AFTER-ACTION ASSESSMENT REPORT

MARCH 31, 2025

PREPARED FOR

City of Richmond
900 E Broad Street
Richmond, VA 23219

Contact: Scott Morris, DBA, P.E.
Phone: (804) 646 - 7970

PREPARED BY

HNTB Corporation
2900 S Quincy Street
Suite 600
Arlington, VA 22206

Contact: Darren Burkhart, P.E.
Phone: (317) 636 - 4682

HNTB

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ATS	Automatic Transfer Switch
AWWA	American Water Works Association
CAO	Chief Administrative Officer
CM	Corrective Maintenance
CMMS	Computerized Maintenance Management System
DECPR	Department of Emergency Communications, Preparedness, and Response
DIT	Department of Information Technology
DPU	Department of Public Utilities
EOC	Emergency Operating Center
EPA	Environmental Protection Agency
EPS	Electric Power Systems
gpm	Gallons per Minute
HNTB	HNTB Corporation
I&C	Instrumentation & Controls
IFB	Invitation for Bids
MCC	Motor Control Center
MG	Million Gallons
MGD	Million Gallons per Day
NETA	InterNational Electrical Testing Association
O&M	Operation & Maintenance
ODW	Office of Drinking Water
PLC	Program Logic Controller
PM	Preventative Maintenance
psi	Pounds per Square Inch
SCADA	Supervisory Control and Data Acquisition
SFP	Small Form-Factor Pluggable
SG	Switchgear
SOP	Standard Operating Procedure
UPS	Uniterruptable Power Supply
VAC	Virginia Administrative Code
VDH	Virginia Department of Health
VDEM	Virginia Department of Emergency Management
WO	Work Order
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

HNTB was contracted by the City of Richmond to perform an after-action assessment of the events at the Richmond Department of Public Utilities (DPU) Water Treatment Plant (WTP) that led to a loss of water service for residents across the region. The event was caused by an equipment failure, and the effects of this equipment failure were compounded by lack of planning, lack of standard and emergency procedures, and poor communication. This report and HNTB's scope are focused on the direct causes on the event on January 6, 2025 and only touch on long-standing or systemic issues within the water utility for the City of Richmond. HNTB made a site visit, conducted staff interviews, requested, and received numerous documents from DPU, reviewed available records and data, and reviewed publicly available information.

Event Description: The following is a high-level description of the event that led to the loss of water service. Additional details surrounding the event are included in the after-action assessment report.

- Main Feeder 1 from Dominion Energy went out. Main Feeder 2 still had power.
- Power did not automatically transfer from Main Feeder 1 to Main Feeder 2 due to a transfer switch failure, as a result the WTP completely lost power.
- Without power, operators were not able to close filter effluent valves or turn on filter effluent pumps. The backup battery powered system did not close the filter effluent valves.
- With flow of water continuing through the filters, the water level increased in both clearwells until it reached the plant basements and submerged equipment and critical electrical systems.
- Upon the electrician's arrival at the WTP, Main Feeder 2 was activated and power was restored, therefore the transition to the backup generator power was not required.
- Diesel-fueled pumps were used to pump water out of the basements, but they were not able to pump at the rate required to overcome or keep up with flow rate of water coming through the filters.
- The water in the basements damaged equipment which resulted in a complete WTP outage for nearly 36 hours.

The after-action assessment report includes additional detailed findings from the investigation process in the following areas: WTP basement flooding and dewatering, storm preparation, power systems, SCADA system, staffing, training, operating procedures, asset management and maintenance, and communications. Refer to the full report for detailed information and conclusions. Short-term and long-term recommendations were developed based on the investigation findings. Primary recommendations from the investigation are listed below. Refer to the full report for a complete list of all recommendations.

Short-Term Recommendations: The following actions are recommended for implementation in the next three (3) to six (6) months.

- Operate the WTP in Summer Mode all the time or at least during storm events that have risks of power outages (DPU has indicated that this has been implemented as the normal operating mode moving forward).
- Develop a Bus Tie/ATS failure plan, ensure all electrical staff are properly trained on the plan, and clearly display the plan on each bus tie cabinet (SG 6 and SG 7). (DPU has indicated that Operations staff has been trained in switchgear operation and transitioning the WTP plant to generator power).
- Review staffing plans and consider staffing the WTP with mechanical and electrical staff during storm events that have risks of power outages. If staffing at this level is not feasible, at minimum implement all other recommendations and develop severe storm event response protocol with requirement that maintenance staff on call during storm events can respond in 30 minutes or less. (DPU has indicated that Plant Maintenance has developed a Storm Preparation SOP that would staff

WTP with mechanical and electrical staff if the EOC is activated by the City).

- Provide a filter effluent valve UPS with a parallel duplicate backup UPS in each plant, all with a minimum runtime of one (1) hour, and ensure that both function as intended to close all filter effluent valves on loss of power. Size the UPS to close all filter valves simultaneously. In lieu of a backup UPS, a small backup generator could be considered to provide backup power in the event of the first UPS failing. The UPS sizing and operation should meet the requirements of Chapter 7 of the Virginia Electrical Code (2020) for Legally Required Systems. (DPU has hired another consultant to update the UPS units, and it is currently in active design).
- Install a SCADA UPS with a minimum runtime of at least one (1) hour. The UPS sizing and operation should meet the requirements of Chapter 7 of the Virginia Electrical Code (2020) for Legally Required Systems. (DPU has hired another consultant to update the UPS units, and it is currently in active design).
- Change the SCADA programming in Plant 1 to match that of Plant 2 so that the filter effluent valves are set to manual, and the manual set point is set to zero when SCADA is on UPS power.
- Verify filter effluent valve fail safe positions are set to close or reprogram to close.
- Develop written SOPs for plant operation, establish a comprehensive training system for staff on SOPs, and implement a regular update schedule for the SOPs.
- Review safety program for all staff. Refer to 12VAC5-590-560 for minimum requirements.
- Expand DPU Emergency Operations Manual to include scenario-specific and process-specific actions for plant staff to follow during emergency events. Ensure plan is kept current and readily accessible per 12VAC5-590-505.
- Evaluate existing Master Plan, Capital Improvement Plan, and other planning efforts for the WTP. Determine which recommended projects have been completed and which have been deferred. Of the deferred projects, develop a plan to re-prioritize the implementation of these projects based on criticality. (DPU has indicated that they are beginning this process).
- Perform a holistic review of the planning, engineering, and procurement processes for capital projects within DPU. Determine inefficiencies in these processes and develop an action plan to address or correct the found inefficiencies.
- Develop a crisis communications plan. (The City has engaged another consultant to assess its emergency communications during crisis response).
- Install dewatering pumps, such as hydraulic-driven pumps, which avoid high suction head issues affecting the priming of the existing dewatering pumps. Dewatering pumps should also have higher flow rates than the existing dewatering pumps, 3,000 to 6,000 gpm is recommended, and permanent piping that routes water away from the plant basements.

Long-Term Recommendations: The following actions are recommended for implementation over several years given the time or financial implications of the recommendations.

- Review staffing plans and consider the addition of a float operator to each shift, so that typical staffing is four (4) operators per shift. If there is an issue getting coverage for an operator that needs a day off, there are always a minimum of three (3) operators.
- Raise as many critical electrical systems above the plant basements as practical.
- Provide an automatic transfer system for the existing backup generator system (DPU has indicated that this is included as part of a current capital project).
- Seal clearwell as much as possible by repairing any cracks or spalling in the concrete and sealing any pipe penetrations and hatches to reduce the flow rate at which water from the clearwell can flood the basement.
- Restructure preventative maintenance (PM) schedule to reduce PM overlap for the same set of assets.
- Develop and implement an asset management plan that includes maintenance and replacement of water system assets, both in the WTP and out in the distribution system

AFTER-ACTION ASSESSMENT REPORT

1. Introduction

HNTB was contracted by the City of Richmond to perform an after-action assessment of the events at the Richmond Department of Public Utilities (DPU) Water Treatment Plant (WTP) on January 5 and January 6, 2025 that led to a loss of water service for residents across the region. The purpose of this report is to summarize the after-action assessment. This report and HNTB's scope are focused on the direct causes on the event on January 6 and only touch on long-standing or systemic issues within the water utility for the City of Richmond. HNTB's contracted scope is included in **Appendix A** and Councilmember questions related to the event are included in **Appendix B**.

HNTB previously submitted an After-Action Review Preliminary Findings report, which was released to the public on February 14, 2025, and an Interim After-Action Assessment Report, which was released to the public on March 3, 2025. It should be noted that there are updates to those findings within this report as additional information was received between the release of the Preliminary Findings and Interim Report and the compilation of this Final Assessment Report.

2. Investigation Process

For the after-action assessment HNTB made a site visit, conducted staff interviews, requested, and received numerous documents from DPU, reviewed available records and data, and reviewed additional, publicly available information.

HNTB was on site at the DPU's WTP Monday, January 27, 2025, through Wednesday, January 29, 2025. HNTB was joined on site by three (3) representatives from the Virginia Department of Health (VDH) Office of Drinking Water (ODW): Bailey Davis, Chief of Field Operations, Jane Nunn, Compliance and Enforcement, and James Reynolds, Richmond Field Office.

After arriving on site Monday, January 27, HNTB was given a tour of the facility by Doug Towne, Plant Operations Superintendent, and Leroy Rice, Plant Operations Supervisor, Senior. While on site HNTB interviewed the following DPU staff and VDH staff were also present for all interviews:

1. Kenny Weeks, Program and Operations Manager
2. Arnie Eberly, Program and Operations Supervisor
3. Matt (Evans) Brizendine, Utility Plant Specialist Supervisor – Electrical
4. Victor Fischer, Plant Operator
5. Leroy Rice, Plant Operations Supervisor, Senior
6. Doug Towne, Plant Operations Superintendent
7. Eric Whitehurst, Deputy Department Director, Senior
8. Demario Roache, Utility Plant Specialist – I&C
9. Oral Gardner, Utility Plant Specialist – Mechanical
10. Logan Roach, Plant Operator
11. Charles Watts, Plant Operations Supervisor
12. Wyatt Cotner, Plant Operator
13. Tom Marsh, Plant Operator
14. Donald Murray, Plant Operator

In addition to the interviews conducted on site, HNTB conducted the following virtual interviews on Microsoft Teams:

1. Bob Steidel, Former Deputy Chief Administrative Officer of Operations (March 5, 2025)
2. Matthew Longshore, Director of Public Utilities, and Matt Ellinghaus, Deputy Director, for Hanover County Public Utilities (March 13, 2025)
3. George Hayes, Director of Utilities for Chesterfield County, Matt Rembold, Assistant Director of Operations & Maintenance, and Chris Overby, Assistant Water Operations Manager for Chesterfield County Utilities (March 13, 2025)
4. Ricky Hatfield, Capital Project Manager, Senior (March 14, 2025)
5. Sabrina Joy-Hogg, Interim Chief Administrative Officer (March 18, 2025)
6. David Spivey and Janardan Lal, E-merge Systems (March 21, 2025)
7. Jeff Gray, Senior Policy Advisor (March 25, 2025)
8. Stephen Willoughby, Director of Emergency Communications, Preparedness and Response (March 25, 2025)
9. Danny Avula, Mayor of Richmond (March 25, 2025)

HNTB met with Scott Morris, Stephen Willoughby, and Hagerty Consulting's Danielle Holmstrom, Aymar Marino, and Jaesa Rogers on March 7, 2025 to coordinate report content. Hagerty Consulting is reviewing and providing recommendations on the City's incident response. HNTB reviewed Hagerty's draft report, and Hagerty reviewed HNTB's Preliminary Findings and Interim Assessment Report.

HNTB also had email exchanges with Bentley Chan, Director of Henrico County's Department of Public Utilities. It was determined that Henrico's after-action report compiled by AquaLaw provided a comprehensive account of the timeline and communications between DPU and Henrico for the purposes of this after-action assessment report.

HNTB requested to interview former DPU Director April Bingham on February 17, 2025. Former Director Bingham was contacted by City staff by phone on February 17 and February 18, but she declined to be interviewed, and that information was conveyed to HNTB on February 18. HNTB's contact information was provided to former Director Bingham on February 28. The City of Richmond did not provide contact information for former Director Bingham to HNTB.

Through a series of data requests and responses, DPU provided the necessary documents for HNTB's review. HNTB also gathered publicly available research documentation independently as part of the investigation process. Refer to the reference list at the end of the report for all documents reviewed for the assessment.

3. Water Treatment Plant Overview

A brief overview of the WTP is included for reference in other sections of the assessment. The WTP has a rated capacity of 132 million gallons per day (MGD) and consists of two interconnected treatment trains, Plant 1 built in 1924, and Plant 2 built in 1950, which are shown in **Figure 1**. The WTP typically treats 50 to 75 MGD.

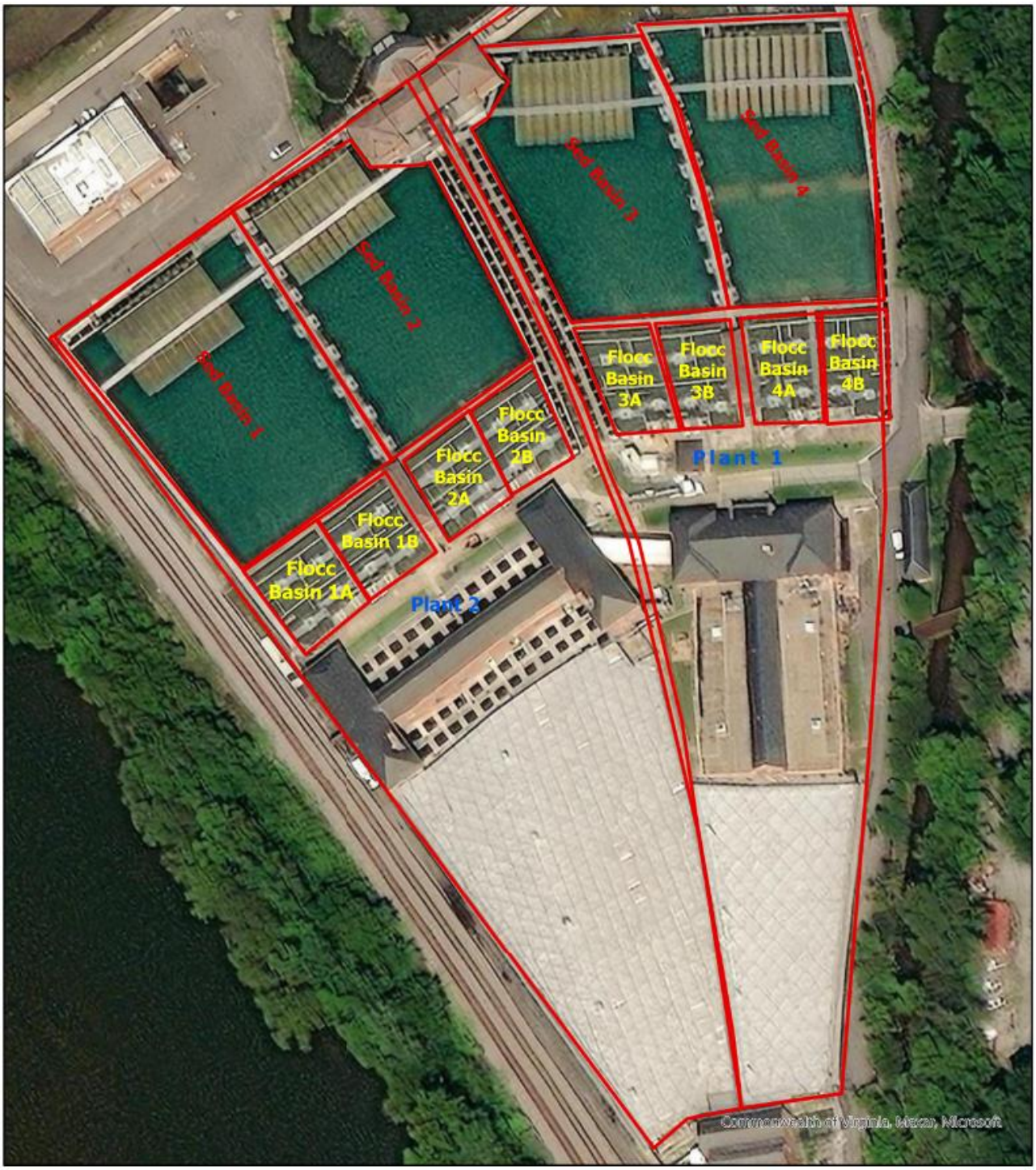

Figure 1. WTP Overview[1]

3.1. Water Treatment Plant Process

This report focuses on the main flow path through the WTP from low service pumps to the finished water basins. The following terms are used throughout the description of the WTP and upset events and are defined here for reference. Note: There are many other systems, subsystems, equipment, and controls not specifically mentioned here because they are not in the direct path of flow from

[1] U.S. Environmental Protection Agency. (2022). *Safe Drinking Water Act Compliance Inspection Report*

raw to finished water or related to the events being reviewed.

- Low service pumps: pump water from the raw water basin to raw water channels that flow to the flocculation basins.
- Raw water channels: channels in which polymer and alum are mixed with the raw water to start the coagulation and flocculation processes needed to settle out as many solids as possible.
- Flocculation basins: tanks that provide gentle mixing of the raw water to continue the flocculation process and settle out as many solids as possible.
- Sedimentation basins: large tanks that provide large cross-sectional volume, which allows the water to slow down and become less turbulent. As the water becomes less turbulent, solids start to settle out, leaving only smaller, lighter non-settleable solids suspended in the water.
- Filter influent gates: open and close to allow or stop the flow of water into the filters (these gates are manually operated).
- Filters: tanks with filter media that removes the non-settled, non-soluble solids from the water.
- Filter effluent valves: open and close to control the flow of water from the filters to the clearwells (these valves are typically automatically operated).
- Clearwells: water storage structures below the filters that hold water to be used in the backwash cycle to clean the filters or pumped to the finished water basins.
- Filter effluent pumps: pump water from the clearwells to the finished water basins. May also be referred to as finished water pumps, aerator pumps, or aerators.
- Finished water basins: water is stored until pumped into the distribution system for customer use.

