NJDEP OVERSIGHT REPORT
TRENTON WATER WORKS
Period: November 2022 – May 2023

Trenton Water Works is a community water system that provides drinking water to 200,000+ people in the City of Trenton and portions of neighboring Mercer County municipalities (Ewing, Hamilton, Hopewell, Lawrence). Due to state Safe Drinking Water Act (N.J.S.A. 58:12A) compliance concerns, the system is subject to the direct operational oversight of the New Jersey Department of Environmental Protection. This report is intended to summarize oversight findings and actions during the six-month period from November 2022 through May 2023.

EXECUTIVE SUMMARY

Due to Trenton Water Works (TWW) historic and ongoing struggles to maintain compliance with the Safe Drinking Water Act (SDWA), the New Jersey Department of Environmental Protection (Department) issued ia Unilateral Administrative Order (UAO) on October 12, 2022 to initiate direct operational oversight of Trenton Water Works (TWW). The objective of the UAO is to stabilize and improve the operations and maintenance of TWW to ensure that the system reliably produces safe drinking water that meets all federal and state requirements. The UAO is the latest step in the Department's long-term effort to provide TWW with technical assistance and assure SDWA compliance. While under the Department's direct operational oversight, TWW remains responsible for managing the daily operations of the water system. To facilitate on-the-ground oversight of TWW's operations and enhance TWW's technical and managerial capacity, the Department appointed a third-party oversight contractor (TPO) that works routinely with TWW staff and reports directly to the Department.

In this initial phase of direct operational oversight (Phase 1), the TPO and select Department representatives have been a routine presence onsite at the TWW Treatment Plant as they conduct ground-level review of system operations and provide regular technical assistance to TWW staff in the performance of their operation and maintenance duties. To date, the review has included evaluation of all aspects of system operations, interim assessments that identify priority deficiencies critical to sustained water service (i.e., those requiring immediate action by TWW), and providing TWW staff with technical assistance and other guidance to support their implementation of priority actions. As of the date of this report, direct operational oversight remains focused on immediate-term concerns, primarily the improvement and maintenance of routine daily operations critical to sustained water service. Once immediate-term concerns are fully addressed and priority deficiencies remedied by TWW, the focus of direct operational oversight will shift to the analysis, planning, and implementation of short-, medium-, and long-term solutions that will enable TWW to maintain SDWA compliance.

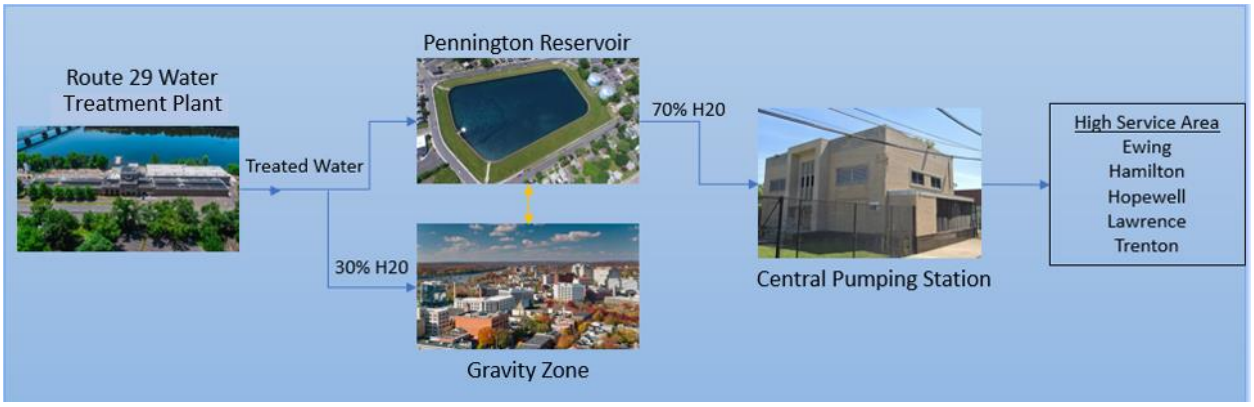
While providing ground-level oversight and support in Phase 1, the Department has also began facilitating the required analysis, planning, and implementation support critical to TWW's ability to sustain SDWA compliance. This includes the start of a comprehensive performance evaluation of the Treatment Plant, an optimization program for the Distribution System, assessment of laboratory processes and their reliability, and system-wide assessments of TWW's existing technical, managerial, and financial capacity and opportunities for improvement. These system-wide assessments will result in a report of detailed organizational and operational recommendations, as well as short-, medium-, and long-term asset management and capital improvement recommendations. All assessments will together serve the basis of future action and investment.

