

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com





WSI 2019

Asheville Takes Commercial Meter Testing Program to Next Level for Real Payback



Relevant Roles:

Chair, AWWA Water Loss Software Subcommittee

Chair, North American Water Loss Conference

IWA Water Loss Specialist Group, Management Committee

Director of Water Efficiency, Cavanaugh

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CAVANAUGH

Stewardship Through Innovation



Management Tool

Economic Optimization for Large Meter Testing Program

[Master List](#)[Testing Plan](#)[Testing Data](#)[Testing Outcomes](#)[Dashboard](#)

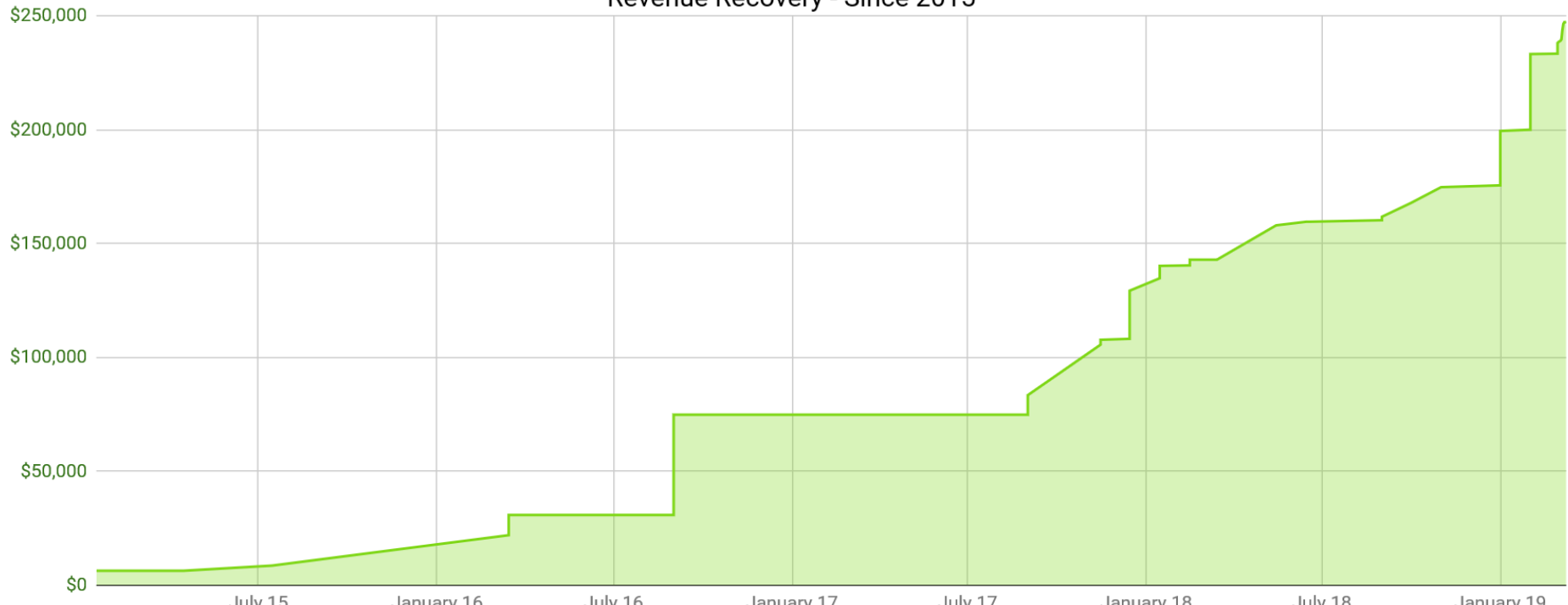
City of Asheville Large Meter Testing Program



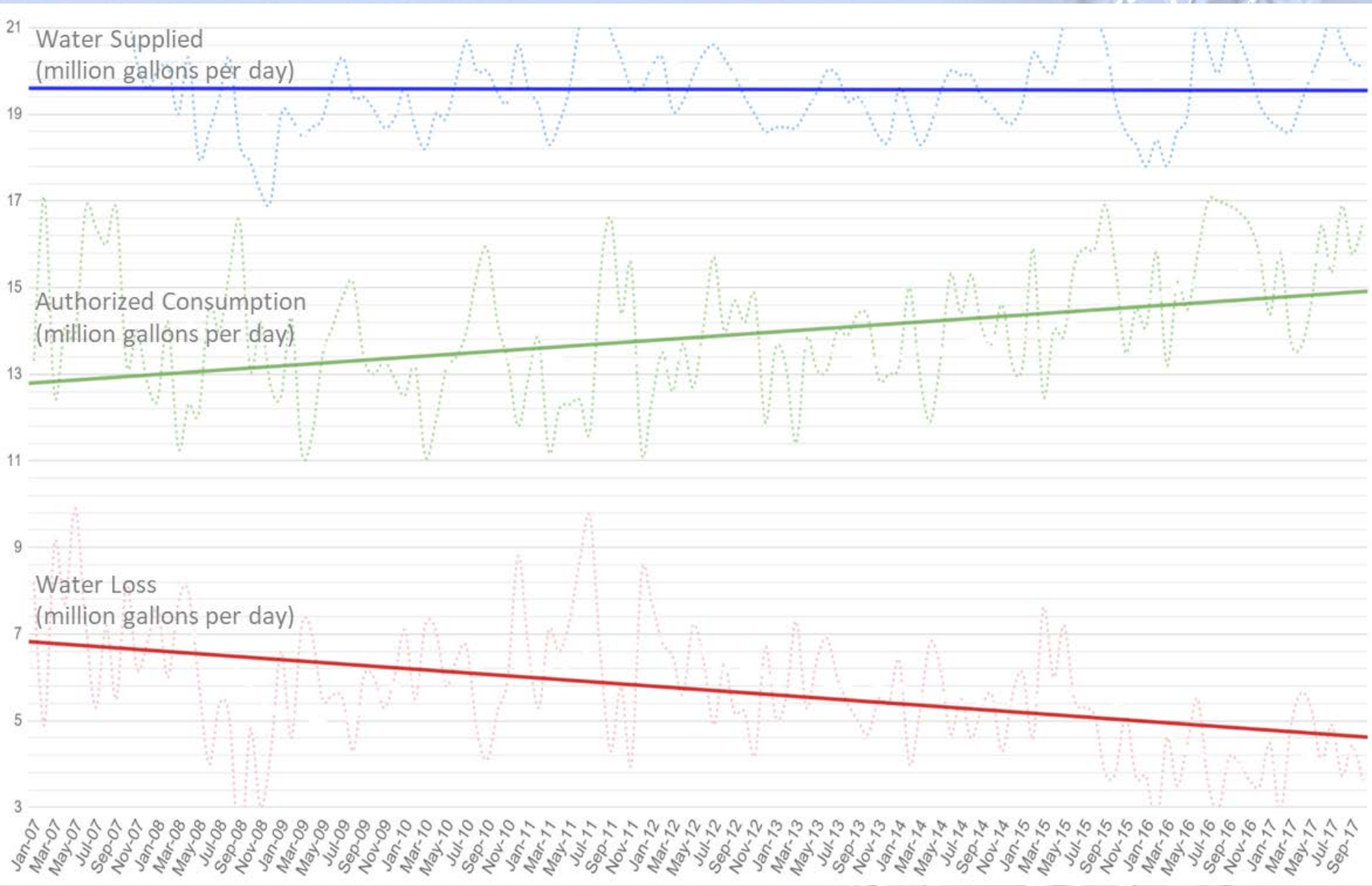
	2019
Total meters to test this year	146
Target year to date	103
Meters tested year to date	48
Percent of target year to date	47%

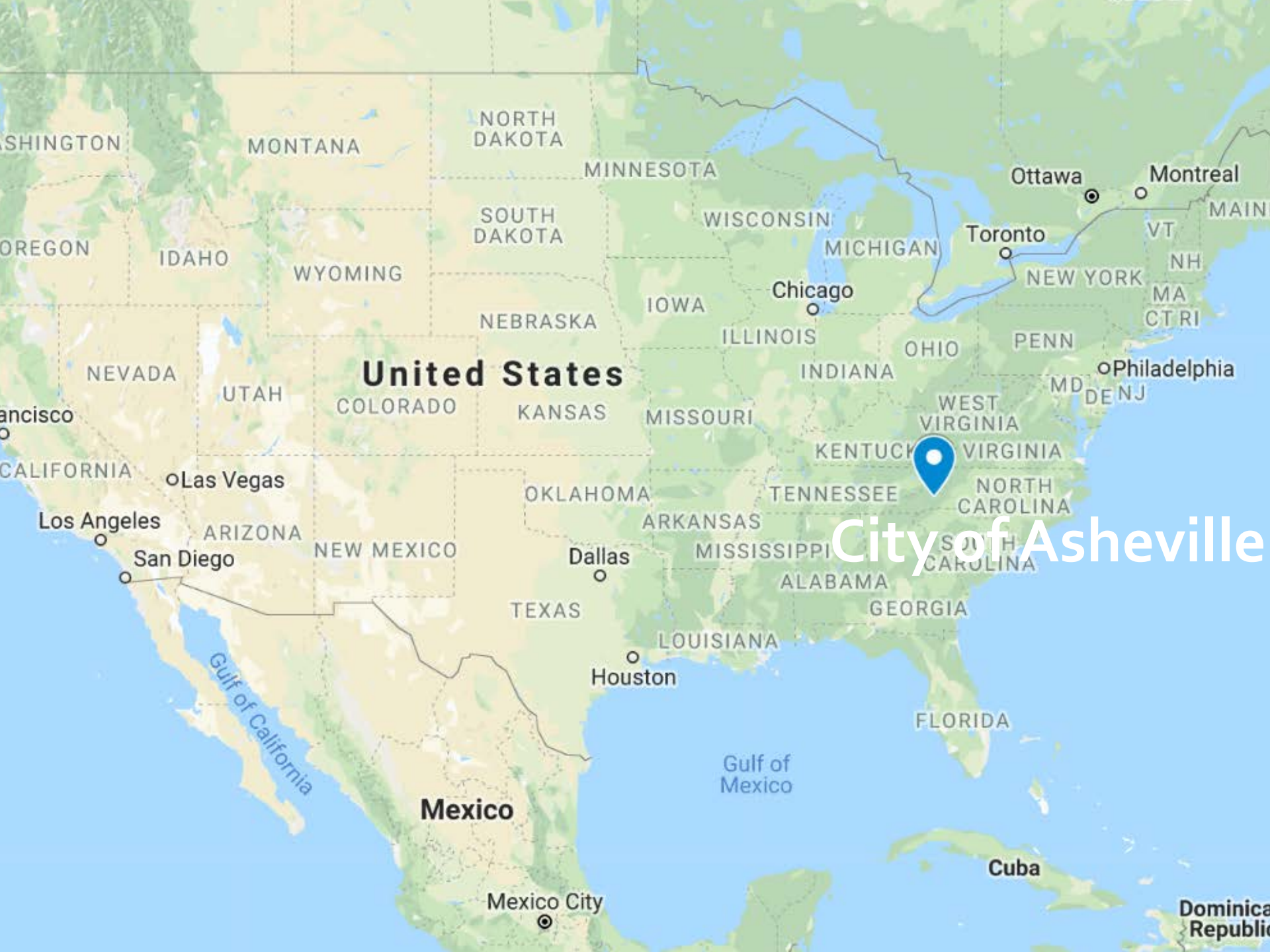
	Since 2015
Meters identified for remedy	63
Revenue recovery to date	\$247,503