Under normal operation WTP flow is lifted by four (4) low service pumps to then flow by gravity through two (2) raw water channels, eight (8) flocculation basins, four (4) sedimentation basins, and twenty-two (22) filters, ten (10) in Plant 1 and twelve (12) in Plant 2. Lower flow rates can pass through those treatment steps entirely by gravity if the James River level is high enough. Filtered water enters clearwells under the filters in each plant. The filtered water is pumped from the clearwells to finished water basins and is then pumped to distribution. A flow diagram for the WTP is shown in **Figure 2.**

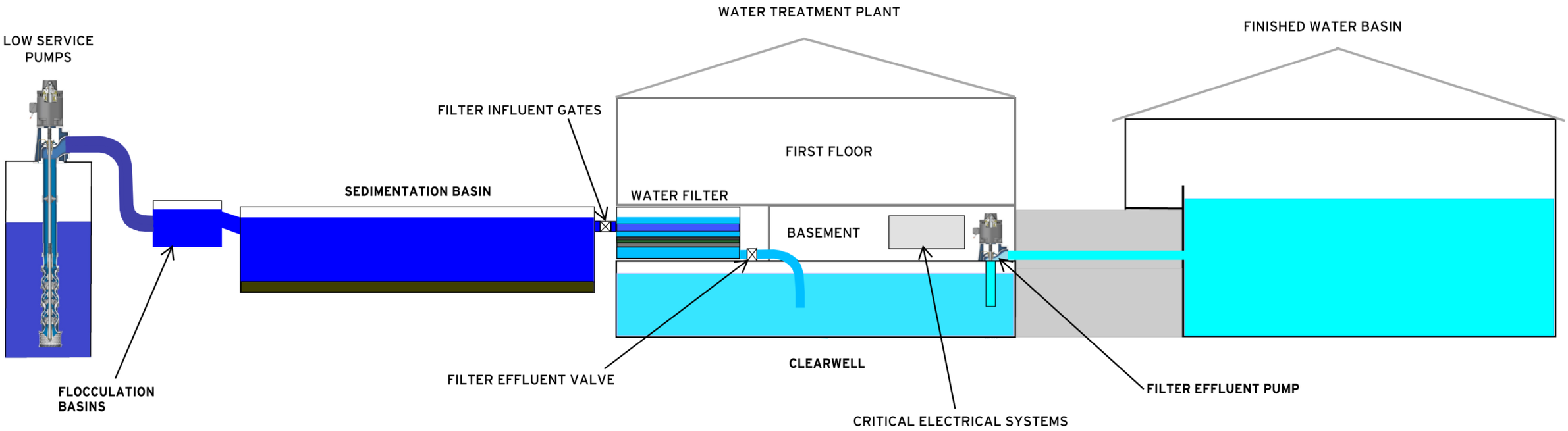

Figure 2. WTP Flow Diagram

3.2. Water Treatment Plant Electrical and Control Systems

The following electrical and control terms are used throughout the description of the upset event and are defined here for reference.

- Main Feeder: the plant may be powered from two (2) main power supplies labelled as Main Feeder 1 and Main Feeder 2. Power flows from Dominion Energy through either Main Feeder 1 or Main Feeder 2 to Switchgear SG 6.

- Backup Generator: diesel-fueled engines that generate backup power for the WTP.

- Switchgear SG 6: a series of control cabinets designed to act like large light switches to turn on and off power to electrically protect the plant and to switch over to auxiliary/backup power during a loss of power from the electric utility. SG 6 contains a Bus Tie (or Automatic Transfer Switch (ATS)) designed to switch power from Main Feeder 1 to Main Feeder 2 or from Main Feeder 2 to Main Feeder 1 if either power source loses power. There is also manual transfer switch to transfer to power from the generator system to the WTP. Power flows from SG 6 to SG 7.

- Switchgear SG 7: a duplicate circuit of SG 6, which connects power from SG 6 to the WTP via switchboards, electrical panels, Motor Control Centers (MCC), and other power distribution panels and devices.

- SCADA: Supervisory Control and Data Acquisition (SCADA), which is a type of automation and control system that the plant operators use to collect data on how the WTP is operating and to control how the WTP processes are adjusted and operated.

- Electric Valve Actuator: electrical motor used to remotely operate a valve.

- UPS: Uninterruptable Power Supply (UPS), which utilizes batteries to store energy and provide backup power for connected systems.

- Agastat Relay: electromechanical time delay relay inside the Bus Tie Cabinet (part of the switchgear). Closes the bus tie after the power has been off for the set amount of time.

- Relay: a type of electromechanical switch used to turn power off and on.

- ATS: Automatic Transfer Switch (ATS) is another way of describing the Bus Tie Cabinet function. When there is a power supply failure, the ATS automatically switches over to backup power supply

- Switch: for the purposes of this document, switch refers to a type of electrical device that is used to open or close an electrical circuit, which turns on and off the power to the attached electrical components.

- Summer Mode: refers to the WTP being fed from both incoming power feeders. Allows power from both feeders to flow through each side of the switchgear to different portions of the plant.

- Winter Mode: refers to the WTP being fed from incoming power Main Feeder 1. This allows the entire WTP to be supplied power by Feeder 1, which appeared to be less expensive power than Feeder 2. Winter Mode operation was established by DPU over 20 years ago as a cost savings measure during times of the year that power outages from thunderstorms are significantly less

frequent. The change to Winter Mode happens after September 30 and the change back to Summer Mode happens by May 30. Annual cost savings provided by DPU were approximated to be $65,600 based on 2024 usage and rates.

3.3. Switchgear SG 6 and SG 7 Operation

Switchgear SG 6 and SG 7 are operated in one of two modes of operation: Summer Mode or Winter Mode. An illustration of Summer Mode in Switchgear SG 6 and SG 7 is shown in **Figure 3**, and an illustration of Winter Mode in Switchgear SG 6 and SG 7 is shown in **Figure 4**. Summer Mode mitigates the risk of a complete WTP power outage when one (1) of the Main Feeders loses power. The Agastat Relay closes the bus tie switch between sides of the switchgear. Summer Mode also allows the Bus Tie/ATS in SG 7 to function as a spare for the Bus Tie/ATS in SG 6. If the Bus Tie/ATS in SG 6 fails to close on loss of a feed, then the Bus Tie/ATS in SG 7 would close and maintain power to the entire WTP. Winter Mode is utilized to take advantage of less expensive power from Main Feeder 1 but requires the Bus Tie/ATS in SG 6 to operate to restore power to the WTP when Main Feeder 1 loses power. When operating in Winter Mode, the Bus Tie/ATS in SG 6 becomes a singular critical component with no redundancy.

3.4. Backup Generator Operation

A tertiary backup generator system was installed to provide backup power to Switchgear SG 6 if a hurricane or other natural disaster causes widespread power line failures that would result in the plant not having access to either of the two (2) electric utility power feeds for a long duration of time. The system was installed in response to a hurricane that left the plant without power for several days. The generator system is currently manually operated, but there is a capital project in process that will automate start-up of and transfer to the generator system in the event both utility power feds are lost. Staff interviewed reported a wide variety of times required to start-up the backup generator and transfer power manually, ranging from 5 minutes to 45 minutes.

3.5. UPS Operation

The are two (2) primary UPS units that provide backup power to the SCADA system and filter effluent valves. UPS units are typically only provided for critical systems due to cost and sizes are kept to a minimum to mitigate any adverse effects of power outages or fluctuations. The programming differs between Plant 1 and Plant 2 when the SCADA system in each plant is on UPS power. In Plant 1, the valves are switched to manual mode and set to the current manual set point. If this set point is not zero, the valve does not close, and the operator must set the value to zero to close the valve. In Plant 2, the valves are switched to manual, and the manual set point is set to zero, starting with Filter 11 and then each subsequent filter in 15-second intervals until all are closed. DPU has hired another consultant to update the UPS units, and it is currently in active design.

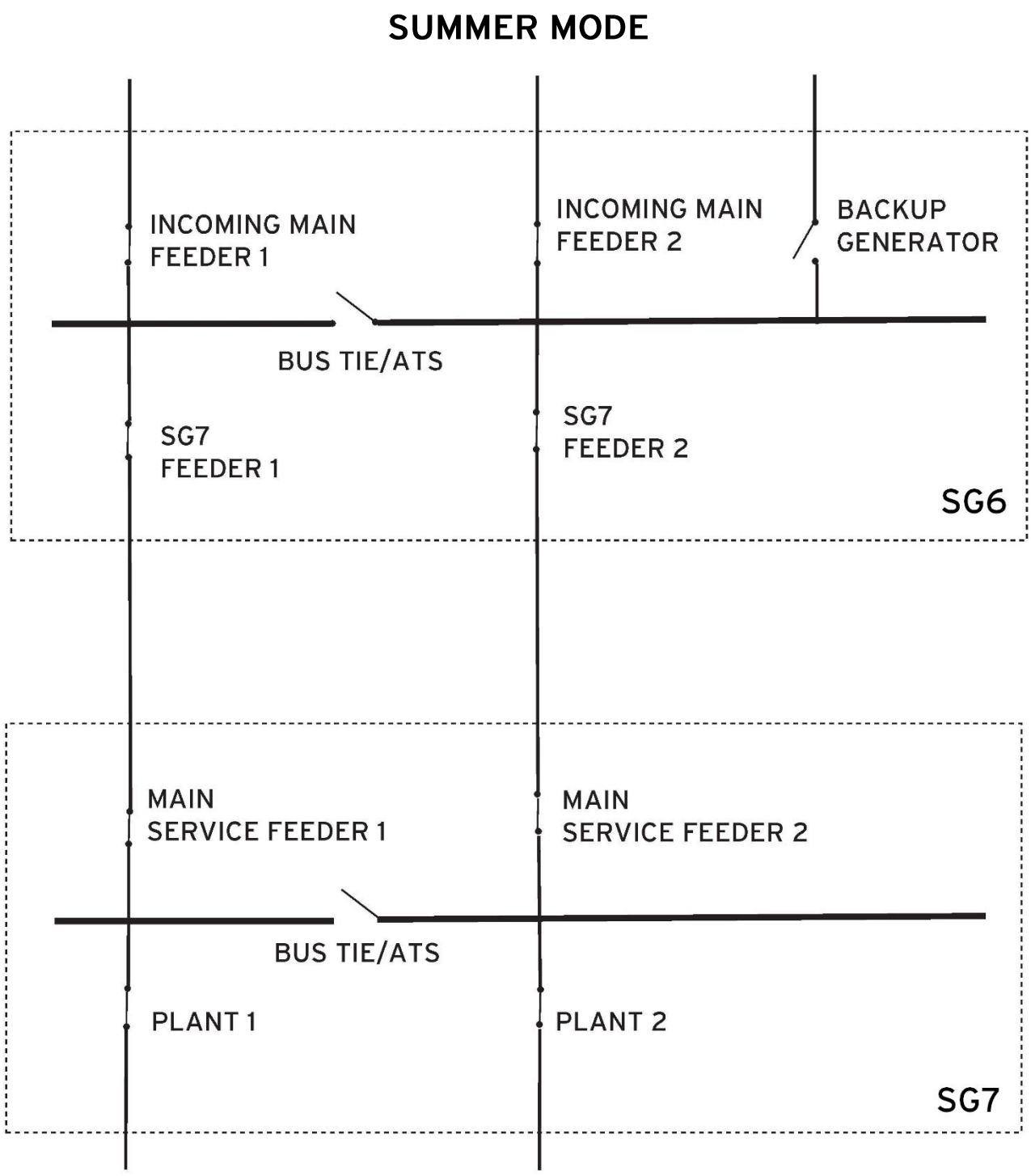

Figure 3. Switchgear SG 6 and SG 7 Summer Mode

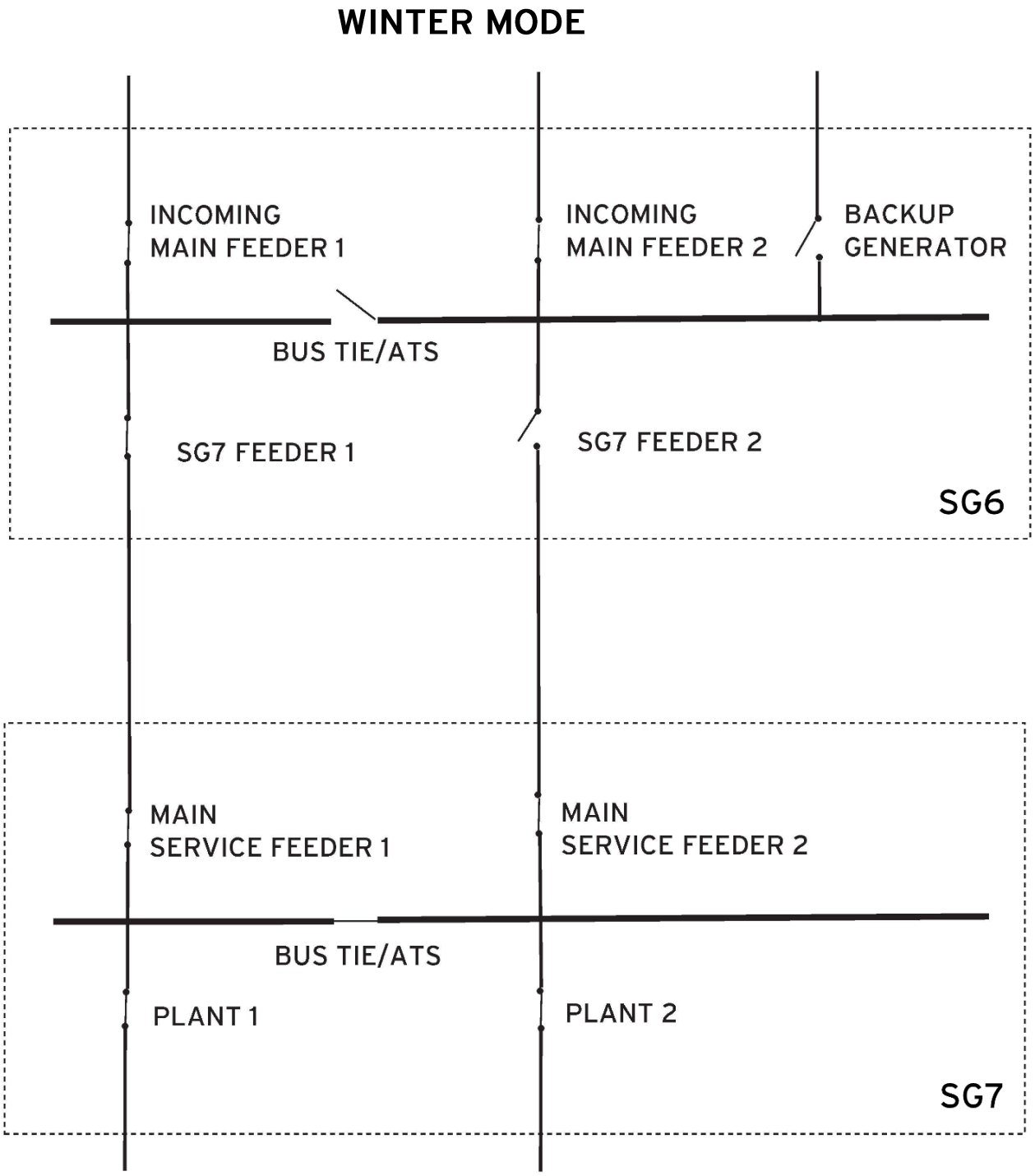

Figure 4. Switchgear SG 6 and SG 7 Winter Mode

4. Event Description

The WTP experienced a complete loss of power in the early morning hours of January 6, 2025. The event was caused by an equipment failure, and the effects of this equipment failure were compounded by lack of planning, lack of standard and emergency procedures, and poor communication. Staff on site at the time the WTP lost power were one (1) Plant Operations Supervisor, three (3) Plant Operators, two (2) regularly schedule night shift operators plus one (1) day shift operator that arrived early for their shift), and one (1) Utility Plant Specialist – Mechanical. The Utility Plant Specialist was on-site for snow removal. The WTP was operating in Winter Mode, so only Main Feeder 1 was powering the entire facility. Main Feeder 1 from Dominion Energy went out, likely due to icing from the winter storm occurring at the time. Main Feeder 2 still had power. The Bus Tie/ATS in SG 6 failed to automatically transfer from Main Feeder 1 to Main Feeder 2, and the WTP completely lost power. The WTP SCADA system lost communication with the server and stopped functioning at the same time as power was lost. Without power, operators were not able to close filter effluent valves or turn on filter effluent pumps. The filter effluent valve UPS failed to close the filter effluent valves, either due to insufficient battery power or the SCADA system not functioning.

With forward flow of water continuing through the filters by gravity, the water level increased in both clearwells until it reached the plant basements with pumps, valve actuators, electrical panels, and other equipment. Water inundated the basements, initially reaching over six (6) feet high in the pipe galleries, which are located at the lowest of both basements, within minutes of the outage.

One (1) Electrical Utility Plant Specialist (electrician) arrived early for their shift at 6:00 AM. The electrician focused on checking the status of Main Feeder 1 and Main Feeder 2 in SG 6 and SG 7 and manually transferring power from Main Feeder 1 to Main Feeder 2. The Utility Plant Specialist Electrical Supervisor completed the manual transfer from Main Feeder 1 to Main Feeder 2 and restored power to the WTP approximately one (1) hour and 20 minutes after it was lost. The water level was several feet high in the pump rooms of both basements, and equipment was damaged by the time power was restored. They did not attempt to start the backup generators and switch to generator power at any point during the event because standard procedure is to switch power to the other Main Feeder if one still has power. Because Main Feeder 2 still had power and power was successfully restored once it was activated, the transition to the backup generator power was not required.

Diesel-fueled pumps were used to pump water out of the basements, but they were not able to pump at the rate required to overcome or even keep up with flow rate of water coming through the filters. Additional pumps were brought to the WTP by wastewater treatment plant (WWTP) maintenance staff to help with dewatering. It was not until the flow of water through the filters was stopped at 8:10 AM, approximately two (2) hours and 25 minutes after power was lost, that the pumps were able to start lowering the water level in the basements. The water in the basements damaged equipment which resulted in a complete WTP outage for nearly 36 hours.

4.1. Event Timeline

Through information provided by DPU, information provided by VDH, staff interviews, and review of SCADA, HNTB compiled the following timeline of events. Additional events may have occurred that are not listed. This timeline is intended to capture the critical items related to the event. Timeline information provided by VDH is included in **Appendix C.**

FRIDAY, JANUARY 3, 2025	
	Virginia Governor Glenn Youngkin declares state of emergency in advance of winter storm that will pass through Virginia January 5 and 6.
12:30 PM	City of Richmond holds a weather briefing that included the Interim Chief Administrative Officer (CAO), Deputy CAOs, Department Heads, Emergency Management Liaisons, and other stakeholders. Preparatory actions ahead of the storm were discussed. DPU Deputy Director attends.
1:00 PM	Virginia Department of Emergency Management (VDEM) hosts a call about the incoming winter storm. DPU Deputy Director attends.
SUNDAY, JANUARY 5, 2025	
	Richmond Mayor Danny Avula declares state of emergency due to anticipated impact of severe weather.
8:00 PM	First Virtual EOC (Emergency Operating Center) briefing is held that included the Interim Chief Administrative Officer (CAO), Deputy CAOs, Department Heads, Emergency Management Liaisons, and other stakeholders. DPU Director attends.
MONDAY, JANUARY 6, 2025	
4:25 AM	WTP experiences a short power outage (power bump) that only lasts a few seconds. In response to power bump, WTP operators reduce filter effluent flow rate to 1.5 MGD. Finished water pump N3 goes out of service as a result of the power bump.
4:35 AM	WTP operators attempt to restart N3, but it fails to start effectively. Operators then prime finished water pump N1 as a replacement and start it up successfully. Operators then begin a check of critical equipment throughout the WTP. Operators increase filter effluent flow rate to 3.15 MGD once 60 MGD finish flow is reestablished.
5:45 AM	WTP loses power. SCADA system goes down and loses communication with the plant without power. Operators and Utility Plant Specialist - Mechanical staff that were on hand to help with snow clearing begin priming Godwin dewatering pumps for both Plant 1 and Plant 2. The suction side hose for the Godwin pump for Plant 1 was disconnected from the pump and had to be reconnected, causing a delay in dewatering.
5:50 AM	Operators observe water beginning to rise and flood the basements of both Plant 1 and Plant 2. Operators call WTP Electrical and I&C staff and ask them to come to the WTP to help restore power.
5:55 AM	Operators observe at least 6 feet of water in the pipe gallery (lowest level) in the basements of both Plant 1 and Plant 2.
6:05 AM	Godwin pump for Plant 2 catches prime and begins discharging water from the Plant 2 filter gallery.
6:20 AM	Water was observed spouting from finished water pump N2 check valve. The pump was in the process of being rebuilt after repairs, and a cover on N2's discharge check valve casing was not secured. Water levels had reached the bottom stair of the staircase leading from the catwalk to the pump room floor in both basements.
6:30 AM	Utility Plant Specialist Electrical Supervisor arrives at the WTP, goes to SG 7, and observes no voltage on the meter reader. He then immediately goes to check on SG 6.
6:35 AM	Godwin pump for Plant 1 catches prime after issues with priming and begins discharging water from the Plant 1 filter gallery.
6:40 AM	Utility Plant Specialist Electrical Supervisor opens SG 6 and observes the main feed is lost and that the bus tie that ties feed 1 to feed 2 together had not closed. An attempt is made to close the breaker using the control handle, but the breaker does not close.
6:45 AM	Utility Plant Specialist Electrical Supervisor observes the main feeds. Main Feeder 1 is open without power and Main Feeder 2 is closed and has power. Dominion Energy is called and notified that Main Feeder 1 is down.
7:00 AM	Utility Plant Specialist Electrical Supervisor goes to Main Feeder 1 switch to observe voltage. Phase 1-2 has full voltage (4160V), but Phase 2-3 has 1800V and Phase 3-1 has 2100V. Plant Superintendent notifies DPU Director as well as Chesterfield County and Henrico County plant staff and requests a demand reduction from both systems.

