American Water Works Association
California-Nevada Section

CA-NV AWWA Water Loss Technical Assistance Program

Wave 4 Water Audit Level 1 Validation Document

Validator Provided

Audit Information:

Utility: Manhattan Beach PWS ID: 1910083

System Type: Potable Audit Period: Fiscal Year 2016/17

Utility Representation: Shawn Igoe, Mark Wood

Validation Date: 7/25/2017 Call Time: 9am Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 61 Data Validity Band (Level): Band III (51-70)

ILI: 0.62 Real Loss: 7.79 (gal/conn/day) Apparent Loss: 7.30 (gal/conn/day)

Non-revenue water as percent of cost of operating system: 3.1%

Certification Statement by Validator:

This water loss audit report has been Level 1 validated per the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34.

All recommendations on volume derivation and Data Validity Grades were incorporated into the water audit. ☒

Validator Information:

Water Audit Validator: Kate Gasner / Kevin Burgers (support) Validator Qualifications: Contractor for CA-NV AWWA Water Loss TAP

WSO CAVANAUGH Stewardship Through Innovation

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Water System Name: **City of Manhattan Beach** **Water System ID Number:** **1910083** **Water Audit Period:** **Fiscal Year 2016/17**

Water Audit & Water Loss Improvement Steps:

Steps taken in preceding year to increase data validity, reduce real loss and apparent loss as informed by the annual validated water audit:

Once the budget is opened, we will request funding for additional meter testing. The City is working on the final portion of a contract for two AMI pilots. This will set the stage for a full AMI project, which has already been put in our CIP budget and will take approximately 2 years to complete once started. The City is currently looking at an Asset Management program that will allow staff to better track operations, leaks, main breaks and better estimate these loses.

Certification Statement by Utility Executive:

This water loss audit report meets the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34 and has been prepared in accordance with the method adopted by the American Water Works Association, as contained in their manual, *Water Audits and Loss Control Programs, Manual M36, Fourth Edition* and in the Free Water Audit Software version 5.

Shawn Igoe	Utilities Division Manager		12/14/18
Executive Name (Print)	Executive Position	Signature	Date

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AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

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? Click to access definition

+ Click to add a comment

Water Audit Report for: City of Manhattan Beach (1910083)

Reporting Year: 2016-17 7/2016 - 6/2017

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.

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

Master Meter and Supply Error Adjustments

WATER SUPPLIED

				Pcnt:	Value:	
Volume from own sources:	5	308.100	acre-ft/yr	3	0.86%	acre-ft/yr
Water imported:	7	4,314.600	acre-ft/yr	8		acre-ft/yr
Water exported:	n/a	0.000	acre-ft/yr			acre-ft/yr
WATER SUPPLIED:		4,620.073	acre-ft/yr			

Enter negative % or value for under-registration

Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:	
Billed metered:	5	4,377.340	acre-ft/yr			
Billed unmetered:	n/a	0.000	acre-ft/yr			
Unbilled metered:	n/a	0.000	acre-ft/yr			
Unbilled unmetered:	5	11.550	acre-ft/yr		11.550	acre-ft/yr
AUTHORIZED CONSUMPTION:		4,388.890	acre-ft/yr			

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

WATER LOSSES (Water Supplied - Authorized Consumption)

231.183 acre-ft/yr

Apparent Losses

			Pcnt:	Value:	
Unauthorized consumption:		11.550	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	89.333	acre-ft/yr	2.00%	acre-ft/yr
Systematic data handling errors:		10.943	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: 111.827 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 119.356 acre-ft/yr

WATER LOSSES: 231.183 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: 242.733 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	9	105.9	miles
Number of active AND inactive service connections:	8	13,681	
Service connection density:		129	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:	9	65.0	psi

COST DATA

Total annual cost of operating water system:	10	$14,271,425	$/Year
Customer retail unit cost (applied to Apparent Losses):	5	$4.28	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	5	$1,733.08	$/acre-ft

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 61 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: Water imported