Revenue Recovery - Since 2015



Cost-Effective Sustainability





United States

City of Asheville

Mexico



City of Asheville

What Led Asheville to a NRW Program?

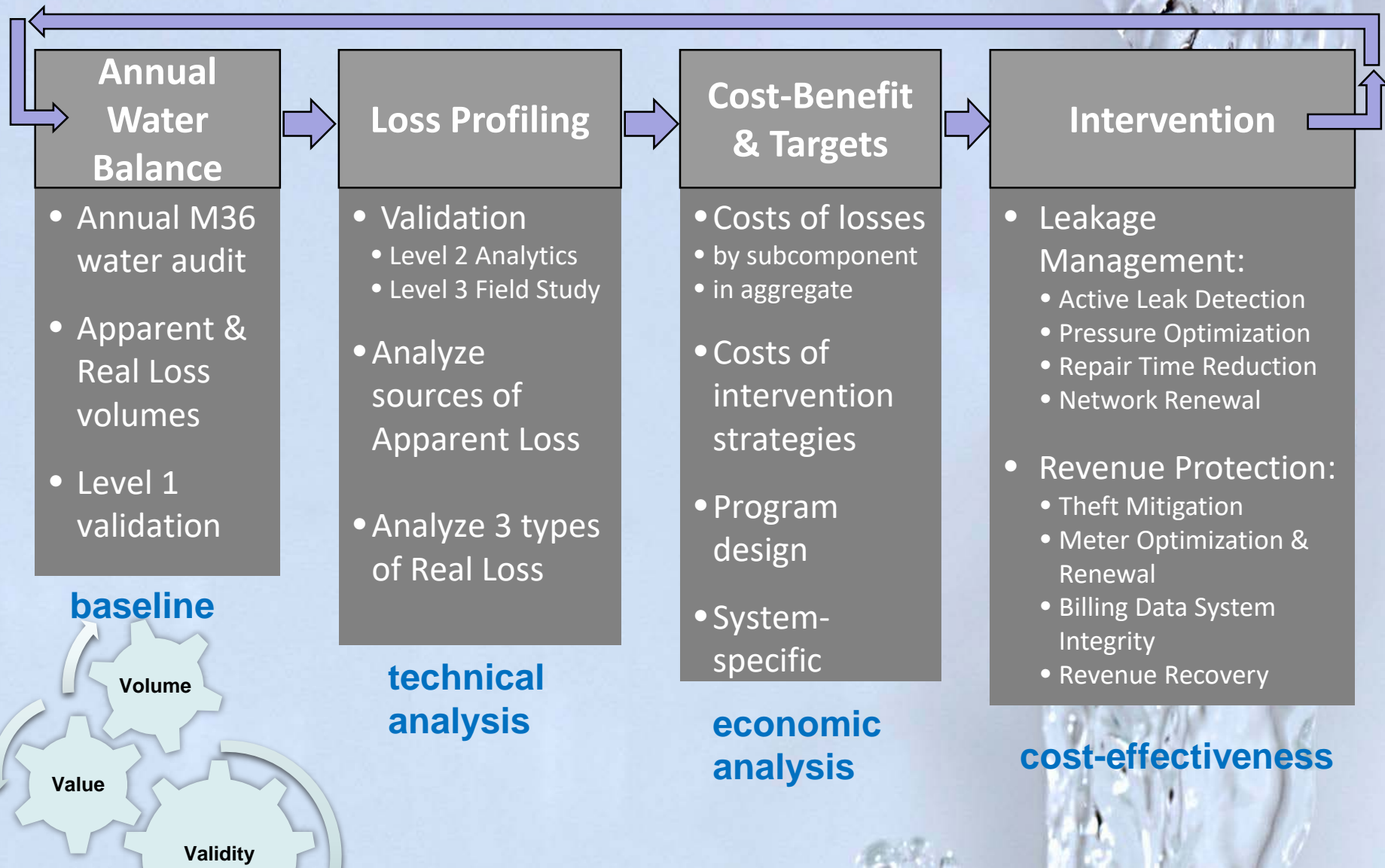
- News Headlines:
 - Millions spent on leaky Asheville water system
 - An audit of the system's water use in 2002-03 found the city produced 21.5 million gallons of treated water a day but lost 6.4 million gallons a day.
- Leaks, leaks, & more leaks:
- Lack of meter maintenance:
- The Perfect environment and perfect need for a NRW program



The AWWA M36 Method: Economic Intervention



CAVANAGH
Stewardship Through Innovation



SUPPLY

CONSUMPTION

METERING



American Water Works
Association

"Dedicated to the World's Most Important Resource"

AUDIT

PROGRAM

DETECTION

PRESSURE

RENEWAL

A Team Based Approach

- Audit Input Team
- Valve & Leak Team
- Unbilled Customer Team
- Customer Service Team
- Metering Team
- Pressure Management Team



Historic Large Meter Testing Program

METERING

Established in 2012

- Size based meter selections
- Testing methods – multi flow ranges
- Field apparatus