7:05 AM	Utility Plant Specialist Electrical Supervisor closes the bus tie breaker manually by closing the plunger on the breaker manually. Power is restored to the WTP via Main 2. SCADA regains power but has communication errors. There are two (2) sump pumps in the basement of each Plant and an unknown number of sump pumps begin to run once power is restored. Water elevation in the Plant 2 basement has reached the bottom of the MCC panel.
7:30 AM	Dominion Energy arrives on site to evaluate and repair Main Feeder 1.
7:40 AM	Operators manually close the settling basin influent and effluent valves. Operators then work to manually close all of the filter influent valves.
7:45 AM	Program and Operations Manager calls the WWTP maintenance staff to support and bring pumps to help dewater.
8:00 AM	DPU Director arrives on site. Dewatering pumps and additional maintenance staff from WWTP arrive at WTP to support. Maintenance staff work to hook up four 2-inch submersible pumps
8:10 AM	Floodwater continues to rise. Operators and maintenance staff work to confirm that all filter influent valves are completely closed. Once this is completed, water begins to recede in the basement. Dewatering continues throughout the morning and afternoon.
8:30 AM	Dominion Energy restores power to Main 1. The bus tie at SG 1 opens automatically once power is restored.
10:00 AM	Plant Superintendent notifies DPU Director and Deputy Department Director that there may be a service interruption and to start considering issuing a Boil Water Advisory.
12:00 PM	City Department of Information Technology (DIT) arrives at the WTP to work to restore the SCADA system.
2:30 PM	Plant 2 is mostly dewatered, and WTP staff begin to dry motors, actuators, and other equipment.
2:51 PM	Representative from VDH calls Plant Superintendent after hearing about issues at the WTP from a third party. Plant Superintendent indicates to VDH that WTP has not produced water since the early morning due to flooding as a result of a power outage.
3:00 PM	Plant Superintendent notifies DPU Director and Deputy Department Director that Byrd Park Reservoir levels are low and have dropped to about 10 feet.
4:26 PM	City of Richmond issues a Boil Water Advisory.
4:30 PM	Plant 1 is mostly dewatered. WTP and WWTP staff begin to dry motors, actuators, and other equipment.
5:00 PM	Contractors with E-merge Systems arrive at the WTP to work to restore the SCADA system.
5:30 PM	Representative from VDH arrives at the WTP but is denied access by the security guard at the gate and could not contact staff at the WTP. Representative leaves the site.
6:50 PM	Representative from VDH arrives at the WTP and is granted access and able to get inside the gate.
TUESDAY, JANUARY 7, 2025	
11:30 AM	Field Director from VDH Richmond Field Office arrives at WTP. VDH staff remain on site until the boil water advisory is lifted.

4.2. Treatment Plant Disruption

The water in the WTP basements damaged pieces of equipment and electrical components including valve actuators and pumps. Once dewatering operations were complete, DPU staff worked to dry out equipment and electrical panels to assess what was and was not functional. Several of the filter effluent pumps had to be sent out for refurbishment before they could be placed back in operation and most of the electric valve actuators were damaged and non-functional. At the time of HNTB's site visit, very few filter valve actuators in Plant 1 were working, most of the valves were being operated manually, and DPU was in the process of replacing the non-working actuators. Several of the filter valves in Plant 2 had hydraulic actuators that were not as affected by the flooding. WTP

production did not resume until the evening of Tuesday, January 7. Full water service was restored to the distribution system on Thursday, January 9, and the boil water advisory was lifted for the City of Richmond on Saturday, January 11.

Richmond's main reservoir, the Byrd Park Reservoir, has a storage capacity of approximately 55 million gallons (MG). Due to an ongoing construction project at the reservoir, half of the reservoir was out of service and the half in service could only be filled less than three-quarters full, significantly reducing its storage capacity. With this constraint, Richmond's distribution system was at an increased risk be able to meet demands in the event of loss of WTP production.

5. Investigation Findings

5.1. WTP Basement Flooding and Dewatering

Flooding of the Plant 1 and Plant 2 basements was the cause of the equipment failures and extended WTP outage. If the filter effluent pumps stop pumping, due to power outage or equipment failure, and flow continues through the filter, the water level in the clearwells can rise quickly, overflow the clearwells, and start flooding the Plant 1 and Plant 2 basements. Operations staff indicated that they prevent flooding from happening or worsening by closing the filter effluent valves, but they have very little time to react. Reaction times reported ranged from five (5) to fifteen (15) minutes. HNTB calculated times for water to reach various depths in the basements based on plant drawings, typical clearwell levels, and WTP flow rates to validate these reaction times. At a WTP flow rate of 60 MGD, water could reach two (2) to three (3) feet of depth in the lowest part of the basement in less than twelve (12) minutes. The time would be even less if the clearwell was at a high level to start and the clearwell leaks due the age of the concrete in both plants. Operators noted that the clearwell level is typically maintained near full to ensure there is adequate finished water for backwashes and to provide better suction conditions for the filter effluent pumps.

All filter valves are in the lowest level of the plants and are accessed via stairs and a number of ladders from platforms in the center of the basement. Manual operation of the valves quickly is impractical because of how they are accessed, the number of valves (22), the amount of time it takes to operate a valve by hand, and the potential safety risks for an operator to be in the lowest levels once flooding starts.

WTP staff interviewed indicated that the basement flooding was a common occurrence at the WTP but that typically meant a small amount of water in the lowest level of the basement that does not damage equipment. Multiple staff interviewed cited a past flooding event, which resulted in an at least six (6) hour timeframe where plant production was paused as a result of flooding in the basement. The primary difference noted by staff between the flooding event on January 6 and previous flooding events was that the WTP had power during previous events.

Once there is water in the basements, staff use a combination of sump pumps in the plant basements and standby pumps located at grade to pump water out of the basements. The standby pumps are Godwin dewatering pumps with self-priming devices. The pumps have a maximum capacity of approximately 1,770 and 2,290 gallons per minute (gpm) under ideal conditions. Data sheets for the same model Godwin pumps as those used at the WTP are included in **Appendix D**. The pumps are operating in less than ideal conditions, with nearly 20-feet of suction lift required by pumps and over 60-feet of six (6) inch pipe and hose from the basement to the pump, so the actual pumping capacity is likely less than half of the maximum capacity. The pumps also discharge at grade which can allow the water to flow back into the basements, which did happen in Plant 1 as the

dewatering efforts took place during this event.

5.2. Storm Preparation

Governor Youngkin declared a state of emergency for the State of Virginia on January 3. Mayor Avula followed this up by declaring a state of emergency for the City Richmond due to the anticipated impact of the storm. The DPU Deputy Department Director also participated in calls hosted by the City's Department of Emergency Communications, Preparedness, and Response (DECPR) and VDEM discussing the winter storm and storm preparation. Despite these indicators of the severity of the incoming winter storm, multiple WTP staff members indicated that there was no discussion of storm preparation from leadership at the at the WTP. Two (2) mechanical staff members were assigned to the overnight shift for the evening of January 5 to help with snow and ice clearing.

There was little proactive action taken at the WTP to prepare the plant for the event of a power outage. Outside of staffing the overnight shift with mechanics for snow removal, there was no formal discussion, written notice, or reminders to the staff on specific actions needed to prepare the plant for a potential power outage caused by the storm. There were only informal discussions among the operators at the shift change on actions to take in the event of a power outage. Staff also noted that electrical and I&C staff had been on hand for the overnight shift for previous storm events, but that was not the case for this event. The only preparations taken by staff were to fuel vehicles and backup generators and fill chemical tanks. The backup generators were also verified to be operational by staff during a pre-storm check on January 4. Otherwise, standby equipment was not prepared for the event of a power outage. For example, the suction hose for the Godwin dewatering pump for Plant 1 was disconnected from the pump at the time of the event and froze. Staff noted that because the hose was frozen, it took five (5) to ten (10) minutes and three (3) staff members to reconnect the hose. It also took Plant 1's dewatering pump approximately 30 minutes longer than Plant 2's dewatering pump to catch prime and begin dewatering the basement, which may have been caused by ice around the hose's seal created a poor seal.

WTP staff were not adequately prepared for the incoming storm. Management should have alerted all staff working during the storm about the potentially disruptive nature of the incoming storm and reminded staff of emergency operating procedures. At the beginning of shifts where there are storm events, safety measures and emergency procedures should be discussed with all staff on shift so that they are aware of what actions to take in the event of an emergency, such as a power outage. If there are severe weather conditions where a power outage is possible, actions should also be taken to prepare any standby equipment at the WTP for a potential outage so that time is not spent on procedures that could have been done ahead of time, especially when time is of the essence and all hands on staff are needed to respond.

5.3. Power Systems

The WTP was in Winter Mode operation of the switchgear system and this put the WTP at risk because the SG 6 Bus Tie/ATS becomes a singular critical component. Given the risk, an SG 6 Bus Tie/ATS failure plan should have been attached to the SG 6 Bus Tie/ATS Cabinet and electrical staff trained on its content. If an electrical staff member had been on site during the power failure, then completing a manual transfer as detailed in a failure plan may have prevented the basement water from reaching the critical electrical systems. Once the electrician did arrive on site, they spent time assessing the situation and restoring power via a manual transfer, but it is unclear if they were trained to complete the transfer because the manual transfer was not completed until the electrical supervisor arrived on site.

As noted in the event description, no attempts were made to start the backup generators. DPU staff's focus was on restoring WTP power from Main Feeder 2 once they established that it still had power. This would seem to be the prudent course of action because had the transfer been made in a timely fashion, by having trained staff on site to react accordingly, then the length of time without power would have been minimized and shorter than the time required to manually transfer to backup generator power.

DPU had a third-party, Electric Power Systems (EPS), review the bus tie failure in SG 6. An email summarizing their findings is included in **Appendix E**. The bus tie failure was attributed to a failed "close" coil. Maintenance staff noted that they use a third-party to inspect and test the switchgear on a three (3) year interval, based on InterNational Electrical Testing Association (NETA) guidance, and the switchgear was due for its next inspection and test in 2025. The failure of the coil would be difficult, if not impossible, to predict, even with more frequent testing.

Based on staff interviews, WTP staff are unclear if the filter effluent valve UPS does what it is intended to do and closes filter effluent valves on loss of power. The difference in programming between the plants may explain the confusion about the function of the filter effluent valve UPS. Consistent programming and having the Plant 1 program match the Plant 2 program would minimize confusion and ensure that the filter effluent valves close in both plants automatically. This would also ensure the valves stay closed until an operator has confirmed that the filter effluent pumps are running, and forward flow can resume through the filters without flooding the plant basements. Given that time is of the essence to prevent flooding, the UPS should be sized adequately, and programming changed to close all valves simultaneously.

5.4. SCADA System

At the time of the power outage, the WTP SCADA system lost communication with the server and stopped functioning. The operators on shift at the time indicated that the system was displaying question marks in place of typical values monitored by the system and that they were unable to make any inputs. There are UPS units in place to power to the SCADA system in the event of a power outage. Plant 1's UPS for its SCADA system was designed to run for an hour once engaged, but additional loads had been added to it since initial design and installation, likely reducing its actual runtime. Plant 2's UPS was designed to run for an hour once engaged and did not have additional loads placed on it. Because the power outage lasted for over an hour, it is presumed that the UPS units had been drained, causing a hard shutdown of the SCADA system, which is not recommended for the servers installed at the WTP. Once contractors arrived on site, it was also determined that there were two breaks in the fiber optic communication loop around the WTP, which were caused by small form-factor pluggable (SFP) transceivers going bad once power was restored. These failures occurred in two different Program Logic Controllers (PLCs) at the WTP, which were located at sedimentation basins 1 and 2 and at the raw water intake, neither of which were impacted by the flooding that occurred.

City DIT staff arrived on site at the WTP at approximately 12:00 PM, and contractors with E-merge Systems arrived on site at the WTP at approximately 5:00 PM on January 6 to work to restore the SCADA system. Upon E-merge's arrival, the SCADA system was partially operational and communicating with only parts of the WTP and the SCADA servers for Plant 1 and Plant 2 were not communicating with each other. At 8:26 PM on January 6, the DPU Director reached out to the directors of Chesterfield and Hanover Counties via text messaging for recommendations of other contractors to fix the SCADA system (also attempted to contact the director of Henrico County but was texting a desk phone as noted in Henrico's after-action report) and separately stated concerns with E-merge Systems ability to restore SCADA functionality to the Interim CAO and the Director

of DECPR. Additional contractors from Heritage Electrical arrived on site late on January 6.

There were several factors that caused delays in getting the SCADA system back up and fully operational. It was noted by E-merge staff that because a hard shutdown of the SCADA system occurred, it took much longer to restore the system than a standard shutdown, causing delays in getting the WTP back into production mode because the filters needed to be backwashed first. To prevent the potential detrimental impacts of a hard shutdown, the SCADA system should be manually shut down to safeguard the program if a failure appears imminent.

The SCADA system was fully operational at approximately 1:30 AM on January 7, but there was still partial data missing due to the communication loss caused by the aforementioned SFP failures. Later that morning, a breaker in one of the filter cabinets tripped while it was being dried out from the flooding. The SCADA system stayed up, but communication was lost at that PLC within the filter cabinet, causing additional downtime in SCADA restoration. Communication was restored once staff assessed what had happened and flipped the breaker back on. The SCADA system was not completely restored, fully operational, and communicating with all parts of the WTP until early morning on January 8 once the replacement SFP transceivers arrived at the WTP and were installed at the affected PLCs.

5.5. Staffing

Staffing for operations at the WTP typically consists of three (3) operators: a chief operator, Plant 1 operator, and Plant 2 operator. Prior to the event, operators were on 12-hour shifts, two (2) shifts per day. After the event operators were on 8-hour shifts, three (3) shifts per day. Operations management, including Operations Supervisor, Senior and Superintendent are typically at the WTP for a typical day shift and on call at all other hours.

Maintenance staff are typically at the WTP for a typical day shift and then rotate call for after-hours maintenance needs. Staff interviewed indicated that maintenance staff may be scheduled at the WTP for additional shifts during storm events. The discipline (i.e., mechanical, electrical, or I&C) and number of maintenance staff scheduled varied based on staff interviews. At the time of the power outage on January 6, only one (1) mechanical staff member was on site for the overnight shift to help with snow and ice clearing; two (2) were scheduled and initially on site but one (1) went home early. There were no electrical or I&C staff on site at the time of power outage. Only the electrical staff were trained and able to perform the transfer to generator power at the time of this event, so there was not a qualified individual on site to switch to generator power in the event of a power outage.

Based on staff interviews, there are occasional problems finding coverage when an operator calls in sick or otherwise cannot come in, which can result in the plant being staffed by only two (2) operators. As of January 6, there were two (2) operator vacancies at the WTP, which can exacerbate issues in finding staff to cover shifts.

Supervision at the WTP is split such that the Plant Operations Superintendent oversees the operations staff while the Program and Operations Manager oversees the maintenance staff, which includes mechanics, electricians, and I&C technicians. The WTP operations and maintenance organization charts, as of December 19, 2024 and as it was structured at the time of the event, are included in **Appendix F** and job specifications are included in **Appendix G**. From interviews with WTP staff and leadership, it was evident that this organizational structure created communication issues, where critical information and job needs were not shared across groups, which was amplified during the response to the power outage. Some operations staff noted during the interviews that

they did not know what to do or how to help during the event and felt that the initial response efforts were the responsibility of the maintenance staff. It is HNTB's understanding that WTP operations and maintenance staff organization charts are currently undergoing revisions to reflect recommendations made in the earlier After-Action Review Preliminary Findings report and the Interim After-Action Assessment Report.

5.6. Training

Based on staff interviews, there are no established training procedures or written training manuals at WTP. While on-the-job training is irreplaceable, written training manuals and job descriptions that are updated regularly are critical to ensure every staff member has access to the same information and critical plant knowledge is not lost as staff retire or move on. Written training documents can help new staff learn procedures quickly. In addition to continual training, annual training and exercises should also be conducted on critical standard operating and emergency procedures to ensure staff are well-equipped to carry them out. American Water Works Association's (AWWA) Utility Management G-Series standards recommend an education or training program to transfer appropriate knowledge, skills, and experience necessary to maintain the competencies of plant personnel to fulfill their tasks and maintain operation at the WTP. AWWA recommends continual assessment of staff skills and knowledge to support the mission of the facility.

In addition to procedural training for operations staff, there was an evident lack of training and development for managerial staff. It was noted during staff interviews that formal supervisor training was rare and infrequent, and the Interim CAO noted that regular supervisor training had not been occurring citywide. Training for managerial staff is important so that they have the skills and competencies to adequately handle personnel issues as they arise. Leaderships skills learned from these trainings would also serve managers well in emergency situations where strong leadership, efficient communication, and buy-in from responding staff is crucial to support the mission at hand.

Multiple staff members also noted that there was no formal safety training established and that most safety measures were communicated through on-the-job training and reminders. VDH Waterworks Regulations as established in 12VAC5-590-560 require that waterworks owners institute a safety program to inform personnel of known hazards, preventive measures, and emergency procedures pertaining to the operation of the plant.

Appropriate training for both standard operation and emergency operation is critical in allowing staff to effectively respond to emergency situations, such as an extended power outage. It is also critical that there is established safety protocol and staff are aware of job hazards and adhere to safety measures, especially during an emergency situation, as staff safety should be the highest priority. Lack of adequate training and written training documents can lead to a lack of awareness of critical actions that need to occur in an emergency event, such as the event that occurred on January 6.

5.7. Operating Procedures

Based on staff interviews of WTP operators, electricians, mechanics, and instrumentation specialists, there is a lack of established written Standard Operating Procedures (SOPs) for typical plant operations and for emergency operations. Some operators noted that there are some written SOPs for basic processes, but some are over a decade old and potentially out of date and multiple operators noted that they would not know where to find these SOPs. It is standard practice at waterworks facilities that SOPs are established to ensure staff are consistent in carrying out

processes to operate and maintain the WTP while meeting facility and regulatory requirements. AWWA's Utility Management G-Series standards note that developing and regularly updating SOPs for equipment and plant production processes as a best practice for WTP operation.

