COMMONWEALTH of VIRGINIA
Department of Health

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May 1, 2025

AMENDED AND SECOND NOTICE OF ALLEGED VIOLATION

Via Electronic Mail
RVAMayor@rva.gov
The Honorable Danny Avula, Mayor, City of Richmond

Scott.Morris@rva.gov
Scott Morris, Director

Richmond Department of Public Utilities
900 E. Broad Street
Room 115
Richmond, Virginia 23219

Re: City of Richmond Water Crisis, January 6, 2025 – January 11, 2025
City of Richmond Waterworks, Public Water System Identification (PWSID) #4760100

Dear Mayor Avula and Director Morris:

The Virginia Department of Health (VDH), Office of Drinking Water (ODW) issued a Notice of Alleged Violation regarding the City of Richmond Waterworks (the Waterworks) on January 23, 2025, following the Waterworks losing system-wide water pressure on January 6, 2025, followed by a boil water advisory until January 11, 2025 (hereinafter described as the "Water Crisis"). The Department of Public Utilities (DPU) for the City of Richmond (City) responded to the Notice of Alleged Violation by letter dated February 21, 2025 (DPU's Response).

This letter is an Amended and Second Notice of Alleged Violation (Amended NOAV), amending the January 23, 2025, Notice of Alleged Violation (Original NOAV).

This Amended NOAV follows investigations of the Water Crisis by ODW, Short Elliott Henderson, Inc. (SEH), an engineering contractor retained by VDH, and HNTB Corporation (HNTB), an engineering contractor retained by the City. Additionally, in the aftermath of the

Water Crisis, ODW conducted a sanitary survey of the Waterworks and reviewed the status of the City's progress in addressing areas of concern identified by the U.S. Environmental Protection Agency (EPA) during a 2022 EPA inspection of the Waterworks. ODW's sanitary survey report and the results of ODW's follow-up site visit related to the 2022 EPA report are attached to this Amended NOAV.

Based on observations and assessments made: (1) during the Water Crisis while ODW staff were physically present at the Water Treatment Plant (WTP), (2) during ODW's sanitary survey inspection and investigation of the Waterworks, (3) from the SEH investigation, (4) the reports from Henrico County and Hanover County, and (5) from the HNTB investigation, VDH has reason to believe that the City of Richmond may have violated the Virginia Public Water Supplies Law, Va. Code § 32.1-167 *et seq*., and the Waterworks Regulations, 12VAC5-590-10 *et seq*.

The Water Crisis

1. The City owns, and holds a permit to operate, the Waterworks (PWSID #4760100). The Waterworks serves over 250,000 consumers and provides wholesale water to neighboring jurisdictions: Chesterfield, Goochland, Hanover, and Henrico counties. The City is the "owner" of the Waterworks as defined by Va. Code § 32.1-167 and 12VAC5-590-10 of the Waterworks Regulations. The City holds a waterworks operation permit pursuant to 12VAC5-590-260.

2. On or about January 1, 2025, news reports started surfacing of a likely winter weather event. On January 3, 2025, Governor Glenn Youngkin declared a state of emergency for the Commonwealth of Virginia in advance of the expected winter storm. On January 4, 2025, the National Weather Service in Wakefield, Virginia, issued a Winter Storm Warning that included the City with predictions of 3-6 inches of snow and 0.1-0.25 inches of ice in the Richmond metropolitan area beginning on January 5, 2025, and ending late on January 6, 2025. On January 5, 2025, Mayor Danny Avula declared a state of emergency for the City.

3. The WTP has two main substation power supplies from Virginia Dominion Energy (Dominion). The WTP has two diesel back-up generators, Uninterrupted Power Supplies (UPSs), and employment of WTP operators, electricians, maintenance experts, instrumentation specialists, and others with specialized expertise to ensure the WTP can operate without interruption and effectively respond to needs, such as a power failure, in accordance with training and standard operating procedures (SOPs). The WTP was built in 1924 (Plant 1) and expanded in 1950 (Plant 2).

4. Comparable waterworks establish SOPs and provide task-specific training at the appropriate frequency to staff to ensure that everyone has the knowledge and skills to quickly respond to an emergency such as a power outage. SOPs help new employees learn critical procedures quickly and accurately. A waterworks' operation and maintenance manual, asset management program, and emergency response plan ensure staff understand and can quickly respond to a power outage.

5. On January 6, 2025, ODW highlights the following:[1]
    a. The WTP was operating in "winter mode," meaning that of the two available main power feeds from Dominion, only the above-ground feed was being used to power the WTP.
    b. At approximately 4:25 a.m., there was a short power interruption at the WTP. Waterworks staff completed a critical equipment check.
    c. At approximately 5:45 a.m., the active power feed to the WTP lost power. The main automatic bus tie failed to transfer power to the alternate power feed.
    d. At approximately 5:50 a.m., Waterworks operators observed flooding in the filter galleries. They attempted to start a diesel engine-driven pump to dewater the basement of Plant 1 but could not successfully prime the pump. The flooding was due to filter valves remaining open.
    e. By approximately 5:55 a.m., Waterworks operators observed six feet of water in the underground filter galleries of both Plant 1 and Plant 2. Vital WTP equipment was located in the basement and was directly impacted by the flooding.
    f. At approximately 6:05 a.m., Waterworks operators successfully primed the diesel engine-driven Godwin pump to dewater Plant 2 and it began pumping water from the underground filter gallery. Meanwhile, an electrical specialist for the Waterworks arrived early for their shift at the WTP and worked to open the entrance gate to the WTP, unaware of the ongoing flooding issues. Approximately 10 minutes later, the electrical specialist began investigating the loss of power.
    g. At approximately 6:30 a.m., the Waterworks' electrical supervisor arrived at the WTP.
    h. At approximately 6:40 a.m., the electrical supervisor tried to close the bus tie but could not close it. The electrical supervisor continued working to restore power. Meanwhile, chest-high water was observed in the Plant 1 pump room.
    i. At approximately 7:00 a.m., the WTP superintendent requested Chesterfield County and Henrico County to reduce their water demand. DPU did not adequately communicate the full extent of the flooding and the likely long-term Water Crisis that was developing. DPU staff did not inform Hanover County because of a lack of contact information.
    j. At approximately 7:05 a.m., power was restored to the WTP after the Waterworks' electrical supervisor manually closed the main bus tie. The SCADA network contained communication errors and failed to resume normal function.
    k. At approximately 7:40 a.m., Waterworks operators began to close all filter influent valves manually to stop the forward flow and flooding.
    l. At approximately 8:00 a.m., WTP maintenance staff arrived onsite and staff worked to hook up four two-inch pumps to dewater the flooded basement.

