

## CA-NV AWWA Water Loss Technical Assistance Program Wave 4 Water Audit Level 1 Validation Document

### Audit Information:

**Utility:** Cambria Community Services District      **PWS ID:** 4010014  
**System Type:** Potable      **Audit Period:** Calendar 2016  
**Utility Representation:** Carolyn Winfrey, Stephanie Salvi, Jason Buhl, Bob Gresens  
**Validation Date:** 6/20/2017      **Call Time:** 10am      **Sufficient Supporting Documents Provided:** Yes

### Validation Findings & Confirmation Statement:

#### Key Audit Metrics:

**Data Validity Score:** 56    **Data Validity Band (Level):** Band III (51-70)  
**ILI:** 0.64      **Real Loss:** 13.13 (gal/conn/day)      **Apparent Loss:** 1.46 (gal/conn/day)  
**Non-revenue water as percent of cost of operating system:** 2%

#### 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. ☒

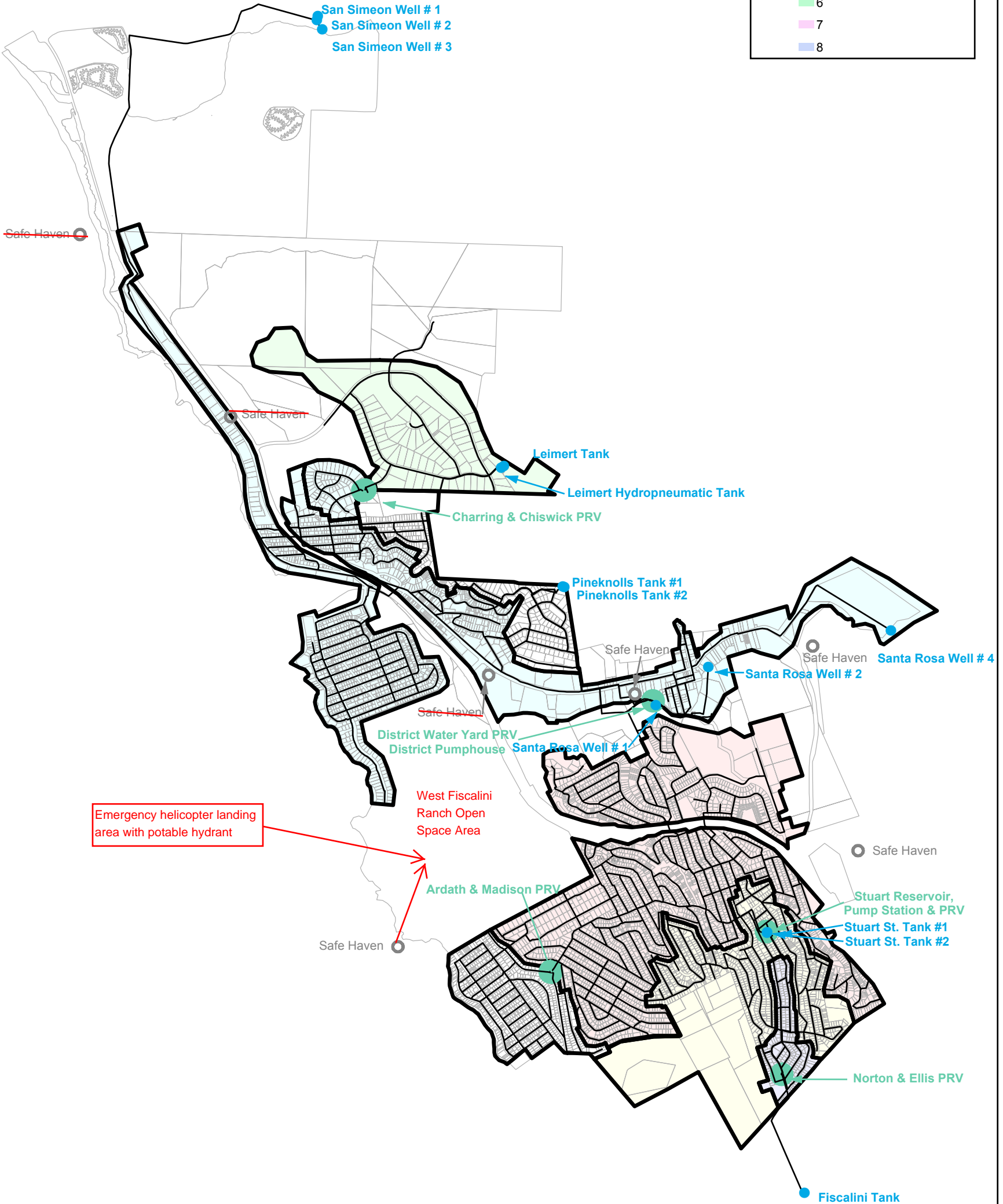
### Validator Information:

**Water Audit Validator:** Reinhard Sturm / Kevin Burgers (support)    **Validator Qualifications:** Contractor for CA-NV AWWA Water Loss TAP

Validator Provided



Legend	
Pressure Zones	Pipes
1	— Existing Pipes
2	
3	
4	
5	
6	
7	
8	



Emergency helicopter landing area with potable hydrant

Revisions by R Gresens for SLO Co.  
 Fire info request, 8-10-2009  
 East-West ranch pipeline not shown  
 across open space from end of  
 Madison to Windsor Blvd.