It is also a standard practice at waterworks facilities to establish an emergency response plan so that staff can understand how to quickly respond to an emergency situation, such as a power outage. AWWA's Utility Management G-Series standards recommend developing, documenting, and maintaining SOPs specific to emergency preparedness, noting that scenario-specific response actions should be a part of these SOPs. DPU does have an Emergency Operations Manual that was last updated in 2021, but a physical copy of this manual was not available at the WTP prior to or during the events on January 6. This plan also lacks facility and process-specific actions that operators of the WTP would need to take in the event of a power outage, which is common for waterworks of DPU's size. At a minimum, SOPs outlining closing the filter effluent or influent valves in the event of a power outage, initiating standby power, and starting the generator should be included in the Emergency Operations Manual to address critical procedures during a power outage. Staff also noted that they had never been involved in any tabletop exercises to simulate a response to emergency situations.

VDH Waterworks Regulations as established in 12VAC5-590-505 require that community water works shall develop and maintain an emergency management plan for extended power outages and that the plan be kept current and readily accessible in the event of a power outage. Without awareness of the location or contents of the emergency management plan, staff will not be equipped to take the necessary actions to respond in the event of an emergency.

It was also noted that many operations and maintenance staff and management staff worked hours far exceeding their typical shift durations, many noting that they were at the WTP for more than 16 hours at a time helping respond to the event. While an all-hands-on-deck approach is often needed in the event of an emergency, it is important that staff are relieved from their duties to get an opportunity to rest. Staff that are not well-rested will be less alert and will perform at a lower level. Decision making can also become impaired, which can disrupt the mission if leadership has difficulty making sound decisions due to lack of rest This can also create safety hazards as reaction time and alertness become impacted and fatigue could lead to injury. An emergency staffing plan to be implemented in situations like this could ensure that there is adequate coverage for crisis response while still ensuring that proper relief is provided to staff members.

5.8. Asset Management and Maintenance

DPU does not have a separate asset management plan that details how assets are maintained and replaced, but did provide the Water Master Plan (2001), Condition Assessment Technical Memorandum (2020), Water Capital Plan, and maintenance work orders for HNTB's review. The Condition Assessment and work orders indicate that the WTP assets have been catalogued and tagged with unique asset identifiers, so the groundwork has been laid for an asset management plan. The Water Master Plan included projects at the WTP that were slated for implementation from 2001 to 2007 however many of these projects were only recently implemented or are just now being implemented per the Water Capital Plan. There could be many reasons for the 20-year delay of capital projects, but it indicates that there may be substantial amounts of deferred replacement that leads to running equipment to failure. Additionally, multiple staff members interviewed noted long delays in the implementation of capital projects. One example of these delays is evident in the progress of the Substation No. 1 Replacement project, where SG 6 is located. While this project does not replace the entire switchgear, it will primarily replace the substation upstream of SG 6 and replace components inside of the switchgear, including controls of the bus tie that failed and adds

automatic operation of the backup generators. Invitation for Bids (IFB) were issued by DPU for this project in October 2016, January 2021, and May 2022. As detailed in **Appendix B**, lack of competitive pricing and lack of multiple bids were noted as reasons for the project to be put out to bid multiple times. Fully understanding the specifics and the root cause of these delays was outside of HNTB's scope, and it is recommended that a holistic review of the planning, engineering, and procurement processes be carried out to confirm inefficiencies in these processes.

Completed and closed maintenance work orders (WOs) from 2023 and 2024 were reviewed and analyzed. In addition, operations staff interviewed noted that there is limited access for them to submit work orders for maintenance staff to address items of concern. Only operations supervisors have access to submit work orders. Multiple operations staff members had indicated that they either were not able or did not know how to access the system to check on the status of a work order. Providing greater access for operators to the computerized maintenance management system (CMMS) could reduce the administrative load on operations supervisors to submit all corrective maintenance (CM) WOs and allow for greater clarity of maintenance activities and status for operators.

Based on the analysis of the WOs, there are opportunities to improve the detail of the maintenance records and streamline the record keeping while ensuring regular and proper maintenance occurs. A majority of the work orders entered into the DPU's CMMS lacked key identifying information and detail, such as asset IDs, asset names, asset locations, and the specific actions taken to complete the WO. This is particularly present in CM WOs, which have a minimal amount of detail and identifiers. Preventive maintenance (PM) WOs contain more asset identifiers but still lack qualitative descriptions of the corrective actions taken to complete the work. From review of the WOs, it was not apparent if maintenance is performed to the degree required. For regular and frequent preventive maintenance, the staff notes for corrective actions taken rarely indicate any further corrective actions are required, such as repair, refurbishment, or replacement.

There were many instances of similar PM WOs open at the same time for the same asset or group of assets, which indicates that some PM is not regularly completed within the recommended time interval. This most commonly occurred with equipment that has PM with multiple intervals within a year and with equipment that requires PM for both individual assets as well as a larger group of assets. There are several individual and group PM WOs which are structured similarly for pumps, motors, and raw water channel mixers. Restructuring of the PM schedule to reduce PM overlap for the same set of assets would decrease the administrative load required to individually review, complete, and close out PMs which overlap.

PM orders frequently extend past the required interval time or indicated due date to complete and close in the CMMS. For instance, with monthly PMs would take longer than a month and quarterly PMs would take longer than three (3) months to complete. Overdue preventative maintenance can cause equipment to leak, malfunction, or not operating properly. Irregular preventative maintenance may lead to increased operations and maintenance (O&M) costs and potentially unnecessary capital investments over the course of an asset's life cycle if equipment is improperly maintained. Maintenance staffing shortages may also be a factor in PMs extending past their required intervals. As of January 6, there were two (2) mechanical vacancies and three (3) electrical vacancies at the WTP.

5.9. Communication

There were several communication deficiencies, both internally and externally to major stakeholders, discovered throughout the review process. For additional information and

recommendations related to communications refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

Prior to the event, staff members interviewed indicated that there was not any discussion of storm preparation from leadership at the WTP even though the Governor Youngkin had declared a state of emergency on January 3. It was noted by multiple staff members present during the event and in response to the event that there was a lack of leadership and little direction on a course of action. Staff worked within fragmented groups and communicated with each other to respond to the outage. A clear chain of command should be established and understood by all staff in an emergency situation. Structured direction and regular communication ensure that crisis response is mission focused. Staff also noted multiple instances of moving throughout the WTP during the event without handheld radios. Not only is this a safety hazard with staff's whereabouts potentially being unknown to others, but it is also an efficiency concern as streamlined communication between all responding parties in the event of a time-sensitive emergency is crucial to ensure mission-specific actions are being carried out. Of particular concern was that no warning or communication preceded power being restored to the WTP.

In the early hours of the response to the event, there were several instances of either miscommunication or misinformation among DPU and City staff members. One example of this was the notion that the backup generator was started at the WTP. It is unclear where this originated, but from reviewing text records, it was communicated up the chain to the Plant Superintendent, DPU Director, the DECPR Director, and the Interim CAO. It was also communicated to the Chesterfield County Director of Utilities. A misrepresentation like this likely caused a false sense of security by City and regional leaders early on in the crisis that occurred. It is common for misinformation to spread or breakdowns in communications to occur in chaotic situations, such as the one at the WTP on January 6. In situations like this, status updates that are clear, accurate, and complete are essential in enabling leaders and decision-makers to make informed, fact-based decisions. It is important that staff are trained in best practices for effective communication in crisis situations to ensure they know what critical facts need to be communicated and what parties to communicate them to.

DPU staff also failed to adequately communicate the severity of the situation at the WTP to City officials in the early hours of the event. The DPU Director notified the Interim CAO of the power outage at the WTP earlier in the morning at approximately 7:20 AM. However, it was not until approximately 10:30 AM, almost five hours after the power outage, when the DPU Director called the Interim CAO and had a discussion of a potential service interruption in the distribution system. Upon learning this, the Interim CAO notified the Mayor and the DECPR Director and set up a call among them and the DPU Director that was held at 1:00 PM. It was not until that briefing where the severity of the crisis became evident to the mayor's office. In situations like this where time is of the essence, swift action and open communication by decision makers are important. It is also critical that those closest to the situation unfolding understand when and how to elevate concerns as they arise so that additional resources can be brought in for assistance, if needed.

The City of Richmond has three (3) wholesale customers: Henrico County, Chesterfield County, and Hanover County. According to DPU's 2018 Water Supply Plan Update, average daily metered sales to these wholesale customers in 2017 was 26.6 MGD, which accounts for about 45% of the WTP's average daily production. Chesterfield County and Henrico County plant staff were not notified about the event at the WTP until 7:00 AM, over an hour after the plant had lost power. Hanover County was not initially notified because the Plant Superintendent did not have up-to-date contact information. Hanover County was not notified about the event until 2:00 PM, over eight hours after the power outage. It should be noted that Chesterfield and Henrico staff were not made aware of

flooding at the WTP until the afternoon of January 6 despite being initially contacted at 7:00 AM. Staff at all three (3) wholesale customers reported that the DPU staff they communicated with minimized the impacts of the power outage at the WTP. They were not informed of the severity of the situation until between 1:00 PM and 2:00 PM on January 6 prior to the first regional coordination call at 2:45 PM.

The following timeline, outlining internal communications and interactions between DPU and its wholesale customers, is based on: 1) interviews with DPU, Chesterfield County, and Hanover County staff, 2) timelines provided by DPU and VDH, 3) phone records, and 4) after-action reports of the event issued by Henrico and Hanover counties. Additional communications may have occurred that are not listed. This timeline is intended to capture the critical items related to how the initial stages of the event were communicated by DPU to City officials and its wholesale customers.

MONDAY, JANUARY 6, 2025	
7:00 AM	Plant Superintendent notifies DPU Director as well as Chesterfield County and Henrico County plant staff of a power outage at the WTP and requests a demand reduction from both systems. Hanover County staff were not notified at this time.
7:20 AM	DPU Director calls Interim CAO to notify her of the power outage at the WTP. DPU Director indicates that backup generators are on based on information received from the Plant Superintendent. DPU Director notes that she was not going to mention the power outage at the upcoming Virtual EOC briefing to be held at 8:00 AM. (Note: It was determined after the event that this was not accurate, and the backup generator was not engaged at this time)
7:33 AM	After receiving notice from Chesterfield Operations about the demand reduction request, Chesterfield County Director of Utilities reaches out to DPU Director inquiring about the power outage. DPU Director indicated that electricians are at the WTP, and backup generators are on based on information received from the Plant Superintendent. (Note: It was determined after the event that this was not accurate, and the backup generator was not engaged at this time)
7:54 AM	Henrico Utilities On-Call Superintendent calls DPU staff contact who advises him that the issues at the WTP are working to be resolved and encourages him to call back to check in later.
8:11 AM	DPU Director notifies Chesterfield County Director of Utilities that power is restored. Chesterfield begins process to return to normal operation.
9:00 AM	Henrico Utilities Operations Director reaches out to DPU staff contacts. DPU staff noted that there are water production issues at the WTP that they are working to resolve and that there are no impacts to the distribution system. DPU staff could not provide a timeline to resume water production when asked.
10:00 AM	Plant Superintendent notifies DPU Director and Deputy Department Director that there may be a service interruption and to start considering issuing a Boil Water Advisory.
10:30 AM	DPU Director calls Interim CAO to notify her that a Boil Water Advisory may need to be issued. DPU Director notes that the Counties had been contacted to reduce consumption. (Note: It was determined after the event that this was not accurate, and Hanover County had not been notified of the power outage or issues at the WTP)
11:00 AM	Interim CAO calls DECPR Director and the Mayor and notifies them of what she has learned from the DPU Director about the issues at the WTP. After those discussions, Interim CAO immediately schedules a 1:00 PM meeting including the Mayor, DPU Director, and DECPR Director.
1:00 PM	DPU Director briefs the Mayor, Interim CAO, and DECPR Director regarding flooding at the WTP. Shortly after this briefing, the Interim CAO begins contacting Chesterfield, Hanover, and Henrico County staff contacts to alert them to the issues at the WTP.
2:00 PM	Hanover County is notified of issues at the WTP by DPU staff member.
2:14 PM	Henrico County Director of Utilities attempts to call DPU Director and DPU Deputy Director to inquire about potential issues at the WTP.

2:34 PM	DPU Director returns Henrico County Director of Utilities call and indicates that production at the WTP was down and that production may not be able to restart by day's end. DPU Director requests that a coordination call be set up between Richmond and its wholesale customers.
2:35 PM	Chesterfield County Director of Utilities sends a text to DPU Director inquiring if there are still issues at the WTP after hearing about potential issues from a contact with Henrico County. DPU Director confirms.
2:45 PM	Regional coordination call is held among Richmond, Henrico, Chesterfield, and Hanover utility representatives. DPU reports that they experienced a power outage and subsequent flooding at the WTP. DPU noted during this call that they hoped that production at the WTP was to resume within three (3) to six (6) hours.
3:00 PM	Plant Superintendent notifies DPU Director and Deputy Department Director that Byrd Park Reservoir levels are low and have dropped to about 10 feet. Full activation of the EOC at the library begins.
3:49 PM	DPU sends email to VDH and the utility directors of Chesterfield, Hanover, and Henrico Counties requesting a review of its draft statement issuing a Boil Water Advisory.
4:26 PM	City of Richmond issues a Boil Water Advisory.
4:30 PM	An additional regional coordination call is held among Richmond, Henrico, Chesterfield, and Hanover utility representatives. Representatives from VDH also attend this call. An initial assessment of response actions, required repairs, and requests for assistance were discussed during this call.

In the event of a power outage where water conservation is needed, DPU's Emergency Operations Manual notes that DPU should notify wholesale customers. Only two of the three wholesale customers were notified of the issues at the WTP the morning of January 6, and the discussions at that time did not adequately convey the severity of the situation at the WTP. All three (3) wholesale customers should have been notified about the severity of the situation much sooner so that they could adequately respond, potentially increase production at their own facilities, and implement their own emergency response procedures. Several regional coordination calls did occur between DPU, its wholesale customers, and VDH the afternoon of January 6, but a thorough understanding of the issues at the WTP and the recovery efforts remained unclear to the parties external to DPU. It is critical that DPU's wholesale customers are notified of any plant production issues as soon as they are known and that demand reductions from the wholesale customers are requested if water conservation is needed. Earlier notification about a WTP outage would allow the utilities to reduce their demands on the DPU's system and notify their large users to also reduce their demands. Doing so will limit widespread water supply issues and reduce stress on the water supply systems in the region in the event of a WTP outage.

DPU also failed to reach out to VDH to notify them of the event at the WTP the morning of January 6, and the ODW's Chief of Field Operations first heard of potential issues from the local health department. It was not until a staff member from the ODW's Richmond Field Office called the Plant Superintendent that afternoon that VDH was made aware of the issues at the WTP. While Virginia Department of Health Waterworks Regulations as established in 12VAC5-590-570 requires that VDH be notified within 24 hours of this incident, it is best practice to notify them as soon it was evident that the event was going to impact plant production and impacts to the distribution system were possible. In an emergency event such as this one, VDH can help communicate with other utilities in the region, aid in emergency response, and assist with communication to the public.

5.10. Conclusions

The loss of power at the WTP resulted in basement flooding, critical electrical systems becoming submerged in water, and, ultimately, an inability for the WTP to produce drinking water and pressure levels dropping across the distribution system. It could be argued that the root cause of

this incident was the power failure of Main Feeder 1; however, that is beyond DPU's control and a power outage is a scenario that the WTP should be equipped to handle, so this cannot be considered as the root cause. The WTP was operating in Winter Mode, so the Bus Tie/ATS in SG 6 was a singular critical component. The failure of the Bus Tie/ATS in SG 6 to automatically transfer from Main Feeder 1 to Main Feeder 2 because a coil in the Bus Tie/ATS failed was determined to be the root cause of the event. If this Bus Tie/ATS worked as intended, the WTP power supply would have been switched over to Main Feeder 2, which still had power at the time of the failure. While this failure was determined to be the root cause, operating in Winter Mode put the WTP at greater risk. Had the WTP been operating in Summer Mode, at minimum Plant 2 still would have had power or the Bus Tie/ATS in SG 7 would have worked as intended and the WTP power supply would have switched over to Main Feeder 2. In addition, the above concerns regarding the basement flooding and dewatering, power systems, control systems, staffing, training, operating procedures, asset management, maintenance, and communication all contributed to the escalation of the event at the WTP on January 6. These factors revealed several concerns and opportunities for improvement regarding operation of the WTP to mitigate the risk of a similar event occurring again.

6. Recommendations

The step in the WTP process where water is pumped from the clearwells to the finished water basins is a limiting factor in the operation of the WTP. If the flow is not continually pumped out of the clearwells or the flow into the clearwells is not stopped quickly, there is a high risk of the water level rising in the basement. Maintaining power to the filter effluent valves and ensuring the valves close when power is lost and the WTP is on battery power are critical to ensuring that the water level does not rise from the clearwells into the basements and damage equipment.

Recommendations to address concerns noted in the assessment report and mitigate the risk of a similar event occurring again are listed in **Table 1**. The recommendations are listed as short-term or long-term recommendations. Items identified as short-term are recommended for implementation in the next three (3) to six (6) months. Items identified as long-term are recommended for implementation over several years given the time or financial implications of the recommendations.

