

BEFORE THE
STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

IN THE MATTER OF THE PETITION OF
NEW JERSEY-AMERICAN WATER COMPANY, INC.
FOR APPROVAL OF INCREASED TARIFF RATES
AND CHARGES FOR WATER AND WASTEWATER SERVICE,
CHANGE IN DEPRECIATION RATES AND
OTHER TARIFF MODIFICATIONS

BPU Docket No. WR1709_____

DIRECT TESTIMONY OF
THOMAS SHROBA

Exhibit PT-11

NEW JERSEY-AMERICAN WATER COMPANY, INC.

1 **1. Q. Please state your name and business address.**

2 A. Thomas Shroba, P.E., 167 John F. Kennedy Parkway, Short Hills, NJ 07078.

3 **2. Q. By whom are you employed and in what capacity?**

4 A. I am employed by New Jersey-American Water Company, Inc. ("NJAWC" or the
5 "Company") as Senior Director, North Operations.

6 **3. Q. What are your responsibilities in this position?**

7 A. I am responsible for the operation and maintenance of the transmission and
8 distribution infrastructure, production facilities, meters, new construction, customer
9 relations, safety of employees, financial results and growth within the North
10 Operations of New Jersey American Water.

11 **4. Q. Please describe your educational background and professional associations.**

12 A. I hold a bachelor of science from the New Jersey Institute of Technology, W-2, T-2,
13 and professional engineering licenses. I am a member of the American Water Works
14 Association ("AWWA").

15 **5. Q. What has been your business experience?**

16 A. I have 29 years of experience in the water industry. I joined American Water as an
17 Engineering Technician in 1988 inspecting the construction of tanks, booster stations
18 and transmission mains. I also worked with developers and engineers to extend the
19 water system in our system development department. In 1997, I joined the
20 Operations department as a Distribution Supervisor. I have held progressively

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responsible positions in the operations group until being promoted to my current position of Senior Director of North Operations in 2013.

6. Q. Have you previously submitted testimony in regulatory proceedings?

A. No.

7. Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to discuss NJAWC's Non-Revenue Water program and its results.

NON-REVENUE WATER

8. Q. What is non-revenue water ("NRW")?

A. Non-revenue water is the difference between system delivery and water sales. The current (July, 2017) level of NRW, expressed as a percentage of system delivery based on a 12-month rolling average, is as follows:

District	% NRW	As of
Essex Passaic	21.00%	7/1/2017
Hunterdon Warren	22.00%	7/1/2017
Raritan	20.50%	7/1/2017
Coastal North	13.40%	7/1/2017
Atlantic Cape May	6.70%	7/1/2017
Burlington Camden	4.80%	7/1/2017
STATE	15.90%	7/1/2017

9. Q. Please describe the Company's efforts to reduce its level of NRW.

A. In addition to utilizing its DSIC mechanism to accelerate the replacement of aging infrastructure in the Company's service territory, NJAWC addresses apparent and real non-revenue water losses using various practices as well as leak detection methods that are described below.

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10. Q. Please describe the practices NJAWC employs to manage and reduce NRW.

A. NJAWC employs several industry-endorsed processes and practices, including an annual water loss management plan and water audits.

Annual Water Loss Management Plan

11. Q. What is the Annual Water Loss Management Plan?

A. The plan objective is aligned with water accountability and loss control processes and practices promulgated by the AWWA. The processes and practices are found in the 4th Edition of the AWWA Manual 36 publication *Water Audits and Loss Control Programs*. Incorporated by reference is AWWA Water Audit software (Version 5.0 and as amended) that includes an additional auditing capability which “grades” the validity of the water audit input data. The grading measure also provides guidance on the means to improve data collection and therefore the functionality of the water audit. The Company, at both the state and the district level, has phased out past practices which utilized ambiguous terminology, especially the use of “unaccounted for water,” as an evaluation criteria.