**Kennedy/Jenks Consultants**  
**Engineers & Scientists**

Cambria Community Services District  
 Task 3: Potable Water Distribution System Analysis

**Existing Potable Water System and Pressure Zones**

K/J 024602.00  
 Figure 4-1





#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
1	Volume from Own Sources	VOS	3	<p><b>Supply meter profile:</b> 5 groundwater wells with mag meters. Pumps are oil lubricated.</p> <p><b>VOS input derived from:</b> Manual reads from production meters as archived.</p> <p><b>Comments:</b> Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.</p>	<p><b>Percent of own supply metered:</b> 100%</p> <p><b>Signal calibration frequency:</b> Annual.</p> <p><b>Volumetric testing frequency:</b> None.</p> <p><b>Volumetric testing method:</b> n/a.</p> <p><b>Percent of own supply tested and/or calibrated:</b> 0%</p> <p><b>Comments:</b> Although calibration occurs, no documentation was available so a DVG of 3 was assigned.</p>
2	VOS Master Meter & Supply Error Adjustment	VOS MMSEA	3	<p><b>Input derivation:</b> Left blank in absence of available test data.</p> <p><b>Net storage change included in MMSEA input:</b> No.</p> <p><b>Comments:</b> No additional comments.</p>	<p><b>Supply meter read frequency:</b> Daily.</p> <p><b>Supply meter read method:</b> Manual.</p> <p><b>Frequency of data review for trends &amp; anomalies:</b> Each business day.</p> <p><b>Storage levels monitored in real-time:</b> No.</p> <p><b>Comments:</b> No additional comments.</p>
3	Water Imported	WI	n/a	<b>Import meter profile:</b> No interties exist.	<b>Comments:</b> No additional comments.
4	WI Master Meter & Supply Error Adjustment	WI MMSEA	n/a	<b>Comments:</b> No additional comments.	<b>Comments:</b> No additional comments.
5	Water Exported	WE	n/a	<b>Export meter profile:</b> No interties exist.	<b>Comments:</b> No additional comments.
6	WE Master Meter & Supply Error Adjustment	WE MMSEA	n/a	<b>Comments:</b> No additional comments.	<b>Comments:</b> No additional comments.



#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
7	Billed metered	BMAC	5	<p><b>Customer meter profile:</b>  <b>Age profile:</b> All residential meters were replaced in 2006. Commercial meters were replaced within 3 years.  <b>Reading system:</b> AMR.  <b>Read frequency:</b> Monthly.  <b>Comments:</b> Lag-time correction is not employed in input derivation, but meter reads are collected during the last 2 days of the month so the effect is minimal. Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.</p>	<p><b>Percent of customers metered:</b> 100%  <b>Small meter testing policy:</b> Reactive - complaint based or flagged-consumption testing only.  <b>Number of small meters tested/year:</b> 15-20  <b>Large meter testing policy:</b> Reactive - complaint based or flagged-consumption testing only.  <b>Number of large meters tested/year:</b> 5  <b>Meter replacement policy:</b> Upon failure only.  <b>Number of replacements/year:</b> 30  <b>Billing data auditing:</b> Standard billing QC, plus review of volumes by use type each billing cycle.  <b>Comments:</b> No additional comments.</p>
8	Billed unmetered	BUAC	n/a	<p><b>Profile:</b> All customers are metered.  <b>Comments:</b> No additional comments.</p>	<p><b>Comments:</b> No additional comments.</p>
9	Unbilled metered	UMAC	7	<p><b>Profile:</b> Combination of specific account agreements, and facility usage.  <b>Input derivation:</b> Direct from meter readings.  <b>Comments:</b> Input derivation from supporting documents confirmed. Specific agreements give 2 customers a minimum amount of water before they receive a bill.</p>	<p><b>Policy for billing exemptions:</b> Own facilities plus other exemptions including 2 customers with a specific agreement.  <b>Comments:</b> No additional comments.</p>
10	Unbilled unmetered	UUAC	2	<p><b>Profile:</b> Operational flushing and fire department usage.  <b>Comments:</b> Flushing activities greatly scaled back, but not tracked. Fire department provides estimate of usage.</p>	<p><b>Comments:</b> Operational uses have not been documented.</p>
11	Unauthorized consumption	UC	5	<p><b>Comments:</b> Default input applied.</p>	<p><b>Comments:</b> Default grade applied.</p>
12	Customer metering inaccuracies	CMI	3	<p>See BMAC comments regarding meter testing &amp; replacement activities.  <b>Input derivation:</b> Rudimentary estimate.  <b>Comments:</b> CMI estimation changed from 2.25% to 1% based on replacement of all meters within last 9 years.</p>	<p><b>Characterization of meter testing:</b> Limited (upon request AND consumption flag only).  <b>Characterization of meter replacement:</b> Limited (upon failure only).  <b>Comments:</b> No additional comments.</p>
13	Systematic data handling errors	SDHE	5	<p><b>Comments:</b> Default input applied.</p>	<p><b>Comments:</b> Default grade applied.</p>



