

STATE OF NORTH CAROLINA  
UTILITIES COMMISSION  
RALEIGH

DOCKET NO. W-218, SUB 526

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

IN THE MATTER OF  
APPLICATION BY AQUA NORTH CAROLINA, INC.,  
202 MACKENAN COURT, CARY, NORTH CAROLINA 27511  
FOR AUTHORITY TO ADJUST AND INCREASE RATES FOR WATER  
AND SEWER UTILITY SERVICE IN ALL SERVICE AREAS IN  
NORTH CAROLINA

PREFILED REBUTTAL TESTIMONY OF  
**JOSEPH PEARCE AND GEORGE KUNKEL**  
ON BEHALF OF  
AQUA NORTH CAROLINA, INC.

June 12, 2020

1 **Q. MR. PEARCE, PLEASE STATE FOR THE RECORD YOUR NAME,**  
2 **BUSINESS ADDRESS, AND PRESENT POSITION.**

3 A. My name is Joseph Pearce and my business address is 202 MacKenan  
4 Court, Cary, North Carolina. I am the Director of Operations for Aqua North  
5 Carolina, Inc. ("Aqua" or "Company").

6 **Q. MR. PEARCE, BRIEFLY STATE YOUR QUALIFICATIONS AND**  
7 **EXPERIENCE RELATING TO WATER AND WASTEWATER**  
8 **OPERATIONS.**

9 A. I am a Professional Engineer and have more than 30 years' experience in  
10 water and wastewater treatment. Additionally, I have multiple operator  
11 certifications including Grade 4 wastewater treatment operator, Grade 3  
12 collection system operator, Grade B well operator. My experience includes  
13 work with the North Carolina Department of Environment and Natural  
14 Resources and its predecessor agencies (in a wide-range of engineering  
15 and regulatory sections), work as the Utility Division Manager and Deputy  
16 Director of Engineering and Environmental Services for Durham County,  
17 and as the Public Utilities Director for Elizabeth City, North Carolina. My  
18 experience includes work with both small decentralized facilities and larger  
19 centralized water and wastewater facilities (up to 12,000,000 gallons per  
20 day).

21 **Q. MR. PEARCE, HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN**  
22 **THIS CASE?**

1 A. Yes, I filed Direct Testimony addressing water loss with the Company's  
2 Application, on December 31, 2019.

3 **Q. MR. KUNKEL, PLEASE STATE FOR THE RECORD YOUR NAME,**  
4 **BUSINESS ADDRESS, AND PRESENT POSITION.**

5 A. My name is George Kunkel and my business address is 30 Clark Road,  
6 Hershey, Pennsylvania. I am Principal of Kunkel Water Efficiency  
7 Consulting ("Consultant").

8 **Q. MR. KUNKEL, BRIEFLY STATE YOUR QUALIFICATIONS AND**  
9 **EXPERIENCE RELATING TO WATER OPERATIONS.**

10 A. I am a Professional Engineer and have 40 years' experience in water utility  
11 operations, specifically in water distribution systems and water loss control.  
12 Additionally, I am a registered professional engineer in the States of  
13 Pennsylvania and Delaware, a Class A certified water system operator in  
14 Pennsylvania, and a Public Services Institute Instructor for the  
15 Pennsylvania Department of Environmental Protection. My experience  
16 includes 35 years working for the Philadelphia Water Department, where I  
17 led its successful water loss control program for 25 years. My experience  
18 also includes five (5) years as an independent consultant working directly  
19 with water utilities, large and small, to compile American Water Works  
20 Association ("AWWA") standard water audits and assist them in their water  
21 loss control efforts. I have also participated in numerous research projects,  
22 serve as an instructor for several programs, and serve as an expert witness.  
23 I am an active volunteer with the AWWA and have had leadership

1 involvement with almost all its major publications, reports, and software  
2 regarding water audits and loss control programs over the past 25 years.  
3 Finally, I am the chair of the Technical Review Board for AWWA Manual  
4 M36 Water Audits and Loss Control Programs, Fourth Edition, and am an  
5 expert in "Water Loss Control."

