AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

American Water Works Association

? Click to access definition
+ Click to add a comment

Water Audit Report for: Marina Coast Water District (2710017)
Reporting Year: 2016 (1/2016 - 12/2016)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

WATER SUPPLIED

<---------- Enter grading in column 'E' and 'J' ---------->

				Pcnt:	Value:	
Volume from own sources:	8	3,025.000	acre-ft/yr	3	-17.268	acre-ft/yr
Water imported:	n/a	0.000	acre-ft/yr			acre-ft/yr
Water exported:	n/a	0.000	acre-ft/yr			acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 3,042.268 acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

			Pcnt:	Value:	
Billed metered:	6	2,572.440	acre-ft/yr			
Billed unmetered:	7	219.850	acre-ft/yr			
Unbilled metered:	8	3.590	acre-ft/yr			
Unbilled unmetered:	6	5.630	acre-ft/yr		5.630	acre-ft/yr

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: 2,801.510 acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption) 240.758 acre-ft/yr

Apparent Losses

			Pcnt:	Value:	
Unauthorized consumption:	7.606	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	3	12.945	acre-ft/yr	0.50%	acre-ft/yr
Systematic data handling errors:		6.431	acre-ft/yr	0.25%	acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: 26.982 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 213.776 acre-ft/yr

WATER LOSSES: 240.758 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: 249.978 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	9	203.0	miles
Number of active AND inactive service connections:	7	7,766	
Service connection density:		38	conn./mile main

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

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure:	5	60.0	psi

COST DATA

Total annual cost of operating water system:	10	$10,535,183	$/Year	
Customer retail unit cost (applied to Apparent Losses):	9	$4.23	$/100 cubic feet (ccf)	
Variable production cost (applied to Real Losses):	5	$131.50	$/acre-ft	☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 71 out of 100 ***

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

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Customer metering inaccuracies
3: Billed metered

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

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Reporting Year: 2016 | 1/2016 - 12/2016

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 71 out of 100 ***

System Attributes:

	Apparent Losses:	26.982	acre-ft/yr
+	Real Losses:	213.776	acre-ft/yr
=	Water Losses:	240.758	acre-ft/yr
?	Unavoidable Annual Real Losses (UARL):	152.10	acre-ft/yr
	Annual cost of Apparent Losses:	$49,716	
	Annual cost of Real Losses:	$393,902	Valued at Customer Retail Unit Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	8.2%	
	Non-revenue water as percent by cost of operating system:	4.4%	Real Losses valued at Customer Retail Unit Cost
Operational Efficiency:	Apparent Losses per service connection per day:	3.10	gallons/connection/day
	Real Losses per service connection per day:	24.57	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.41	gallons/connection/day/psi

	From Above, Real Losses = Current Annual Real Losses (CARL):	213.78	acre-feet/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	1.41	

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

AWWA Free Water Audit Software:
User Comments

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	Prepared by: Paul Carson. Find complete workbook with calculations, derivations and comments in the filepathway: 2016_AWWA_Audit_Calculations_Datatables_CURRENTDATE

Audit Item	Comment
Volume from own sources:	MCWD has 8 wells, 7 of which are active. MCWD used well production numbers to determine total water extracted. The data is reported by O&M department. They produced a 2016 well production summary report in acre feet. MCWD extracted 3025 acre feet fror the 2016 calenday year. File Pathway: P:\0_Well Production\2016 Well Production\Prod._Sum.
Vol. from own sources: Master meter error adjustment:	The Master meter & supply error calculations are outsources from Craig Evans Pumping Service. MCWD determined the total meter error for all active wells to be (under) reporting by 17.268 acre feet. For suporting calculations see: Water Supplied Tab in the 2016_AWWA_Audit_Calculations_Datatables workbook.
Water imported:	The MCWD does not import any water into their system. MCWD has an emergency connection with Cal Am. Rarely used. 1 direction (to Marina). Not actively metered.
Water imported: master meter error adjustment:	The emergency connection with Cal AM is not metered and has not been used during the 2016 calendar year.
Water exported:	The MCWD does not export any water into their system. . All water is produced and distributed within the Marina Coast Water District service area.
Water exported: master meter error adjustment:	N/A The MCWD does not have systems installed for exporting to other agencies.
Billed metered:	The data was collected from 2016 Monthly and consumption by category data table (2016 total consumption). Billed metered consumption (single family/multi family/commercial/ intitutional/ landscape) = 2572.44 AF
Billed unmetered:	Of the 1872 Army housing units in the Ord service area, the number of active, unmetered accounts varied monthly between 735 accounts and 803 accounts. For this report, only these active accounts were multiplied by a water use factor (an estimate of use) of 0.28 AF/YR = Billed Unmetered = 219.85 AF
Unbilled metered:	Unbilled Metered water use = water used by Operations department for distribution and sewer system maintenance, flushing. = 3.59 AF