[1] More specifics on the timeline of events of the Water Crisis can be found in the SEH report.

m. At approximately 8:11 a.m., the DPU Director notified Chesterfield County that power had been restored. The DPU Director did not clarify that the WTP was not operational despite the return of power. Chesterfield County reverted to its normal withdrawal of water. The next communication with Chesterfield County did not occur until 2:35 p.m.
n. At approximately 8:20 a.m., the Waterworks' program and operations supervisor determined that not all filter influent valves were closed. Water levels began to recede once all the valves were closed.
o. At approximately 8:30 a.m., Dominion restored the power feed that had failed.
p. At approximately 8:45 a.m., the DPU Deputy Director arrived at the WTP.
q. By approximately 2:30 p.m., Plant 2 was mostly dewatered down to the basement level. Waterworks staff began to dry motors, actuators, and other equipment.
r. At approximately 2:34 p.m., the DPU Director called Henrico County's Director of Public Utilities and said that the WTP was not operating and may not be able to be restarted that day.
s. At approximately 2:45 p.m., a virtual meeting was held with Richmond DPU and its regional partners to explain that the WTP was not operating and the City would soon run out of water.
t. Between approximately 2:30 and 3:00 p.m., ODW contacted the water treatment plant staff and learned for the first time of the Water Crisis.
u. At approximately 4:30 p.m., the City issued a Boil Water Advisory.
v. At approximately 6:30 p.m., DPU staff updated ODW that most of the Waterworks' water storage tanks were empty and the entire City was out of water.

6. On January 7, 2025:
    a. At approximately 8:15 a.m., Plant 1 had three filters rewashed and online along with a finished water pump. WTP operators began filling the finished water tank, with production at approximately 15.4 million gallons per day (MGD).
    b. At approximately 3:45 p.m., flooding began again in the Plant 2 basement while backwashing a filter. The backwash pumps had been manually turned off without the operator's knowledge prior to initiating backwash. Waterworks operators turned on the pumps, but the area quickly flooded.
    c. At approximately 4:00 p.m., Waterworks operators were able to start pumps to dewater the Plant 2 basement area that had flooded. Effluent valve actuator panels that were open for drying, after the initial flooding event, were impacted by water splashing and had to be further dried out. This event delayed progress in returning the WTP to normal function.
    d. At approximately 4:30 p.m., Waterworks staff reconfigured the main plant electrical switchgear such that the bus tie was energized between both main feeds from Dominion, thereby placing the system into "summer mode" for added redundancy.

e. At approximately 6:00 p.m., four filters were online in Plant 1 and production was at 24 MGD.

7. On January 8, 2025:
    a. At approximately 2:30 a.m., the SCADA system became operational.
    b. At approximately 10:00 p.m., the WTP achieved production of 76.5 MGD.

8. On January 9 – 11, 2025:
    a. At approximately 11:00 a.m. on January 9, all service zones were repressurized to 20 psigauge, the minimum required under the Waterworks Regulations.
    b. A first set of water quality samples were taken to lift the Boil Water Advisory.
    c. On January 10, 2025, a second round of water quality samples were taken.
    d. On January 11, 2025, approximately 11:30 a.m., the Boil Water Advisories for the City, and Henrico, Hanover, and Goochland Counties were lifted.

Investigation into the Water Crisis

9. From January 7 through January 11, 2025, VDH ODW remained onsite at the City's WTP, located off Douglasdale Road in Richmond, to monitor response actions, promptly address regulatory needs, and provide technical assistance during the Water Crisis.

10. Subsequently, on January 27, February 6, and February 18-20, 2025, ODW staff conducted a sanitary survey inspection at the Waterworks, consisting of a detailed inspection of the Waterworks, including the WTP and the distribution system.

11. VDH retained SEH to help ODW investigate the Water Crisis. SEH provided a Comprehensive Waterworks Evaluation and Cost Estimate report dated April 8, 2025, which was released to the public.

12. The City retained HNTB to perform an after-action assessment of the events that led to the Water Crisis. HNTB released an After-Action Assessment Report, dated March 31, 2025.

13. The investigation into the Water Crisis revealed that the Water Crisis was avoidable and should not have happened:[2]
    a. Despite the state of emergency issued by the Governor and Mayor, the City chose to operate in "Winter mode," with main power to the WTP being provided by a single overhead main power feed from Dominion, as a cost-saving measure. The City's decision increased the risk of a significant WTP failure and failed to provide adequate redundancy. The Water Crisis would not have occurred with a better operational decision.

[2] See April 15, 2025, letter from State Health Commissioner Karen Shelton to Governor Youngkin and Mayor Avula.

b. The DPU has been aware for years of the risk of flooding, yet did not take appropriate action to properly maintain critical back-up UPS systems to protect against a flooding event. The Water Crisis would not have happened with a more proactive culture that kept up with proper asset management of critical equipment.
c. The WTP is overly reliant on manual operation. Back-up diesel generators that could provide power for limited operation require manual operation by qualified electrical maintenance staff. The City had placed undersized pumps, manually operated, to respond to flooding events. The Water Crisis would not have happened had the City taken better and more proactive steps to prevent flooding rather than having reactive manual response.