Water Audits

12. Q. Has NJAWC performed water audits throughout its system?

A. Yes. NJAWC has performed extensive water audits throughout its service territory. Beginning in 2013, water audits have been completed annually for systems in the jurisdiction of the Delaware River Basin Commission (DRBC). The systems of record are as follows:

- Homestead NJ0318002

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- 1 • Mt. Holly NJ0323001
- 2 • Delaware NJ0327001
- 3 • Sunbury NJ0329006
- 4 • Harrison NJ0808001
- 5 • Bridgeport NJ0809001
- 6 • Logan NJ0809002
- 7 • Frenchtown NJ1011001
- 8 • New Egypt NJ1523003
- 9 • Pennsgrove NJ1707001
- 10 • Belvidere NJ2103001
- 11 • Washington NJ2121001

12 Beginning in 2016, the Company submitted water audits to NJDEP for the following
13 additional systems that were impacted by the NJDEP 2016 drought warning:

- 14 • Coastal North NJ1345001
- 15 • Edison Water (non-regulated O&M only) NJ1205001
- 16 • Liberty (non-regulated O&M only) NJ2004001
- 17 • Little Falls NJ1605001
- 18 • Raritan NJ2004002
- 19 • Short Hills NJ0712001

20 As referenced above, the Company has already initiated water audits of all its
21 regional systems, which are updated regularly. The Company tracks NRW
22 performance and other indicators of every operating system. However, water audits
23 have limited applicability for very small systems. Where customer density is less than
24 32 connections per mile and system overall size is less than 5,000 customers, the

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water audit derived benefits are limited. For these small systems, NJAWC performs a basic water balance.

13. Q. Can you briefly explain what information a basic water balance provides?

A. A basic water balance compiles system delivery and sales data for a discrete area. Both of these two data elements are tracked over many years. Trends in the data are then used to determine if the system is operating efficiently or if there is excessive water loss which requires remedial actions.

14. Q. What indicators are reported within the Water Audit?

A. The Water Audit provides five (5) key indicators as reported by the Reporting Worksheet of the AWWA WLCC Free Water Audit Software. These indicators are:

- 1) Apparent Losses: The sum of unauthorized consumption, customer metering inaccuracies, and systematic data handling errors;
- 2) Real Losses: Total water losses less Apparent Losses;
- 3) Non-Revenue Water (NRW) which is total water losses including unbilled metered, unbilled unmetered; and authorized Company use;
- 4) Financial Indicators: NRW as a percentage by volume supplied and NRW as a percentage by cost of operating system; and
- 5) Operational Efficiency: Unavoidable Annual Real Losses (UARL), Current Annual Real Losses (CARL), and Infrastructure Leakage Index (ILI) or CARL/UARL. The dimensionless indicator of system performance is the Infrastructure Leakage Index (ILI). The ILI is a highly effective performance

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indicator for comparing (benchmarking) the performance of utilities in operational management of real losses.

15. Q. How does NJAWC use the information it gathers through its water audits to reduce NRW?

A. The information gathered is analyzed and action plans are developed for NRW reduction as part of NJAWC's overall NRW strategy.

16. Q. What are the main characteristics of NJAWC's NRW strategy?

A. The Company's NRW strategy follows the latest industry-accepted standards including the water audit methodology set out above, while also working to maximize customer satisfaction, return on investment, and operational efficiency at an acceptable level of risk. The key elements include the following:

- 1) providing accurate, regular metering of production flows and customer consumption volumes;
- 2) maintaining a system of real time hydraulic data collection and monitoring via a Supervisory Control and Data Acquisition (SCADA) System, Advanced Metering Infrastructure (AMI), or similar system of instruments and data collection technology;
- 3) compiling an annual water audit as a standard business practice for all systems; and
- 4) employing sufficient loss control methods (such as those contained herein) to contain water and revenue losses at economic levels and to minimize system upsets.

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1 **17. Q. What efforts has the Company employed to align functional areas of the**
2 **Company to support the NRW efforts?**

3 A. In 2013, NJAWC established a corporate business unit to manage the Company's
4 water loss. This team of water loss professionals measures and analyzes the losses
5 and advises the Company on the type of water loss management that is required in
6 each district. Programs are statewide and include leak detection, pressure
7 management, water audits, reduction of theft of services, monitoring zero
8 consumption, and leaks on owner's lines. In 2016, the team was realigned with the
9 Supervisory Controls and Data Acquisition (SCADA) team, the work management
10 team (MapCall) and the Technology and Innovation pod. This realignment allows for
11 a more rapid engagement in data management and quality and engineering
12 opportunities and issues. An example of these opportunities include reviewing of
13 areas of apparent high pressure to determine if additional pressure management or
14 modulation is feasible, creation of additional district metered areas, use of innovative
15 technologies to perform condition assessment and leak detection on transmission
16 mains and supplementing existing leak detection tools with additional equipment.
17 The team has direct input into Company practices on system delivery, sales and
18 NRW. Moreover, the team can directly engage the asset planning group and GIS
19 group, and is now fully aligned with the various comprehensive planning studies and
20 capital improvement projects associated with the engineering group.

