the Town of Monument staff on May 30, 2014 to learn more about their non-revenue water concerns; to establish project goals and timelines; and to begin the data gathering process. The consultant team provided Monument a list of data needed to begin our analysis, using the AWWA M36 method.

The audit team met again with the Town of Monument on June 12. The water loss control audit data input process was completed, and few gaps and uncertainties were identified. Using

the AWWA M36 methodology, it was determined that overall, Monument's data quality is good. The consulting team was able, in most cases, to assign a high confidence level to the various categories of data required by the M36 audit format. In the future, improved reporting (or classifying) non-revenue water combined with some potential policy changes will produce a clearer picture of both real and apparent losses.

Next the audit team held a phone discussion with Reinhard Sturm of Water System Optimization (WSO) to discuss the audit results, clarify issues, and revise the reporting worksheet responses. A revised audit spreadsheet was provided to Monument.

On September 4, Reinhard Sturm, Peter Mayer, and Linda Firth met again with Tom Tharnish and Town of Monument staff to review and finalize the water loss control audit. On September 5, the Team conducted a water loss control workshop at the Water Research Foundation facility at 6666 West Quincy Ave. in Denver. The workshop was led by Reinhard Sturm and Kate Gasner of WSO, assisted by Peter Mayer and Linda Firth.

## Findings from 2013 Water Audit

The 2013 water loss control audit for the Town of Monument found that approximately 13.6 million gallons of water are lost from the system each year. About 6.7 million gallons are apparent losses and 6.9 million gallons are real losses.

Real water losses in the district amount to 18.0 gallons per connection to day. This is a relatively low level of water loss per service connection compared with other utilities. Reducing this level is possible, but could be challenging since it is already fairly low. It is calculated that in 2013, the annual cost of the Apparent Losses in the system was \$46,623 and the annual cost of Real losses to the system was only \$9,790.

## 2013 Water Loss Control Performance Indicators

### *Financial Indicators*

- \$46,623 – Annual cost of Apparent losses
- \$9,790 – Annual cost of Real losses (valued at the variable production cost - \$1,731.60 per MG)
- 17.2% - Non-revenue water as percent by volume of water supplied.
- 5.7% - Non revenue water as percent by cost of operating water system

### *Operational Efficiency*

- Apparent losses per service connection – 18.0 gal/connect/day
- Real losses per service connection per day – 18.6 gal/connect/day
- Current Real Annual Losses – 6.9 million gallons/year
- Infrastructure Leakage Index (ILI) – An improved data validity score is required before ILI can be calculated.

The ILI is a performance indicator for comparing utilities operational management of real losses.

### *Water Audit Data Validity Score*

The data validity score is a measure of audit accuracy and accountability and is not a reflection on the Town's water loss level, which is quite low per connection compared with many larger communities.

Monument received a 61 out of 100 Water Audit Data Validity Score for their first Water Audit. A score of 61 is an acceptable score for a first audit and indicates a reasonable level of data validity. It can and will be improved upon in subsequent audits starting with action the Town has already taken in 2014.

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Specifically, improvements made to the Town's billing procedures and accountability and new metering at a Town fill station, will immediately increase the validity score.

Monument's validity score can be further improved by implementing as many of the recommendations described below as possible and by reviewing the data validity requirements in the AWWA software (v5.0) provided. The Grading Matrix worksheet in the Excel-based software is particularly useful for understanding the validity score.

### **Recommendations from 2013 Water Audit**

The Town of Monument's 2013 water audit indicates a real water loss level of 18.6 gallons per service connection per day. This is a comparatively low level of real water loss that other utilities might seek to achieve. Significant improvement on this level of real water loss is possible, but may not be economically justified. In 2014, improvements to the Town's water accountability may shift some water loss from the apparent to real loss categories.

During his review of Monument's 2013 water audit, the following recommendations for Monument were made by Reinhard Sturm of WSO:

- Work to obtain a digital signal from for all Monument well meters for future SCADA reads.
- Verify meter position and accuracy of Monument well meters as per manufacturer specification including pipe length and diameter upstream and downstream of the meter.
- Create electronic data records for each Monument well meter installation to track age, consumption, testing, maintenance, etc.
- Water meters will deteriorate over time and with use. Monument should pull a small random sample of 15 - 20 customer meters annually and test them for accuracy at low, medium, and high flow regimes. AWWA M6 manual has recommendations for meter testing. Based on the results on those tests the Town should develop a rational meter replacement program.
- Think long term. There is a direct correlation with pressure and leakage and pressure and system failure. Reducing system operating pressure, potentially by upgrading to flow modulated PRVs, will help extend the life of the infrastructure and reduce water loss over time.
- Systematic data handling errors that were present in the 2013 water audit have largely been corrected through improved water billing system accounting and management practices. Monument should work to extend these improvements.