14. ODW's investigation also revealed the following:
    a. Critical electrical equipment, including pumps and motors that are not immersion rated, are located in an area of the WTP that is known to be susceptible to flooding. The location of this equipment significantly increases the risk of a catastrophic flooding event. The Water Crisis would not have happened if DPU had relocated critical equipment subject to a known flooding risk.
    b. The City had insufficient staff, specifically staff with electrical expertise, present at the WTP in light of the known winter storm event. The reliance upon manual operation of critical portions of the WTP made it especially crucial that staff with the necessary knowledge, experience, and training be present. On the morning of January 6, 2025, DPU had three onsite operators – consisting of a Class 1 operator, a Class 3 operator, and a Class 4 operator. Two maintenance staff, titled mechanical specialists, were present and assigned snow removal duties, but one of them went home at 5:00 a.m. due to illness. The electrical supervisor arrived onsite about 45 minutes after power was lost at the WTP.
    c. Communication among WTP staff was insufficient. Equipment was manually operated, including backwash waste pumps being manually shut off, without coordination and communication among staff. Failure to communicate about this resulted in WTP operators being unaware of the situation and attempting to return to normal operations with backwashing the filters, which resulted in a secondary flooding event causing another minor delay to recovery from the Water Crisis.
    d. The portable pumps, known as Godwin pumps, that Waterworks staff used to address the basement flooding were insufficient to address a major flooding event. The Godwin pumps are intended to address minor water infiltration from the filter clearwells into the pump rooms and filter pipe galleries, which was a known occurrence. The two Godwin pumps provide a pumping capacity of approximately 5 MGD, while the power failure caused a filter flow rate into the clearwells of approximately 60 MGD. After the valves were closed and the water levels stopped increasing, the Godwin pumps did allow for dewatering of the WTP and an eventual return to normal function.

e. The City allowed a culture to persist among Waterworks staff where known problems, such as flooding, were viewed as obstacles to work around rather than problems to be solved, and maintenance was reactive. This culture resulted in WTP staff focusing on specific individual operation tasks and not the primary and broader objective to provide safe and reliable water to the Waterworks' customers.
f. Review of standard operating procedures (SOPs) in place at the time of the Water Crisis show they were largely related to conducting distribution system repairs. At the time of the Water Crisis, the City had two emergency response-related SOPs in place: a "DPU Water Treatment Plan Emergency Response (ERP) – 2021 Update" that was specific to the WTP, and a "DPU Emergency Operations Manual (EOM) – 2021 Update" that was intended to be used across DPU departments. These SOPs were not widely distributed to Waterworks staff, they were only available in digital format, and some staff were unaware these documents existed. Operation of the WTP relied on the individual experience of operators rather than guidance provided by SOPs and other written documentation. Ultimately, the actions taken by DPU to dewater the WTP were in accordance with these SOPs. Additionally, the City did not have a specific training program in place for operations and maintenance staff at the Waterworks.
g. The Waterworks has not been maintained in a clean and orderly condition. Significant clutter, abandoned equipment – both with and without power - storage containers, and other debris was evident in the WTP. Additionally, equipment and supplies were stored in inappropriate locations, such as filter plant hallways, underground flocculator hallways, and chemical rooms. The WTP had significant amounts of standing water that increases the risk of corroding equipment and the building infrastructure.
h. Some control instruments were past the manufacturer's design life. There was no functional alarm in the control room for switchgear.
i. According to SEH, the Waterworks needs approximately $64 million in infrastructure upgrades, including approximately $11 million to move pumps and electrical equipment out of the basement area that is susceptible to flooding.

Causes of the Water Crisis

15. Multiple bad and improper operational decisions over many years caused or contributed to the Water Crisis, which resulted in DPU normalizing and accepting conditions that should not have been allowed:
    a. Despite the increased likelihood of a winter weather event causing a power outage, DPU chose to operate the Waterworks in "Winter mode," with a single, overhead main power feed to Dominion providing power to the WTP.
    b. Despite a declared state of emergency by the Governor and Mayor, staffing at the WTP overnight on January 5 into January 6 was insufficient to immediately and effectively respond to a power outage and subsequent flooding incident.

c. DPU staff displayed a lack of adequate proactive emergency response planning, equipment testing, and proactive asset management before the Water Crisis.
d. Despite decades of flooding history at the WTP, DPU never moved critical equipment susceptible to flooding and did not communicate it with its engineering contractors in the late 1980's and early 1990's when DPU sought to double the filter flow rate. The increased filter flow rate, combined with the need to keep clearwells nearly full at all times, significantly increased the risk of a catastrophic flooding event. Flooding events in 2021 and 2022 were never reported to VDH. DPU accepted known flooding as a normal condition and did not communicate it to its engineering firm consultants or to regulatory agencies.
e. The City had insufficient SOPs and training, including a lack of written emergency SOPs, a failure to make the Waterworks' emergency response plan readily available, and a lack of staff training on key equipment related to backup power. DPU did not adequately or timely communicate the critical flooding to stakeholders and regulators.

Water Crisis: Alleged Violations

This Notice is to advise that, based on the observations outlined above and ODW's investigation into the Water Crisis, the City of Richmond Waterworks may be in violation of, or may have violated, the Public Water Supplies Law, Title 32.1, Chapter 6, Article 2 of the Code of Virginia, and the following sections of the Virginia *Waterworks Regulations:*

16. The National Primary Drinking Water Regulations (40 CFR Part 141), the Public Water Supplies Law (Va. Code § 32.1-167, *et seq.*), and the Waterworks Regulations (12VAC5-590) establish standards for drinking water quality, drinking water infrastructure, and oversight of the drinking water program.

17. The Waterworks Regulations at 12VAC-590-350.A state, "Frequent assessments shall be made by the [waterworks] owner of the water supply and waterworks to locate and identify health hazards to the waterworks. The manner and frequency of making these assessments, and the rate at which discovered health hazards are to be removed, shall be the responsibility of the owner. Every effort shall be made by the owner, to the extent of his jurisdiction, to prevent the degradation of the quality of water supplies."

    The City failed to engage in proper oversight of the Waterworks, including: (a) the failure to conduct needed maintenance, repair, and replacement of vulnerable equipment; (b) the failure to address known hazards such as flooding of the clearwells and the exposure of key electrical components to a serious flooding event; and (c) the failure to have the proper procedures in place to address known risks to the water supply.

18. The Waterworks Regulations at 12VAC5-590-360.A state, "The [waterworks] owner shall provide and maintain conditions throughout the entirety of the waterworks in a manner that will assure a high degree of capability and reliability to comply with Part II (12VAC5-590-340, *et seq.*) of [the Waterworks Regulations]. This requirement shall

pertain to the source water, transmission, treatment, storage, and distribution system facilities and the operation thereof. The owner shall identify and evaluate factors with the potential for impairing the quality of the water delivered to the consumers. Preventative control measures identified in Part II of [the Waterworks Regulations] shall be promptly implemented to protect public health."