Described in the AWWA M6 Manual

DETECTOR MODEL W-1250



Shown with Standard Equipment
Electronic Registers



Water Meters—
Selection, Installation,
Testing, and Maintenance

MANUAL OF WATER SUPPLY PRACTICES

M6

Fifth Edition

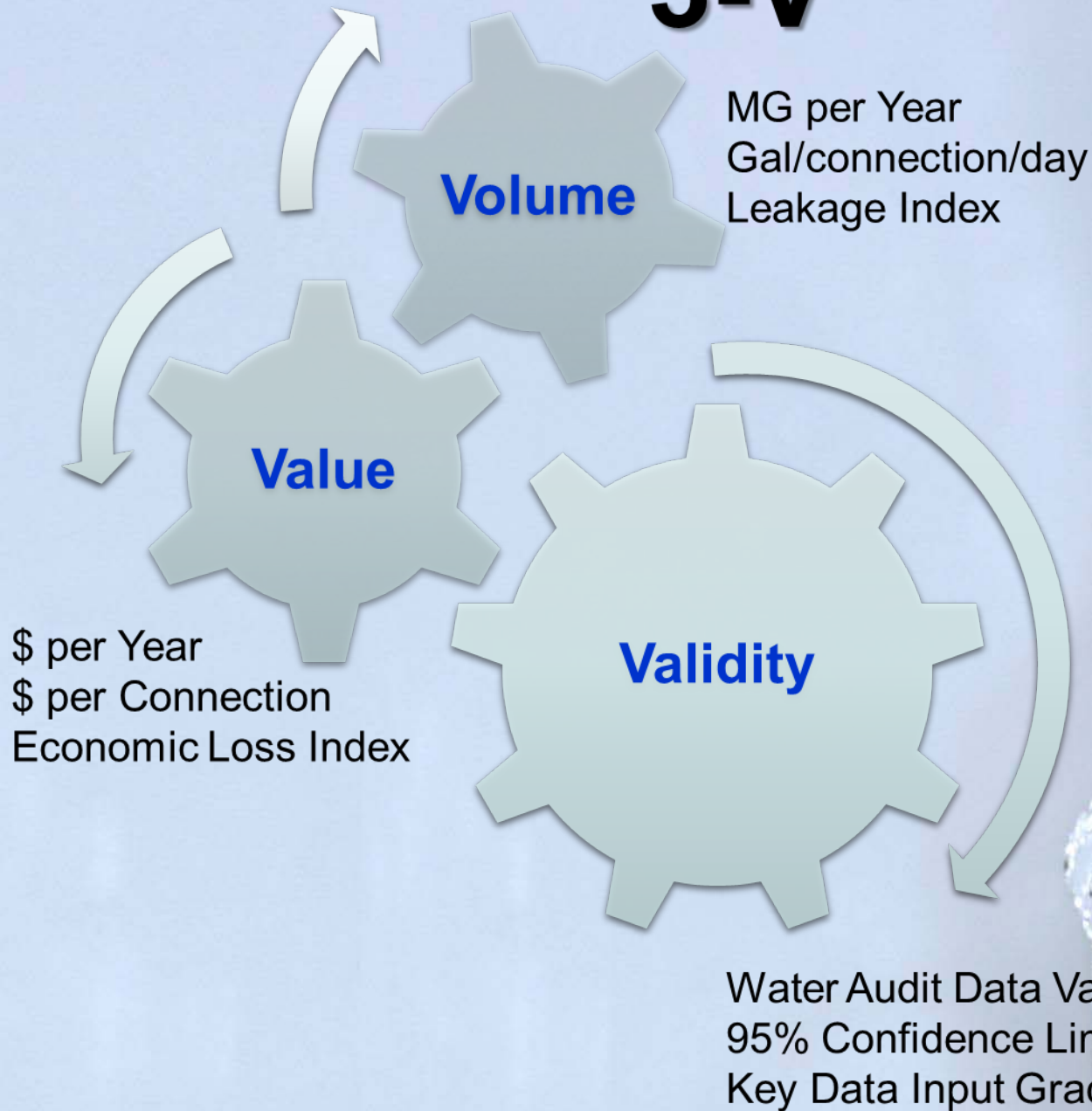


American Water Works
Association

The Authoritative Resource on Safe Water™

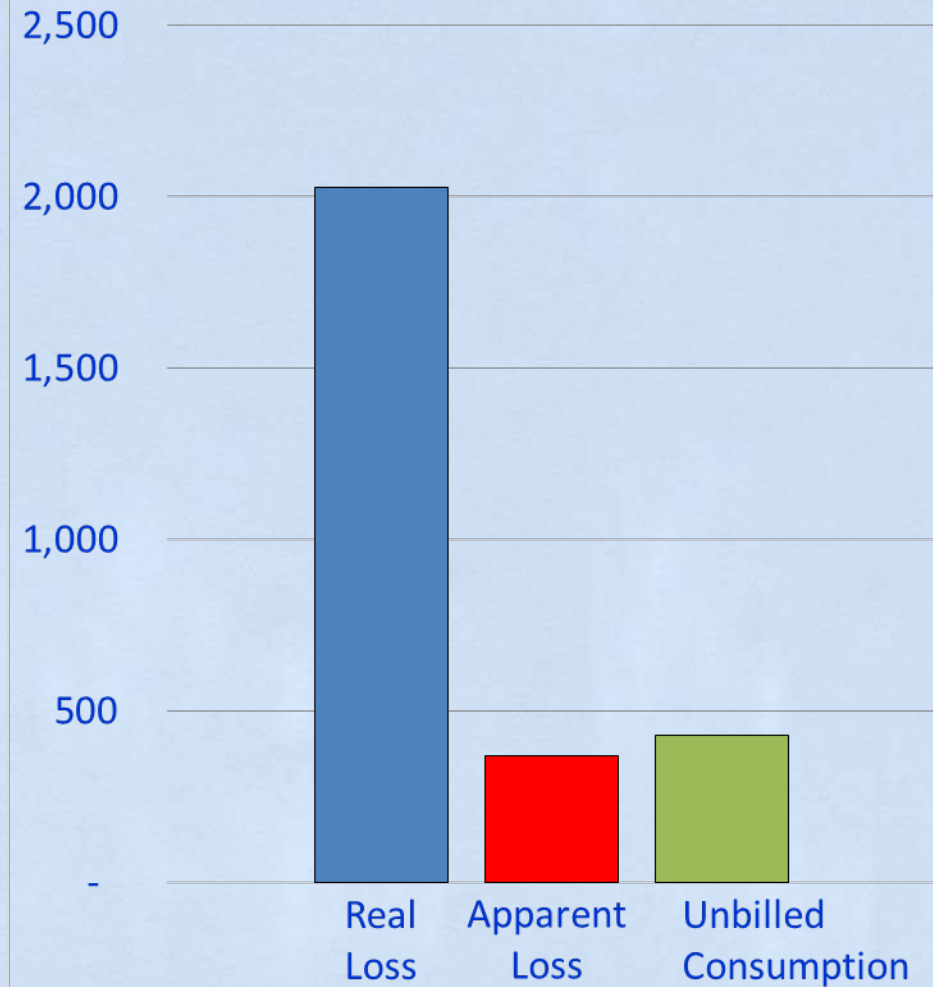
AWWA
Education
Conference
Exhibitor and Training
Center at the Technology
Center