Table 1. Recommendations

RECOMMENDATION	TIMEFRAME
Operate the WTP in Summer Mode all the time or at least during storm events that have risks of power outages (DPU has indicated that this has been implemented as the normal operating mode moving forward).	Short-term
Develop a Bus Tie/ATS failure plan, ensure all electrical staff are properly trained on the plan, and clearly display the plan on each bus tie cabinet (SG 6 and SG 7). (DPU has indicated that Operations staff has been trained in switchgear operation and transitioning the WTP plant to generator power).	Short-term
Review staffing plans and consider staffing the WTP with mechanical and electrical staff during storm events that have risks of power outages. If staffing at this level is not feasible, at minimum implement all other recommendations and develop severe storm event response protocol with requirement that maintenance staff on call during storm events can respond in 30 minutes or less. (DPU has indicated that Plant Maintenance has developed a Storm Preparation SOP that would staff WTP with mechanical and electrical staff if the EOC (Emergency Operations Center) is activated by the City).	Short-term
Provide a filter effluent valve UPS with a parallel duplicate backup UPS in each plant, all with a minimum runtime of one (1) hour, and ensure that both function as intended to close all filter effluent valves on loss of power. Size the UPS to close all filter valves simultaneously. In lieu of a backup UPS, a small backup generator could be considered to provide backup power in the event of the first UPS failing. The UPS sizing and operation should meet the requirements of	Short-term

RECOMMENDATION	TIMEFRAME
Chapter 7 of the Virginia Electrical Code (2020) for Legally Required Systems. (DPU has hired another consultant to update the UPS units, and it is currently in active design).	
Install a SCADA UPS with a minimum runtime of at least one (1) hour[1]. The UPS sizing and operation should meet the requirements of Chapter 7 of the Virginia Electrical Code (2020) for Legally Required Systems. (DPU has hired another consultant to update the UPS units, and it is currently in active design).	Short-term
Change the SCADA programming in Plant 1 to match that of Plant 2 so that the filter effluent valves are set to manual, and the manual set point is set to zero when SCADA is on UPS power.	Short-term
Develop an SOP for operators to manually shut down the SCADA system if a failure appears imminent to safeguard against a hard shutdown.	Short-term
Verify filter effluent valve fail safe positions are set to close or reprogram to close.	Short-term
Add clearwell high level floats that signal control system to override filter effluent valve commands to close the valves. An engineered design is required to ensure that the WTP operates as designed with the addition of these floats.	Short-term
Ensure all filter valve actuators are rated as watertight and provide seal-tight fitting and conduit drain fitting prior to the seal-tight fitting within 10-inches of the actuator body. Install a breather fitting near the basement ceiling. Inspect the seal-tight fittings initially after one (1) month and then annually to check if water intrusion has occurred. (DPU has indicated that this has been completed and the recommended inspection checks will be conducted).	Short-term
Install visual indicators of filter effluent valve positions with remote open/close switch for each at locations in each control room or basement that are safely accessible by operators in the event of minor flooding. (DPU has indicated that this is currently in process).	Short-term
Review and re-evaluate organizational structure of operations and maintenance staff at the WTP. (DPU has indicated that that WTP operations and maintenance staff organization charts are currently undergoing revisions).	Short-term
Develop written SOPs for plant operation, establish a comprehensive training system for staff on SOPs, and implement a regular update schedule for the SOPs.	Short-term
Develop standardized agenda for start of shift or shift change meetings with the input of plant staff. Agenda should include safety and emergency operating plan reminders as well as a log or record of all shift meetings.	Short-term
Implement seasonal risk assessment. Involve all WTP staff to identify potential risks to assets based on seasonal conditions and remind them of emergency procedures.	Short-term
Implement reoccurring formal training for WTP management staff, including emergency response	Short-term
Review safety program for all staff. Refer to 12VAC5-590-560 for minimum requirements.	Short-term
Expand DPU Emergency Operations Manual to include scenario-specific and process-specific actions for plant staff to follow during emergency events. Ensure plan is kept current and readily accessible per 12VAC5-590-505.	Short-term
Develop an emergency staffing plan for DPU facilities in cases of emergency situations. Ensure operations, maintenance, and leadership staffing have coverage while providing adequate relief.	Short-term
Evaluate existing Master Plan, Capital Improvement Plan, and other planning efforts for the WTP. Determine which recommended projects have been completed and which have been deferred. Of the deferred projects, develop a plan to re-prioritize the implementation of these projects based on criticality. (DPU has indicated that they are beginning this process).	Short-term
Perform a holistic review of the planning, engineering, and procurement processes for capital projects within DPU. Determine inefficiencies in these processes and develop an action plan to address or correct the found inefficiencies.	Short-term
Develop a crisis communication plan. The plan should include the following at minimum: Establish clear protocols for communicating with staff and internal stakeholders during a crisis, ensuring all staff are informed and aligned with the DPU's response strategy. Develop clear protocols for communicating with external stakeholders and to ensure key stakeholders (including regulatory agencies) and wholesale customers (Henrico, Chesterfield, and Hanover) are notified immediately in the event of a WTP outage, using multiple communication channels, as appropriate, to ensure timely dissemination of information.	Short-term

RECOMMENDATION	TIMEFRAME
Regular training of relevant staff on this plan and expectations of communication responsibilities during an emergency. Regularly review and update contact information to maintain accuracy and effectiveness. (The City has engaged another consultant to assess its emergency communications during crisis response).	
Install dewatering pumps, such as hydraulic-driven pumps, which avoid high suction head issues affecting the priming of the existing dewatering pumps. Dewatering pumps should also have higher flow rates than the existing dewatering pumps, 3,000 to 6,000 gpm is recommended, and permanent piping that routes water away from the plant basements.	Short-term
Review staffing plans and consider the addition of a float operator to each shift, so that typical staffing is four (4) operators per shift. If there is an issue getting coverage for an operator that needs a day off, there are always a minimum of three (3) operators.	Long-term
Raise as many critical electrical systems above the plant basements as practical.	Long-term
Provide an automatic transfer system for the existing backup generator system (DPU has indicated that this is included as part of a current capital project).	Long-term
Seal clearwells as much as possible by repairing any cracks or spalling in the concrete and sealing any pipe penetrations and hatches to reduce the flow rate at which water from the clearwells can flood the basement.	Long-term
Restructure PM schedule to reduce PM overlap for the same set of assets.	Long-term
Develop and implement an asset management plan that includes maintenance and replacement of water system assets, both in the WTP and out in the distribution system.	Long-term

1. Provided all other recommendations are implemented, one (1) hour of runtime for all UPS units would be sufficient under normal operating conditions. However, consideration should be given to providing UPS units with longer runtimes based on the outage that occurred during this event, which was an hour and twenty minutes, or 1.3 hours. An additional buffer of 50-percent additional runtime should also be considered for the SCADA UPS as well, which would provide two (2) hours of runtime.

The recommendations in Table 1 will significantly reduce the risk of the WTP basements flooding and risk of equipment damage from flooding, however flooding will forever remain a risk with the hydraulic limitations of the existing WTP. It is recommended that DPU perform a study to evaluate the continued investment of the existing WTP against a new WTP either on the existing site or on a new site. A new WTP would be a significant capital improvement project that would come at considerable cost and take many years to implement. Portions of the existing WTP are over 100 years old and continued investment in operating and maintaining the facility may eventually become more expensive than the capital investment and operation and maintenance costs for a new facility. Further studies and evaluations should be conducted to determine the most beneficial option from a cost-benefit analysis standpoint.

6.1. Post Recommendation Situational Mitigation

The following details how the recommendations above will reduce the likelihood of an incident or reduce the impact of an incident in the future. This event was started by a loss of utility power however there is a risk that power failure inside of the WTP could lead to a similar event with flooding in the basement.

The WTP can have primary power provided by either Main Feeder 1, Main Feeder 2, or both. Each of these power feed schemes require switchgears SG 6 and SG 7 to properly set up to do so.

Setting up the WTP so that both Main Feeders are powering the WTP (Summer Mode) should be the standard mode of operation. This is a type of quasi-dual power feed where Plant 1 is fed from Main Feeder 1 and Plant 2 is fed from Main Feeder 2; where if one feeder loses power a Bus Tie/ATS engages and allows both Plant 1 and 2 to continue to operate on one (1) power feeder.

Furthermore, this mode of operation allows the Bus Tie/ATS of SG 7 to function as a redundant system for the Bus Tie/ATS in SG 6. (Note: Some modification may need to be made to the switchgear(s) to allow for redundant operation. Operation manuals for SG 6 and SG 7 were not available to verify if any modification would be required.) Having a redundant switchgear Bus Tie/ATS substantially mitigates the risk of a primary power failure.

The following steps would take place automatically on loss of Main Feeder 1 (same concept applies for loss of Main Feeder 2):

Step 1. After SG 6 detects the failure of Main Feeder 1, it opens Incoming Main Feeder 1. (This prevents power back feeding to the utility.)

Step 2. SG 6's Bus Tie/ATS closes to continue to supply power to Plant 1. Power is restored and no further steps are implemented. If SG 6's ATS fails to close, then Step 3 is initiated.

Step 3. After a preset amount of time, SG 7 detects the loss of power from SG 7 Main Feeder 1 and opens SG 7's Main Service Feeder 1. (This prevents power from back feeding to SG 6.)

Step 4. SG 7's Bus Tie/ATS closes to continue to supply power to Plant 1.

If both bus ties fail to close, electrical staff would implement the bus tie failure plan to manually close the bus tie and continue to supply power to both plants.

The following steps would take place automatically on loss of both main feeders:

Step 1. After SG 6 detects the failure of Main Feeder 1, it opens Incoming Main Feeder 1 and 2. (This prevents power back feeding to the utility.)

Step 2. SG 6's Generator ATS detects loss of power and starts the backup generators.

Step 3. SG 6's Generator ATS closes to continue to supply power to Plant 1. Power is restored.

In the event of an internal WTP electrical failure, the UPS system will maintain power to the SCADA system and filter effluent valves. The SCADA system will close all filter effluent valves and keep them closed until an operator intervenes and opens the valves.

If power is maintained to the WTP and the filter effluent pumps in either plant stop due to a different electrical issue, equipment failure or other issue, the high-level float in the clearwell will signal the SCADA system to close the filter effluent valves to prevent flooding.

Should a small amount of flooding occur, more effective dewatering pumps with permanent discharge piping will pump the water down more quickly than the current dewatering pumps.

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APPENDIX A

HNTB CONTRACT EXHIBIT B

EXHIBIT B

HNTB's approach to help the City of Richmond understand what led to your water treatment plant failure, we propose the following methodology.

1. **Step 1: Incident Overview**: Our team will conduct a multifaceted investigation into what led to the water treatment plant (WTP) failure. This investigation will include:
    a. Interviews with WTP staff
    b. Review of WTP Plans
    c. Site Visit
    d. Interviews with Richmond, VA leadership about the incident
    e. Review of additional materials (data gathered by others, newspaper articles, permits).

We anticipate that this initial Incident overview phase will take approximately 10 days to complete and our team proposes to have an update with Richmond leadership/staff at the 10 day mark to present preliminary findings. This initial phase would in a draft summary to include:

- Event Description
- Location
- Failure Type
- Timeline of critical events and actions leading up to and directly after power loss
- Operational and community impact

While we are working our way through the incident overview phase, we would also start to assess what led to failure in the following phase:

2. **Step 2: Objectives of Assessment**: While we are gathering the information in Step 1, we will simultaneously begin compiling common concerns/items which may have led to the failure. We will use lessons learned from similar evaluations, like we performed for the City of Evansville, Indiana, following a similar event, to preliminarily identify likely causes of failure. Our interviews and reviews of available data will help us confirm or eliminate these suspected failure mechanisms while understanding what led to your failure.

    At the end of this phase, we would have the following objectives completed:

- Identification of root causes of the failure related to standby systems
- Evaluation of the effectiveness of SOPs, including storm preparedness and technical systems
- Assessment of the quality of internal communications and response related to incident
- Recommendations to enhance technical resilience and communication protocols

We would anticipate that the combination of Step 1 and Step 2 would take 20 days, at which point we would propose to have a check in meeting with RVA staff to provide updates on the assessment

Following these initial data gathering phases, we would propose to move into a more detailed failure analysis.

3. **Step 3: Root Cause Analysis**: During this phase, we would get more granular in the failure by examining each step of the treatment process and how the plant is run on a daily basis and during storm events. This step will also be occurring while gathering information in Steps 1 and 2, but will be a critical point that will need attention following the data gathering phase.

   At the end of this phase, we will have the following analysis completed:

- Systemic Breakdown of Failure
  - Primary System Failure
  - Backup and Tertiary Systems
  - SCADA/Automation Systems
  - Human Factors
    - Organizational structures
    - Training
    - Staffing in normal and emergency preparedness circumstances
    - Credentialing
  - External Factors
    - Dominion transmission feed lines

We anticipate that Step 3 would also happen within the first 20 days while simultaneously gathering information during the previous steps.

While performing Step 3, we would simultaneously be evaluating the technical impact analysis from the failure and moving into the following.

4. **Step 4: Technical Impact Analysis:** During this phase, we would evaluate the impacts of the failure on the plant itself. This would be simultaneously occurring with the previous steps and be part of our multifaceted interview with WTP staff. At the conclusion of this phase, we will have the following assessment complete:

- Treatment disruption summary
- Process performance deviation
- Equipment damage summary
- Technical review of power standby systems and their effectiveness

Similar to step 3, we anticipate that this phase would occur simultaneously with other phases and be included in a preliminary summary to be presented at 20 days.

While completing steps 1-4, our team will be involving our public relations/communications team to evaluate communications that had occurred following the incident in the following step:

5. **Step 5: Communications**: Our team includes communications professionals with experience in handling difficult conversations with the public. Our team will help evaluate the messages that have been previously communicated and will be available to provide an independent assessment of communication or craft that communication after we are engaged. This phase will result in the following:

- Evaluation of communications to public and stakeholders

We anticipate that our communication review will be completed during the first 20 days and available to provide an update at the 20 day mark.

While taking the previous steps, we anticipate working through recommendations for the operation of the WTP in the following phase:

6. **Recommendations:** While gathering the information in the previous phases, we anticipate that our team will be able to find commonality and threads to what led to the failure. We anticipate that we would be able to have preliminary recommendations at Day 20, at which point we would meet with RVA to discuss these preliminary recommendations. These preliminary recommendations would include the following:

- Immediate Actions
- SOP's needed
- Protocols needed
- Improvements of standby systems
- Technology integration and automation
- Crisis and public communications improvement

We anticipate that we would have preliminary recommendations available at Day 20 and available to present at an update meeting with RVA. After presenting our preliminary recommendations, we anticipate that we talk the next 10 days to refine our preliminary recommendations and present refined recommendations at Day 30.

With our refined recommendations developed, we anticipate meeting with WTP staff and RVA leadership to further develop recommendations over the next 30 days.

7: Conclusion: At day 60 we would anticipate having a report completed which includes the following:

- Summary
- Key lessons
- Next steps for improvements

Throughout the entire assessment, we anticipate up to 5 meetings with RVA with 3 meetings in person and up to 2 virtual meetings

Although outlined in our approach, our preliminary schedule can be found below:

Days 1-5 - On Site Assessment/Staff Interviews/Review Available Drawings/Processes
Days 6-10 - Summary Assessment/High Level Findings
Day 11 - Check In Meeting with Richmond
Day 12 - 20 - Preliminary Recommendation Development
Day 21 - Check In Meeting to discuss preliminary recommendations
Day 22- 29 - Draft Assessment Development
Day 30 - Present Draft Assessment Summary
Day 31-45 - Refine Assessment/Meet with WTP Staff
Day 46-60 - Final Assessment Report/Presentation

Fee

Based on our expected effort, we anticipate the following:

Step 1: $92,000

Step 2: $20,000

Step 3: $18,000

Step 4: $16,000

Step 5: $15,000

Step 6: $73,000

We also have allocated $22,000 for assistance with crisis communications, should it be required throughout our fee. This crisis communication allocation results in approximately 150 hours available to RVA. Our total anticipated fee is $234,000

APPENDIX B

COUNCILMEMBER QUESTIONS

HNTB was provided with the listing of questions that Councilmembers hoped would be addressed in the after-action assessment. Responses from HNTB are below in *italics*. Not all questions are within HNTB's contracted scope and those outside of the contracted scope are noted as such. The intent of the HNTB's after-action assessment is to review the events that occurred on January 6 that led to the WTP failure, determine the root cause through a systemic breakdown of contributing factors, and provide recommendations for improvement.

Preparedness

- What redundancies do we have and how often do we test them?

  Refer to Parts 5.2, 5.3, and 5.8 of the After-Action Assessment Report.

- What does emergency preparedness training for DPU Water Treatment Plant staff look like?

  Refer to Part 5.6 of the After-Action Assessment Report.

- Any understanding of pre water loss emergency plans for water failure? (EPA report states the Fire Department had managed safety drills?)

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- Prior to the incident, describe DPU's preventive maintenance policies and investments. For example, were electronic water meters maintained on a regular basis? If so, how?

  Refer to Part 5.8 of the After-Action Assessment Report.

- Does DPU do disaster planning? If so, when was their last tabletop scenario exercise?

  Refer to Parts 5.6 and 5.7 of the After-Action Assessment Report.

- What vacancies currently exist in the department, how long have the positions been vacant for, and how did vacancies impact the department's ability to respond during this crisis?

  Refer to Parts 5.5 and 5.8 of the After-Action Assessment Report.

Initial Event and Immediate Response

- Provide a detailed timeline of the incident and immediate response.

  Refer to Part 4.1 of the After-Action Assessment Report.

- Who was on call following the Governor's emergency declaration on Friday, January 3rd, including at the Water Treatment Plant?

  Refer to Part 5.5 of the After-Action Assessment Report.

- How many workers were physically in the plant the day of the pump breaking?

Refer to Part 4 of the After-Action Assessment Report.

- Why did it take multiple hours to get an electrician to the WTP, and what was the timeline from alerting electrician to getting them on site?

  One electrician arrived early for day shift at 6:00 AM. The Utility Plant Specialist Electrical Supervisor arrived at 6:30 AM after being called in at 5:45 AM. Refer to Part 4 of the After-Action Assessment Report.

- Do department protocols require having an electrician on-site? If so, why did an electrician have to be called in?

  No protocols required having an electrician on site. Refer to Part 5.5 of the After-Action Assessment Report.

- Describe the role of Dominion in this outage. Why did the plant electrician manually switch the plant to the secondary Dominion power source rather than the backup generator?

  Refer to Parts 4 and 5.3 of the After-Action Assessment Report.

- At the time of the initial unreported water outage, and then later during the known water shortage, what was the potential (at the time) health impact of drinking the tap water? (some have asked this from a public health standpoint of watching for symptoms or preparing health system for mass illness).

  Outside of HNTB's contracted scope.

- Does this crisis increase potential exposure to lead in our water due to lead pipes?

  Outside of HNTB's contracted scope.

- Why did some parts of the city lose water completely, some lost only partially, and others did not lose water service at all. I had a lot of constituents in the far western part of my district that never lost service, but they weren't sure if they should still boil.

  Chesterfield County Utilities has an interconnect with the Richmond DPU's system and water service was provided to a small portion on the West side of Richmond DPU's system (Zones 7 and 7A) through that interconnect. When a system-wide boil water advisory has been issued, all customers should boil water to be safe. Other specifics regarding water service loss are outside of HNTB's contracted scope.

- Why did the department not have a clear understanding of how long the reserves would last before residents would see a drop in water pressure?

  Based on interviews, DPU staff believed early in the morning on January 6 that they would have adequate water supply for the distribution system until approximately 5:00 PM. However, it appears that some areas experienced a loss in water pressure prior to 5:00 PM. There could be

many reasons for this, such as higher than expected usage or water main breaks due to the cold weather.

- An anonymous hospital executive said they were warned by the city 3 days prior to the outage that this was a planned repair on the pump on the James and the pump needed to be dry before the repairs could be done. Can this be substantiated and how did this impact the outage?

  HNTB cannot substantiate claims from anonymous sources. The WTP was producing finished, potable water right up until the time of the loss of power. The WTP and other critical facilities like the WTP are designed so that equipment such as a pump can be removed from service for maintenance and repairs without taking the entire facility offline.

- Did the city use its 2017 Emergency Response Plan (referenced in the 2022 EPA inspection report), and if not, why not? Can we see a copy of the current Emergency Response Plan?

  Refer to Part 5.7 of the After-Action Assessment Report.

- What materials were purchased or leased to address the issue, how much did they cost, and what was the budget to cover the expense?

  Outside of HNTB's contracted scope.

<u>Communication with the Public</u>

- Do we have an SMS alerting system available for major updates and alerts? What is the protocol for when we use this system?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- Residents reported getting texts from DPU during the emergency reminding them to pay their bill. Couldn't we have used that system to push out alerts about boil water advisory?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- What improvements will be made to ensure timely and consistent updates are provided to residents, particularly for those without access to digital platforms? Additionally, what improvements will be made to the city website? As I've previously stated to DIT and relevant agencies, the city website is outdated and hard to navigate.

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- Could we develop a proactive communication plan, including pre-drafted emergency messages for various scenarios, to avoid delays in sharing information?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan

prepared by Hagerty Consulting.

- Can RVA311's capacity be expanded to handle high volumes of calls during emergencies? What additional tools (e.g., online forms, live updates) could be added?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- How will the City engage community leaders and organizations to help disseminate information in emergencies, especially to vulnerable populations?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- Frustration with no return phone call from city workers, especially for residents who didn't know the city was closed.