6 **Q. WHAT ISSUES DO YOU ADDRESS IN YOUR REBUTTAL TESTIMONY?**

7 A. We rebut the testimony of Public Staff witness Darden regarding  
8 Appropriate Water Loss Standard.

9 **Q. MR. PEARCE, WHAT IS AQUA'S POSITION CONCERNING THE**  
10 **PROPER LEVEL OF WATER LOSS STANDARD TO BE EMPLOYED**  
11 **FOR OPERATIONAL AND REGULATORY REVIEW PURPOSES?**

12 A. Aqua's position is that water loss should be evaluated using the AWWA's  
13 water loss method, and that Aqua should prioritize water loss reduction  
14 efforts based upon the site-specific key indicators, such as water loss per  
15 connection and water loss per mile of pipe. I, along with my fellow operators  
16 at Aqua, are trying to limit water loss and at the same time recognize there  
17 are costs involved in that endeavor. While the Public Staff suggested  
18 standard and accompanied adjustment may be minor in the big picture, I do  
19 not believe it is appropriate.

20 **Q. HAVE EACH OF YOU REVIEWED THE TESTIMONY OF WITNESS**  
21 **DARDEN WITH REGARD TO THE WATER LOSS STANDARD AND, IF**  
22 **SO, DO YOU AGREE WITH HER RECOMMENDATIONS?**

1 A. Yes, we have reviewed the testimony and do not agree with witness  
2 Darden's recommendations.

3 **Q. WHY ARE YOU PROVIDING JOINT TESTIMONY?**

4 A. Witness Pearce is a seasoned utility professional with extensive experience  
5 on leak detection, leak repair, and water loss reduction projects; however,  
6 he is not an expert regarding the AWWA standard. To ensure that the  
7 Commission has the best possible information, witness Kunkel will provide  
8 expert rebuttal regarding the AWWA standards and his findings regarding  
9 the Chapel Ridge (Town of Pittsboro purchased water) water audit.

10 **Q. MR. PEARCE, WHAT IS THE BASIS FOR YOUR DISAGREEMENT WITH**  
11 **WITNESS DARDEN'S POSITION ON WATER LOSS?**

12 A. Aqua opposes witness Darden's recommendation for the continued use of  
13 the 15% gross purchased water loss standard that was allowed in Aqua's  
14 last Rate Case Order under Docket No. W-218, Sub 497. The 15% cap  
15 "incentivizes" a utility to potentially spend more capital or expense dollars  
16 to address purchased water loss issues than the cost of the water itself.  
17 Aqua---in the exercise of sound, professional, operational judgment---is  
18 currently using a more appropriate standard (AWWA Water Audit method  
19 that includes performance indicators) to help make prudent decisions as to  
20 which projects to pursue for investment in water loss reduction.

21 **Q. MR. PEARCE, WHAT IS WITNESS DARDEN'S RECOMMENDED LEVEL**  
22 **OF WATER LOSS ADJUSTMENT?**

1 A. Per Line 7 on Page 30 of witness Darden's testimony, she makes a  
2 recommendation to reduce Aqua's recovery of its requested purchased  
3 water costs from \$1,850,078 to \$1,787,711. The difference is \$62,367 per  
4 year.

5 **Q. MR. PEARCE, USING WITNESS DARDEN'S WATER LOSS**  
6 **ADJUSTMENTS, DOES ONE PROVIDER DOMINATE THE**  
7 **REDUCTION?**

8 A. Yes. Witness Darden recommends that Aqua's purchased water actual  
9 expense from the Town of Pittsboro be reduced by approximately \$37,500.  
10 Sixty percent (60%) of the penalty for all water loss is for water purchased  
11 from the Town of Pittsboro.

12 **Q. MR. PEARCE, FOR WHICH WATER SYSTEM DOES AQUA PURCHASE**  
13 **WATER FROM THE TOWN OF PITTSBORO?**

14 A. Aqua purchases water from the Town of Pittsboro to serve only the Chapel  
15 Ridge water system.

16 **Q. MR. PEARCE, HOW MUCH HAS THE COMPANY SPENT TRYING TO**  
17 **COME INTO COMPLIANCE WITH THE PUBLIC STAFF'S**  
18 **RECOMMENDED STANDARD?**

19 A. It is over \$135,000. The details are discussed below.

20 **Q. MR. PEARCE, DURING AND AFTER THE TEST PERIOD, HAS AQUA**  
21 **COMPLETED SIGNIFICANT WATER LEAK REDUCTION WORK IN THE**  
22 **CHAPEL RIDGE SYSTEM?**

1 A. Yes. Aqua has taken a two-pronged approach to reduce water loss in  
2 Chapel Ridge. The first prong was to professionally assess the system for  
3 leaks. The second prong was to install a monitoring system which could  
4 provide rapid reporting for potential breaks or abnormal water usage events.