INTRODUCTION

System Description

Trenton Water Works (TWW) is a large public community surface water system located in Mercer County, New Jersey that provides water to over 200,000 people residing in the City of Trenton and in portions of the surrounding municipalities of Ewing Township, Hamilton Township, Lawrence Township and Hopewell Township. TWW's Treatment Plant treats surface water from the Delaware River to meet the water supply needs of the communities it serves. Surface water treatment requires water systems to implement a "multi-barrier approach" which relies on a complex set of steps to eliminate bacteria, viruses and other pathogens from the drinking water. A breakdown of any step in the process can have a significant impact on water quality, which is why operators must consistently maintain oversight to ensure all processes are working effectively.

The treated water leaves the Treatment Plant in two different directions. One provides water to the "gravity zone" comprising portions of the City of Trenton and a small section of Hamilton Township, which is roughly 30% of TWW's consumers. The rest of the treated water is directed to the Pennington Reservoir, an uncovered finished water reservoir. Water from the Reservoir is re-chlorinated and treated for corrosion control prior to being pumped through the Central Pump Station to serve the remaining 70% of TWW customers in the high service area. The Reservoir has the capacity to store a three-day supply to meet system demand in emergencies or when the Treatment Plant is offline. When the Treatment Plant is offline the Reservoir can supply customers in the gravity zone by opening a gate valve which normally isolates the two pressure zones.



TWW's service area consists of approximately 683 miles of water mains and several above ground water storage tanks to maintain pressure and provide additional storage. TWW also maintains an interconnection with New Jersey American Water (NJAW) that can be used to supply NJAW from TWW or receive additional water for delivery to TWW customers. However, the interconnections with NJAW do not have sufficient capacity to provide water to fully meet TWW customer demands in an emergency.

Safe Drinking Water Act Compliance

As a public water system, TWW must comply with the federal and State Safe Drinking Water Act which sets standards including enforceable maximum contaminant levels (MCLs) for contaminants in drinking water or required ways to treat water to remove contaminants. Each standard also includes monitoring requirements at both the treatment plant and in the distribution system that the water system must follow to ensure compliance. This coordinated set of requirements forms a multi-barrier approach that helps to ensure drinking water is safe for consumers. A failure to follow any one of these set standards can increase

the risk to public health.

On September 27, 2022, the Department issued an inspection report of the TWW water system based on a months-long compliance evaluation that revealed TWW's ongoing failure to properly operate and maintain the system to ensure it reliably produces safe drinking water in compliance with the federal and New Jersey Safe Drinking Water Acts. The deficiencies cited included a failure to properly maintain critical treatment processes, monitor water quality, employ adequately trained operating personnel, and invest in required maintenance and capital needs. In addition, TWW's failure to address the factors noted above and within the system is enhancing conditions that are likely to promote the growth of pathogens including *Legionella* that may present an imminent and substantial endangerment to the health of TWW's consumers.

UNILATERAL ADMINISTRATIVE ORDER (UAO)

Direct Operational Oversight

On October 12, 2022, the Department issued a UAO to initiate direct operational oversight of TWW. The objective of the UAO is to stabilize and improve the operations and maintenance of TWW to ensure that the system reliably produces safe drinking water that meets all federal and state requirements. The Department seeks to ensure TWW improves its SDWA compliance today and secures its future performance. The immediate-term goals of direct operation oversight include improving operations and maintenance of TWW, ensuring that long-overdue capital improvements are identified, and supporting TWW in establishing needed implementation plans.

In Phase 1, TWW committed to facilitating the direct oversight and monitoring of the system by the Department and its consultants, including a third-party oversight contractor (TPO) embedded in the system for the purposes of monitoring and assessing all system operations and maintenance, adding necessary technical and managerial capacity to the system, and making technical, managerial, and financial recommendations necessary to bring the system into full compliance with applicable law. The engineering firm of Mott MacDonald was selected as the TPO, which works routinely with TWW staff and reports directly to the Department. Beginning in November 2022, the TPO and staff from the Department began a weekly onsite presence at the treatment facility and distribution system offices to observe initial baseline water system operations and identify immediate-term actions necessary to sustain water service and SDWA compliance.

In Phase 2, TWW will undergo a comprehensive technical, managerial, and financial capacity assessment of the system that will result in a report of detailed organizational and operational recommendations, as well as short-, medium-, and long-term asset management and capital improvement recommendations that will serve the basis of future action and investment.

Summary of Phase 1 Findings and Immediate-Term Actions
Nov 2022 through April 2023

The focus of Phase 1 involved a baseline system assessment of the operation and maintenance of the water system and the development of an immediate-term workplan that prioritized actions necessary to address immediate concerns identified during the assessment. The workplan also prioritized actions to address historical issues of non-compliance and the deficiencies identified in the Department's September 22, 2022 inspection report. This workplan primarily focused the efforts of the TPO and the Department in the following areas: 1) Staffing and Management; 2) Operation and Maintenance of the Trenton Water Works Treatment Plant; 2) Water Quality Data Reliability; 3) Distribution System Optimization and *Legionella*. A summary of findings and initial steps in each of these areas follows below.