The Waterworks experienced a complete loss of water pressure that extended for multiple days and customers were subject to a Boil Water Advisory after pressure was restored. Additionally, neighboring localities that depended upon the Waterworks for service also were significantly impacted by the lack of water. The City's acts and omissions, as discussed in paragraphs 5 through 15 above, caused the Water Crisis event following the loss of power from the one main power feed from Dominion that was being utilized on January 6, 2025, and the failure of the automatic transfer switch that was relied upon to switch power to the second main power feed. Additionally, the Waterworks relied on manual operation of other important components in the event of a power outage and flooding, such as a diesel generator and the dewatering pumps. Heavy reliance on manual operation negatively impacted the City's ability to respond to the Water Crisis in as timely a manner as possible.

19. The Waterworks Regulations at 12VAC5-590-450 state, "Waterworks operation comprises the constant oversight and management of the facilities and personnel. Consideration shall be given to such factors as the competency of personnel; water quality, including drinking water standards; water treatment plant maintenance and cleanliness; analytical laboratory control; and the operation and maintenance of the facilities, including water treatment plant equipment, distribution system equipment, and piping. As the complexity of the waterworks increases, so does the expertise and skill required of the operating staff."

    The City failed to exhibit adequate oversight and management of the facilities and personnel of the Waterworks. Specifically, the City: (a) failed to ensure the reliability of water production in the event of a power outage; (b) failed to properly maintain critical fail-safe equipment in the event of a power outage; (c) failed to adequately clean and maintain the Waterworks; (d) failed to have adequate SOPs; (e) failed to properly inform staff of SOPs that were in place and have staff prepared to address emergencies; (f) failed to have adequate staffing at the WTP at the time of the power outage on January 6, 2025, to effectively respond, especially given the WTP's reliance on manual operation, which can be especially problematic in a crisis situation; and (g) failed to have a specific training program for Waterworks operations and maintenance staff in place to ensure that the expertise and skill of staff was commensurate with the complexity of the Waterworks.

20. The Waterworks Regulations at 12VAC5-590-470 state, "The waterworks shall be maintained in a clean and orderly condition."

    Clutter and abandoned equipment – both with and without power - storage containers, and other debris was evident in the WTP. Equipment and supplies were stored in

inappropriate locations, such as filter plant hallways, underground flocculator hallways, and chemical rooms. Additionally, the WTP had areas with standing water and high moisture that could be resolved or better addressed to reduce risks of corroding equipment and building infrastructure.

21. The Waterworks Regulations at 12VAC5-590-480.E state, in part, "Process control instruments, monitors, gauges, and controllers, including reading, recording, and alarm features, required in Part III, Manual of Practice (12VAC5-590-640 *et seq*.), shall be maintained fully operational and calibrated in accordance with the manufacturer instructions."

    The WTP has abandoned or obsolescent equipment still in place making it difficult to know what equipment, instruments, monitors, gauges and controllers are functional. Some control instruments were past the manufacturer's design life. There was no functional alarm in the control room for switchgear.

22. The Waterworks Regulations at 12VAC5-590-505.A – B state, "A. The owner of a community waterworks (including consecutive waterworks) shall develop and maintain an emergency management plan for extended power outages. B. The plan shall be kept current and shall be retained at a location that is readily accessible to the owner in the event of an extended power outage."

    While the City has an emergency management plan for the Waterworks, it was from 2021, it was not widely distributed, and staff were not aware of the emergency response procedures.

23. The Waterworks Regulations at 12VAC5-590-510.C state, "All waterworks shall provide a minimum working pressure of 20 psigauge (psig) at all service connections."

    Water pressure in the distribution system was below 20 psig beginning on January 6, 2025. All zones were repressurized to at least 20 psig by approximately 11:00 a.m. on January 9.

24. The Waterworks Regulations at 12VAC5-590-725 state, in part, "The design of computers, including supervisory control and data acquisition (SCADA) systems if used to monitor and control water treatment and distribution system facilities, shall meet the following general requirements:... 4. Waterworks pumps, chemical feeders, and other essential electrical equipment controlled through a SCADA or an automated control system shall have the capability for independent manual operation. Where a high degree of reliability is required, a backup control system shall be provided."

    There was insufficient reliability and equipment maintenance based on the timeline for the Water Crisis event on January 6, 2025. The firmware for the SCADA system was not up-to-date for independent manual operation.

25. The Waterworks Regulations at 12VAC5-590-730 state, "A. An emergency management plan for extended power outages shall be developed for each community waterworks as specified in 12VAC5-590-505. B. Alternative power sources at all waterworks shall be considered in the design to maintain a minimum level of service during an electrical power outage."

    The emergency management plan did not adequately consider alternative and back-up power sources based on the timeline associated with a power outage, such as experienced during the Water Crisis.

The City's Corrective Actions To Date

26. On February 21, 2025, DPU provided a response (DPU's Response) to the Original NOAV. DPU's Response states that the City has conducted training with operators and maintenance staff regarding power outages and additional SOPs and revisions to current SOPs are being developed. DPU expects those materials to be completed in June 2025. DPU's Response states that the bus tie that failed was replaced on January 13, 2025.

27. DPU's Response states that a new UPS was tested by the manufacturer on January 14, 2025, prior to installation, and a new UPS was tested during the commissioning process on January 17, 2025. UPS systems for the effluent filter operations were tested with new actuators and valves. UPS systems are upgraded.

28. DPU's Response states that the emergency generators will be upgraded to include an automatic transfer switch, with that project scheduled for completion in November 2025.

29. DPU has changed its leadership team, increased staffing on shifts, and improved its organizational structure.

30. The City has replaced the bus tie that failed with new equipment and new controls for automatic transfer for the generator. The WTP now operates using both main power feeds as the standard procedure.

31. The City has updated and increased its staffing on each shift since the Water Crisis.

Sanitary Survey

32. The Sanitary Survey Report developed by the Richmond Field Office (RFO), including recommendations, significant deficiencies, and minor deficiencies, must be addressed in a Corrective Action Plan (CAP). The CAP must address 12 significant deficiencies with an associated schedule pursuant to 12VAC5-590-350.D of the Waterworks Regulations. RFO's recommendations and identified deficiencies are incorporated by reference.