5 **Q. MR. PEARCE, PLEASE ELABORATE ON THE PROFESSIONAL**  
6 **SYSTEM LEAK ASSESSMENT.**

7 A. Aqua contracted a water loss reduction firm to complete acoustic leak  
8 detection for the entire Chapel Ridge water system. Five (5) leaks in the  
9 distribution system which totaled an estimated 2.35 gallons per minute were  
10 found and repaired. Twenty-four (24) additional small leaks were  
11 discovered on the customers' side of their meters. These customer leaks  
12 were so small that they were not registering on the water meters.  
13 Customers were notified of their leaks. It must be noted that several of  
14 these customer leaks were from irrigation back flow assemblies, which  
15 inherently "spritz and dribble." A summary table of the leak assessment  
16 findings is provided as *Pearce Kunkel Rebuttal Exhibit 1 – Chapel Ridge*  
17 *Leak Detection Summary*.

18 **Q. MR. PEARCE, PLEASE ELABORATE ON THE MONITORING SYSTEM.**

19 A. A District Metering Area ("DMA") system is being pilot tested in the Chapel  
20 Ridge system. The DMA system divided the Chapel Ridge system into five  
21 (5) sub-areas. Each sub-area is continuously monitored and data-logged  
22 for flow at the connection points of the sub-areas to determine atypical flow  
23 in the sub-area. If atypical flow occurs, it allows for early detection and

1 repair. This pilot test is to determine the efficacy of this method of early leak  
2 detection.

3 **Q. MR. PEARCE, IS THERE ANYTHING ELSE THAT CAN BE**  
4 **REASONABLY DONE TO REDUCE WATER LEAKAGE IN CHAPEL**  
5 **RIDGE?**

6 A. Aqua has cautiously reduced the operating pressure in the system by  
7 lowering the water level maintained in the water tank; however, there is risk  
8 of causing supply issues during irrigation periods in the system. Aqua will  
9 continue to evaluate whether the operating pressure can be further reduced.  
10 The only other option which is readily available is the installation of higher  
11 accuracy water (ultrasonic) water meters in the Chapel Ridge system. Aqua  
12 has some concerns about the prudence of this option due to the ability to  
13 tamper with these meters and meter battery life. We have effectively  
14 exhausted our options for leak reduction in the Chapel Ridge system.

15 **Q. MR. PEARCE, PLEASE COMMENT ON FIRE DEPARTMENT FLUSHING**  
16 **DURING HYDRANT TESTING?**

17 A. In Chapel Ridge, the Fire Department periodically flushes and tests the  
18 hydrants. During the rate case test period, the Fire Department flushed  
19 62,000 gallons of water. The value of this water is \$848 at the purchased  
20 water rate of \$13.67 per one thousand gallons. The use of this water for  
21 this purpose is authorized and unbilled. The Fire Department is currently  
22 not funded to pay for this water. If the water loss penalty remains, then the  
23 value of water used for Fire Department flushing and testing should be



1 removed from the calculation, or Aqua should be authorized to assess  
2 charges to Fire Departments who use Aqua's water systems.

3 **Q. MR. PEARCE, WHAT IS YOUR OPINION ON THE 15% STANDARD**  
4 **RECOMMENDED BY WITNESS DARDEN BEING APPLIED TO EVERY**  
5 **PURCHASED WATER SYSTEM?**

6 A. I disagree with this standard. This standard ignores the proactive measures  
7 the Company continues to make to address water loss. It is imposed  
8 without regard to Aqua's active pursuit of water loss measures, the costs  
9 involved in those efforts, and with a lack of evidence of improper operation  
10 or management.

11 **Q. MR. KUNKEL, WHAT ISSUES DO YOU ADDRESS IN YOUR REBUTTAL**  
12 **TESTIMONY?**

13 A. I rebut the testimony of Public Staff witness Darden regarding the  
14 Commission's use of the volumetric percentage performance indicator as  
15 an appropriate type of performance indicator to employ in setting a water  
16 loss standard.