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- Should we have a unified City Council newsletter to help ensure that critical information reached all residents equitably regardless of their district?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- How can we ensure that City Councilmembers are more proactively communicated with by administration so that we can also be first to share information. In many cases my constituents knew about an update from social media before I got an email from the proper channels.

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

<u>Water Distribution</u>

- How did the city decide locations for water distribution?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- Will there be a review of which sites ran out of water and which sites had extras?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- How can we prepare for future emergencies with plans for water deliveries to help residents who cannot make it to water distribution sites?

Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

Relief for Residents & Businesses

- How will we support residents or businesses who lost wages because of the water emergency?

  Outside of HNTB's contracted scope.

- Outline the rental and eviction assistance available for families.

  Outside of HNTB's contracted scope.

- How are we adjusting due dates for taxes and fees due to the city last week?

  Outside of HNTB's contracted scope.

- How much can we estimate that this incident has cost the city, in terms of: expended city funds, forgone city services, foregone student learning, and foregone economic activity?

  Outside of HNTB's contracted scope.

After-Action Investigation and Future Reforms

- How are we analyzing the crisis? Who is leading it? What is the timeline? What immediate corrective actions have already been put in place to respond?

  Refer to the After-Action Assessment Report.

- Why did DPU only respond to EPA October 2022 report last week? Why did the city spokesperson say that we didn't receive the findings from the EPA until August of 2024 when news reports indicate that wasn't the case?

  DPU was and is working to address the observations from the EPA report. HNTB reviewed the EPA report, DPU response, and observed conditions at the WTP in January 2025 and noted that many of the observations have been addressed as described in DPU's response dated January 3, 2025. The January 3 letter was in response to a letter from VDH sent in October 2024.

- Lot of discussion about regional management going forward. Is that on the table?

  Outside of HNTB's contracted scope.

- Is it correct that we issued requests for proposals three times before finally contracting with a company to repair a part [switchgear] at the Water Treatment Plant? If so, why the delays?

  Based on information provided by DPU, Invitation for Bids (IFB) were issued for the Substation 1 Replacement project (SG 6 is located at Substation 1) in October 2016, January 2021, and May 2022. A Request for Qualifications (RFQ) prequalification to bid for this project was issued in March 2019. The IFBs in October 2016 and January 2021 were cancelled. Richmond Procurement

Services noted that the October 2016 bid was cancelled because the lowest bid was higher than expected and negotiation to a lower price was unsuccessful. The January 2021 bid was cancelled because only one bid was received, and re-bidding was recommended.

- What steps will be taken to ensure better internal coordination among the Mayor's Office, DPU, Councilmembers, and liaisons during future crises?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- Will there be training for city staff, Councilmembers, and liaisons to ensure we are prepared to handle future emergencies effectively?

  Refer to the January 2025 Winter Storm Incident Response Assessment and Improvement Plan prepared by Hagerty Consulting.

- What is the toll on the system when we sell water to surrounding counties? Is their usage and payments actually accounting for the additional stress/use it puts on our infrastructure?

  Outside of HNTB's contracted scope.

- Over the last 5 and 10 years, how much maintenance/updates dollars were put into the water treatment building/equipment?

  Outside of HNTB's contracted scope.

- Please publish the most recent maintenance records related to the water treatment plant. Were all of the pumps fully operational prior to the crisis? How old are all of our pumps and what are the maintenance costs for each of them?

  One (1) filter effluent pump was out of service for repair, all seven (7) other pumps were in service at the time of the power outage.

- Please publish maintenance records related to the plant IT system

  HNTB reviewed two (2) years of maintenance records from DPU's CMMS. Records indicated corrective work was completed on the WTP control system (SCADA) on numerous occasions in the past two (2) years but no preventative maintenance. There is limited preventative work that can be completed on control systems beyond routine software updates, equipment upgrades, and replacement.

- Did we use or request any federal funding (ARPA, IRA, etc.) to invest in our water treatment plant and its related IT systems?

  Outside of HNTB's contracted scope.

- What is the annual revenue produced by the DPU Utility PILOT enterprise back to FY2018?

  Outside of HNTB's contracted scope.

- Provide data on city expenditures by FTE count of staff, operational expenses, and material expenses. Please include the general fund budget and CIP budget during this timeframe.

  Outside of HNTB's contracted scope.

- Share an update on all outstanding capital improvement projects at the Water Treatment Plant.

  Outside of HNTB's contracted scope.

- What is the role of the Public Utilities and Services Commission (PUSC) in reaction to this emergency?

  Outside of HNTB's contracted scope.

- Why were there vacancies on the Public Utility Commission for so long?

  Outside of HNTB's contracted scope.

- Has our inspector general and auditor received tips or completed any reports related to the water treatment plant in the past five years or so?

  Outside of HNTB's contracted scope.

- When will we hear public comment on this matter?

  Outside of HNTB's contracted scope.

- Please publish the document being used to define the scope of the investigation which we are using to solicit bids.

  Outside of HNTB's contracted scope.

APPENDIX C

VIRGINIA DEPARTMENT OF HEALTH PROVIDED TIMELINES

From: Roadcap, Dwayne (VDH) <Dwayne.Roadcap@vdh.virginia.gov>
Sent: Wednesday, February 19, 2025 11:52 AM
To: Darren Burkhart; Reynolds, James (VDH)
Cc: Scott Lord; Ryan Gansemer; Roger Bush; Robert Page; Nate Nickerson; Davis, Bailey (VDH); Coughlin, Jessica (VDH); Miles Jensen; Turner Perrow
Subject: RE: Richmond WTP Assessment

Darren,

As additional background, Jessica Coughlin, Emergency Services Coordinator with the Office of Drinking Water, provided additional timeline details as described below.

1/6/25 approx 3:12 Jessica Coughlin receives call from Donna Pletch (VDEM Region 1 Chief Regional Coordinator) asking if the rumors about Richmond running out of water are true. I noted I had not heard anything but would quickly look into it.
At about the same time I heard from Andy Aigner with VDH Central Region asking the same question.
1/6/25 3:19 I called James after getting off with Donna and Andy
1/6/25 3:23 I called Bill Lawson with the City of Richmond Office of Emergency Management and spoke to him. He did not have any information but would call me back.
1/6/25 3:24 Bill called me back with the situation. I then called Donna back. I asked Bill to schedule a coordination call. He did not. I asked when the Richmond staff would be available for a call and did not hear back from him
1/6/25 3:36 James called me back with more information and included a 4:30pm regional call with Henrico, Hanover, and Chesterfield that was planner. Because of this call I scheduled a larger coordination call for after this 4:30p call.
1/6/25 3:50 the VDEM SAU called me asking about the situation.
1/6/25 4:30 regional waterworks call
1/6/25 5:30 ODW led larger stakeholder coordination call

Dwayne Roadcap
Director, Office of Drinking Water
Virginia Department of Health
109 Governor Street
Richmond, Virginia 23219
Cell: (804) 338-0371

From: Reynolds, James (VDH) <James.Reynolds@vdh.virginia.gov>
Sent: Tuesday, February 18, 2025 8:57 PM
To: Darren Burkhart
Cc: Scott Lord; Ryan Gansemer; Roger Bush; Robert Page; Nate Nickerson; Roadcap, Dwayne (VDH); Davis, Bailey (VDH)
Subject: Re: Richmond WTP Assessment

Darren,

One point of clarification. When the physical office is closed, staff telework at home during regular office hours. This has been in place since 2020 when all rfo staff received Cell phones and laptop/ tablets. So on jan 6, while the office was closed, staff were available through email, cell phone, text, and emergency number and worked during the business day.

Get Outlook for Android

From: Reynolds, James (VDH) <James.Reynolds@vdh.virginia.gov>
Sent: Tuesday, February 18, 2025 8:24:29 PM
To: Darren Burkhart <DBurkhart@HNTB.com>
Cc: Scott Lord <slord@HNTB.com>; Ryan Gansemer <rgansemer@HNTB.com>; Roger Bush <rbush@HNTB.com>; Robert Page <rtpage@HNTB.com>; Nate Nickerson <nnickerson@sehinc.com>; Roadcap, Dwayne (VDH) <Dwayne.Roadcap@vdh.virginia.gov>; Davis, Bailey (VDH) <Bailey.Davis@vdh.virginia.gov>
Subject: Re: Richmond WTP Assessment

Darren,

Nobody from Richmond Field Office was contacted by DPU or WTP on Jan 6. Office was closed, checked voicemails on main office phone later in the week- none from DPU on Jan 6. Asked all staff in RFO if they received any contact- everyone indicated they did not have any contact with DPU until VDH reaches out Jan 6 afternoon.

Here is the timeline that day from VDH Richmond Field Office:

Jan 5 1810- James sends email to RFO staff that office will be closed on Jan 6

Jan 6 1437- Bailey Davis, VDH contacts James. Indicates that someone from local health department contacted him saying they heard there were issues at WTP

Jan 6 1451- Randy Morrissette, VDH contacts Doug Towne. Doug says WTP has not produced water since early AM because of flooding at WTP created by a power outage

Jan 6 1510- Randy Morrissette talks to Matt Rembold, Assistant Utilities Director - Chesterfield County. Matt says counties and Richmond just got off conference call. Chesterfield to shut off supply. Another conference call to occur 1630

Jan 6 1520- James calls Bentley Chan, Henrico DPU Director, gets invite for 1630 conference call. Forwards to other VDH staff (Jessica Coughlin, Toby Bryant, Sam Neth, Randy Morrissette)

Jan 6 1531- Randy Morrissette talks to Alvin Christianson , Deputy Utilities Director Henrico County. Henrico increased production at WTP

Jan 6 1531- Sam Neth talks to Doug Towne, says power outage of about 1.5 hours and significant flooding. At time, they hoped to get water out to distribution within next 6 hours

Jan 6 1556- Toby Bryant, VDH gets distribution tank levels from Trafford Road operator I believe

Jan 6 1630- James and other VDH staff (Jess Coughlin, Toby Bryant, Randy Morrissette, Sam Neth were forwarded invite from James) attend 1630 conference call. Learn that Richmond DPU will issue Boil Water Advisory

Jan 6 1730- Randy Morrissette tries to stop by the plant, could not get in contact with anyone at the WTP and can't get past guard gate. Leaves the parking lot

Jan 6 1820- Toby Bryant stops by Trafford Road PS and gets tank levels

Jan 6 1850- Toby Bryant heads to Richmond WTP, able to get inside gate

Jan 6 1948- Toby Bryant updates James that no power at raw water PS yet

Jan 6 1957- Toby Bryant updates James that one raw water pump has been put online, start to fill sed basin

Jan 6 2039- Charlie Watts to begin updating James on status of WTP overnight shift

Jan 6 2050- Toby Bryant leaves Richmond WTP

Jan 6 2202- Charlie tells James SCADA still down

Jan 7 1229- Charlie tells James SCADA is working towards functionality. Dewatering filter actuators

Jan 7 1241- Charlie tells James working on drying out electrical boxes hope to bring filters online ASAP

Jan 7 0158- Charlie tells James that hope to have 4 filters online by 0600 and once re-establish house pressure try to start putting one filter online per hour

Jan 7 0416- Charlie tells James that hope to be producing between 8 and 16 MGD by 0600

Jan 7 0720- Doug Towne tells James that working on trying to get plant up to 12 MGD. Having some issues with getting filters up and running, so no water is leaving the plant yet

Jan 7 0730- Jess Coughlin, VDH says secretary of health requesting hourly updates and if progress is being made

Jan 7 1130- James and Toby Bryant arrive at Richmond WTP and establish 24 hour presence of VDH until Jan 11 around 1200. Stand down 24/7 presence 1200

James on site- Jan 7 1130-1900; Jan 8 0700-1930; Jan 9 0700/0800-1900; Jan 10 arrive around 1100 leave Jan 11 around 0800

James Reynolds, PE
Field Director
Richmond Field Office
Office of Drinking Water
Phone: (757)406-1252
Emergency 24/7: (866) 531-3068

Facebook | Twitter | YouTube | LinkedIn
109 Governor Street, 6th Floor
Richmond, Virginia 23219

From: Darren Burkhart <DBurkhart@HNTB.com>
Sent: Tuesday, February 18, 2025 2:50 PM
To: Reynolds, James (VDH) <James.Reynolds@vdh.virginia.gov>
Cc: Scott Lord <slord@HNTB.com>; Ryan Gansemer <rgansemer@HNTB.com>; Roger Bush <rbush@HNTB.com>; Robert Page <rtpage@HNTB.com>
Subject: Richmond WTP Assessment

James,
Good Afternoon! As we continue to work through our assessment and based upon some of the feed back we received from the Preliminary Findings Report, we have need to confirm a couple things on the timeline.

1. Were you contacted by someone from the Richmond WTP staff or DPU?
2. If so, what time was the contact made.
3. If not, please confirm how you became aware of the issues at the WTP.
4. When did you arrive to the WTP site on January 6.
5. Please indicate/confirm the dates and time you were on site at the WTP.

Thanks for your help in confirming the timeline of the events of the day.

Darren C. Burkhart, PE
Senior Project Manager
Water
Tel (317) 636-4682 **Cell** (812) 525-3437 **Email** dburkhart@hntb.com

HNTB CORPORATION
111 Monument Circle Suite 1200 | Indianapolis, IN 46204 | hntb.com

APPENDIX D

GODWIN PUMP DATA SHEETS

CD150M Dri-Prime® Pump

WITH FINAL TIER 4 (FT4) DIESEL ENGINE

The Godwin Dri-Prime CD150M pump offers flow rates to 2290 USGPM and has the capability of handling solids up to 3.0" in diameter.

The CD150M is able to automatically prime to 28' of suction lift from dry. Automatic or manual starting/stopping available through integral mounted control panel or optional wireless-remote access.

Indefinite dry-running is no problem due to the unique Godwin liquid bath mechanical seal design. Solids handling, dry-running, and portability make the CD150M the perfect choice for dewatering and bypass applications.

Features and Benefits

- Simple maintenance normally limited to checking fluid levels and filters.
- Dri-Prime (continuously operated Venturi air ejector priming device) requiring no periodic adjustment. Optional compressor clutch available.
- Extensive application flexibility handling sewage, slurries, and liquids with solids up to 3.0" in diameter.
- Dry-running high pressure liquid bath mechanical seal with high abrasion resistant solid silicon carbide faces.
- Close-coupled centrifugal pump with Dri-Prime system coupled to a diesel engine or electric motor.
- All cast iron construction (stainless steel construction option available) with cast steel impeller.
- Also available in a critically silenced unit which reduces noise levels to less than 70 dBA at 30'.
- Standard engine JCB TCAE-55 (FT4). Also available with John Deere 4045TFC03 (FT4).

Specifications

Suction connection	6" 150# ANSI B16.5
Delivery connection	6" 150# ANSI B16.5
Max capacity	2290 USGPM †
Max solids handling	3.0"
Max impeller diameter	11.0"
Max operating temp	176°F*
Max working pressure	70 psi
Max suction pressure	58 psi
Max casing pressure	104 psi
Max operating speed	2200 rpm

* Please contact our office for applications in excess of 176°F.

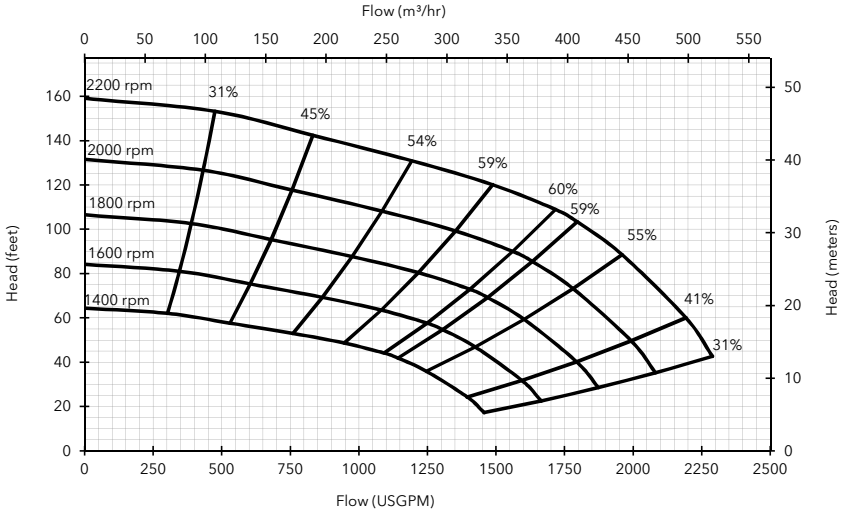
† Larger diameter pipes may be required for maximum flows.

Please contact the factory or office for further details. A typical picture of the pump is shown.
All information is approximate and for general guidance only.

godwin
a xylem brand

PLANT 1

Performance Curve



Materials

Pump casing & suction cover	Cast iron BS EN 1561 - 1997
Wearplates	Cast iron BS EN 1561 - 1997
Pump Shaft	Carbon steel BS 970 - 1991 817M40T
Impeller	Cast Steel BS3100 A5 Hardness to 200 HB Brinell
Non-return valve body	Cast iron BS EN 1561 - 1997
Mechanical seal	Silicon carbide face; Viton elastomers; Stainless steel body

Engine option 1

JCB TCAE-55 (FT4), 74 HP @ 2200 rpm

Impeller diameter 11.0"

Pump speed 2200 rpm

Suction Lift Table

Total Suction Head (feet)	Total Delivery Head (feet)				
	30	46	62	81	121
	Output (USGPM)				
10	2179	2131	2083	1889	1356
15	2058	1937	1816	1574	1162
20	1453	1453	1453	1332	848
25	1259	1211	1114	969	484

Fuel capacity: 60 US Gal

Max fuel consumption @ 2200 rpm: 4.5 US Gal/hr

Max fuel consumption @ 1800 rpm: 2.4 US Gal/hr

Weight (Dry): 3,200 lbs

Weight (Wet): 3,630 lbs

Dim.: (L) 119" x (W) 66" x (H) 77"

Performance data provided in tables is based on water tests at sea level and 20°C ambient. All information is approximate and for general guidance only. Please contact the factory or office for further details.