33. Waterworks Regulations cited in the Sanitary Survey Report and not cited above in paragraphs 17 through 25, include:

a. 12VAC5-590-360.B

B. For the purpose of achieving compliance with this chapter, the owner shall exercise control of the waterworks from the source water to the service connection. This requirement does not imply ownership of or maintenance for any portion of the service line where local agreements and conditions dictate otherwise.

b. 12VAC5-590-375.B.1.h

B. Monitoring requirements for lead and copper in tap water.

1. Sample location…

h. The owner of a waterworks whose distribution system contains lead service lines shall draw 50% of the samples the owner collects during each monitoring period from sites that contain lead pipes, or copper pipes with lead solder, and 50% of the samples the owner collects from sites served by a lead service line. The owner who cannot identify a sufficient number of sampling sites served by a lead service line shall collect first-draw tap samples from all of the sites identified as being served by these lines.

c. 12VAC5-590-395.A.2.a

A. Surface water and GUDI [groundwater under the direct influence of surface water] source treatment techniques…

2. A waterworks that uses a surface water source, a GUDI source, or both is considered to be in compliance with the requirements of subdivision A 1 of this section if it meets the following disinfection and filtration requirements:

a. Disinfection requirements.

(1) The disinfection treatment shall be sufficient to ensure that the total treatment processes of that waterworks achieve at least 99.9% (3-log) inactivation or removal of Giardia lamblia and at least 99.99% (4-log) inactivation or removal of viruses. If any physical process can achieve at least a 3-log removal of Giardia lamblia but cannot adequately remove pathogens, then the disinfection treatment shall provide a second treatment barrier for Giardia lamblia, Legionella, heterotrophic bacteria, and viruses. The disinfection treatment shall be sufficient to assure at least a 0.5 log inactivation of Giardia lamblia.

(2) The residual disinfectant concentration in the water entering the distribution system shall not be less than 0.2 mg/L for more than four hours.

(3) The residual disinfectant concentration in the distribution system, measured as total chlorine, free chlorine, combined chlorine, or chlorine dioxide, shall not be undetectable in more than 5% of the samples each month, for any two consecutive months that the waterworks serves water to the public. If the department determines that a waterworks is experiencing excessive coliform occurrences in its distribution system, then the department may require the owner to maintain minimum chlorine residual levels of 0.2 mg/L or monochloramine levels of 0.5 mg/L throughout the distribution system. Water in the distribution system with a heterotrophic bacteria concentration less than or equal to 500/mL, measured as HPC, is deemed to have a detectable residual disinfectant for the purposes of determining compliance with this requirement. Thus, the value "V," in percent, in the following formula shall not exceed 5% in one month, for any two consecutive months.

$V = [(c + d + e) / (a + b)] \times 100$

where

a = number of instances where the residual disinfectant concentration is measured;

b = number of instances where the residual disinfectant concentration is not measured but HPC [heterotrophic plate count of a bacterial population] is measured;

c = number of instances where the residual disinfectant concentration is measured but not detected and no HPC is measured;

d = number of instances where no residual disinfectant concentration is detected and where the HPC is greater than 500/mL; and

e = number of instances where the residual disinfectant concentration is not measured and HPC is greater than 500/mL.

d. 12VAC5-590-480.B

B. Testing for regulatory compliance purposes shall use an EPA-approved analytical method found in 40 CFR Parts 141 and 143. Instruments used for operational control purposes must be calibrated in accordance with manufacturer instructions. Calibrations shall be documented in a manner acceptable to the department.

e. 12VAC5-590-480.E

E. Process control instruments, monitors, gauges, and controllers, including reading, recording, and alarm features, required in Part III, Manual of Practice (12VAC5-590-640, *et seq.*), shall be maintained fully operational and calibrated in accordance with the manufacturer instructions.

1. The owner of a waterworks employing UV [ultraviolet] for inactivation credit shall perform UV sensor calibration checks. Calibrations and instrument checks shall be documented in a manner acceptable to the department. All UV sensors shall be calibrated with a reference UV sensor at least monthly. It is also recommended that offline and standby sensors be calibrated at the same time. At least one reference sensor for calibration of online sensors shall be provided. The reference UV sensor shall be calibrated at least yearly at a qualified facility, usually the manufacturer. Ultraviolet transmittance (UVT) analyzer calibration is required when used as a control instrument. The UVT analyzer shall be calibrated at least weekly by comparing online measurements to a benchtop spectrophotometer that is calibrated in accordance with manufacturer instructions. Instead of an online UVT analyzer, a benchtop spectrophotometer may be utilized to determine UV transmittance at least every four hours.

2. The owner of a waterworks employing ozone for inactivation credit shall perform calibration checks on continuous, online ozone residual monitors at least weekly. Inactivation credits for a multiple chamber contactor shall be based on only the chambers that have a measured ozone residual greater than 0.02 mg/L or higher, depending on residual analysis instrumentation.

f. 12VAC5-590-490

A. Adequate treatment is any one or any combination of the controlled processes of coagulation, sedimentation, absorption, filtration, disinfection, or other processes that produce water consistently meeting the requirements of this chapter. The concept of adequate treatment also includes processes that are appropriate to (i) the source water; (ii) waterworks that are of adequate capacity to meet maximum demands without creating health hazards and that are located, designed, and constructed to eliminate or prevent cross-connections; and (iii) the conscientious operation by well-trained and competent personnel whose qualifications are commensurate with the responsibilities of the position and acceptable to the department.