17 **Q. MR. KUNKEL, HAVE YOU REVIEWED THE TESTIMONY OF WITNESS**  
18 **DARDEN IN THIS CASE, AND DO YOU AGREE WITH HER**  
19 **RECOMMENDATIONS?**

20 A. I have reviewed the testimony and do not agree with witness Darden's  
21 recommendations.

22 **Q. MR. KUNKEL, WHAT IS THE BASIS FOR YOUR DISAGREEMENT?**

1 A. In applying a volumetric percentage performance indicator, with a target of  
2 15% as a water loss standard, witness Darden employs a method that is  
3 characterized by the AWWA – the nation’s leading water utility standard-  
4 setting organization – to be imprecise and inappropriate for reliably  
5 assessing non-revenue water levels in drinking water utilities. It is  
6 inappropriate for the Commission to employ a volumetric percentage  
7 performance indicator – classifying a level of 15%, or any other percentage  
8 level – as an appropriate water loss standard. AWWA provides a best-  
9 practice method for drinking water utilities to reliably quantify their level of  
10 non-revenue water and identify achievable and cost-effective non-revenue  
11 water reduction goals.

12 **Q. MR. KUNKEL, HOW DOES WITNESS DARDEN JUSTIFY HER**  
13 **POSITION?**

14 A. Witness Darden testimony states that “The Public Staff asserts that the  
15 appropriate standard of water loss for use in this proceeding is 15%. This  
16 level is consistent with the AWWA’s recommendation that action should be  
17 taken when water loss is 15%.” However, the latter sentence is factually  
18 incorrect. AWWA specifically recommends *against* the use of percentage  
19 indicators of any kind in water loss assessments. Additionally, AWWA does  
20 not support any percentage level of “allowable water loss” because it does  
21 not recognize the use of percentage indicators as valid.<sup>1</sup>

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<sup>1</sup> Jernigan, W, G. Kunkel, G. Trachtman, A. Wyatt, 2020. AWWA Water Loss Control Committee Report: Key Performance Indicators for Non-revenue Water – AWWA’s 2020 Position. *Journal AWWA*, 112 (1): 20.

1 The standard for the Commission to render technically sound and objective  
2 decisions must be a reliable one. Unfortunately, the standard previously  
3 allowed by the Commission does not reliably represent water utility  
4 non-revenue water levels and can result – in some cases – in water utilities  
5 spending money to enact water loss reductions that may never be reflected  
6 by an appropriate change in the percentage performance indicator value.

7 **Q. MR. KUNKEL, WHY DOES THE AMERICAN WATER WORKS**  
8 **ASSOCIATION REGARD VOLUMETRIC PERCENTAGE**  
9 **PERFORMANCE INDICATORS – SUCH AS THE PERCENTAGE USED**  
10 **ON AQUA’S PURCHASED WATER SYSTEMS – TO BE UNRELIABLE?**

11 A. Multiple reasons exist. First, volumetric percentages are unduly influenced  
12 and skewed by changing volumes of customer consumption such as the  
13 shutdown of a large water using customer. In such a case, the percentage  
14 may increase in the next year even if water losses decline. In this way, the  
15 percentage is heavily influenced by a parameter (total customer  
16 consumption) outside of the parameter that it attempts to measure, i.e.,  
17 water loss volumes, making it highly unreliable. Next, AWWA defines  
18 non-revenue water (“NRW”) as the difference between the annual volume  
19 of water supplied into the water distribution system, and the annual volume  
20 of total customer consumption. NRW is then broken into three components:  
21 Unbilled Authorized Consumption (unbilled water authorized by the utility  
22 and not a water loss), Apparent Losses (non-physical losses of under-billing  
23 due to measurement or billing error and theft of service), and Real Losses

(leakage and unintended storage tank overflows). The occurrence and impact of apparent losses and real losses are notably different – as are their cost impacts – and, thus, different control strategies are needed to quantify and control each type of loss. Attempting to use a single volumetric percentage - which hides the volumes of apparent losses and real losses – does not provide water utilities an ability to directly address specific losses. Because of this, percentage indicators are not “actionable” for water loss control; a confirmed reduction in a utility’s apparent or real losses may or may not move the percentage in an appropriate way. Finally, it is essential in NRW management to know the cost impact of apparent losses (valued at the customer retail charge) and real losses (usually valued at the variable production or purchased water cost). The volumetric percentage reveals nothing about cost impacts of losses and therefore places water utilities at the great disadvantage of being pressed to undertake loss control actions without the cost-effectiveness of such actions being linked to the water loss standard employed by the Commission.