2: Customer metering inaccuracies

3: Billed metered

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#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
1	Volume from Own Sources	VOS	5	Supply meter profile: There are 2 groundwater wells, though only 1 was active in FY16/17. One well was offline for maintenance purpose. Active meter is a 12" propeller. VOS input derived from: Manual reads from production meters as archived. Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.	Percent of own supply metered: 100% Signal calibration frequency: Annual. Volumetric testing frequency: Within last 5 years but less than annually. Volumetric testing method: Pitot Tube Percent of own supply volumetrically tested: 100% Comments: No additional comments.
2	VOS Master Meter & Supply Error Adjustment	VOS MMSEA	3	Input derivation: Adjusted based on the results of accuracy test. Net storage change included in MMSEA input: No. Comments: No additional comments.	Supply meter read frequency: Daily. Supply meter read method: Manual. Frequency of data review for trends & anomalies: Each business day. Storage levels monitored in real-time: Yes. Comments: No additional comments.
3	Water Imported	WI	7	Import meter profile: Water imported from MWD through 1 meter. Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.	Percent of import supply metered: 100% Signal calibration frequency: Semi-annual. Volumetric testing frequency: None. Percent of import supply volumetrically tested: 0% Comments: No additional comments.
4	WI Master Meter & Supply Error Adjustment	WI MMSEA	8	Input derivation: Left blank in absence of available test data. Comments: No additional comments.	Import meter read frequency: Continuous. Import meter read method: Manual and automatic logging. Frequency of data review for trends & anomalies: Each business day. Comments: No additional comments.
5	Water Exported	WE	n/a	Export meter profile: Connections exist for emergency use only.	Comments: No additional comments.
6	WE Master Meter & Supply Error Adjustment	WE MMSEA	n/a	Comments: No additional comments.	Comments: No additional comments.

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
7	Billed metered	BMAC	5	Customer meter profile: Age profile: Half of meters replaced within last 7 years, half within 15 years. Reading system: Manual. AMI piloted and planned for full conversion in coming years. Read frequency: Bi-monthly. Comments: Lag-time correction is not employed in input derivation. Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.	Percent of customers metered: 100% Small meter testing policy: Reactive - complaint based or flagged-consumption testing only. Number of small meters tested/year: 5 Large meter testing policy: Reactive - complaint based or flagged-consumption testing only. Number of large meters tested/year: 0 Meter replacement policy: Upon failure only. Number of replacements/year: Very few Billing data auditing: Standard billing QC, plus review of volumes by use type each billing cycle. Comments: Replacement program put on hold due to pending AMI implementation
8	Billed unmetered	BUAC	n/a	Profile: No usage	Comments: No additional comments.
9	Unbilled metered	UMAC	n/a	Profile: Some UMAC exists for temporary construction meters, though the volume is currently quantified as BMAC.	Comments: No additional comments.
10	Unbilled unmetered	UUAC	5	Profile: Operational flushing and fire department usage. Comments: Flushing activities greatly scaled back due to drought. Custom California default of 0.25%xWS utilized.	Comments: Default grade applied.
11	Unauthorized consumption	UC	5	Comments: Default input applied.	Comments: Default grade applied.
12	Customer metering inaccuracies	CMI	3	See BMAC comments regarding meter testing & replacement activities. Input derivation: Inferred from reference data (manufacturer, anecdotal test results) but not derived from test data analysis & calculation. Comments: No additional comments.	Characterization of meter testing: Limited (upon request AND consumption flag only). Characterization of meter replacement: Limited (upon failure only). Comments: No additional comments.
13	Systematic data handling errors	SDHE	5	Comments: Default input applied.	Comments: Default grade applied.
14	Length of mains	Lm	9	Input derivation: Totaled from GIS based map. Hydrant leads included: Yes. Comments: No additional comments.	Mapping format: Digital. Asset management database: In place and integrated with GIS system. Map updates & field validation: Accomplished through normal