Audit Item	Comment
Unbilled unmetered:	Fire fighting and practice drill water use is reported to us. Operations department estimates and records losses due to water main breaks = 5.63 AF
Unauthorized consumption:	This was derived automatically from the AWWA water loss audit software.
Customer metering inaccuracies:	The MCWD does not have a system in place to test for customer meter inaccuracies. Meters were upgrades to AMR in 2004-2005. Accuracy assumed to still be +/- 0.5%
Systematic data handling errors:	The MCWD has not yet gathered detailed data or assesed the systematic data error. It's applying the default value of 0.25% of of the billing authorized consumtion volume.
Length of mains:	The data was sent in email from James Derbin estimating 203 miles of mains. This should be derrived from the GIS system / Geo-database. As of May 2017 the MCWD can only estimate this number.
Number of active AND inactive service connections:	It is estimated that 70% of all 3,925 marina water service points share a connection to the mainline = 2,551 service connections. In the Ord service area, it is estimated that 1872 (33.6% - MBM Housing) of all 5,575 water service points share a common connection to the mainline. = 4,639 Service Connections. In addition, there are This does not include inactive service connections.
Average length of customer service line:	20'
Average operating pressure:	The O&M department measured service elevation in feet and service pressure to derive the average (PSI) for the individual zones (A-E). The average system operating pressure is calculated by the sum of all zones devided by the 5 zones to equal 60.0 PSI
Total annual cost of operating water system:	MCWD used data from the 4th quarter financial report. The total annual operating cost = Marina water operations + Marina water CIP + Ord water operations + Ord water CIP
Customer retail unit cost (applied to Apparent Losses):	CRUC is derived for Marina and Ord then combining the totals using a weighted average for the total CRUC for 2016. Find the Cost Data tab in the 2016_AWWA_Audit_Calculations_Datatables workbook. Detailed comments of the data used in workbook.
Variable production cost (applied to Real Losses):	Variable production cost for 2016 was calculated by the annual cost for pumping power and chemical treatment (sum of well power, booster stations, well oils, well salts, and water softening) devided by the total water produced for the 2016 calendar year (1722.26) acr e feet. We derived the variable production cost per year for each service area then used a weighted average based on the percentage of water extracted for each service area. The reported number is a weighted average from both Marina and Ord.

Audit Item	Comment

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AWWA Free Water Audit Software: Water Balance

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American Water Works Association.

Water Audit Report for:	Marina Coast Water District (2710017)
Reporting Year:	2016 (1/2016 - 12/2016)
Data Validity Score:	71

<table>
<tr><td rowspan="10">Own Sources
(Adjusted for known errors)
3,042.268

Water Imported
0.000</td><td rowspan="10">System Input
3,042.268</td><td rowspan="10">Water Supplied
3,042.268</td><td rowspan="10">Water Exported
0.000</td><td rowspan="5">Authorized Consumption
2,801.510</td><td rowspan="3">Billed Authorized Consumption
2,792.290</td><td>Billed Metered Consumption (water exported is removed)
2,572.440</td><td rowspan="2">Revenue Water
2,792.290</td></tr>
<tr><td>Billed Unmetered Consumption
219.850</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption
9.220</td><td>Unbilled Metered Consumption
3.590</td><td rowspan="5">Non-Revenue Water (NRW)
249.978</td></tr>
<tr><td>Unbilled Unmetered Consumption
5.630</td></tr>
<tr><td rowspan="5">Water Losses
240.758</td><td rowspan="3">Apparent Losses
26.982</td><td>Unauthorized Consumption
7.606</td></tr>
<tr><td>Customer Metering Inaccuracies
12.945</td></tr>
<tr><td>Systematic Data Handling Errors
6.431</td></tr>
<tr><td rowspan="3">Real Losses
213.776</td><td>Leakage on Transmission and/or Distribution Mains
Not broken down</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks
Not broken down</td></tr>
<tr><td>Leakage on Service Connections
Not broken down</td></tr>
</table>