#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
14	Length of mains	Lm	2	<p><b>Input derivation:</b> Totaled from GIS based map in 2003.</p> <p><b>Hydrant leads included:</b> Yes.</p> <p><b>Comments:</b> Restrictions have limited possible construction, but records are not reliably updated.</p>	<p><b>Mapping format:</b> Paper.</p> <p><b>Asset management database:</b> Not currently in place.</p> <p><b>Map updates &amp; field validation:</b> Accomplished through normal work order processes.</p> <p><b>Comments:</b> No additional comments.</p>
15	Number of service connections	Ns	7	<p><b>Input derivation:</b> Standard report run from billing system.</p> <p><b>Basis for database query:</b> Number of customers – non-premise based.</p> <p><b>Comments:</b> No additional comments.</p>	<p><b>CIS updates &amp; field validation:</b> Accomplished through normal meter reading processes.</p> <p><b>Estimated error of total count within:</b> 2%.</p> <p><b>Comments:</b> No additional comments.</p>
16	Ave length of cust. service line	Lp	10	<p><b>Comments:</b> Default input and grade applied, as customer meters are typically located at the property boundary given California climate.</p>	
17	Average operating pressure	AOP	4	<p><b>Number of zones, general profile:</b> 7 separate pressure zones.</p> <p><b>Typical pressure range:</b> 40 – 120 psi</p> <p><b>Input derivation:</b> Calculated as simple average from analysis of field data.</p> <p><b>Comments:</b> Value was calculated based on a sample of static pressures collected by the fire department.</p>	<p><b>Extent of static pressure data collection:</b> Hydrant pressures taken during routine system flushing and/or hydrant testing.</p> <p><b>Characterization of real-time pressure data collection:</b> Basic - telemetry or pressure logging at boundary points (supply locations, tanks, PRVs, boosters).</p> <p><b>Hydraulic model:</b> One exists but has not been calibrated within the last 5 years.</p> <p><b>Comments:</b> No additional comments.</p>
18	Total annual operating cost	TAOC	10	<p><b>Input derivation:</b> From official financial reports.</p> <p><b>Comments:</b> Confirmed costs limited to water only, and water debt service included.</p>	<p><b>Frequency of internal auditing:</b> Annually.</p> <p><b>Frequency of third-party CPA auditing:</b> Annually.</p> <p><b>Comments:</b> No additional comments.</p>
19	Customer retail unit cost	CRUC	9	<p><b>Input derivation:</b> Total consumptive revenue divided by Billed Metered Authorized Consumption. Sewer charges are based on water meter readings. Sewer revenues are incorporated into calculation.</p> <p><b>Comments:</b> No additional comments.</p>	<p><b>Characterization of calculation:</b> Weighted average composite of all rates. Input calculations have not been reviewed by an M36 water loss expert.</p> <p><b>Comments:</b> No additional comments.</p>
20	Variable production cost	VPC	4	<p><b>Supply profile:</b> Own sources only.</p> <p><b>Primary costs included:</b> Treatment chemicals and supply &amp; distribution power.</p> <p><b>Secondary costs included:</b> None currently included.</p> <p><b>Comments:</b> No additional comments.</p>	<p><b>Characterization of calculation:</b> Primary costs only. Input calculations have not been reviewed by an M36 water loss expert.</p> <p><b>Comments:</b> No additional comments.</p>



### Key Audit Metrics

(~)	VALIDITY	Data Validity Score: 56	Data Validity Band (Level): Band III (51-70)
(#)	VOLUME	ILI: 0.64	Apparent Loss: 13.13 (gal/conn/day)    Real Loss: 1.46 (gal/conn/day)
(\$)	VALUE	Annual Cost of Apparent Losses: \$37,705	Annual Cost of Real Losses: \$31,815

### Infrastructure & Water Loss Management Practices:

Infrastructure age profile: Majority of system built in late 1970's                      Infrastructure replacement policy (current, historic): None  
 Estimated main failures/year: 1-2                      Estimated service failures/year: 120  
 Extent of proactive leakage management: Drive by inspections for wet spots during the dry months of the year, and actively seeking public input.  
 Other water loss management comments: Plans for sub-zone metering to further identify losses.

### Comments on Audit Metrics & Validity Improvements

The Infrastructure Leakage Index (ILI) of 0.64 describes a system that experiences leakage at 0.64 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:

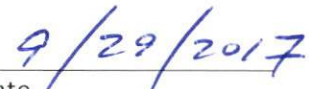
- Improved understanding of Supply Meter (Own or Import) Master Meter Error: consider adopting or increasing the rigor of a source meter volumetric testing and calibration program, informed by the guidance provided in AWWA Manual M36 – Appendix A.
- Improved estimation of CMI: consider a customer meter testing program which tests a sample of random meters whose stratification (by size, age, or other characteristics) represents the entire customer meter stock.

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.



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.

  
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Robert C. Gresens, P.E.  
District Engineer  
Cambria Community Services District

  
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Date