3-V



Volume

NRW Components - By Volume
(MG) - Level 2



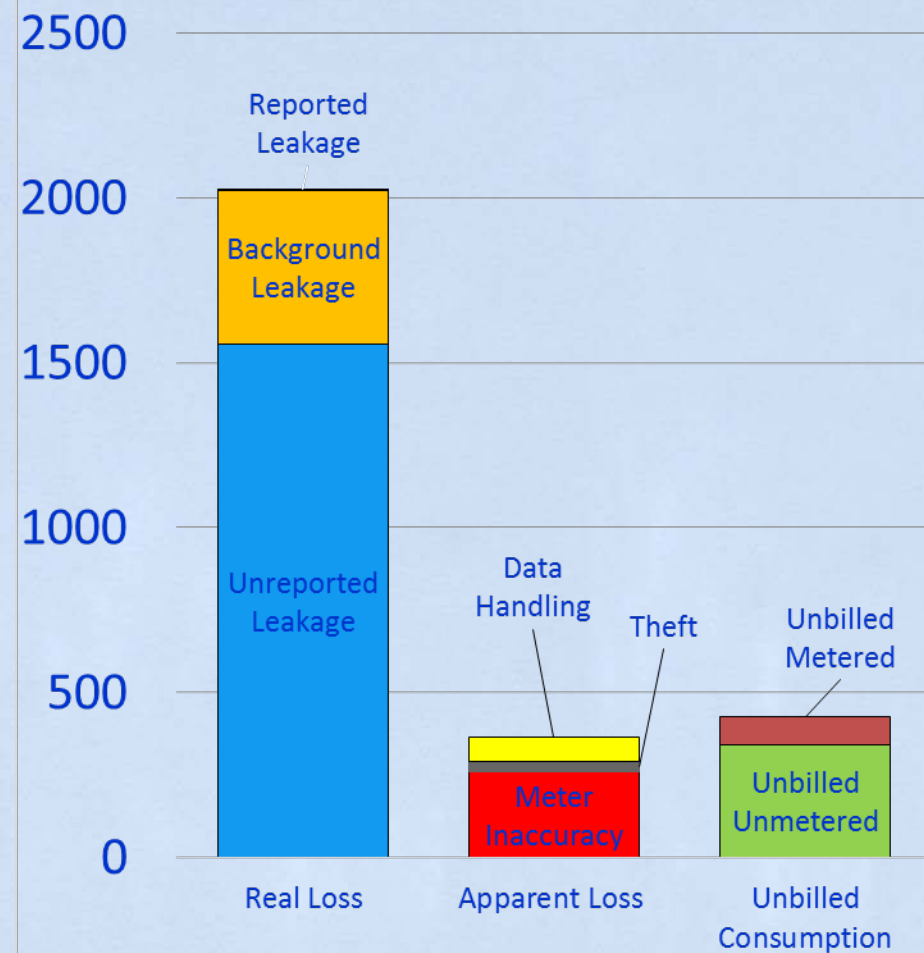
Value

NRW Components - By Value
Level 2



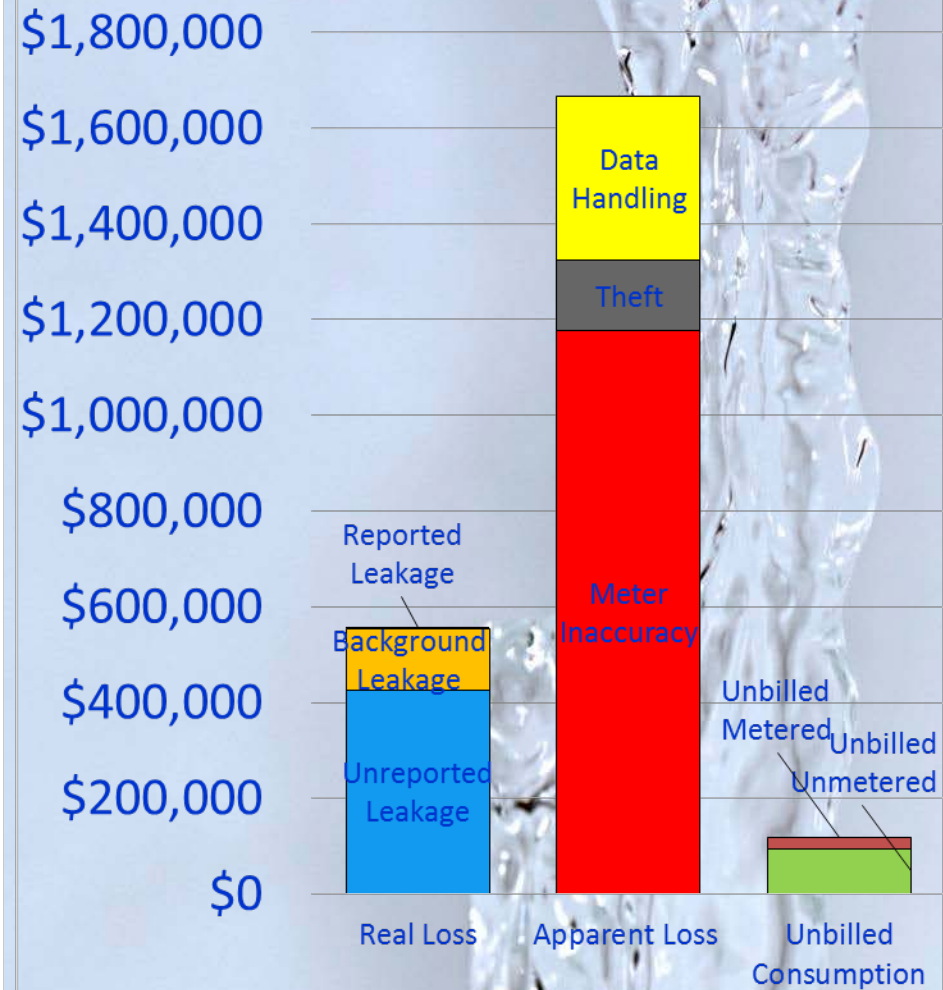
Volume

NRW Components - By Volume
(MG)
Level 3



Value

NRW Components - By Value
Level 3



Volume

Level 3

Meter
Inaccuracy

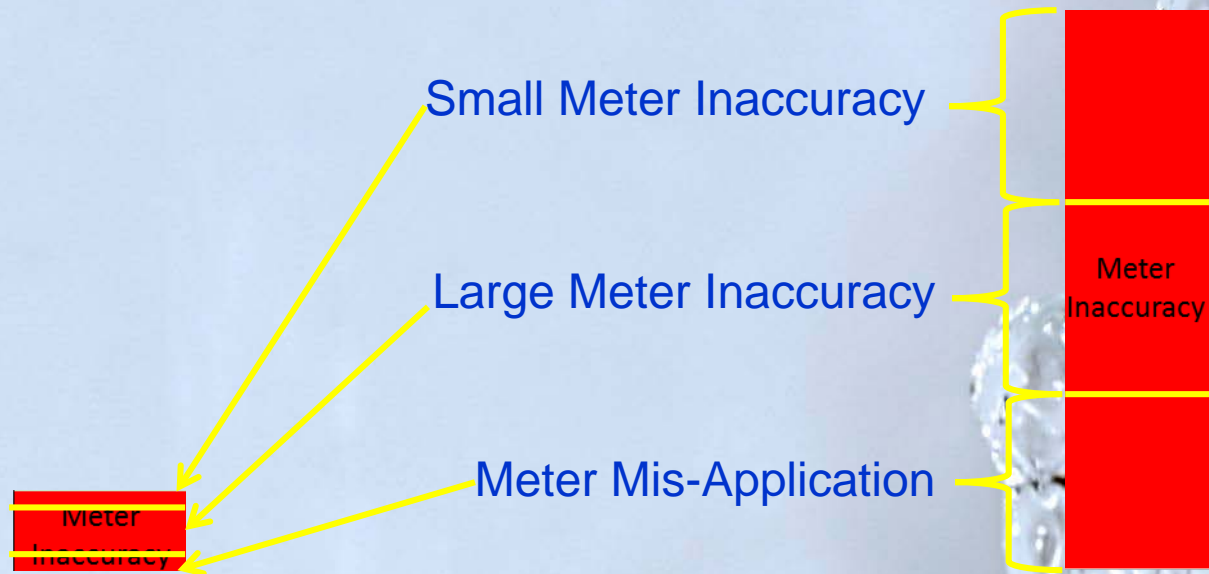
Value

Level 3

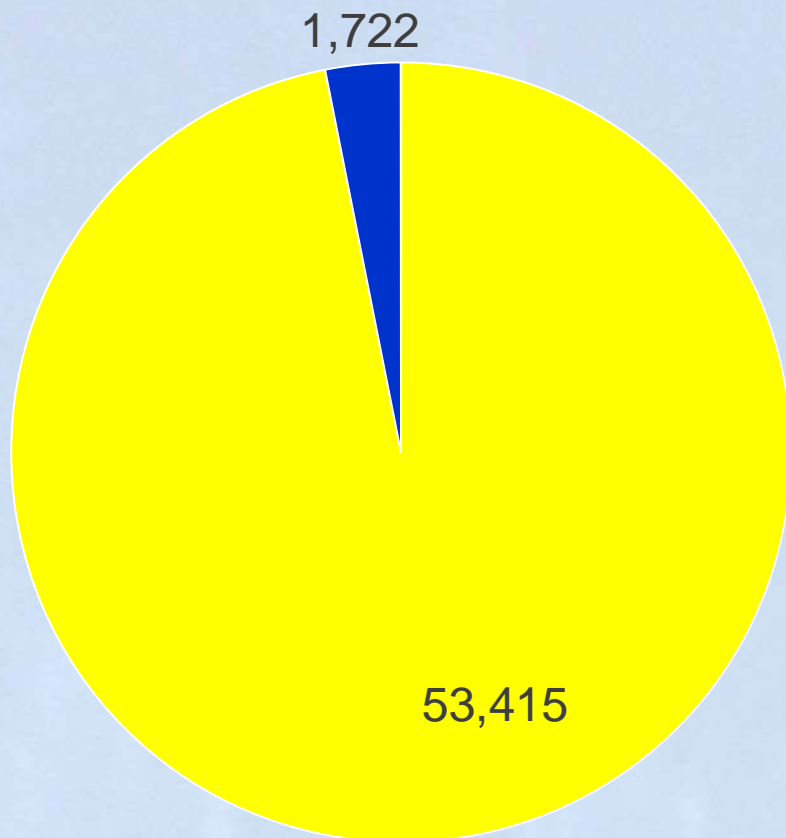
Meter
Inaccuracy

Volume
Level 4

Value
Level 4

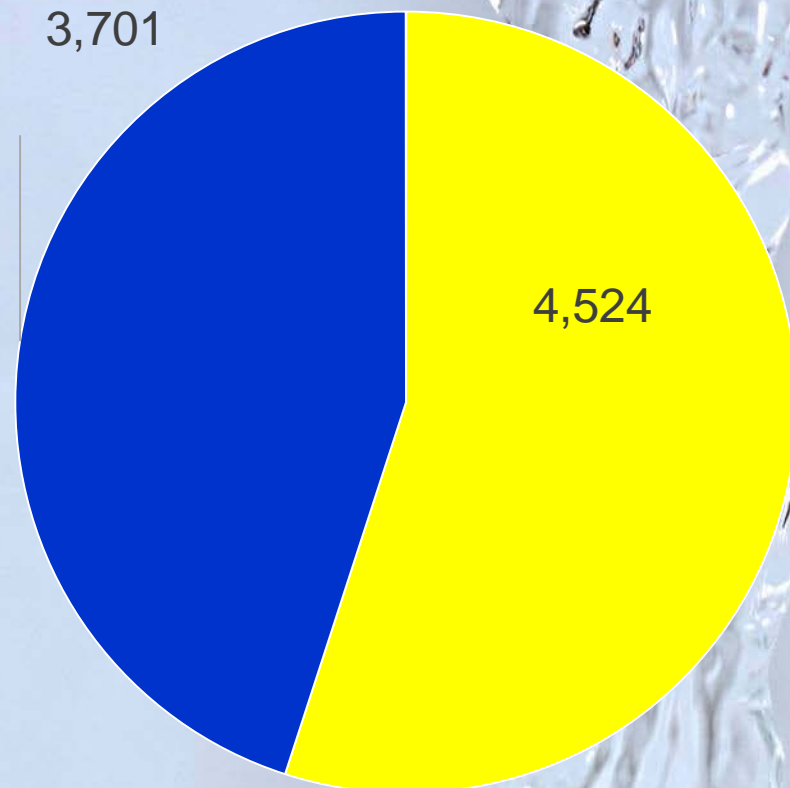


Count



■ ≤ 1" meters ■ ≥ 1.5" meters

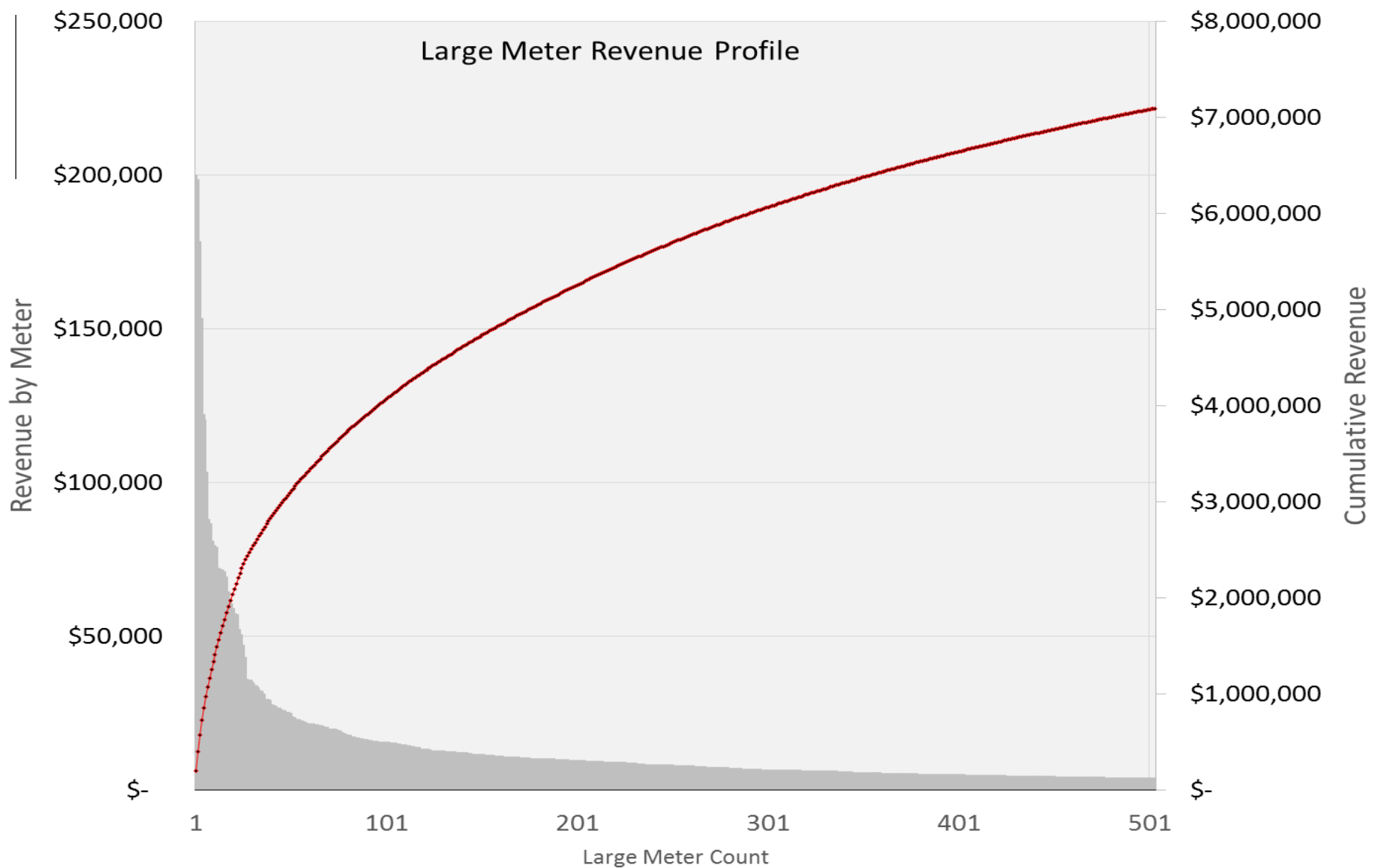
Volume (MG)