Engine option 2

John Deere 4045TFC03 (FT4), 74 HP @ 2200 rpm

Impeller diameter 11.0"

Pump speed 2200 rpm

Suction Lift Table

Total Suction Head (feet)	Total Delivery Head (feet)				
	30	46	62	81	121
	Output (USGPM)				
10	2179	2131	2083	1889	1356
15	2058	1937	1816	1574	1162
20	1453	1453	1453	1332	848
25	1259	1211	1114	969	484

Fuel capacity: 60 US Gal

Max fuel consumption @ 2200 rpm: 5.2 US Gal/hr

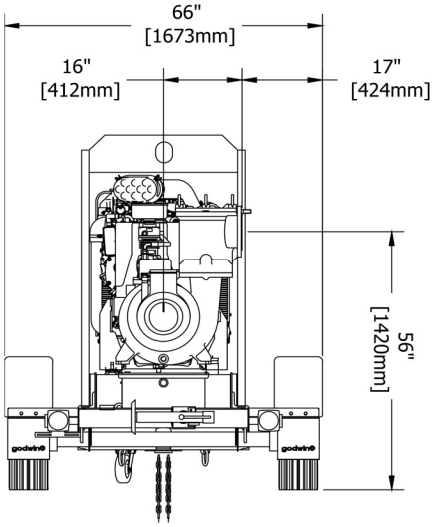
Max fuel consumption @ 1800 rpm: 2.6 US Gal/hr

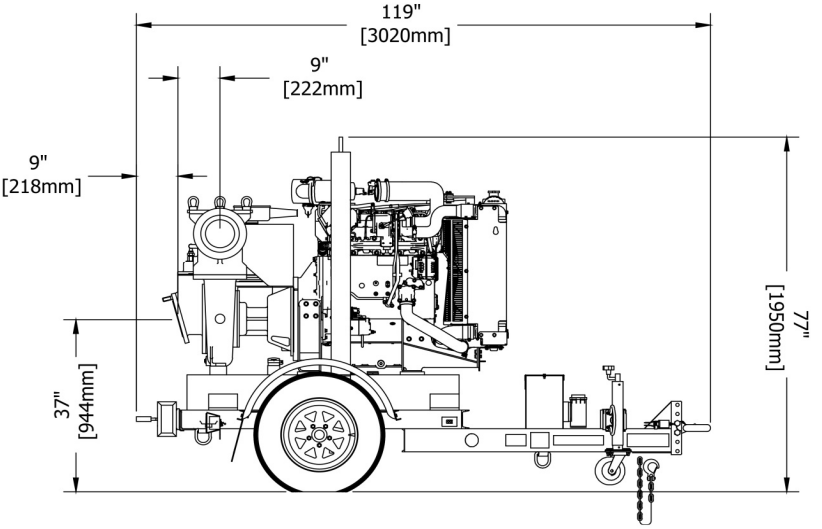
Weight (Dry): 3,180 lbs

Weight (Wet): 3,610 lbs

Dim.: (L) 119" x (W) 66" x (H) 91"

Performance data provided in tables is based on water tests at sea level and 20°C ambient. All information is approximate and for general guidance only. Please contact the factory or office for further details.





xylem
Let's Solve Water

84 Floodgate Road
Bridgeport, NJ 08014 USA
(856) 467-3636 . Fax (856) 467-4841

Reference number : 200GPA0000980
Date of issue : November 2, 2015
Issue : -

www.godwinpumps.com

PLANT 2

NC150 Dri-Prime® Pump

The Godwin Dri-Prime NC150 pump is an extremely powerful yet compact pump with flow capabilities to 1770 USGPM.

The NC150 features the unique patented Flygt N-technology with its innovative self-cleaning impeller.

NC Series pumps are engineered to deliver sustained high efficiency resulting in lower energy and fuel costs while reducing unplanned downtime.

This makes the NC150 a best-in-class portable pump suitable for both sewage and clean water applications.

Features and Benefits

- Dri-Prime (continuously operated Venturi air ejector priming device) requiring no periodic adjustment. Optional compressor clutch available.
- Incorporates N-technology for non-clog performance, sustained high efficiency and long-term energy/fuel savings.
- Hard-Iron™ (EN12513:2000) impeller and insert ring.
- Dry-running, high-pressure oil bath mechanical seal with highly abrasion resistant silicon carbide faces.
- Close-coupled centrifugal pump mounted to a diesel engine or electric motor for easy pumpend or engine/motor changeover in the field.
- Also available in a critically silenced unit which reduces noise levels to less than 70 dBA at 30'.
- Standard engine John Deere 4045TF290 (IT4 Flex). Also available with Caterpillar C4.4M-T (Export Only).

Specifications

Suction connection	6" 150# ANSI B16.5
Delivery connection	6" 150# ANSI B16.5
Max capacity	1770 USGPM †
Max Impeller diameter	11.3"
Max operating temp	176°F*
Max working pressure	90 psi
Max suction pressure	58 psi
Max casing pressure	135 psi
Max operating speed	2200 rpm

* Please contact our office for applications in excess of 176°F.

† Larger diameter pipes may be required for maximum flows.

Please contact the factory or office for further details. A typical picture of the pump is shown.
All information is approximate and for general guidance only.

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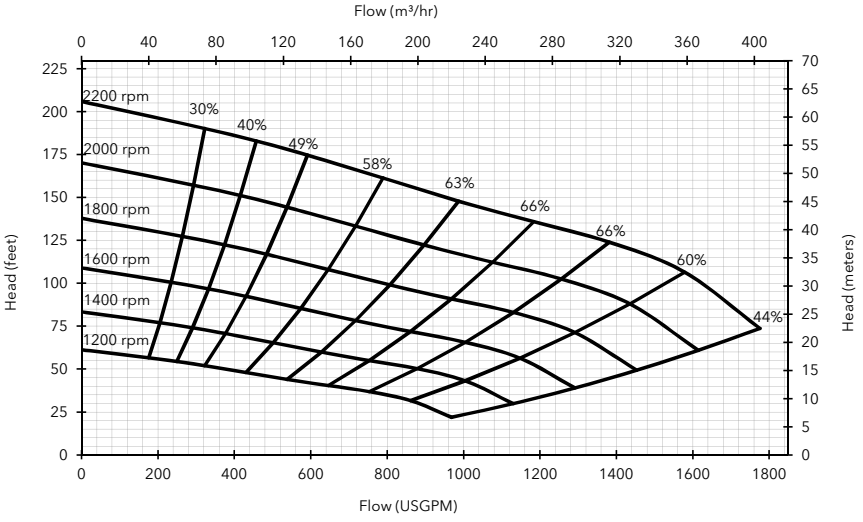
PLANT 2

Performance Curve



Materials

Pump casing & suction cover	Cast iron BS1561:1997
Wearplates	Front - Hard Iron EN12513:2000 Rear - Cast Iron BS1561:1997 0
Pump Shaft	Carbon steel BS970:1991 817M40T
Impeller	Hard Iron EN12513:2000
Non-return Valve body	Cast iron BS1561:1997
Mechanical Seal	Silicon carbide face; Viton elastomers; Stainless steel body

Engine option 1

John Deere, 4045TF290 (IT4 Flex), 75 HP @ 2200 rpm

Impeller diameter 11"

Pump speed 2200 rpm

Suction Lift Table

Total Suction Head (feet)	Total Delivery Head (feet)				
	64	115	151	167	187
	Output (USGPM)				
10	1574	1211	581	363	48
15	1308	1114	533	242	-
20	1090	969	339	-	-
25	848	678	242	-	-

Fuel capacity: 60 US Gal

Max Fuel consumption @ 2200 rpm: 4.4 US Gal/hr

Max Fuel consumption @ 1800 rpm: 3.8 US Gal/hr

Weight (Dry): 3,080 lbs

Weight (Wet): 3,500 lbs

Dimensions: (L) 119" x (W) 66" x (H) 77"

Performance data provided in tables is based on water tests at sea level and 20°C ambient. All information is approximate and for general guidance only. Please contact the factory or office for further details.

Engine option 2

Caterpillar, C4.4M-T (Export Only), 78 HP @ 2200 rpm

Impeller diameter 11"

Pump speed 2200 rpm

Suction Lift Table

Total Suction Head (feet)	Total Delivery Head (feet)				
	66	117	153	169	189
	Output (USGPM)				
10	1574	1211	581	363	48
15	1308	1114	533	242	-
20	1090	969	339	-	-
25	848	678	242	-	-

Fuel capacity: 60 US Gal

Max Fuel consumption @ 2200 rpm: 4.6 US Gal/hr

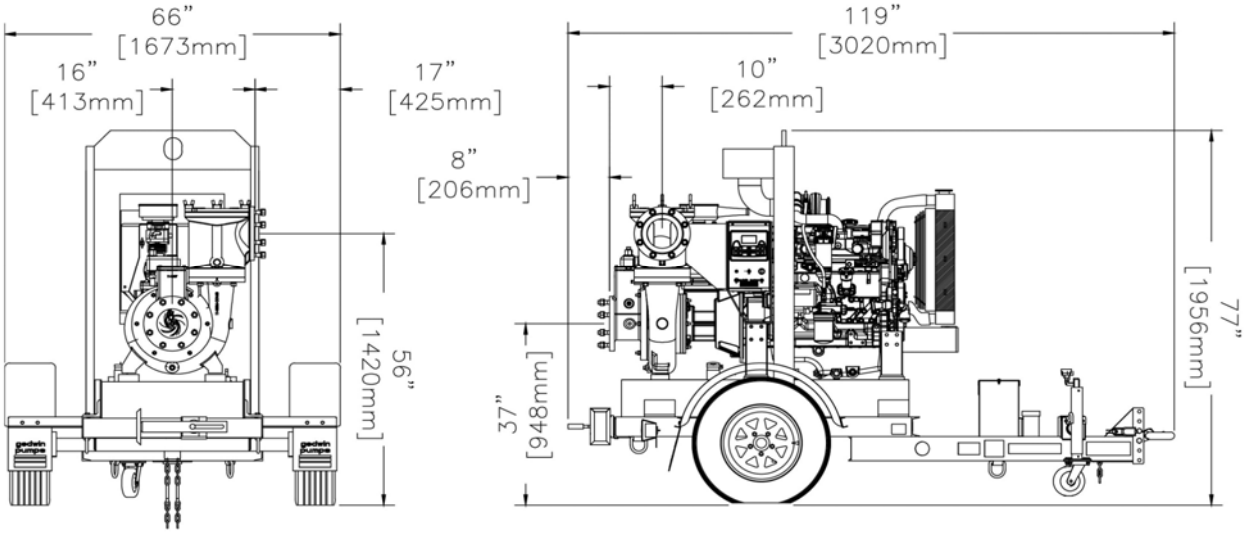
Max Fuel consumption @ 1800 rpm: 4.2 US Gal/hr

Weight (Dry): 3,080 lbs

Weight (Wet): 3,500 lbs

Dimensions: (L) 119" x (W) 66" x (H) 77"

Performance data provided in tables is based on water tests at sea level and 20°C ambient. All information is approximate and for general guidance only. Please contact the factory or office for further details.



xylem
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84 Floodgate Road
Bridgeport, NJ 08014 USA
(856) 467-3636 . Fax (856) 467-4841
Email: sales@godwinpumps.com

Reference number : 95-1805-3000
Date of issue : February 26, 2014
Issue : 8

www.godwinpumps.com

APPENDIX E

EPS FINDINGS AND RESPONSE TO SG 6 BUS TIE FAILURE

Brizendine, Matthew E. - DPU

From: Ben Condon <b.condon@epsii.com>
Sent: Tuesday, January 14, 2025 8:54 AM
To: Brizendine, Matthew E. - DPU
Cc: RVA-ADMIN
Subject: Richmond Freshwater MV Gear Transfer Scheme Troubleshooting

Evans,

Arrived on site yesterday to troubleshoot the transfer scheme in the MV Gear.
On arrival I met with Skip to review the events that lead to the plant losing utility power.
Skip informed me when one of the Dominion feeds dropped, the corresponding main break opened, but the tie breaker failed to close automatically. He stated there was a power blip earlier in the morning and it appeared everything transferred successfully earlier that morning. He also informed me a blown fuse had been found and replaced. Talking with the person who responded to the original outage, the TIE breaker was charged on arrival and did not need to be manually charged.

At this time, I reviewed the switchgear wiring diagram. I located a fuse on the drawings that would have been in the "close" circuit for the tie breaker. Audibly asked Skip if the blown fuse was 20 amp FU1 in the tie cabinet. He said yes.

Then we went to visually inspect the switchgear. It was noticed that the White Indicating Light (WIL) was illuminated above the TIE breaker, the WIL should not be illuminated in the state the switchgear was in (both mains closed, tie open, system in auto). The TIE breaker also showed DISCHARGED.
We confirmed both AC and DC control power was present. Therefore, the charging motor should have operated. It was also noticed that the CLOSE push button on the front of the breaker seemed slightly depressed and had not returned to its "ready" state.

We removed the TIE breaker from the cubicle and plugged it into the remote testing station that is inside the switchgear building. The TIE breaker immediately charged (removing the breaker from the cell had let the CLOSE button return to its proper "ready" position). We tried electrically operating the close function on the test station. The TIE did not close. We pressed the CLOSE button on the front of the breaker. Breaker closed but did not start charging again as it should. It was noticed again that the CLOSE button on the front of the breaker was depressed and had not returned to its proper "ready" point. We lifted the breaker and inspected underneath. The close button can be electrically or mechanically operated. The mechanical portion of the button was binding slightly. I manually returned the button to its proper state and the breaker immediately started charging. We again tried to close the breaker electrically, but we were unsuccessful. The CLOSE coil is bad.

At this point we removed a SPARE breaker from the switchgear and performed the same checks.
Plugged in: Breaker charged.
Hit close on test station: breaker closed and recharged to be ready for another operation.
Hit open on test station: breaker opened.
Hit close on front of breaker: breaker closed and recharged.
Hit open on front of breaker: breaker opened.
Hit close on test station: breaker closed and recharged.
Hit open on test station: breaker opened.

This breaker operated successfully and was installed in the TIE cubicle. White Indicating Light above the tie was NOT illuminated. As it should not be.

My assessment is the original TIE breaker had operated successfully and charged from a prior operation because the breaker was charged and did not need to be manually charged to close and restore power to the plant. Then during the outage that dropped the plant, the MAIN opened properly on loss of utility power. The TIE did not close due to a failed CLOSE coil. The coil failing resulted in a blown fuse for the 240v controls in the tie cubicle. Once the fuse was replaced the coil had completely failed to the point of open circuiting, so there was no longer a fault.

The TIE was manually closed, leaving the close button mid “travel”. This state of mid travel prevented the breaker from charging again.

I am happy to discuss anything and everything. Feel free to pull me into a call. Please let me know if you have any questions.

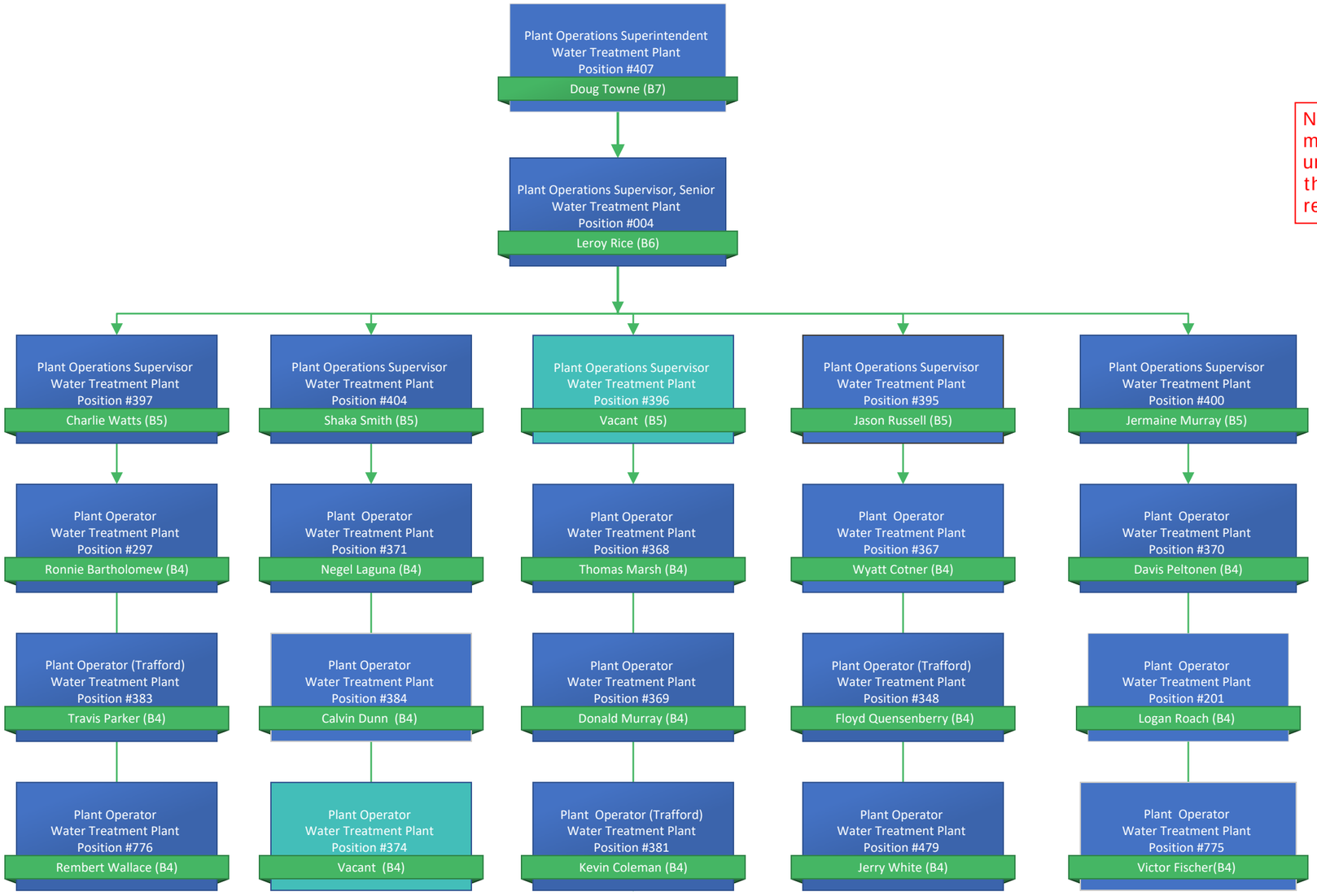
Thank You,

Ben Condon
Senior Project Manager
NETA 3, Master Electrician
O: 804-299-2991 **M:** 804-380-7957
1051 Technology Park Drive Glen Allen, VA 23059
b.condon@epsii.com
epsii.com

APPENDIX F

WATER TREATMENT PLANT ORGANIZATION CHARTS

Water Treatment Plant Operations- 12/19/24



Vacant

Filled

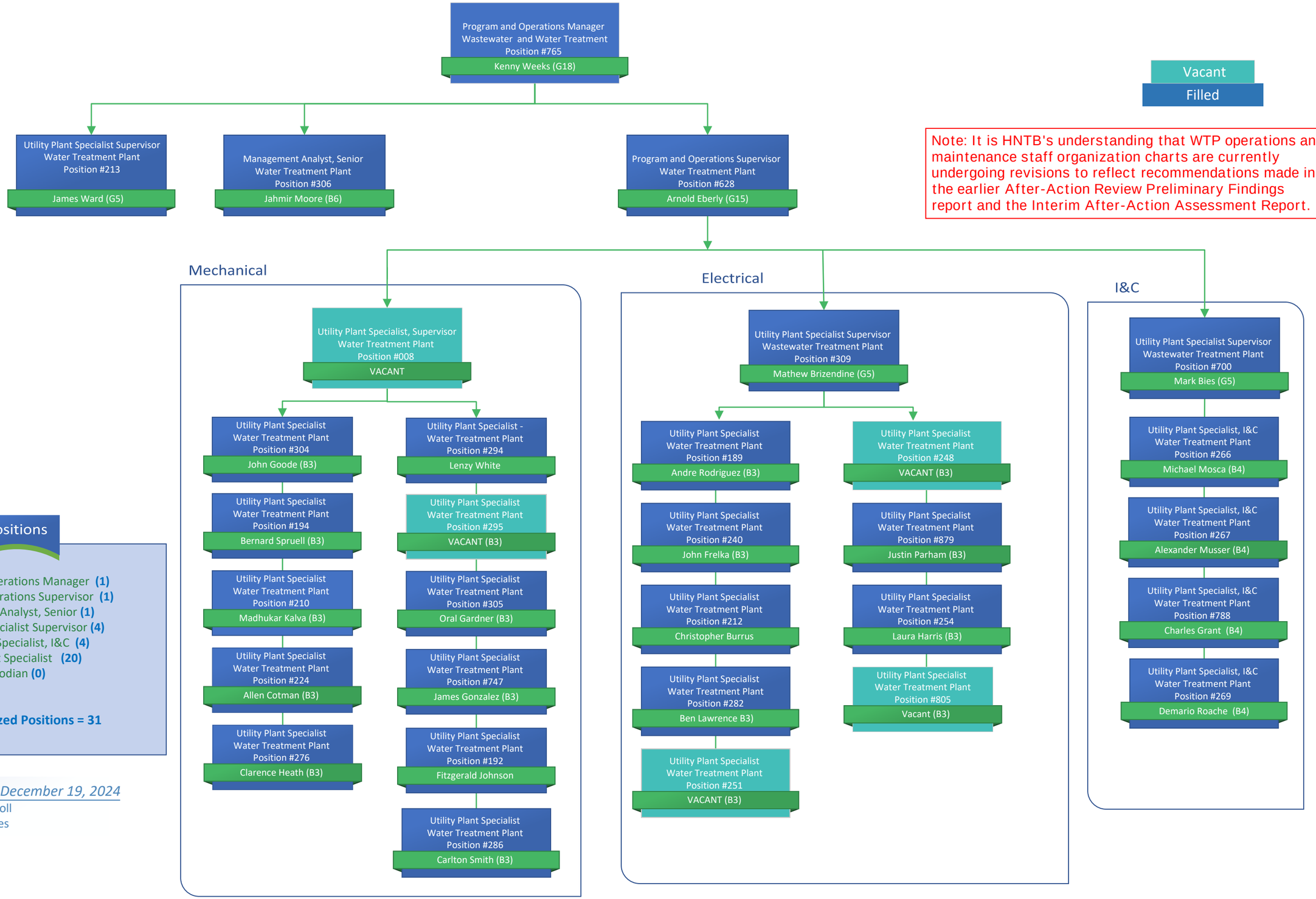
Note: It is HNTB's understanding that WTP operations and maintenance staff organization charts are currently undergoing revisions to reflect recommendations made in the earlier After-Action Review Preliminary Findings report and the Interim After-Action Assessment Report.