**Q. MR. KUNKEL, DOES AWWA PROVIDE A MEANS OF SETTING UTILITY WATER LOSS STANDARDS THAT ARE SUPERIOR TO THE USE OF VOLUMETRIC PERFORMANCE INDICATORS?**

**A.** Yes, this is a best practice approach that was first published by AWWA in 2003 – followed by many subsequent publications and free water audit software – and is now utilized in several US states - most prominently in Georgia and California.

1 **Q. MR. KUNKEL, DOES AQUA NORTH CAROLINA PROPOSE AN**  
2 **ALTERNATIVE APPROACH IN QUANTIFYING NON-REVENUE WATER**  
3 **LEVELS FOR USE AS A STANDARD IN ITS WATER SYSTEMS?**

4 A. Yes, the water audit method and performance indicators embodied in the  
5 AWWA M36 manual publication *Water Audits and Loss Control Programs*  
6 (4<sup>th</sup> edition, 2016) and the AWWA Free Water Audit Software (version 5.0,  
7 2014) define this approach and provide a software tool to compile the  
8 AWWA water audit.

9 **Q. MR. KUNKEL, WHAT ARE THE KEY ELEMENTS OF THE**  
10 **ALTERNATIVE APPROACH USING THE AWWA WATER AUDIT**  
11 **METHDOLOGY AND PERFORMANCE INDICATORS AND HOW DO**  
12 **THEY QUANTIFY WATER LOSS LEVELS AND COST IMPACTS IN A**  
13 **WAY THAT COULD BETTER EMPOWER THE COMMISSION IN**  
14 **RENDERING FAIR AND OBJECTIVE DECISIONS ON WATER RATES?**

15 A. The AWWA Water Audit method is rational in assigning quantities to all  
16 components of water supply, customer consumption, and losses - apparent  
17 and real. Because quantities are input for all components, all water is  
18 “accounted-for” and no water is “unaccounted-for.” It is recognized that  
19 some components are quantified in a robust manner while others are often  
20 derived from estimates. The AWWA Free Water Audit Software features a  
21 data grading capability that allows the auditor to assign a grading – or rating  
22 of data integrity – to each component. The grading is a number from 1-10,  
23 with 1 being low validity (rough estimate) and 10 being high validity (robust

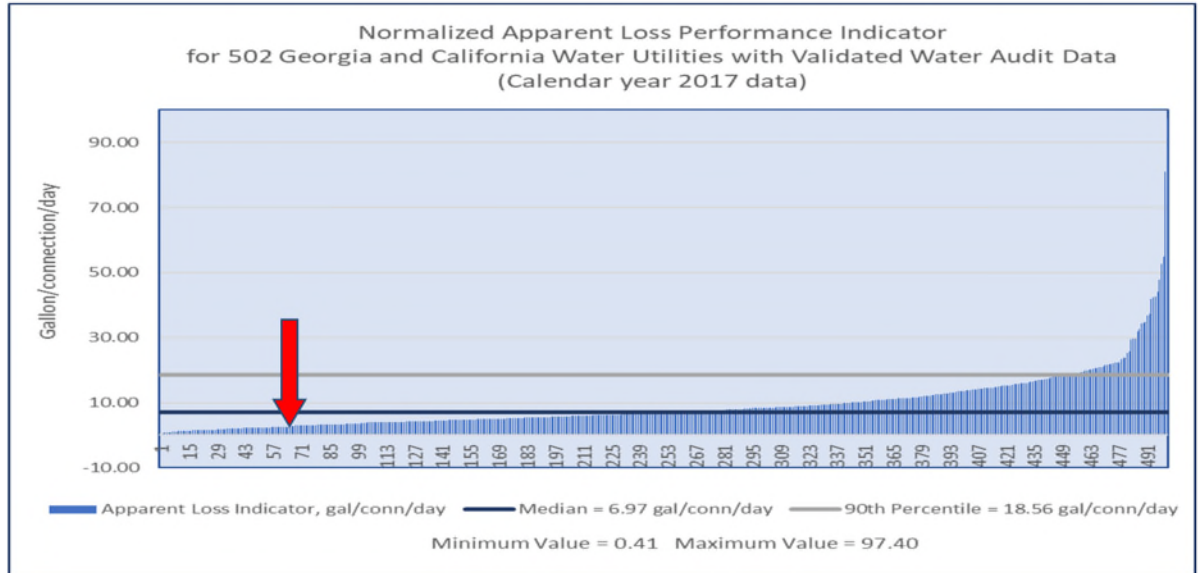
1 number from well-maintained measuring and monitoring structures). The  
2 gradings are used to calculate the Data Validity Score ("DVS"), with an  
3 upper range of 100, that reflects the validity of the water audit. The gradings  
4 and DVS give a rating of the trustworthiness of the water audit data and the  
5 DVS can serve as a performance indicator.