■ ≤ 1" meters ■ ≥ 1.5" meters

METERING

Economic Optimization for Large Meter Testing Program



METERING

Economic Optimization for Large Meter Testing Program

Annual Test Planning Cost Table

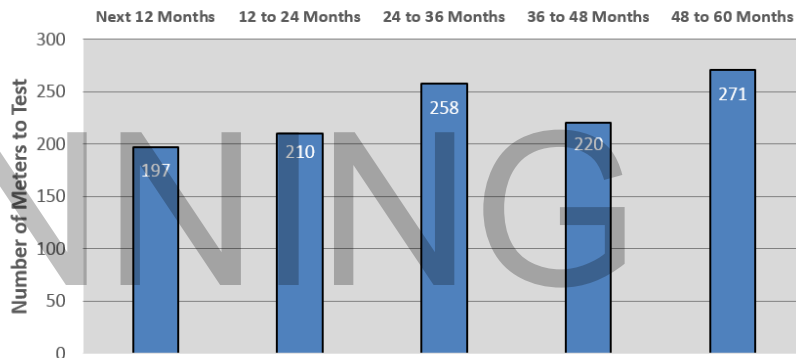
This data will support planning before testing.

Meter Size	Cost to Test (\$)	Cost to Repair (\$)	Predicted Inaccuracy
1.5	75	100	1.0%
2	75	100	1.2%
3	125	200	2.1%
4	125	200	1.3%
6	175	300	1.0%
8	175	400	1.0%
10	175	500	1.0%

Instructions - Before Testing:

Frequency = Annually

1. Populate front-end cost table, based on history and educated guess.
2. Annual Test Planning tab - click SORT.
3. That is your work plan for meters to be tested in the next 12 months.
4. Note those with SEMI-ANNUAL test frequency should be tested twice in the year.



5 Year Testing Outlay

Simple Payback Analysis (PBT)

Test	Flow Range	Accuracy Test Result (%)	Weighted (%)	Flow Range	Accuracy Test Result (%)	Weighted (%)	Flow Range	Accuracy Test Result (%)	Weighted (%)
1.5	Low	95**	30*	Mid	97**	35*	High	98**	35*
2	Low	95**	30*	Mid	97**	35*	High	98**	35*
3	Low	95**	30*	Mid	97**	35*	High	98**	35*
4	Low	95**	30*	Mid	97**	35*	High	98**	35*
6	Low	95**	30*	Mid	97**	35*	High	98**	35*
8	Low	95**	30*	Mid	97**	35*	High	98**	35*
10	Low	95**	30*	Mid	97**	35*	High	98**	35*

Weighting (%)	Flow Range	Accuracy Test Result (%)	Weighted (%) x Accuracy Test Result (%)	Weighted Accuracy by Flow Range (%)	Composite Weighted Accuracy (%)
30*	Low	95**	30 x 95	28.5	96.75
35*	Mid	97**	35 x 97	33.95	
35*	High	98**	35 x 98	34.3	

Determine simple payback (in years)

Simple Payback (N) =

CR (\$) = \$5,500

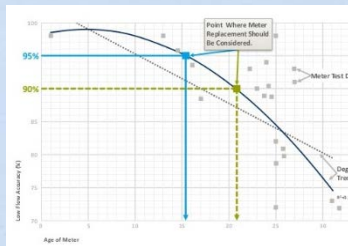
ACR (\$/YR) = \$11,375/YR

= 0.48 YR or 6 months

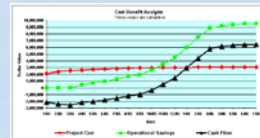
METERING

Economic Optimization for Large Meter Testing Program

PLANNING



**Compilation/
analysis of
historical test
results**

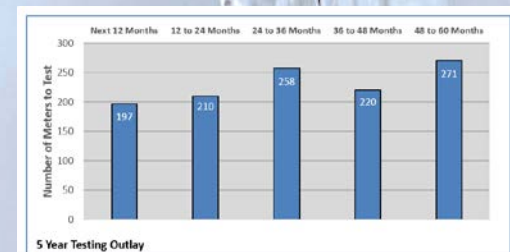


**Prediction of
costs & benefits
from historic
perspective**

**Generate annual
test planning list
with optimization
model**

Annual Test Planning Cost Table			
This data will support planning before testing.			
Meter Size	Cost to Test (\$)	Cost to Repair (\$)	Predicted Inaccuracy
1.5	75	300	1.2%
2	75	300	1.2%
3	125	200	2.1%
4	125	200	1.3%
6	175	300	1.0%
8	175	400	1.0%
10	175	500	1.0%

Instructions - Before Testing:
 1. Populate front-end cost table, based on history and educated guess.
 2. Annual Test Planning tab - click SORT.
 3. That is your work plan for meters to be tested in the next 12 months.
 4. Note those with SEMI-ANNUAL test frequency should be tested twice in the year.



METERING

Economic Optimization for Large Meter Testing Program

EXECUTION



Monthly testing activities & raw data recorded



Run filters for datalog list, collect datalogs to true-up flow weightings

Determine single payback (in years)
Single Payback (N) =

CH (\$)= \$5,500
ACR (\$/YR)= \$13.375/YR

= 0.48 YR or 6 months

Populate weighted test results into optimization model to get simple payback analysis

Generate actionable meters to work order system for repair/replacement

Management Tool

Economic Optimization for Large Meter Testing Program

[Master List](#)

[Testing Plan](#)

[Testing Data](#)

[Testing Outcomes](#)

[Dashboard](#)



Management Tool

Economic Optimization for Large Meter Testing Program

Master List

Testing Plan

Testing Data

Testing Outcomes

Dashboard

Meter Serial	Customer Name	Meter Size	Account	Service Code	Customer ID	Address	City	Customer Type	Cycle Route	Meter Install Date	Annual Consumption Revenue
70264057	MILKCO INC	4	1010438	10000	2028157	220 DEAVERVIEW RD	ASHE	MN	1074		\$168,477
70144051	JACOB HOLM INDUSTRIES AMERICA	8	1414948	10000	2192553	155 JACOB HOLM WAY	CDLR	MN	638	2005-08-01	\$151,414
31955073	MISSION HOSPITAL	6	1009848	10000	2028019	509 BILTMORE AVE	ASHE	HS	1074		\$139,837
14845033	BILTMORE ESTATE	8	1010078	10000	2028069	240 MEADOW RD	ASHE	CM	1074	5/14/2015	\$127,688
28140183	GOLBOND INC	6	1010648	10000	2155269	1301 SAND HILL RD	ASHE	MN	1074	3/13/15	\$122,430
28140179	NEW BELGIUM BREWING CO.	6	1031768	10000	12859	91 CRAVEN ST	ASHE	CM	1074	12/8/2015	\$119,245
31957408	WOODFIN WATER DISTRICT	3	1009258	10000	2027873	721 WEAVERVILLE RD	ASHE	WH	1074	11/4/92	\$96,512
11958851	JACOB HOLM INDUSTRIES AMERICA	2	1414948	10000	2192553	155 JACOB HOLM WAY	CDLR	MN	638	2012-08-15	\$90,855
31911534	TOWN OF BLACK MOUNTAIN	6	1011928	10000	2028515	225 W STATE ST	BMTN	WH	1076	5/6/93	\$88,006
1426605	Craggy Correctional Center NC	6	1009268	10000	2027875	721 OLD MARSHALL HWY	ASHE	CM	1074	5/3/04	\$86,247
70240598	ST JOSEPH HOSPITAL LAUNDRY	4	1009838	10000	2028017	428 BILTMORE AVE	ASHE	HS	1074	2/28/11	\$81,774
11459732	DEERFIELD EPIS HOME	2	1175118	10000	2130275	1617 HENDERSONVILLE RD	ASHE	RM	877	8/1/12	\$80,234
70131941	SOUTHEASTERN CONTAINER INC	4	1160758	10000	2123855	1250 SAND HILL RD	CDLR	MN	1074	1/10/06	\$79,897
12643064	BSC HOLDINGS INC	2	101611	10000	2320267	200 KENSINGTON PL	ASHE	RM	1076	2/2/15	\$79,879
11946034	M REALTY LLC	2	1139038	10000	2287521	42 AIRPORT RD	ARDN	RM	822	5/16/12	\$78,169
70252567	DAY INTERNATIONAL	4	1010958	10000	2028287	25 OLD SHOALS RD	ASHE	MN	1076	2/5/18	\$77,737
12948582	TOWN OF BILTMORE FOREST	6	1011338	10000	2028385	1025 HENDERSONVILLE RD	ASHE	WH	1076	2013-02-07	\$77,522
12900219	INGLES WAREHOUSE	6	1011948	10000	2028519	2913 US 70 HWY	BMTN	CM	1076	3/8/12	\$77,501
13802356	WOODFIN WATER DISTRICT	6	1592708	10000	2027873	721 MOUNT CARMEL RD	ASHE	WH	1074	2013-07-29	\$69,509
31955074	U S VETERANS HOSPITAL	6	1011598	10000	2028447	1100 TUNNEL RD	ASHE	HS	1076	1993-06-07	\$66,870
12948581	GIVENS ESTATE	6	1011198	10000	2028347	3 D WESLEY DR	ASHE	RM	1076		\$66,230
12962739	CCC FOREST AT BILTMORE PARK LLC	6	1010768	10000	29070	300 LONG SHOALS RD	ASHE	RM	1076	5/6/12	\$64,522
70247984	CONTINENTAL TEVES	4	1166528	10000	2126767	1 QUALITY WAY	FLET	CM	1010	1/23/12	\$62,169
31900050	OMNI GROVE PARK INN LLC	4	1009128	10000	18498	290 MACON AVE	ASHE	CM	1074	4/22/93	\$61,773
17845204	ARCADIA FARMS INC	4	1165138	10000	2185697	9 TRIDENT DR	ARDN	CM	1076	3/12/18	\$58,746
13845003	OMNI GROVE PARK INN LLC	8	1009108	10000	18498	29 N COUNTRY CLUB RD	ASHE	CM	1074	2/18/15	\$57,715
11459718	HULSING HOTELS	2	1010218	10000	2149407	380 HANSEL AVE	ASHE	CM	442	8/6/12	\$56,179
12642971	CHERRA NEVADA BREWING CO	2	101457	10000	20509			MN	823	7/16/14	\$54,987