NEW JERSEY-AMERICAN WATER COMPANY, INC.**Active Leakage Control****18. Q. What are real losses?**

A. Real losses are physical losses of water from the distribution system, including leakage and tank overflows.

19. Q. What does the Company do to reduce real losses?

A. The Company is actively working to identify leaks and to repair them. The Company's ability to quickly address these leaks saves customers from potential disruptions of service, and saves the Company the increased costs associated with losing millions of gallons of treated and pumped water. Employees have been afforded technical training from both internal and external resources and have been provided with new tools to perform proactive leak work. Likewise, surfacing leaks have been pinpointed by these employees and have been repaired, resulting in improvement in reducing real losses. The Company has an established internal goal of repairing 90 percent of all leaks within 96 hours of finding them. (This 96-hour time period provides the time for mobilization and for One Call mark outs.) As a result, in 2016, 1,027 miles of mains were proactively or reactively surveyed. These surveys resulted in the location of 358 leaks.

20. Q. Please describe the specific methods that the Company uses to actively control leaks.

A. Leak surveying is typically done on a proactive basis when leaks are suspected to be a significant contributing factor to NRW. Focused, proactive surveys are mainly conducted in the Raritan and Essex/Passaic Districts, where the distribution network

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1 is generally older and more prone to failure due the geographic variations and
2 consolidated geology. The Company also has completed numerous leak surveys of
3 its Warren systems. Currently, these systems are either proactively surveyed or
4 continuously monitored acoustically. We have seen an immediate improvement in in
5 the systems water losses, where leaks on our mains, hydrants, valves and both
6 Company side and consumer side service lines have been located. Over the two year
7 period from 2015 through 2016, these efforts resulted in identifying and repairing
8 889 leaks.

9 Additionally, targeted Company employees now receive more leak detection training
10 across the State, and the Company purchased additional equipment (discussed below)
11 for continuous, proactive leak detection work in the Delaware, Coastal North and
12 Coastal South Districts as deemed necessary. For the Essex/Passaic and Raritan
13 Districts, the Company has increased the number of man hours spent on proactive
14 leak surveying. The additional manpower has enabled the leak detection teams to
15 provide multiple benefits: proactively locating leaks prior to surfacing; pinpointing
16 leaks; and supporting permanent acoustic monitoring efforts. Additionally, leak
17 detection on large-diameter transmission mains, those water mains 16 inches in
18 diameter and greater, and other high-risk buried linear assets, is outsourced to third
19 party service providers. These studies prompted the Company to initiate pipe
20 rehabilitation programs as necessary.

21 **21. Q. Please describe the way in which NJAWC uses technology to identify leaks.**

22 A. The Company utilizes the following suite of technologies for leak detection:

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1 LeakFinderST by Echologics – LeakFinderST is an advanced acoustic leak detection
2 system. Echologics is globally recognized as a leader in non-invasive leak detection
3 technology. The LeakFinderST correlator is a result of extensive research as well as
4 the input from global leak detection experts on the user interface and design of
5 equipment to meet the needs of end user. The LeakFinderST can pinpoint a leak
6 between any two water system appurtenances or can listen directly on the water main.
7 Typically, hydrants and valves are used since they are most accessible. Generally,
8 leaks can be located over a distance of approximately 1,500 feet. The sensing units
9 use accelerometers or hydrophones which record acoustic data which is relayed to a
10 mobile portable computer. The results are instantaneous.

11 ZCorr by Subsurface Utility (formerly offered by Itron) – ZCorr is a network of
12 Digital Correlating Loggers (DCLs) which pinpoint the locations of many leaks. It
13 can be used for overnight surveillance or multiple day time deployments. The ZCorr
14 software is very user friendly and provides convenience and accuracy of pipeline leak
15 detection and pinpointing. Each ZCorr set consists of eight (8) correlating loggers
16 deployed typically in grid fashion on hydrants covering an overall grid main length
17 of 2 miles. The acoustic data is stored on the DCLs and uploaded to a mobile portable
18 computer via USB and then processed by the onboard software. This instrument is
19 used as a leak surveying tool and is much more sensitive than traditional leak
20 surveying methodology which uses only contact point listening.