B. A waterworks shall provide adequate treatment when required and in accordance with 12VAC5-590-680 to ensure the production of potable water.

g. 12VAC5-590-510.E

E. A waterworks owner shall provide the commissioner at least 90 days prior written notice of the intent to initiate or discontinue a program to provide the optimum fluoride ion concentration.

h. 12VAC5-590-531.A.3.d

A. The owner of a waterworks using a surface water source, a GUDI source, or both shall report monthly to the department the following specified information…

3. For a waterworks with combined distribution systems serving 10,000 or more persons…

d. For an individual filter that has a measured turbidity level of greater than 2.0 NTU [nephelometric turbidity units] in two consecutive measurements collected 15 minutes apart at any time in each of two consecutive months, the owner shall report the filter number, the turbidity measurement, and the dates on which the exceedances occurred. In addition, the owner shall arrange for the conduct of a comprehensive performance evaluation (CPE) by the department or a third party approved by the department no later than 30 days following the exceedance and have the evaluation completed and submitted to the department no later than 90 days following the exceedance. A CPE means a thorough evaluation and analysis of a water treatment plant's performance-based capabilities and associated administrative, operational, and maintenance practices. A CPE is conducted to identify factors that may be adversely impacting a water treatment plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements.

i. 12VAC5-590-560

The owner of a waterworks shall institute a safety program to inform personnel of the known hazards, preventive measures, and emergency procedures pertaining to the operation of the waterworks in accordance with VOSH [Virginia Occupational Safety and Health program] laws and regulations.

j. 12VAC5-590-570.A.2

A. Monthly operational reports…

2. A classified waterworks using conventional filtration shall report using the monthly operating report (MOR) form approved by the department. All other classified waterworks shall report the required information specified in Tables 570.1 through 570.14, based on the treatment processes employed. Monitoring

data shall be collected for each day the operating staff attend to the operation of the facilities.

k. 12VAC5-590-580.B

B. No owner shall install, maintain, or allow a service connection to any premises where cross-connections to a waterworks or a consumer's water system exist, unless the owner and department ensure the cross-connections are adequately safeguarded.

l. 12VAC5-590-600.D

D. The CCCP [cross-connection control program] shall ensure testing, maintenance, and repairs of all backflow prevention assemblies, backflow elimination methods, and backflow prevention devices required and installed pursuant to 12VAC5-590-610.

m. 12VAC5-590-630.B.1

B. General safeguards

1. The backflow prevention assembly or backflow elimination method or backflow elimination device used shall depend on the degree of hazard that exists or may exist. The safeguard shall ensure maintenance of the distribution system water quality and its usefulness.

n. 12VAC5-590-1002.B

B. The process shall be controlled to minimize formation of dichloramine and nitrogen trichloride, which can create objectionable taste and odors. Control should be sufficient to limit free ammonia leaving the chloramination facility to no more than 0.1 mg/L as nitrogen.

o. 12VAC5-590-1081.B

B. Finished water storage structures shall be designed to facilitate turnover of water. Consideration shall be given to locating inlet and outlet pipes at different elevations and locations, tank mixers, and other acceptable means to avoid stagnation. Excessive storage capacity shall be avoided to prevent water quality deterioration. See 12VAC5-590-640 B 3.

EPA Inspection Review

34. The findings of ODW's follow-up site visit regarding the U.S. Environmental Protection Agency's July 2022 inspection of the Waterworks are attached and incorporated by

reference. Waterworks Regulations cited in the follow-up site visit report and not cited in paragraphs 17 through 33 above include:

a. 12VAC5-590-370 (quoted below in part)

A. Bacteriological monitoring.

1. The owner shall collect total coliform samples at specific sites and according to a schedule that is representative of water quality throughout the distribution system, which shall be documented in a written BSSP [bacteriological sample siting plan]. The BSSP shall be established or approved by the department after investigation of the source water, method of treatment and storage, and the final delivery of the drinking water through the distribution system…

Table 370.1…

220,001 to 320,000[3]	150[4]

b. 12VAC5-590-375.B.1.a

B. Monitoring requirements for lead and copper in tap water.

1. Sample site location.

a. By the date determined by the department for commencement of monitoring under subdivision B 4 a of this section, the owner shall complete a materials evaluation of the distribution system to identify a pool of targeted sampling sites that meets the requirements of this subdivision, and that is sufficiently large to ensure that the owner can collect the number of lead and copper tap samples required in subdivision B 3 of this section. All sites from which first-draw samples are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have POU [point-of-use] devices or POE [point-of-entry] devices designed to remove inorganic contaminants.

c. 12VAC5-590-550.B.16.a-f[5]

B. The owner shall retain at the waterworks or at a convenient location near the waterworks the following records for not less than the time periods specified:…

16. The owner of a waterworks that recycles flow, as stipulated in 12VAC5-590-395 C, shall collect and retain on file the recycle flow information for review and evaluation by the department. This information shall be retained for a minimum

[3] Population served per day.
[4] Minimum number of samples.
[5] ODW's follow-up report mistakenly cited 12VAC5-590-500.16.a-f, and not 12VAC5-590-550.B.16.a-f.

of 10 years. Information shall include, as a minimum:

a. Copy of the recycle notification submitted to the department.
b. List of all recycle flows and the frequency with which they are returned.
c. Average and maximum backwash flow rate through the filters and the average and maximum duration of the filter backwash process, in minutes.
d. Typical filter run length and a written summary of how the filter run length is determined.
e. The type of treatment provided for the recycle flow.
f. Data on the physical dimensions of the equalization or treatment units, typical and maximum hydraulic loading rates, type of treatment chemicals used, average dose, frequency of use, and frequency at which solids are removed, if applicable.

d. 12VAC5-590-600

A. The owner shall establish and implement a CCCP consistent with the extent of the distribution system and the consumers served by the waterworks. The owner shall review the CCCP and written cross-connection control plan not less than every five years and update it as necessary to satisfy the requirements of this chapter. The owner shall submit updates to the department to obtain approval. The department may review the plan upon request. This program shall include at least one designated individual assigned by the owner. Requirements for this position shall include training and experience in cross-connection control programs.

B. The CCCP shall not be in conflict with the USBC [Uniform Statewide Building Code] and applicable building code regulations, including 13VAC5-63 or subsequent regulations promulgated by the Board of Housing and Community Development.

C. The CCCP shall ensure complete assessments of every consumer's water system and shall determine both the degree of hazard and the appropriateness of existing safeguards to prevent contamination from cross-connections and backflow.

D. The CCCP shall ensure testing, maintenance, and repairs of all backflow prevention assemblies, backflow elimination methods, and backflow prevention devices required and installed pursuant to 12VAC5-590-610.

E. 13VAC5-63-530, which incorporates the International Property Maintenance Code into the USBC, requires testing of RPZ [reduced pressure zone backflow prevention] assemblies, double check valve assemblies, double check detector backflow assemblies, and pressure vacuum breaker assemblies after initial installation, immediately after repairs or relocation, and annually thereafter. The CCCP shall establish procedures for completing and monitoring operational tests, or other evaluation procedures as appropriate, at least annually, and after

installation, relocation, or repairs, for testable backflow prevention assemblies, devices, and methods that provide containment. The CCCP may include a public education program to:

1. Prompt consumer self-assessments, increase the awareness of cross-connections, and inform the consumer of the public health hazards of backflow.