Management Tool

Economic Optimization for Large Meter Testing Program

Master List

Testing Plan

Testing Data

Testing Outcomes

Dashboard

	Met	Account	Service	Customer	Address	City	Custom	Cycle	Meter Install D	Annual Consum	Testing Frequency (Y	Testing Status	Test Date
70264057	4	1010438	10000	2028157	220 DEAVERVIEW RD	ASHE	MN	1074	1/0/00	\$168,477	semi-annual	Tested Once	1/8/19
70144051	8	1414948	10000	2192553	155 JACOB HOLM WAY	CDLR	MN	638	8/1/05	\$151,414	semi-annual	Tested Once	3/20/19
31955073	6	1009848	10000	2028019	509 BILTMORE AVE	ASHE	HS	1074	1/0/00	\$139,837	semi-annual	Not Testable	
14845033	8	1010078	10000	2028069	240 MEADOW RD	ASHE	CM	1074	2015-05-14	\$127,688	annual	Not Tested	
28140183	6	1010648	10000	2155269	1301 SAND HILL RD	ASHE	MN	1074	2015-03-13	\$122,430	semi-annual	Not Tested	
28140179	6	1031768	10000	12859	91 CRAVEN ST	ASHE	CM	1074	2015-12-08	\$119,245	semi-annual	Not Tested	
31957408	3	1009258	10000	2027873	721 WEAVERVILLE RD	ASHE	WH	1074	1992-11-04	\$96,512	semi-annual	Not Testable	NO T
11958851	2	1414948	10000	2192553	155 JACOB HOLM WAY	CDLR	MN	638	8/15/12	\$90,855	semi-annual	Tested Once	3/20/19
31911534	6	1011928	10000	2028515	225 W STATE ST	BMTN	WH	1076	1993-05-06	\$88,006	annual	Tested Once	1/7/19
1426605	6	1009268	10000	2027875	721 OLD MARSHALL HWY	ASHE	CM	1074	2004-05-03	\$86,247	annual	Not Testable	
70240598	4	1009838	10000	2028017	428 BILTMORE AVE	ASHE	HS	1074	2011-02-28	\$81,774	semi-annual	Tested Once	2/26/19
11459732	2	1175118	10000	2130275	1617 HENDERSONVILLE RD	ASHE	RM	877	2012-08-01	\$80,234	semi-annual	Tested Once	1/9/19
70131941	4	1160758	10000	2123855	1250 SAND HILL RD	CDLR	MN	1074	2006-01-10	\$79,897	semi-annual	Not Testable	
12643064	2	101611	10000	2320267	200 KENSINGTON PL	ASHE	RM	1076	2015-02-02	\$79,879	semi-annual	Tested Once	1/9/19
11946034	2	1139038	10000	2287521	42 AIRPORT RD	ARDN	RM	822	5/16/12	\$78,169	semi-annual	Not Tested	
70252567	4	1010958	10000	2028287	25 OLD SHOALS RD	ASHE	MN	1076	2018-02-05	\$77,737	annual	Tested Once	3/19/19
12948582	6	1011338	10000	2028385	1025 HENDERSONVILLE RD	ASHE	WH	1076	2013-02-07	\$77,522	annual	Tested Once	3/21/19
12900219	6	1011948	10000	2028519	2913 US 70 HWY	BMTN	CM	1076	2012-03-08	\$77,501	annual	Not Testable	
13802356	6	1592708	10000	2027873	721 MOUNT CARMEL RD	ASHE	WH	1074	7/29/13	\$69,509	annual	Not Testable	
31955074	6	1011598	10000	2028447	1100 TUNNEL RD	ASHE	HS	1076	6/7/93	\$66,870	annual	Tested Once	3/28/19
12948581	6	1011198	10000	2028347	3 D WESLEY DR	ASHE	RM	1076	1/0/00	\$66,230	annual	Not Testable	
12962739	6	1010768	10000	29070	300 LONG SHOALS RD	ASHE	RM	1076	2012-05-06	\$64,522	annual	Tested Once	3/19/19
70247984	4	1166528	10000	2126767	1 QUALITY WAY	FLET	CM	1010	2012-01-23	\$62,169	annual	Not Testable	
31900050	4	1009128	10000	18498	290 MACON AVE	ASHE	CM	1074	1993-04-22	\$61,773	annual	Not Tested	
17845204	4	1165138	10000	2185697	9 TRIDENT DR	ARDN	CM	1076	2018-03-12	\$58,746	annual	Tested Once	4/1/19
13845003	8	1009108	10000	18498	29 N COUNTRY CLUB RD	ASHE	CM	1074	2015-02-18	\$57,715	2 years	Not Tested	
11459718	2	1010218	10000	2149407	380 HANSEL AVE	ASHE	CM	442	2012-08-06	\$56,179	semi-annual	Tested Once	12/12/18
12642971	2	101457	10000	20509		MILL	MN	823	2014-07-16	\$54,987	semi-annual	Tested Once	10/22/18
16172160	1.5	1168128	10000	2288047	9 TRIDENT DR	ARDN	CM	634	2016-08-11	\$52,125	annual	Tested Once	4/29/19

Management Tool

Economic Optimization for Large Meter Testing Program

Master List

Testing Plan

Testing Data

Testing Outcomes

Dashboard

Asheville Meter Testing Program: Data (enter white cells)								LOW 1					LOW 2			
serial #	customer	address	test date	Flow Profile Complete (AVL)	Analysis & Outcomes Complete (CAV)	Average Meter Accuracy	Preliminary Revenue Recovery	test rate (gpm)	meter volume (cf)	tester volume (cf)	tester accuracy (from TAG)	meter accuracy	test rate (gpm)	meter volume (cf)	tester volume (cf)	a
70244263	ADREL RIDGE PROPERTY OWNERS	0 SUGAR MAPLE DR	3/15/16	Yes	Yes	#DIV/0!	\$0					tbd				
12643052	INVOLVE MOUNTAIN VIEW	5000 DAVIS GREY DR	1/27/17	Yes	Yes	93.47%	\$1,334	34	10.2	10	100.60%	102.61%				
11946034	IM REALTY LLC	42 AIRPORT RD	9/7/17	Dismiss	n/a	101.95%	Tested Over	5	1	1	100.80%	100.80%	10	10.2	10	
16172160	CK'S PACKAGING INC	9 TRIDENT DR	9/22/17	Dismiss	n/a	101.25%	Tested Over	5	5.1	5	100.80%	102.82%	10	10	10	
12643064	ISC HOLDINGS INC	200 KENSINGTON PL	9/25/17	Dismiss	n/a	101.93%	Tested Over	5	5	5	100.80%	100.80%				
70281299	ISC HOLDINGS INC	200 KENSINGTON PL	9/25/17	No	n/a	101.35%	Tested Over	70	48.5	50	99.60%	96.61%				
70247984	CONTINENTAL TEVES	1 QUALITY WAY	9/27/17	Dismiss	n/a	99.68%	\$196	15	10.04	10	100.20%	100.60%				
70248717	HYPRO ASHEVILLE INC	100 VISTA BLVD	9/28/17	No	n/a	99.20%	\$57	10	14.96	15	100.20%	99.93%				
10961006	MOUNTAIN HOUSING OPP	372 DEPOT ST	11/3/17	No	n/a	101.25%	Tested Over	1	1	1	100.60%	100.60%	10	10.2	10	
70084385	UPM RAFLATAC INC	400 BROADPOINTE DR	11/3/17	Dismiss	n/a	98.31%	\$237	5	5.14	5	100.80%	103.62%				
70002760	CIMARRON HOMEOWNER'S ASSOC	100 CIMARRON DR	11/9/17	No	n/a	101.59%	Tested Over	5	9.9	10	100.80%	99.79%				
12948581	GIVENS ESTATE	3 D WESLEY DR	11/9/17	Yes	Yes	52.09%	\$31,733	25	0	10	101.20%	0.00%				
1426605	CRAGGY CORRECTIONAL CENTER NC	721 OLD MARSHALL HWY	11/14/17	Dismiss	n/a	101.75%	Tested Over	1	2	2	101.00%	101.00%	5	10	10	
70175645	BEAVERDAM RUN CONDO ASSOC	54 CLUBSIDE DR	11/14/17	No	n/a	99.57%	\$97	1	0.95	1	100.60%	95.57%	5	10	10	
70298235	36 ANSLEY AT ROBERTS LAKE LLC	120 ROBERTS LAKE CIR	11/16/17	No	n/a	98.43%	\$25	1	1	1	100.70%	100.70%	10	4.9	5	
70084465	MINENT CAPITAL LLC	890 BREVARD RD	11/16/17	Dismiss	n/a	99.25%	\$133	1	1	1	100.70%	100.70%				
31931267	FLETCHER HOSPITALITY	550 NEW AIRPORT RD	11/17/17	No	n/a	101.42%	Tested Over	1	0.96	1	100.80%	96.77%				
11459398	DEERWOOD HOMEOWNER INC	1 CLUBWOOD CT	11/17/17	Dismiss	n/a	99.81%	\$37	1	1	1	100.60%	100.60%	5	4.9	5	
70190776	INGLES GAS EXPRESS/CAR	1869 HENDERSONVILLE RD	11/17/17	Dismiss	n/a	99.79%	\$37	1	0.99	1	100.70%	99.69%				
70149388	HOMWOOD SUITES HOTEL	88 TUNNEL RD	11/22/17	No	n/a	100.95%	Tested Over	1	1	1	100.70%	100.70%				
31977266	SOUTH ASHEVILLE HOTEL ASSOC	204 TUNNEL RD	11/27/17	No	n/a	98.91%	\$209	1	0.91	1	100.60%	91.55%				
70167558	LATEL INC	42 TUNNEL RD	12/4/17	No	n/a	100.50%	Tested Over	1	0.95	1	100.70%	95.67%				
70182574	CCC VERDE VISTA LLC	1 VERDE VISTA CIR	12/4/17	Dismiss	n/a	102.46%	Tested Over	1	1	1	100.60%	100.60%				
70240598	ST JOSEPH HOSPITAL LAUNDRY	428 BILTMORE AVE	12/4/17	Dismiss	n/a	97.05%	\$2,414	1	0.93	1	100.60%	93.56%				
11459722	ASIANA GRAND BUFFET	1968 HENDERSONVILLE RD	12/6/17	No	n/a	101.30%	Tested Over	1	1	1	100.60%	100.60%				
70177730	HAMPTON INN	1 ROCKY RIDGE RD	12/6/17	No	n/a	98.91%	\$218	1	0.94	1	100.70%	94.66%				
13840114	MARCADIA FARMS INC	9 TRIDENT DR	12/7/17	No	n/a	101.63%	Tested Over	5	5.2	5	100.80%	104.83%	10	12.8	13	
11958850	WINTERBURY HOMEOWNERS ASSOC	1000 VISTA LAKE DR	12/7/17	Yes	Yes	88.08%	\$4,818	1	0.5	1	100.60%	50.30%				