21 Sebalog N-3 by Seba is similar to the ZCorr instrumentation in that it offers
22 correlating logging of up to eight (8) listening points. However, the device is a real

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1 time correlator which eliminates the need to deploy and retrieve loggers. Also, the
2 devices, when deployed, are auto processed for geolocation using the accompanying
3 GPS mobile portable computing software.

4 Metrotech HL5000 by Seba – is an advanced ground microphone and point listening
5 device. On board filtering and memory is provided that allows the user to graphically
6 display up to nine (9) points of data on a bar chart to determine where the strongest
7 acoustic response is. The tool is used in the final step in pinpointing a leak prior to
8 excavation.

9 Sewerin Aquaphon A 100 by H Sewerin – is an advanced ground microphone and
10 contact point listening device. Operation is similar to the Metrotech HL5000 device.

11 DLD by Subsurface Utility (formerly by Itron) – is an advanced ground microphone
12 and point listening device. Operation is similar to the Metrotech HL5000 device,
13 however, acoustic signal intensity is displayed as a relative signal strength in the form
14 of a number. It allows additional operators to utilize it, including crew foremen.

15 Aqua M-200D by FAST – is a new entry into the North American market. This
16 instrument is also a combination ground and contact microphone. The instrument
17 offers six different acoustic filters and graphically displays five (5) readings in the
18 form of a bar graph. This device combines the best features of the HL5000 and DLD.

19 Active Leakage Control: Continuous Monitoring

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1 MLog by Itron - Noise logging is currently used in selected portions of the
2 Essex/Passaic District. In 2016, the existing network of sensors was upgraded from
3 2G to 3G AMR in those that are so provisioned. There are 1,304 AMI/AMR and
4 3,564 radio read types installed. In 2016, the Company continued to experience
5 success in utilizing these loggers, and consequently, numerous non-surfacing leaks
6 were located and repaired.

7 EchoShoreDX by Echologics – The EchoShoreDX platform incorporates the latest
8 generation of acoustic sensors that are the result of Echologics pioneering success
9 with correlating leaks on a variety of pipe materials and large diameter mains. The
10 sensors are built into a standard fire hydrant cap and are capable of identifying
11 extremely faint acoustical noises emitted by leaks before they become detectable by
12 conventional methods. This early detection capability enables the Company to
13 prioritize repairs based on actual need and the most effective allocation of repair
14 crews. The EchoShoreDX is stationary and designed to be deployed in an area-wide
15 grid system continuously monitored. Data from the listening nodes is either sent
16 directly to a cell based collector or repeated to a collector. The data is then uploaded
17 nightly to an internet cloud based system, processed and graphically displayed on
18 New Jersey American Water's GIS mapping system. The Company installed this
19 technology in late 2015.

20 **22. Q. What are apparent losses?**

21 A. Apparent losses are non-physical losses that occur in utility operations to do customer
22 meter inaccuracies, systematic data handling errors in customer billing systems, and

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1 unauthorized consumption. This is water that is consumed, but not properly
2 measured, accounted or paid for.

3 **23. Q. What does the Company do to manage apparent losses?**

4 A. The Company monitors its customer database system and billing system losses.
5 These are monitored and improved through a team of internal resources. These team
6 members look for inactive accounts/premises with consumption (or vice versa),
7 premise mismatches and consecutive zero consumptions. These exceptions are
8 processed into work orders that determine and eliminate the issue that caused the
9 exception. Currently in development is the utilization of Geographic Information
10 Systems (GIS) analytics to allow greater flexibility in reviewing data tables of
11 consumption, rate class, public water system identification number (PWSID) and
12 pressure gradient. This is a pilot program, and these tools are being customized based
13 upon user experience and results.

14 **24. Q. How does NJAWC's meter program help manage apparent losses?**

15 A. The meter program is managed by our field services teams. We monitor our
16 successful reads on a monthly basis, with a goal of minimizing estimated bills.
17 Additionally, we ensure that our periodic testing of meters meets BPU requirements.

18 **25. Q. Please describe how meter testing and meter studies are utilized in reducing**
19 **apparent losses.**

20 A. The Company employs large meter testing and profiling, pressure zone management,
21 and zonal metering studies, which are described below.

NEW JERSEY-AMERICAN WATER COMPANY, INC.Large Meter Testing and Profiling

This is conducted by both our production (bulk sales and inter-district transfers) and distribution teams (large customer meters). An effort has been devoted toward analyzing consumption patterns to determine if the customers' meters were still appropriate for their current consumption rates, and if not, the installation of new meters was recommended. Moreover, wherever feasible, turbine meters are being replaced with more accurate compound meters.