AWWA Free Water Audit Software:
Dashboard

WAS v5.0

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

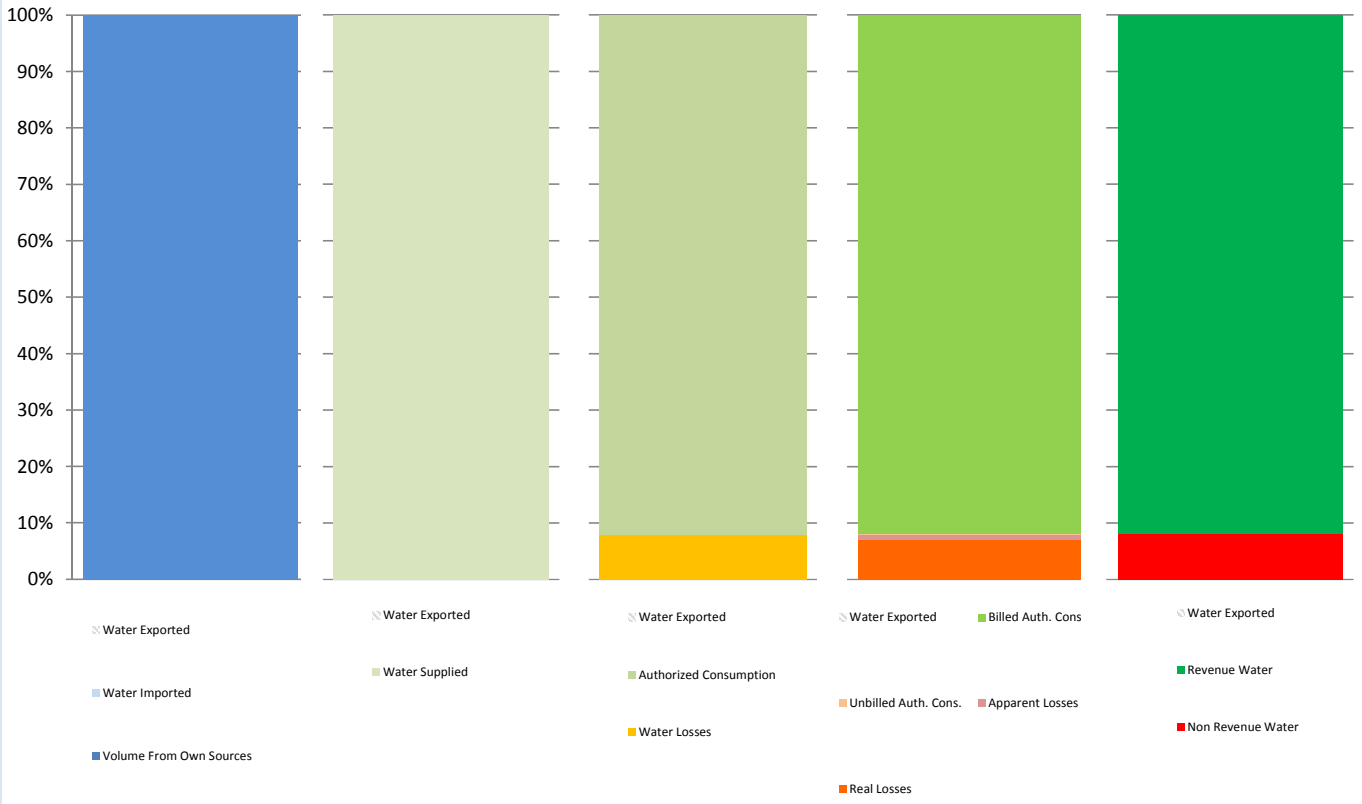
Water Audit Report for: **Marina Coast Water District (2710017)**

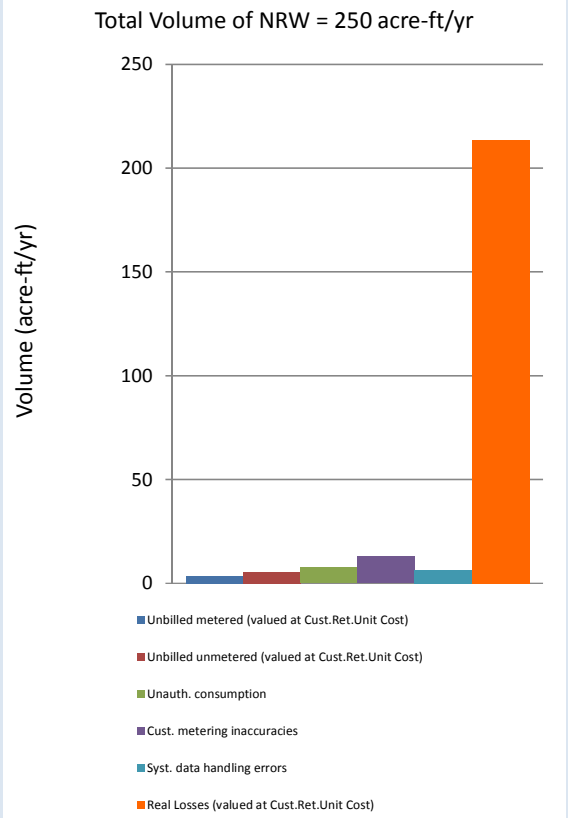
Reporting Year: **2016** **1/2016 - 12/2016**

Data Validity Score: **71**

(●) Show me the VOLUME of Non-Revenue Water

( ) Show me the COST of Non-Revenue Water





6	7	8	9	10
Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
<u>to qualify for 8</u>: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		<u>to qualify for 10</u>: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10</u>: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively

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Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	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 Automatic Meter Reading (AMR) 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 the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator 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.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI (without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		