Management Tool

Economic Optimization for Large Meter Testing Program

Master List

Testing Plan

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Dashboard

Serial #	Customer	Address	Revenue	Final Composite Avg.	Potential Revenue Recovery	Cost of Action	Simple Payback	Action Required	Annualized Revenue Recovery
28140014	BATTERY PARK SENIOR HOUSING	1 BATTLE SQ	\$709	97.5%	\$18	\$1,700	95.9	NO ACTION	\$0
1245335	GSA FINANCE DIV UTILITIES	208 OTIS ST	\$302	92.6%	\$22	\$1,700	76.1	NO ACTION	\$0
70144051	JACOB HOLM INDUSTRIES AMERICA	155 JACOB HOLM WAY	\$151,414	99.7%	\$454	\$1,700	3.7	NO ACTION	\$0
50120058	WINDSOR CAPITAL GROUP INC	31 WOODFIN ST	\$2,748	95.0%	\$137	\$1,700	12.4	NO ACTION	\$0
70246499	SOUTHERN CONCRETE MATERIAL	240 MEADOW RD	\$1,383	88.3%	\$162	\$1,700	10.5	NO ACTION	\$0
70246500	OMNI GROVE PARK INN LLC	29 N CHARLOTTE ST	\$279	87.4%	\$35	\$1,700	48.4	NO ACTION	\$0
70129221	COURTSIDE CONDOS	200 RACQUET CLUB RD	\$-	92.6%	#VALUE!	\$1,700		NO ACTION	\$0
70149383	MILKCO INC	599 DEAVERVIEW RD	\$841	97.4%	\$22	\$1,700	77.7	NO ACTION	\$0
70002762	WARREN WILSON COLLEGE	123 LOWER COLLEGE RD	\$-	94.5%	#VALUE!	\$1,700		NO ACTION	\$0
11459647	THE LAURELS OF GREENTREE RIDGE	70 SWEETEN CREEK RD	\$12,228	96.1%	\$481	\$1,700	3.5	NO ACTION	\$0
31960547	GOLDELM AT ASHEVILLE LLC	1680 HENDERSONVILLE RD	\$26,299	94.0%	\$1,578	\$1,700	1.1	REPLACE	\$1,578
13945523	CARMEL RIDGE APARTMENTS	2 CARMEL RIDGE CIR	\$18,170	95.0%	\$909	\$1,700	1.9	REPLACE	\$909
70175645	BEAVERDAM RUN CONDO ASSOC	54 CLUBSIDE DR	\$22,679	90.0%	\$2,268	\$1,700	0.7	REPLACE	\$2,268
12948581	GIVENS ESTATE	3 D WESLEY DR	\$66,230	79.0%	\$13,908	\$1,700	0.1	REPLACE	\$13,908
31977266	SOUTH ASHEVILLE HOTEL ASSOC	204 TUNNEL RD	\$19,244	93.0%	\$1,347	\$1,500	1.1	REPLACE	\$1,347
11958850	MONTECITO NORTHVIEW LLC	1000 VISTA LAKE DR	\$40,402	99.3%	\$283	\$500	1.8	REPLACE	\$283
31955073	MISSION HOSPITAL	509 BILTMORE AVE	\$139,837	90.0%	\$13,984	\$7,500	0.5	REPLACE	\$13,984
11459628	RCG SKYLAND LLC	30 ALLEN AVE	\$10,939	65.0%	\$3,829	\$500	0.1	REPLACE	\$3,829
28140179	NEW BELGIUM BREWING CO.	91 CRAVEN ST	\$119,245	96.8%	\$3,816	\$1,700	0.4	REPLACE	\$3,816
70189808	ASHEVILLE HOUSING AUTH	50 WILBAR AVE	\$14,796	99.0%	\$148	\$250	1.7	REPLACE	\$148
70218343	SUMMIT HOTEL TRS 123 LLC	151 HAYWOOD ST	\$14,063	86.6%	\$1,884	\$1,500	0.8	REPLACE	\$1,884
31940283	LAUREL OF ASHEWOOD MANOR	100 RICEVILLE RD	\$513	92.7%	\$37	\$500	13.4	NO ACTION	\$0
16172159	M REALTY LLC	160 BRADLEY BRANCH RD	\$17,298	20.2%	\$13,811	\$1,700	0.1	REPLACE	\$13,811
31960547	GOLDELM AT ASHEVILLE LLC	1680 HENDERSONVILLE RD	\$26,299	94.0%	\$1,578	\$1,700	1.1	REPLACE	\$1,578
70296188	THE AVALON APARTMENTS	10 AVALON DR	\$102	93.8%	\$6	\$1,700	266.7	NO ACTION	\$0
16172160	C K S PACKAGING INC	9 TRIDENT DR	\$52,125	99%	\$521	\$1,700	3.3	NO ACTION	\$0
11459580	60 N. MARKET CONDO	60 N MARKET ST	\$5,067	99%	\$51	\$1,700	33.6	NO ACTION	\$0