Pressure Zone Management and Zonal Metering Studies

These studies are conducted in conjunction with each district's comprehensive planning study (CPS). Pressure management ensures that we are providing our customers with appropriate pressures. When pressures are too high, background leakage occurs at a greater rate. Zonal metering is now universally supported and the need to invest in creating smaller and very well defined zones within the distribution system can then be ascertained. Additional metering sites connected to the SCADA system have been identified to provide additional data for compilation and analysis for NRW. This data will be utilized in determining zonal consumption patterns. The Company is aggressively exploring additional options relative to pressure management and district metering. The Company is piloting an innovative modulation device for pressure reducing valves in Belvidere where preliminary results are encouraging. The Belvidere system experienced an improvement of 5% in the volume of NRW as a result of the PRV modulation project.

NEW JERSEY-AMERICAN WATER COMPANY, INC.**26. Q. How does the Company work to reduce unauthorized consumption?**

A. Unauthorized Consumption may be determined in a variety of ways. In addition to the approaches discussed above, the Company has continued its Theft of Service (“TOS”) program whereby our employees are educated and encouraged to spot and report any potential water consumption that is not authorized. The TOS program often finds unmetered irrigation systems, bypasses, upstream (of the metering point) connections and unauthorized hydrant use, all of which contribute to the NRW. Since inception, there have been 1,980 reports of TOS that have been successfully investigated and resolved.

27. Q. Does the Company’s DSIC program help reduce NRW?

A. The Company continues its successful participation in the Distribution System Investment Charge (“DSIC”) program. Potential main rehabilitation and replacement projects have been identified through the DSIC planning process. At such an early stage of our DSIC program, the impact on NRW is not quantifiable. The basic premise is to remove structurally weak pipe that is prone to leak with a more durable pipe. This statement is supported by AWWA in Manual 36, Figure 7-1 (page 189). These efforts, over time, will reduce background leakage and improve NRW through lower leakage levels and reduced pressures, as the infrastructure is either replaced or rehabilitated. This program encourages water utilities to invest in the replacement of aging water distribution assets. It allows for a timely return on investment of capital used for the replacement or rehabilitation of aging infrastructure. DSIC facilitates the compilation of an accelerated program targeting the rehabilitation of unlined cast iron

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1 mains in appropriate areas with discolored water occurrences, as well as the
2 replacement of obsolete and undersized mains with significant break history. These
3 improvements will enhance the safety and reliability of the water system, improve
4 system flows and pressures, minimize service disruptions, improve water quality and
5 reduce aesthetic complaints, and enhance conservation by reducing leaks and main
6 breaks. Problems identified in the leak detection reports will be added to the DSIC
7 future project list.

8 **28. Q. Has the Company employed other efforts in managing NRW?**

9 A. Yes. In 2016, the Company realigned internal resources to align the water loss team,
10 SCADA, and work management team into an instrumentation and controls group. A
11 team of information technologists was also assigned to work with this team. Using a
12 third party integrator, Space Time Insight (STI), a web-based tool was developed to
13 pull data from multiple sources to provide one view of non-revenue water and
14 automatically calculate, on a monthly basis, the NRW metrics stated previously. By
15 automating the process, the teams are now focusing on improved analytics to provide
16 targeted guidance on asset management and NRW management. The tool has
17 integrated system delivery, both raw and refined, consumption data, both raw (meter
18 reads) and refined (billed consumption), pressure data, work management data
19 (leaks) and internal and external GIS information.

20 The development of this tool lead to the preparation of an auditing process for system
21 delivery, which follows the water from source, through the metering and data
22 delivery stream, to the data storage database. This has standardized the data process

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1 for system delivery, thus improving the quality of the system delivery database. The
2 data now meets the highest level of criteria required in the water audit grading
3 process.

4 **29. Q. What has been the result of the Company's efforts?**

5 A. The Company has reduced the level of NRW through its targeted and enhanced
6 efforts at managing real and apparent losses. Focused efforts in Hunterdon Warren
7 and the Essex/Passaic District have yielded positive results. A comparison of NRW
8 based upon data provided in our last filing (2014) compared to data gathered as of
9 July, 2017 is as follows:

	2014	2017
Essex Passaic	26.8%	22.3%
Warren Morris	33.7%	23.1%
State	16.5%	15.9%

10 **30. Q. Does this conclude your direct testimony?**

11 A. Yes, it does.