6 In addition to water volumes, the auditor inputs data on water system  
7 characteristics and costs. All of this data is used to calculate a series of  
8 performance indicators, which reflect losses and loss rates for apparent  
9 losses and real losses. Having multiple indicators that represent apparent  
10 and real losses in detail is a robust means of assessing water efficiency,  
11 while a single imprecise volumetric percentage is incapable of providing this  
12 insight. On a general level, the AWWA Water Audit method stresses that  
13 water utilities focus on Volume of losses (apparent and real), the Value (or  
14 cost impacts of annual loss volumes), and Validity (as represented by the  
15 Data Validity Score).

16 The AWWA Free Water Audit Software calculates loss volumes, costs of  
17 losses, and the performance indicators. Collectively, these parameters give  
18 a highly reliable way to quantify non-revenue water and serve as the basis  
19 to set a cost-effective loss control strategy. The most useful AWWA  
20 performance indicators representing losses calculate a normalized unit rate  
21 of loss by dividing the annual loss volume by the number of customer  
22 service connections in the system and placing it on a daily basis to give  
23 units of gallons per service connection per day. One indicator in this form

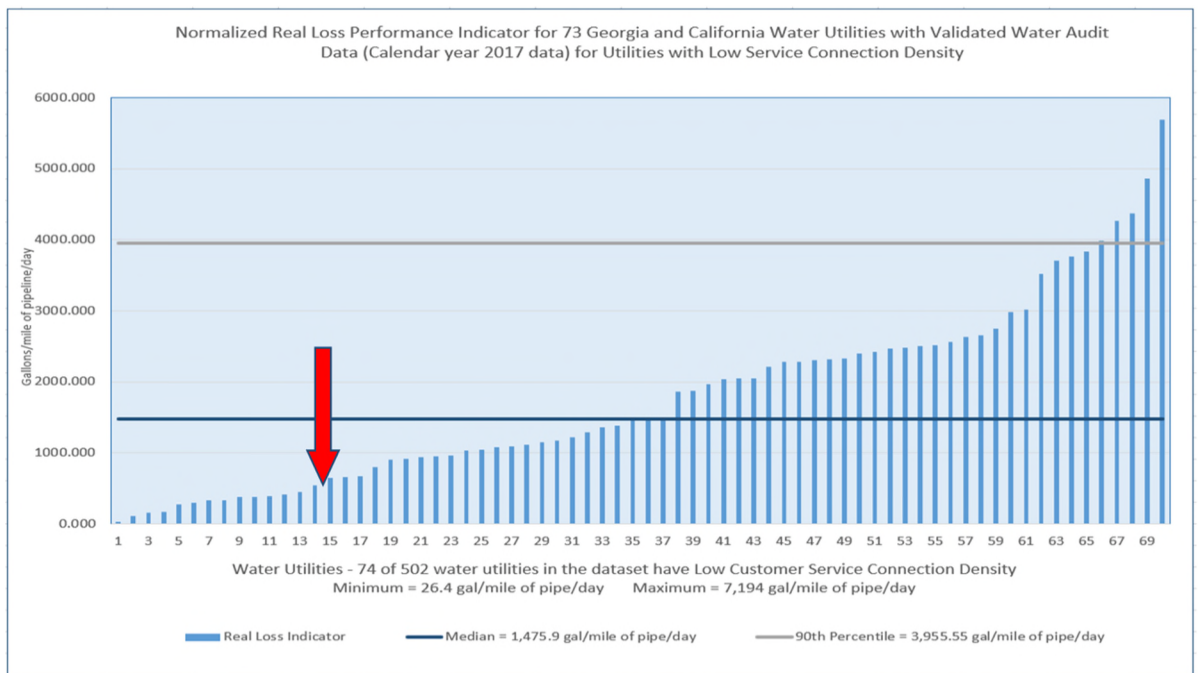
1 exists for apparent losses and one for real (leakage) losses. Additionally,  
2 for distribution systems with a low density of customer service connections  
3 per mile of system pipeline, an expression of unit leakage losses exists in  
4 the units of gallons/mile of pipeline/day.