2. The public education program, if provided as part of the CCCP, shall include, at a minimum, the following:
a. Causes of backflow;
b. Hazards and health effects of cross-connections and backflow;
c. Resources available to identify actual or potential cross-connections;
d. Safeguards to use to eliminate or control the hazards at the point of use; and
e. Sources for additional information.

F. The CCCP shall provide a method to discontinue or refuse water service to the consumer to ensure that the waterworks is adequately protected from cross-connections and backflow if any of the following conditions occur:

1. The consumer does not install, test and maintain a required backflow prevention assembly or backflow elimination method in accordance with the applicable sections of this chapter;
2. The consumer allows a required backflow prevention assembly or backflow elimination method to become inoperable or the consumer removes or bypasses it; or
3. The owner knows an unprotected or inadequately protected cross-connection exists on the premises and determines that there is inadequate backflow prevention at the service connection.

G. In the event of backflow of contaminants into the waterworks, the owner shall promptly take or cause corrective action to confine and eliminate the contamination. The owner shall report the event to the department within one business day in the most expeditious manner. The owner shall submit a written report by the 10th day of the month following the month during which backflow occurred addressing the incident, its causes and effects, and safeguards required or other action taken.

H. The owner shall maintain an inventory and records of testing, repairs, and maintenance of all backflow prevention assemblies, backflow elimination methods, and backflow prevention devices required and installed under 12VAC5-590-610 C. In the case of single-family residences subject to 12VAC5-590-610 C 5, the owner may determine whether or not to maintain an inventory or records. The department recommends the owner follow best practices identified in the AWWA Manual of Water Supply Practices M14 and the EPA Cross-Connection Control Manual.

I. The owner shall maintain an inventory and records of testing, repairs, and maintenance of all backflow prevention assemblies, backflow elimination methods, and backflow prevention devices required and installed under 12VAC5-590-610 E.

J. The owner shall maintain records related to the CCCP implementation, and any other records the department requires in accordance with 12VAC5-590-550.

e. 12VAC5-590-860.D.1.a

D. Chemicals.

1. Storage.

a. Space shall be provided where at least 30 days of chemical supply can be stored, based on the average dose and average annual water treatment plant flow rate. Storage shall be at a location that is convenient for efficient handling and safety. Lesser storage capacity may be approved if the owner can demonstrate that the local suppliers or other conditions will provide an uninterrupted source of chemicals.

f. 12VAC5-590-865.C.4

C. The department may require presedimentation of waters containing high turbidity or organics (as measured by TOC [total organic carbon])…

4. Provisions for bypassing presedimentation basins shall be provided.

g. 12VAC5-590-871.A.2

A. Rapid mixing is the rapid dispersion of chemicals throughout the water to be treated, usually by violent agitation, to promote coagulation…

2. Basins shall be equipped with mechanical mixing devices. Other arrangements, such as baffling, may be acceptable under special conditions and only when approved by the department. Where mechanical mixing devices are utilized, duplicate units or spare mixing equipment shall be provided.

h. 12VAC5-590-960.A

A. The continuous or periodic treatment of source waters with copper sulfate and other copper compounds to kill algae or other growths shall be controlled to prevent a copper concentration in excess of 1.0 mg/L, as copper, in the finished water leaving the treatment plant.

i. 12VAC5-590-1002

A. Chloramines shall be acceptable for secondary disinfection. Chloramines are formed by the reaction of ammonia and chlorine. Multiple chemical species may be created; however, monochloramine is the desired form.

B. The process shall be controlled to minimize formation of dichloramine and nitrogen trichloride, which can create objectionable taste and odors. Control should be sufficient to limit free ammonia leaving the chloramination facility to no more than 0.1 mg/L as nitrogen.

C. pH adjustment facilities shall be provided to maintain pH in the range of 7 to 8.

D. When use of chloramines is proposed, the potential increase of lead leaching within the distribution system shall be considered. Additional distribution system monitoring may be required by the department.

E. The owner shall inform the public before initiating any disinfection process involving chloramines, as directed by the department.

j. 12VAC5-590-1050.A.8

A. General…

8. A suitable outlet for drainage from pump glands shall be provided without discharging onto the floor.

k. 12VAC5-590-1081.A.2

A. Protection…

2. All finished water storage structures shall be designed to prevent vandalism and entrance by animals or unauthorized persons.

l. 12VAC5-590-1081.D

D. Overflows.

1. Finished water storage structures shall be provided with a downward-discharging, screened overflow pipe. The discharge pipe shall be brought down near the ground surface and into a drainage inlet structure or a splash plate that will divert the overflow away from the storage structure. The overflow pipe discharge shall be high enough above normal or graded ground surface to prevent the entrance of surface water.

2. Overflow pipe screens shall be installed so as to withstand the force of overflows. Properly designed flapper valves or rubber flex-type valves may be used instead of screens if approved by the department.

m. 12VAC5-590-1081.H

H. Penetrations. The roof and sidewalls of all structures shall be watertight with no openings except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping for inflow and outflow.

1. All pipes running through the roof or sidewall of a finished water storage structure shall be welded or properly gasketed in metal tanks or should be connected to standard wall castings that were placed during the forming of a concrete structure; these wall castings shall have flanges imbedded in the concrete.

2. Valves and controls shall be located outside the finished water storage structure so that valve stems and similar projections will not pass through the roof or top of the structure.

3. Downspout pipes for roof drainage shall not enter or pass through the structure.

n. 12VAC5-590-1081.J

J. Every catwalk over finished water in a storage structure shall have a solid floor with raised edges designed so that shoe scrapings and dirt will not fall into the water.