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
					work order processes. Comments: No additional comments.
15	Number of service connections	Ns	8	Input derivation: Standard report run from billing system. Basis for database query: Meter ID - non-premise based. Comments: No additional comments.	CIS updates & field validation: Accomplished through normal meter reading processes. Estimated error of total count within: 2%. Comments: No additional comments.
16	Ave length of cust. service line	Lp	10	Comments: Default input and grade applied, as customer meters are typically located at the property boundary given California climate.	
17	Average operating pressure	AOP	9	Number of zones, general profile: System has 2 pressure zones. One large one and one smaller zone. Typical pressure range: 50 – 100 psi Input derivation: Calculated as simple average from analysis of field data. Comments: No additional comments.	Extent of static pressure data collection: Hydrant pressures taken during routine system flushing and/or hydrant testing. Characterization of real-time pressure data collection: Full-scale - telemetry or pressure logging (including seasonal variations) in place beyond the boundary points in all zones representing full pressure profile. Hydraulic model: One exists but has not been calibrated within the last 5 years. Comments: No additional comments.
18	Total annual operating cost	TAOC	10	Input derivation: From internal budgeting reports. Comments: Confirmed costs limited to water only, and water debt service included.	Frequency of internal auditing: Annually. Frequency of third-party CPA auditing: Annually. Comments: No additional comments.
19	Customer retail unit cost	CRUC	5	Input derivation: Single rate class selected, with some rate classes excluded. Sewer charges are based on water meter readings. Sewer revenues are not incorporated into calculation. Comments: No additional comments.	Characterization of calculation: Weighted average but not composite of all rates. Input calculations have not been reviewed by an M36 water loss expert. Comments: No additional comments.
20	Variable production cost	VPC	5	Supply profile: Own sources and import supply. Primary costs included: Treatment chemicals, supply & distribution power, and purchase costs. Secondary costs included: None currently included. Comments: No additional comments.	Characterization of calculation: Primary costs only. Input calculations have not been reviewed by an M36 water loss expert. Comments: No additional comments.

Key Audit Metrics

(~) VALIDITY Data Validity Score: 61 Data Validity Band (Level): Band III (51-70)

(#) VOLUME ILI: 0.62 Real Loss: 7.79 (gal/conn/day) Apparent Loss: 7.30 (gal/conn/day)

($) VALUE Annual Cost of Apparent Losses: $208,487 Annual Cost of Real Losses: $206,853

Infrastructure & Water Loss Management Practices:

Infrastructure age profile: Unknown at time of call. Infrastructure replacement policy (current, historic): Robust capital improvement program with $1.5 million/year budgeted for replacement.

Estimated main failures/year: 6 Estimated service failures/year: Few, and mostly caused by contractor error.

Extent of proactive leakage management: None

Other water loss management comments: No additional comments.

Comments on Audit Metrics & Validity Improvements

The Infrastructure Leakage Index (ILI) of 0.62 describes a system that experiences leakage at 0.62 times the modeled technical minimum for its system characteristics.

While this system may experience low volumes of leakage, the ILI after level 1 validation indicates that advanced validation is warranted before conclusions can be made regarding the system's leakage. At least one of the following scenarios may contribute to this result:

- **Water Supplied (both Own Source and Imported Water) may be understated**. This can occur if supply meters are under-registering more significantly than is currently reflected in the Master Meter Error & Supply Adjustment (MMSEA). This can also occur if the supply volumes include uncorrected inaccuracies in the data archives due to data gaps or SCADA formula errors.
- **Authorized consumption may be overstated.** This can occur if sales volumes have not been pro-rated to align consumption with dates of actual use instead of the dates of meter reads. This can also occur if the BMAC input includes any non-potable volumes or duplication/exclusion of potable volumes.
- **The estimate of average operating pressure may be too high**, thereby overestimating the technical minimum volume of leakage for the system.

The Data Validity Score falling within Band III (51-70) suggests that next steps may be focused simultaneously on improving data reliability and evaluating cost-effective interventions for water & revenue loss recovery. Opportunities to improve the reliability of audit inputs and outputs include:

- Temporal alignment of Billed Metered Authorized Consumption with Water Supplied: consider pro-rating the first and last months of the audit period to better align consumption with actual dates of use, and using read date as basis for reporting.
- Improved estimation of CMI: consider a customer meter testing program which tests a sample of random meters whose stratification (by size, age, or other characteristics) represents the entire customer meter stock.

- Improved understanding of Supply Meter (Own or Import) Master Meter Error: consider adopting or increasing the rigor of a source meter volumetric testing and calibration program, informed by the guidance provided in AWWA Manual M36 – Appendix A.

When the CA-NV AWWA Water Audit Validator (WAV) program comes online after this year, is the utility planning on having a staff member become certified to perform the Level 1 Validation for future audits? Yes.