5 As multiple US state and regional regulatory agencies have begun to  
6 employ the AWWA Water Audit method, a growing body of water audit data  
7 has emerged. California and Georgia are the largest programs in terms of  
8 data collection, but also in that the data is carefully reviewed in a data  
9 validation process that provides for data quality control of the water audits  
10 submitted by the water utilities. The data from these two states stands out  
11 as the most reliable to date. In 2019, I conducted a detailed validation of  
12 the AWWA water audit for Aqua North Carolina's Chapel Ridge water  
13 system supplied from the Town of Pittsboro. In figures 1 and 2 the  
14 normalized unit rates of apparent and real losses, respectively, are shown  
15 for this system, and its value is placed in a chart of the same parameter with  
16 over 500 validated water audits from California and Georgia.



**Figure 1 Comparison of Aqua NC Chapel Ridge Water System with the GA/CA Dataset**

**Normalized Apparent Losses: Chapel Ridge value of 4.64 gal/conn/day shown by red arrow**



**Figure 2 Comparison of Aqua NC Chapel Ridge Water System with the GA/CA Dataset**

**Real (Leakage) Losses – Normalized Real Losses for Low Service Connection Density Systems Chapel Ridge value of 584.21 gal/mile of pipeline/day shown by red arrow**



1 As shown in these figures, the unit rates of apparent losses and real losses  
2 compare to systems in the lowest quartile of the dataset and are well below  
3 the median values of the California and Georgia data. On a relative basis  
4 compared to the largest validated water audit dataset in the US, the loss  
5 levels in the Chapel Ridge Water System are extremely low. This is a good  
6 reflection on Aqua North Carolina as the operators of this system, but also,  
7 it suggests that further loss reduction here would come with only great effort  
8 and at great expense – and then – with likely only minimal additional  
9 reduction achieved. The cost-effectiveness of such undertakings is highly  
10 questionable. To further validate the low loss findings of the Chapel Ridge  
11 water system audit, the findings of work undertaken by MatchPoint to  
12 measure flows and pressure in small zones known as District Metered  
13 Areas and conduct acoustic leak detection was evaluated. The water audit  
14 quantified the annual leakage volume in the Chapel Ridge water system at  
15 4.478 million gallons in 2018. Dividing this volume by 365 days in the year  
16 and 1,440 minutes in a day calculates to the equivalent of a continuously  
17 running leakage rate of 8.52 gallons per minute (“gpm”). This is equivalent  
18 to two low-volume customer service line leaks, and an extremely small level  
19 of leakage. The acoustic leak detection work conducted by MatchPoint  
20 uncovered only five small leaks on customer service lines that totaled to a  
21 rate of 2.35 gpm. The difference between the water audit average leakage  
22 rate and the rate of leaks detected by MatchPoint may be scattered

1 background leakage (weeps and seeps at joints and fittings) which is not  
2 acoustically detectable.

3 By all measures of the considerable work undertaken on the Chapel Ridge  
4 water system, apparent and real losses are extremely low and efforts to  
5 further reduce them are expensive and likely to result in only minimal  
6 additional reduction. It is most likely that the loss levels existing in the  
7 Chapel Ridge water system exist below the economic level or point where  
8 the cost of loss reduction activities equals the savings in the reduced losses.  
9 Pursuing further loss reduction will be cost-inefficient, as more operator and  
10 management time and utility money will be spent on loss reduction activities  
11 than can be recovered in loss reduction. This is not a financially prudent  
12 requirement to impose on Aqua North Carolina for the Chapel Ridge water  
13 system. Yet, the current standard applied to Aqua by the Commission is a  
14 15% loss level. The Chapel Ridge water system volumetric percentage was  
15 approximately 22%. To reduce this percentage to 15%, means that Aqua  
16 North Carolina would need to achieve additional customer billings of  
17 2,743,000 gallons annually, or a drop in imported (purchased) water supply  
18 due to leakage reduction of the same amount (assuming all other  
19 components of the water audit remain unchanged). To achieve this through  
20 leakage reduction an average leakage rate reduction of 5.2 gpm is needed.  
21 The remaining leakage in the Chapel Ridge water system is most likely not  
22 a single leak but the collective leakage from numerous scattered weeps and  
23 seeps occurring as background leakage. It is not cost effective to attempt

1 to locate, repair and/or reduce numerous scattered weeps to reduce  
2 leakage by another 5.2 gpm.