1) Staffing and Management

Pursuant to Department's October 12, 2022, UAO, TWW provided the Department with organizational charts and initial position descriptions for TWW staff throughout the organization. A review of this information, as confirmed by ground-level evaluations, confirmed the following:

- TWW's organizational structure is not suited to a public water system of this size and complexity
- TWW lacks an adequate number of staff to meet operational needs
- TWW lacks sufficiently qualified staff in critical positions

Circumstances at the Treatment Plant are reflective of these deficits. A large water system with the complexity of TWW relies on licensed operators to provide 24/7 coverage at the Treatment Plant to make real-time determinations about water treatment adjustments and ensure completion of a multitude of daily tasks critical to sustaining operations. During the Phase 1 baseline evaluations, multiple instances were observed where critical adjustments to treatment processes were delayed and 24/7 coverage was not in place due to the limited number of licensed operators employed by TWW.

As an immediate step to ensure adequate licensed operator coverage, the Department required that TWW have a treatment system licensed operator or "T-class" operator onsite 24/7 and provide a biweekly staffing schedule of the treatment plant. TWW has taken interim steps to address the lack of qualified personnel at the water system, which includes deploying the services of a licensed operator from the Sewer Department to assist with the 24-hour coverage requirement. TWW is also developing remote access capabilities for the Supervisory Control and Data Acquisition (SCADA) System to allow the licensed operator of record and other treatment plant operators remote access to controls, data, and plant information when not onsite. Once implemented later this year, remote SCADA will provide an additional level of oversight and reduce response times in making treatment adjustments during emergencies. TWW is also evaluating critical staffing needs and identifying ways to promote the hiring or licensing of additional qualified personnel within the organization.

2) Operation and Maintenance of the Trenton Water Works Treatment Plant

The TWW Treatment Plant treats surface water from an intake on the Delaware River. Surface water treatment relies on the performance of specific tasks in a specific order and at specific times to protect public health from viruses and other pathogens. A disruption to any step in this process can directly impact water quality both at the treatment plant and in the distribution system.

Historical issues of non-compliance, recent inspection findings and the initial evaluation of the TWW Treatment Plant, indicated that TWW was not maintaining and operating critical treatment processes. The TPO contracted with a licensed operator with previous experience at a large surface water system to oversee and evaluate the treatment plant operations.

Since starting work in January 2023, the TPO's contracted licensed operator has focused on inspecting the critical treatment process used to remove turbidity (solids) from the water and reviewing the daily operating procedures to identify and institute changes to improve the performance of the operational units. This includes identifying daily preventative maintenance tasks, conducting spot inspections, modifying standard operating procedures to increase solids removal, and assisting TWW staff with troubleshooting and repair of equipment malfunctions.

Figure 1 illustrates how these changes have improved conditions in one of the SuperPulsator Clarifier® Units[1], used to remove turbidity from the water.

FIGURE 1: LEFT: INITIAL CONDITION OF THE TOP OF A SUPERPULSATOR TREATMENT UNIT; RIGHT: THE SAME UNIT AFTER OPERATIONAL CHANGES FROM THE DIRECT OVERSIGHT.

In February 2023 TWW hired a new maintenance supervisor after having the position vacant for almost eight (8) months. The maintenance supervisor is responsible for ensuring that staff are performing basic tasks including routine inspections of water treatment components, performing maintenance and repairs, and testing and exercising offline/standby equipment. The provision of supervisory support that instills accountability to standard operating procedures, especially within operational environments as complex as those at TWW, is critical to ensuring the delivery of reliably clean and safe drinking water.

Over the next several months, a key challenge for TWW will be providing adequate training and ensuring staff properly document the completion of these procedures to sustain SDWA compliance and in the short- and long-term.

This effort will also be expanded to include a more in-depth evaluation and updated standard operating procedures (SOP) for other unit processes throughout the treatment plant.

3) Water Quality Data Reliability

The SDWA requires the collection of data to ensure the quality of the water delivered to consumers is safe for consumption. The data collected is the foundation for decision-making by the water system to ensure public health and safety, as well as regulatory compliance. A lack of confidence in data quality is a serious cause for concern and requires further evaluation.

FIGURE 2: TWW'S CERTIFIED LABORATORY LOCATED IN THE WTP.