## 2013 Water Loss Control Audit Summary

A summary of the data input and outputs from the 2013 Town of Monument water loss control audit is presented here.

### WATER SUPPLIED

Volume from own sources: 130.297 MG/Yr

**WATER SUPPLIED: 130.297 MG/Yr**

### AUTHORIZED CONSUMPTION

Billed metered: 107.366 MG/Yr  
Billed unmetered: 0.564 MG/Yr  
Unbilled metered: 7.498 MG/Yr  
Unbilled unmetered: 1.3 MG/Yr

**AUTHORIZED CONSUMPTION: 116.728 MG/Yr**

**WATER LOSSES (Water Supplied - Authorized Consumption) 13.569 MG/Yr**

### Apparent Losses

Unauthorized consumption: 0.326 MG/Yr  
Customer metering inaccuracies: 2.344 MG/Yr  
Systematic data handling errors: 4.000 MG/Yr

**Apparent Losses: 6.670 MG/Yr**

**Real Losses = Water Losses - Apparent Losses: 6.899 MG/Yr**

**WATER LOSSES: 13.569 MG/Yr**

### NON-REVENUE WATER

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**NON-REVENUE WATER:** **22.367** MG/Yr  
= Water Losses + Unbilled Metered + Unbilled Unmetered

**SYSTEM DATA**

Length of mains:	22.5	miles
Number of active AND inactive service connections:	1,015	
Service connection density:	45	conn./mile main
<u>Average</u> length of customer service line:	40.0	ft
Average operating pressure:	102.0	psi

**COST DATA**

Total annual cost of operating water system:	\$1,215,909	\$/Year
Customer retail unit cost (applied to Apparent Losses):	\$6.99	\$/1000 gallons (US)
Variable production cost (applied to Real Losses):	\$1,419.00	\$/Million gallons

## 2013 Water Balance

AWWA Free Water Audit Software: Water Balance

WAS v5.0  
American Water Works Association.  
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Water Audit Report for: **Town of Monumnet**

Reporting Year: **2013**1/2013 - 12/2013

Data Validity Score: **61**

Own Sources (Adjusted for known errors)  130.297	Water Exported 0.000	Billed Water Exported			
	116.728	Billed Authorized Consumption  107.930	Billed Metered Consumption (water exported is removed)  107.366	Revenue Water  107.930	
			Billed Unmetered Consumption  0.564		
		Unbilled Authorized Consumption  8.798	Unbilled Metered Consumption  7.498	Non-Revenue Water (NRW)  22.367	
			Unbilled Unmetered Consumption  1.300		
	Water Losses  13.569	Apparent Losses  6.670	Unauthorized Consumption  0.326		
			Customer Metering Inaccuracies  2.344		
			Systematic Data Handling Errors  4.000		
		Real Losses  6.899	Leakage on Transmission and/or Distribution Mains Not broken down		
			Leakage and Overflows at Utility's Storage Tanks Not broken down		
			Leakage on Service Connections Not broken down		
Water Imported  0.000					

## 2013 Performance Indicators



**AWWA Free Water Audit Software:**  
**System Attributes and Performance Indicators**

WAS v5.0  
 American Water Works Association.  
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Water Audit Report for: Town of Monumnet  
 Reporting Year: 2013 1/2013 - 12/2013

\*\*\* YOUR WATER AUDIT DATA VALIDITY SCORE IS: 61 out of 100 \*\*\*

System Attributes:

	Apparent Losses:	6.670	MG/Yr
+	Real Losses:	6.899	MG/Yr
=	Water Losses:	13.569	MG/Yr

? Unavoidable Annual Real Losses (UARL): See limits in definition MG/Yr

Annual cost of Apparent Losses: \$46,623

Annual cost of Real Losses: \$9,790 Valued at **Variable Production Cost**  
Return to Reporting Worksheet to change this assumption

Performance Indicators:

Financial:

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Non-revenue water as percent by volume of Water Supplied:
17.2%

Non-revenue water as percent by cost of operating system:
5.7%
Real Losses valued at Variable Production Cost

Operational Efficiency:

{

Apparent Losses per service connection per day:
18.00
gallons/connection/day

Real Losses per service connection per day:
18.62
gallons/connection/day

Real Losses per length of main per day\*:
N/A

Real Losses per service connection per day per psi pressure:
0.18
gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): 6.90 million gallons/year

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

\* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

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