Management Tool

Economic Optimization for Large Meter Testing Program

Master List

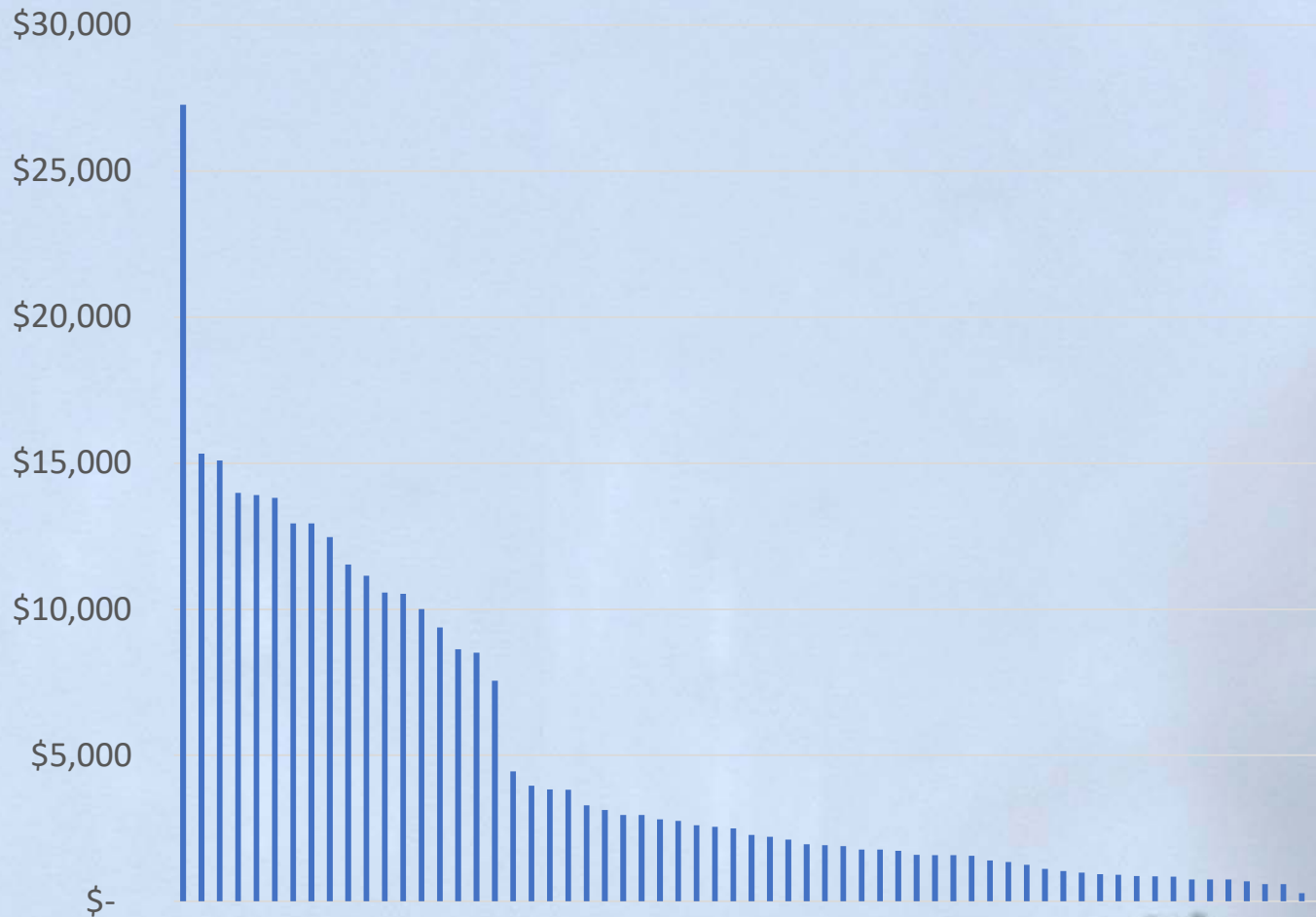
Testing Plan

Testing Data

Testing Outcomes

Dashboard

Annualized Revenue Recovery



Management Tool

Economic Optimization for Large Meter Testing Program

[Master List](#)[Testing Plan](#)[Testing Data](#)[Testing Outcomes](#)[Dashboard](#)

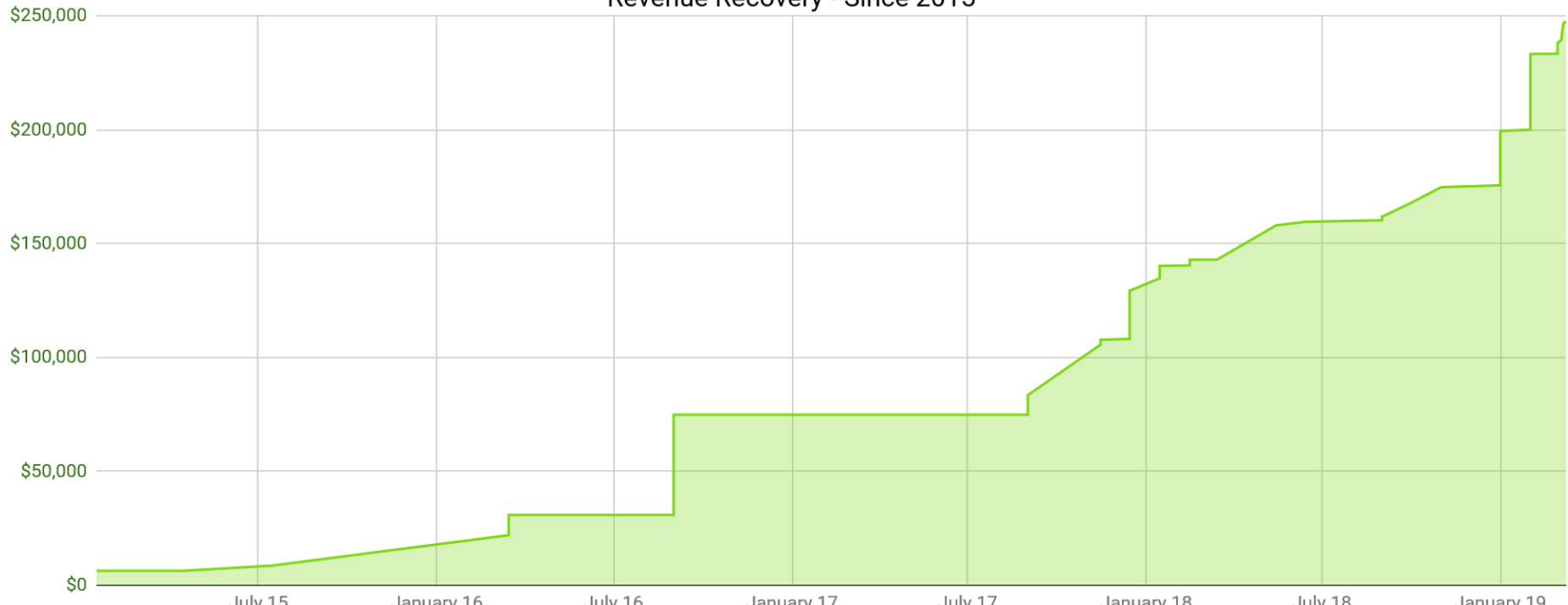
City of Asheville Large Meter Testing Program



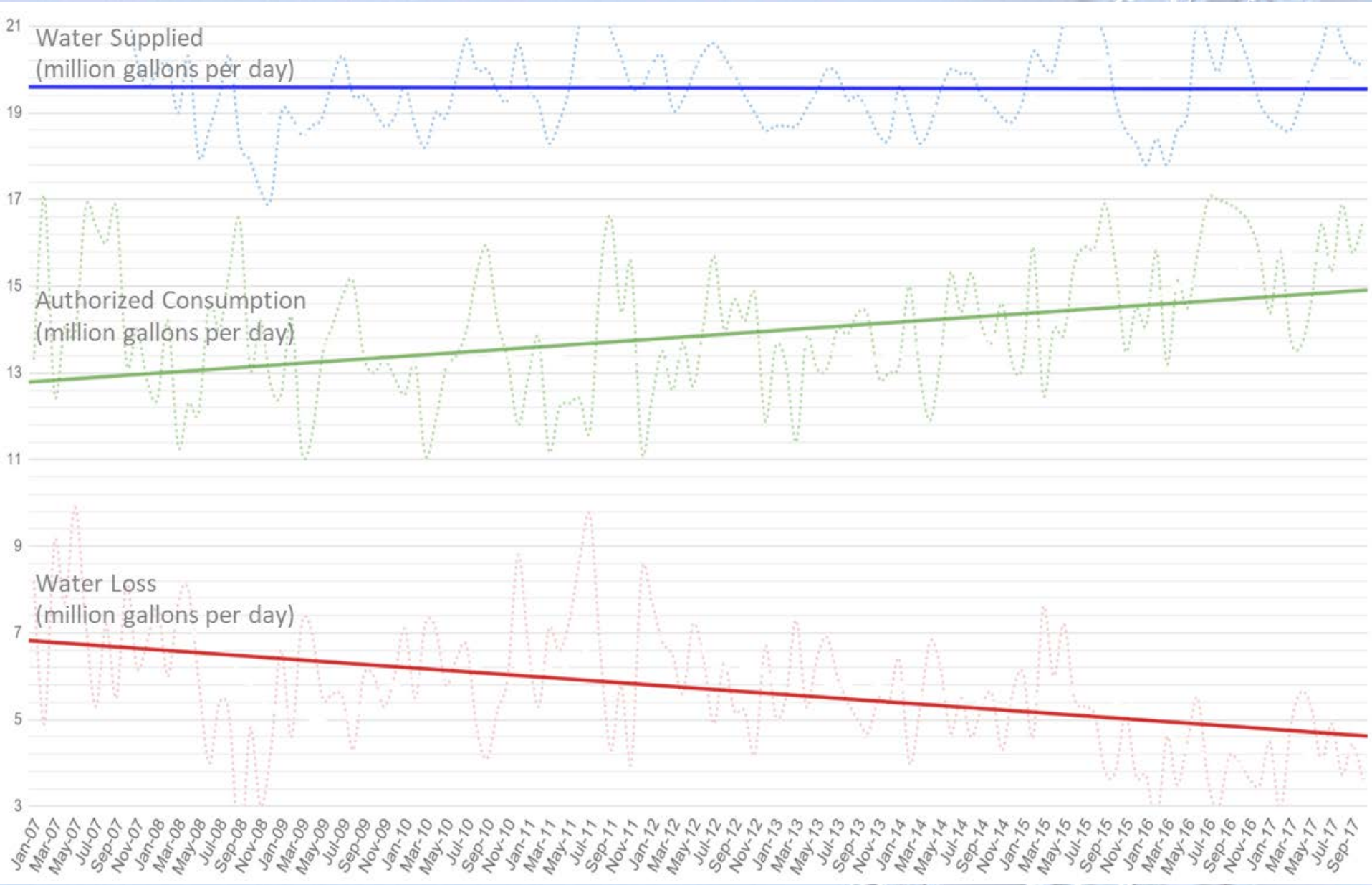
	2019
Total meters to test this year	146
Target year to date	103
Meters tested year to date	48
Percent of target year to date	47%

	Since 2015
Meters identified for remedy	63
Revenue recovery to date	\$247,503

Revenue Recovery - Since 2015

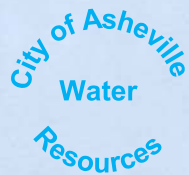


Cost-Effective Sustainability



Frank Talk

- It takes a village
- It takes time
- Visible tracking is essential
- Revenue-driven intervention



ISO 14001 REGISTERED





**American
Water Works
Association**



NORTH AMERICAN WATER LOSS 2019

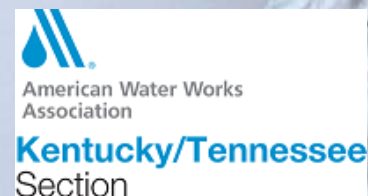
NASHVILLE, TENNESSEE
DECEMBER 3-5

Registration is Open!
www.awwa.org/waterloss

With Support From:



Local Host:





WSI 2019

Asheville Takes Commercial Meter Testing Program to Next Level for Real Payback



Relevant Roles:

Chair, AWWA Water Loss Software Subcommittee

Chair, North American Water Loss Conference

IWA Water Loss Specialist Group, Management Committee

Director of Water Efficiency, Cavanaugh

Will Jernigan, P.E.

will.jernigan@cavanaugholutions.com

CAVANAUGH

Stewardship Through Innovation