TWW maintains a New Jersey certified laboratory, which is located at the Treatment Plant with oversight by the Chief Chemist. The inspection report identified several of the Department's overarching concerns regarding an insufficient number of qualified laboratory staff, failure to conduct staff training and potential issues with instrumentation. Evaluation of the certified laboratory by the TPO's water quality expert, concurred with the inspection findings and raised concerns about TWW's failure to properly calibrate lab equipment, follow established recordkeeping procedures and the need to replace older model online analyzers due to the lack of readily available replacement parts.

The TPO's water quality expert continues to engage routinely with laboratory staff on developing checklists to ensure proper procedures are following in performing analysis, recordkeeping improvements, and updating sampling plans.

[1] These units use combine the fundamental water treatment processes of flocculation and clarification to remove the bulk of turbidity, color, TOC, and other constituents from the raw water entering the plant.

4) Distribution System Optimization and *Legionella*

Operation & Maintenance

As noted above, TWW maintains a 683-mile water distribution system that provides drinking water to five municipalities through a network of water mains and other components. The SDWA requires that water systems evaluate water quality for bacteria and other parameters by collecting and analyzing water samples from discrete points throughout the distribution system on a routine basis. These samples are used to demonstrate proper operation and maintenance of the distribution system. TWW's distribution system sampling indicates the need for routine flushing, maintenance of storage tanks and maintenance of distribution system infrastructure. TWW has historically failed to adequately take these and other actions necessary to ensure that water quality is sustained throughout the distribution system. This has resulted in areas throughout the system with low chlorine residual and/or stagnant water which promotes the formation of disinfectant by-products (DBPs) and the growth of *Legionella* or other opportunistic pathogens.

Legionella

The Department has partnered with the New Jersey Department of Health (NJDOH) to investigate the occurrence of Legionnaires' disease and *Legionella* bacteria in areas served by TWW. Legionnaires' disease is a severe type of pneumonia (lung infection) caused by bacteria called *Legionella*. *Legionella* can enter the lungs when a person breathes in aerosolized water (e.g., small droplets of water in the air) containing *Legionella* from showerheads, faucets, hot tubs, humidifiers, and decorative fountains.

In consultation with experts from Centers for Disease Control (CDC), the U.S. Environmental Protection Agency (USEPA), NJDOH and other state agencies, a strategy was developed to address the risk of *Legionella* in the TWW water system. With assistance by USEPA and the Department, TWW initiated a low-velocity flushing program throughout its service area in early April 2023 to increase water circulation throughout the distribution system, and to increase and optimize chlorine levels.

FIGURE 3: TWW, DEPARTMENT AND USEPA STAFF IN THE FIELD DURING THE LOW VELOCITY FLUSHING PROGRAM.

The data obtained during this initial effort will be used to identify intermediate steps to improve water quality, including the installation of automatic flushers or booster chlorine stations, or the opening/closing of valves to maintain water flow.

Addressing the risk of *Legionella* in the TWW system will require long-term action and ongoing coordination between NJDOH, the Department, and TWW. This will require a routine flushing schedule, ongoing monitoring of chlorine residual and water quality parameter data, and improved maintenance of the water system long-term.

Summary of Phase 2 Expectations (Capacity Development)

While providing ground-level oversight of and support to TWW in Phase 1, the Department has taken steps to begin Phase 2 of the direct operational oversight. Phase 1, which remains ongoing, is focused immediate-term issues regarding the improvement and maintenance of routine daily operations critical to sustained water service. Phase 2, by comparison, will focus on capacity development analyses and measures that support TWW's ability to sustain short-, medium-, and long-term SDWA compliance.

The Department began facilitating Phase 2 through the issuance of Request for Proposals for three independent system-wide assessments that will analyze TWW's fiscal condition, evaluate existing organizational structure, adequacy of staffing, and managerial capacities, and will also include a comprehensive evaluation of a Treatment Plant performance-based capabilities and associated administrative, operation and maintenance practices. These independent system-wide assessments will provide the information and analysis critical to identifying critical needs and operational changes for the TWW system. The assessments are anticipated to be ongoing through at least the end of 2023.

CONCLUSION

At the outset of direct operational oversight, the Department and TPO worked closely with TWW to evaluate baseline conditions related to SDWA noncompliance and implement immediate-term actions to remedy priority deficiencies, including actions to improve critical Treatment Plant processes and address the risk of *Legionella* and water quality concerns throughout the distribution system. Moving forward, the Department and TPO will continue providing ground-level oversight and technical assistance at TWW while facilitating the required analysis, planning, and implementation support critical to TWW's ability to sustain SDWA compliance. Forthcoming comprehensive system-wide assessments will provide detailed organizational and operational recommendations, as well as short-, medium-, and long-term asset management and capital improvement recommendations, all with a shared goal of ensuring the current and future viability of the water system.