3 For the Commission to effectively monitor and address water losses in  
4 North Carolina water utilities, it should employ performance indicators that  
5 are based directly upon loss levels, apparent and real, that are further  
6 discussed later in this testimony. The AWWA Water Audit method provides  
7 these features in an array of performance indicators, with the unit rates of  
8 apparent and real losses – discussed herein – superior measures compared  
9 to volumetric percentage indicators.

10 **Q. MR. KUNKEL, WHAT IS YOUR RECOMMENDATION FOR THE**  
11 **COMMISSION'S ASSESSMENT OF AQUA'S WATER LOSSES IN THIS**  
12 **DOCKET?**

13 A. In assessing non-revenue water for the purchased water systems of  
14 Aqua North Carolina, the Commission should abandon its use of a  
15 volumetric percentage performance indicator and instead employ the  
16 AWWA Water Audit method performance indicators – the normalized unit  
17 loss rates specifically as shown in Figures 1 and 2.

18 **Q. MR. KUNKEL, DOES THIS CONCLUDE YOUR REBUTTAL**  
19 **TESTIMONY?**

20 A. Yes, it does.

21  
22 **Q. MR. PEARCE, WHAT IS YOUR RECOMMENDATION FOR THE**  
23 **COMMISSION'S ASSESSMENT OF AQUA'S WATER LOSSES IN THIS**  
24 **DOCKET?**

1 A. I concur with witness Kunkel and offer the following additional  
2 recommendations:

3 1. First, I urge the Commission to not substitute regulatory review, based  
4 on a fixed "standard," for the utility's professional judgment, which is  
5 based on its reliance on a more detailed industry method, site-specific  
6 review, and analysis. Aqua North Carolina should be allowed to  
7 complete Water Loss Audits and focus on those systems which perform  
8 more poorly on the normalized unit loss rates and suspend the  
9 disallowance of actual purchased water costs incurred. Additionally,  
10 Aqua proposes to work with Public Staff to develop an appropriate  
11 metric, such as water loss per connection, water loss per mile, or similar.  
12 2. Secondly, if the disallowance of actual purchased water costs incurred  
13 is to continue, please recognize that the Chapel Ridge purchased water  
14 loss has been thoroughly investigated and is exceptionally low on a  
15 per-connection basis, as well as on a length of pipeline basis. Thus, I  
16 recommend that no adjustment to purchased water revenue be made in  
17 this proceeding for the Town of Pittsboro purchased water.

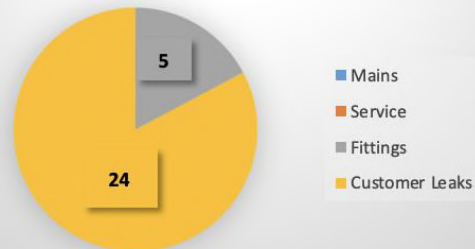
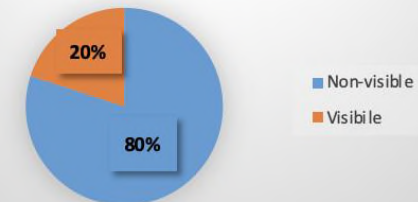
18 **Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?**

19 A. Yes, it does.

## Project: LDS / GIS - 2019 (Chapel Ridge NC) Leak Detection / GIS Report

Project Contract Mileage:	17.10
Project Complete To Date:	100.00%
Mileage Completed To Date:	17.10
Mileage Remaining To Complete:	0.00
Days Completed On Project:	11.00
Average Miles Covered Per Day:	1.55
Est Days Remaining On Project:	0.00
Overall System Leaks Found To Date:	5
Overall GPM Loss Found To Date:	2.35
Leaks Found Per Mile:	0.29
Water Loss Per Mile (in GPM):	0.14
Average Leak Size (in GPM):	0.47
Total Fittings/Connections Sounded:	883
Average Fittings Sounded Per Mile:	52
Total GIS assets Mapped to Date:	425

Leak Type

Visible v. Non-Visible  
Distribution Leaks

Leaks by Size