Requested Corrective Actions

To address the above-cited violations of the Waterworks Regulations and protect and promote the reliability of the Waterworks, VDH asks that the City, in addition to the previous work actions already taken in response to the Original NOAV, take these specific actions regarding the Waterworks to return to compliance:

- Enter into a consent order (proposed consent order attached) with the State Board of Health requiring, among other things:
    - Within 90 days of the effective date of the Consent Order, provide RFO with updated SOPs, or a statement that the current SOP was last updated since January 6, 2025, and does not require a further update at this time, regarding:
        - Power outage response;
        - Ensuring back-up power systems are routinely exercised and tested, including prior to storm events, in order to prevent flooding or other

damage to the WTP or loss of water service. This SOP is to include the frequency and procedures to test critical equipment and back-up power supplies on a periodic basis, as well as before storm events, and the frequency and procedures to practice transitioning the WTP from commercial power to emergency power and returning to commercial power; and

- Maintenance, construction, and other project oversight.

The SOPs must include roles and responsibilities of Waterworks staff in carrying out the action items within the SOPs. In addition to drafting and revising the SOPs, the City must provide RFO with documentation at least annually to establish that SOPs are being followed, including DPU's schedule for periodic training and re-training of DPU staff, and for periodic testing of emergency back-up systems.

- Beginning with the calendar quarter that the Consent Order becomes effective, provide RFO with quarterly progress reports regarding the status of the City's efforts to address each of the significant deficiencies identified in the Sanitary Survey Report. The progress reports are due by the 10th day after the last day of the quarter being reported on.
- Within 60 days of the Consent Order becoming effective, or otherwise as soon as possible, assign a full-time engineer to oversee maintenance, construction, and other projects affecting the operation of the Waterworks.
- Within 120 days of the Consent Order becoming effective, submit to RFO a capital improvement plan (CIP) or other operational changes, as appropriate, including timeline, in tabular format, to resolve the specific SEH and HNTB recommendations that are not specifically associated with the 12 significant deficiencies in the Sanitary Survey Report, but relevant and necessary based on the alleged violations outlined herein. If the City believes that any SEH or HNTB capital improvement recommendation is not necessary or should be changed, then provide that information in tabular format with the associated engineering firm recommendations.
- Within 270 days of the effective date of the Consent Order, or longer if agreed to by ODW, submit a completed Waterworks Business Operation Plan (WBOP) for the Waterworks to ODW for review. The WBOP will ensure that the City has the appropriate technical, managerial, and financial capacity and oversight to reliably operate the Waterworks. The City should consult with ODW while creating the WBOP. Additionally, the City must update the WBOP on an annual basis for at least three years, or longer if ODW determines necessary, and submit the annual WBOP update to ODW.
- Within 120 days of the effective date of the Consent Order, or as otherwise possible and appropriate, provide RFO with a comprehensive spreadsheet of all regulatory violations alleged in the Amended NOAV, and all deficiencies, areas of concern, and recommendations in: (1) the Sanitary Survey Report; (2) EPA's 2022 Safe Drinking Water Act Compliance Inspection Report and RFO's April 7,

2025, report regarding the findings of RFO's follow-up site visit; (3) the HNTB report, and (4) the SEH report. For each regulatory violation, deficiency, area of concern, and recommendation, the City's comprehensive spreadsheet must include the City's corrective action plan for addressing each item and a schedule for execution of the City's corrective action plan for ODW's review and approval. After submission of the comprehensive spreadsheet, provide ODW with quarterly progress reports to resolve or respond to each identified item in the corrective action plan. This comprehensive spreadsheet would constitute the City's entire corrective action plan and incorporate the CAP and schedule to address the 12 significant deficiencies identified in the Sanitary Survey Report and required pursuant to 12VAC5-590-350.D, discussed below.

Additionally, pursuant to 12VAC5-590-350.D of the Regulations, the City is required to consult with VDH regarding appropriate corrective action with a schedule for implementation to address the significant deficiencies set forth in the Sanitary Survey Report issued to the City by VDH. This consultation is required to occur within 30 days of the City being notified of the significant deficiencies. Furthermore, also pursuant to 12VAC5-590-350.D of the Regulations, within 45 days of the City being notified of the significant deficiencies, the City is required to submit to VDH a CAP and schedule to address the significant deficiencies.

Pursuant to Code of Virginia § 2.2-4019 and 12VAC5-590-115 of the Waterworks Regulations, the City may request an informal fact-finding proceeding (IFFP) if it disagrees with the allegations in this Notice or wishes to obtain a determination as to whether a violation has occurred. Please advise VDH in writing within 15 business days of the City's receipt of this notice if the City wishes to request an IFFP. To request an IFFP, please contact Grant Kronenberg, ODW Director of the Division of Compliance, Enforcement, and Policy, at grant.kronenberg@vdh.virginia.gov. If the City fails to attend a scheduled IFFP absent good cause, VDH may issue an adverse case decision against the City pursuant to Code of Virginia § 2.2-4020.2.

Failure by the City to comply with the Virginia Public Water Supplies Law or the Waterworks Regulations may result in VDH taking enforcement action. Enforcement actions include permit revocation, administrative orders, and civil or criminal proceedings, and civil charges or penalties of up to $5,000 per day for each violation. Va. Code §§ 32.1-26, 32.1-27, 32.1-175.01 and 32.1-176.

If you have questions, you may reach me directly at James.Reynolds@vdh.virginia.gov or (757) 406-1252. You can also contact Dwayne Roadcap, Office Director, at (804) 338-0371 or Dwayne.Roadcap@vdh.virginia.gov.

Sincerely,

James Reynolds, PE
Field Director, Richmond Field Office

Enclosures

SEH Comprehensive Waterworks Evaluation and Cost Estimate report, April 8, 2025
HNTB After-Action Assessment Report, March 2025
ODW Sanitary Survey Report
ODW Follow-Up Site Visit regarding EPA Safe Drinking Water Act Compliance Report, April 7, 2025
April 15, 2025, letter from State Health Commissioner Karen Shelton, MD

ec: Dr. Elaine Perry, Health Director, Richmond Henrico Health District; Elaine.Perry@vdh.virginia.gov
Dr. Thomas Franck, Health Director, Chickahominy Health District; Tom.Franck@vdh.virginia.gov
Dr. Alexander Samuel, Chesterfield Health District; Alexander.Samuel@vdh.virginia.gov
Mr. Dwayne Roadcap, Director, Office of Drinking Water; Dwayne.Roadcap@vdh.virginia.gov
Mr. Grant Kronenberg, Director of Compliance, Enforcement, & Policy, Office of Drinking Water; Grant.Kronenberg@vdh.virginia.gov