Positions

Plant Operations Superintendent **(1)**
Plant Operations Supervisor, Senior **(1)**
Plant Operations Supervisor **(5)**
Plant Operator **(15)**

Total Authorized Positions = 22

Water Treatment Plant-Maintenance



Positions

Program and Operations Manager **(1)**
Program and Operations Supervisor **(1)**
Management Analyst, Senior **(1)**
Utility Plant Specialist Supervisor **(4)**
Utility Plant Specialist, I&C **(4)**
Utility Plant Specialist **(20)**
Custodian **(0)**

Total Authorized Positions = 31

Total as of December 19, 2024
- 26 On Payroll
- 5 Vacancies

APPENDIX G

JOB SPECIFICATIONS

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Director of Public Utilities*

CLASS CODE	EM36E	**SALARY**	$82.09 - $137.11 Hourly $6,567.58 - $10,968.62 Biweekly $14,229.75 - $23,765.33 Monthly $170,757.00 - $285,184.00 Annually
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class provides strategic direction and management oversight to the Department of Public Utilities, and ensures implementation of Mayor and City Council goals, policies, and performance expectations. The incumbent is responsible for providing leadership, fiscal management, administration, and operational direction to the Department of Public Utilities in the administration and management of City Utilities. The Director plans, organizes, and implements programs; reports progress of major activities to executive level administrators, and is responsible for the accomplishment of the goals and objectives for the department as set forth by the Mayor and Chief Administrative Officer (CAO). The Director researches and formulates long-range goals and works closely with the city administration, Mayor, and elected officials to accomplish the goals.

The incumbent supervises management, professional, paraprofessional, and support staff including conducting performance evaluations, coordinating training, and implementing hiring, discipline, and termination procedures.
Supervision Exercised/Received:

- **Exercised:** This classification typically supervises other employees.
- **Received:** This classification typically reports directly to a Deputy Chief Administrative Officer.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentages of time are a representative sample; position assignments may vary. Typical Percentage of Time (none less than 10%)

1. Plans, directs, coordinates, and controls the operations and maintenance of City utility systems and services; initiates departmental personnel actions; Consults with senior management to establish policies and resolve complex administrative problems. **20%**
2. Develops and directs comprehensive departmental construction, maintenance, and operational programs; coordinates inter-departmental activities; confers with Chief Administrative Officer. **20%**
3. Provides for the analysis of complex statistical data regarding utility demand and operations; Monitors and analyzes information and reports, such as monthly financial statements, to determine any necessary modifications to rate schedules; assumes responsibility for the growth and profitability of the gas utility. **20%**
4. Reviews operations reports, monitors department expenditures, and analyzes annual budgetary proposals; makes recommendations. Provides directions and communicates to managers and direct subordinates; performs various supervisory duties; engages and motivates employees. **20%**

5. Attends meetings and makes presentations and recommendations to City Council; serves on various task groups and committees; functions as a liaison to local, State, and Federal regulatory agencies; makes speeches and serves on panels for civic, social, and other interested groups. **20%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- Bachelor's Degree in engineering, public administration, business administration or a field directly related to Public Utilities
- Ten years of progressively responsible related experience that includes significant management and supervisory experience
- A Master's Degree in a field directly related to assignment is preferred
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification

LICENSING, CERTIFICATIONS, and/or OTHER SPECIAL REQUIREMENTS:

- Some departments and positions may require or prefer licenses or certifications in area of focus.

KNOWLEDGE, SKILLS, AND ABILITIES: TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Contemporary public utilities practices, methods, materials, equipment, procedures, objectives, and standard practices of municipal utilities field operations, including but not limited to water, wastewater, and reclaimed water operations.
- Federal, State, county, City, tribal, and other applicable statutes, agreements, standards, and codes for assigned Municipal Utilities functions; and considerable knowledge of governmental budgeting and administrative practices and procedures.
- Federal laws (OSHA), State regulations and City policies regarding safety training and safe work practices.
- Computer programs such as Microsoft Office Suite
- Electronic databases and related software applications such as RAPIDS
- Emergency management operations
- Financial management
- Human resources management
- Knowledge of accounting, finance, and economics
- Planning and marketing principles
- Policies and procedures
- Project management
- Richmond community awareness and values
- ROI model
- Services that can be provided by technology as well as the contractors and consultants in the field of Public Utilities

Skills (some combination of the following):

- Municipal administration, project management, and budget procedures
- Analyzing problems, identifying/implementing solutions
- Assessing, adjusting, and instating policies and procedures
- Communicating with various internal and external departments
- Developing teams
- Enhancing employee engagement
- Strategic planning
- Presenting and reporting
- Providing leadership and overseeing all aspects of a program, project, or other area of focus
- Supervising multiple assigned functions and divisions and significant resources
- Understanding and managing complex budgets
- Using standard office equipment
- Writing various documents including grants
- Interpersonal communication
- Oral and written communication
- Customer relations

Abilities (some combination of the following):

- Plan, organize, direct, coordinate, evaluate and oversee activities of operating divisions and their personnel.
- Communicate effectively, both orally and in writing to groups, as well as individuals
- Develop and oversee the implementation of departmental public relations and public education programs
- Establish and maintain productive working relationships with City administrative officials, elected officials at the local and state levels, the press, the general public and other governmental and public organizations
- Think critically
- Comprehend and retain information quickly
- Prioritize
- Problem solve
- Speak publicly
- Manage time effectively
- Create and implement a shared vision
- Professionally represent the department and the City

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: The working conditions may include frequent exposure to travel outside organization's locations; and occasional exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, and imminent danger, and threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to regularly talk, hear, see, and perform repetitive motions; frequently reach, stand, walk, finger, and grasp; and occasionally climb, balance, stoop, kneel,

crouch, crawl, push, pull, lift, and feel. The working conditions may include environmental hazards. In terms of the physical strength to perform the essential duties, this classification is considered to be sedentary, exerting up to 10 pounds of force occasionally, and a negligible amount of force frequently or constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Exempt
EEO Classification: Official and Administrator
Type of Service: Executive
Residency: Required
Classification Approved: January 2019
Job Specification Revised:
Revision Approved by: Deputy Chief Administrative Officer

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Deputy Department Director, Senior*

CLASS CODE	AS44U	**SALARY**	$56.07 - $93.64 Hourly $4,485.62 - $7,490.96 Biweekly $9,718.83 - $16,230.42 Monthly $116,626.00 - $194,765.00 Annually
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class provides assistance to the department director or the Chief Administrative Officer in setting the strategic direction and management oversight to a large or complex City department, and ensures implementation of Mayor and City Council goals, policies, and performance expectations. Incumbents oversee a major division(s) within a large or complex department and serve as a second or third level manager reporting directly to the Department Director. Incumbents make interpretive decisions on behalf of the organization regarding the means for executing the goals established by the Director, subject to available technology and resources. Such interpretive decisions provide context for the work to be accomplished by the subordinates supervised. Incumbents are typically assigned to serve as Director in the absence of the Director.

Supervision Exercised/Received:

- **Exercised:** This classification typically supervises other employees.
- **Received:** This classification typically reports to a Director or other executive.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentage of time are a representative sample; position assignments may vary.

Typical Percentage of Time (none less than 10%)

1. Directs, manages, and supervises staff; performs some supervisory duties such as performance evaluations and training; supports managers as needed. **30%**
2. Manages, implements, and monitors large scale projects, programs, reviews, budgets, etc.; determines each staff member's role. **25%**
3. Prepares, reviews, edits, and approves various documents, reports, contracts, expenditures, packets, budgets, etc.; ensures proper reporting. **20%**
4. Prepares presentations; conducts, attends, and participates in various meetings. **15%**
5. Works with various internal and external departments on special assignments or projects; coordinates projects as needed. **10%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- Bachelor's Degree in public administration or field directly related to assignment
- Eight years of progressively responsible related experience that includes significant management and supervisory experience
- Some departments may prefer a Master's Degree in a field directly related to the assignment
- Some positions may have additional specialized requirements
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification

LICENSING, CERTIFICATIONS, and/or OTHER SPECIAL REQUIREMENTS:

- Some departments and positions may require or prefer licenses or certifications in area of focus.

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Budget analysis
- Community relations
- Computer programs such as Microsoft Office Suite
- Electronic databases and related software applications within department's focus area
- Federal, states, and local laws, rules, regulations, codes, and statutes
- Government administration and legislative processes
- Government finance and budgeting practices
- Organizational structure in focus area
- Policy development
- Project management
- Related policies and procedures
- Specific knowledge and standards within focus area

Skills (some combination of the following):

- Coaching and mentoring employees
- Communicating with various internal and external departments
- Conducting extensive research
- Establishing and maintaining effective working relationships
- Managing and leading
- Performing data analysis
- Planning, directing, coordinating, and evaluating operations of the department of focus
- Preparing, writing, and reviewing reports and other work, including scope of work
- Providing strategic oversight to City departments and functions
- Responding in a timely manner to inquiries and concerns of the public
- Serving as Director in the absence of the Director
- Using efficient learning techniques to acquire and apply new knowledge and skills
- Working strategically and collaboratively across departments and agencies

- Oral and written communication
- Interpersonal communication

Abilities (some combination of the following):

- Be adaptable
- Anticipate future needs and assess operational concerns
- Balance conflicting priorities
- Make important decisions
- Be flexible
- Problem solve
- Self-manage
- Work in teams

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to regularly finger, talk, hear, see, and perform repetitive motions; frequently reach, stand, walk, and grasp; and occasionally climb, balance, stoop, kneel, crouch, crawl, push, pull, feel, and lift. The working conditions may not include environmental hazards. In terms of the physical strength to perform the essential duties, this classification is considered to be sedentary, exerting up to 10 pounds of force occasionally, and a negligible amount of force frequently or constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Exempt
EEO Classification: Official and Administrator
Type of Service: Unclassified
Residency: Not required
Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:
The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Plant Operations Superintendent*

CLASS CODE	LP08C	**SALARY**	$32.98 - $61.91 Hourly $2,638.73 - $4,952.85 Biweekly $5,717.25 - $10,731.17 Monthly $68,607.00 - $128,774.00 Annually
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class is responsible for all operational, technical, laboratory and managerial aspects of a water or wastewater treatment plant. As assigned, work may include: signing off on all reports to regulatory agencies; establishing goals, making assignments, and reviewing and approving work; providing technical guidance; coordinating maintenance activities; participating in civic and technical meetings; writing complex reports; preparing and administering the plant's budget; making technical recommendations; preparing and managing major cyclical activities such as performance measures, billing, and inventory; managing consultants and sub-contractors; managing utility-wide compliance programs and serving as an operations liaison.

Incumbents supervise professional, paraprofessional, technical, and support staff including conducting performance evaluations, coordinating training, and implementing hiring, discipline, and termination procedures.

Supervision Exercised/Received:

- **Exercised:** This classification typically supervises other employees.
- **Received:** This classification typically reports to a Deputy Department Director.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties are a representative sample; position assignments may vary. Typical Percentage of Time (none less than 10%)

1. Monitors plant operations and maintenance activities. Ensures that the plant is meeting compliance goals and staffing is adequate for safe operations. Reviews SCADA reports daily to review treatment and production operations. Inputs operational data into system. Makes suggestions for improvement. **40%**
2. Prepares budgets, bids, and contract renewals. Collaborates with other City departments (e.g. Finance, Procurement) for day-to-day activities and special projects. Approves time cards, material/supply requests, and invoices. **30%**
3. Prepares and reviews monthly reports for the Health Department, Department for Environmental Quality, and other state and federal agencies. **20%**
4. Conducts operations, maintenance, and safety meetings. **10%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- Associate's Degree in environmental science, chemistry, engineering, or related field
- Five years of progressively responsible water or wastewater treatment experience with at least two years of supervisory experience in a treatment facility

LICENSING, CERTIFICATIONS, and/or OTHER SPECIAL REQUIREMENTS:

- Requires a Commonwealth of Virginia Level 1 Water or Wastewater Operator's License

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following)

- Principles and practices of water and wastewater treatment operations
- Maintenance, electrical, and instrumentation procedures and concepts
- Operations of water distribution systems
- Safety principles and practices
- Microsoft Office Suite (Word, Excel, Outlook)
- Applicable federal, state and local laws, codes and regulations regarding wastewater treatment.
- Computer software used in wastewater plant system controls and operations such as SCADA and Operator 10
- Industrial Safety Program
- Budget concepts

Skills (some combination of the following)

- Strategic planning
- Using standard office equipment such as computers, printers, and fax machines
- Oral and written communication

Abilities (some combination of the following)

- Prioritize, assign, supervise, and review the work of others
- Multi-task
- Make decisions
- Coordinate different groups to reach a common goal
- Collaborate and communicate with internal and external departments
- Facilitate workgroups and project teams

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to balance, stoop, kneel, crouch, reach, stand, walk, push objects, pull objects, lift, use fingers and grasp objects. The working conditions may include exposure to hazardous physical and atmospheric conditions and potentially hazardous chemicals and extreme temperatures. In terms of the physical strength to perform the essential duties, this classification is considered to be light work, exerting up to 20 pounds of force occasionally, up to 10 pounds of force frequently, and a negligible amount of force constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Exempt
EEO Classification: Paraprofessional
Type of Service: Classified
Residency: Not Required
Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:
The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Plant Operations Supervisor*

CLASS CODE	LP04C	**SALARY**	$28.68 - $53.83 Hourly
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class provides supervision of skilled labor and technical work in the water or wastewater facilities. Incumbents provide supervision over an assigned shift, and water or wastewater processes. As assigned, work may include: adjusting processes to ensure permit compliance; implementing and monitoring safety programs; providing shift-change briefings; preparing routine plant reports; managing consultant contracts and sub-contractors; serving as an operations liaison; and performing the work of a plant operator when needed.

Incumbents supervise paraprofessional and support staff including conducting performance evaluations, coordinating training, and implementing hiring, discipline, and termination procedures.

Supervision Exercised/Received:

- **Exercised:** This classification typically supervises other employees.
- **Received:** This classification typically reports to a superintendent.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentage of time are a representative sample; position assignments may vary.

Typical Percentage of Time (none less than 10%)

1. Evaluates plant treatment operations to ensure water distribution, tank levels, and pumping are working appropriately. **50%**
2. Evaluates employee performance against goals; ensures adequate staffing levels/coverage; holds periodic meetings with employees to evaluate progress and training needs; maintains records; and recommend discipline when necessary. Implements and monitors appropriate safety procedures. **20%**
3. Records maintenance problems and resolutions. **10%**
4. Generates and updates SOP's for new processes or process changes. Prepares reports. **10%**
5. Generates contracts and purchase orders, and verify invoices. **10%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- High School Diploma or GED

- 6 years of water or wastewater experience
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification

LICENSING, CERTIFICATIONS, and OTHER SPECIAL REQUIREMENTS:

- Requires a Commonwealth of Virginia Level 1 Water or Wastewater Operator's License.

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Principles and practices of wastewater treatment operations
- Operating principles of valves, pumps, and motors
- Principles and methods of bacteriological and chemical wastewater analyses
- Effects of wastewater treatment processes, and potential issues that may arise
- Safety principles and practices
- Applicable federal, state, and local laws, codes, and regulations regarding wastewater treatment
- Management / supervision principles, practices
- Computer software used in wastewater plant system controls and operations
- Basic mathematics concepts
- Chemicals and Material Safety Data Sheets.
- Basic physics concepts and their applications in regards to plant operations

Skills (some combination of the following):

- Understanding diagrams and blueprints
- Reading and interpreting plans and specifications
- Safely using various tools, light trucks, and power driven equipment
- Budget management
- Leadership
- Operating heavy equipment (some positions)
- Operating and maintaining assigned equipment
- Oral and written communication

Abilities (some combination of the following):

- Prioritize, assign, supervise, and review the work of plant operators
- Make important decisions

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases,

and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to balance, stoop, kneel, crouch, crawl, reach, stand, walk, push objects, pull objects, lift, use fingers and grasp objects. The working conditions may include exposure to noise, dust, grease, smoke, fumes, gases and potentially hazardous chemicals, working in or with wastewater. In terms of the physical strength to perform the essential duties, this classification is considered to be medium work, exerting up to 50 pounds of force occasionally, up to 20 pounds of force frequently, and up to 10 pounds of force constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Non-Exempt
EEO Classification: Skilled Craft Worker
Type of Service: Classified
Residency: Not Required
Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:
The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Plant Operator*

CLASS CODE	LP02C	**SALARY**	$22.28 - $40.70 Hourly
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class operates water and wastewater treatment facilities through the performance of skilled labor and technical work. Incumbents perform skilled work of moderate to considerable difficulty, requiring state certification for all but the entry-level operator assignment. As assigned, work may include: collecting samples of water and liquid waste and performing basic chemical and biological laboratory analyses; adjusting the amounts of chemicals used to treat water or wastewater; reading, interpreting, and adjusting gauges, meters, and control panels; observing and documenting variations in operating conditions to determine processing requirements; recording operational data; operating valves and gates; starting and stopping plant equipment to control and adjust treatment processes; adjusting, monitoring, and responding to operational situations involving water distribution or wastewater collection systems.

Operators may be assigned to Zones I through V, with each Zone requiring performance of progressively responsible duties, along with possession of commensurate competency and certification requirements.

As assigned, incumbents may serve as lead workers, assigning work and monitoring work completion. Incumbents may act as supervisors in the supervisors' absence.

Supervision Exercised/Received:

- **Exercised:** This classification typically do not supervise other employees but may act as leads for lower level employees.
- **Received:** This classification typically reports to a supervisor.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentage of time are a representative sample; position assignments may vary.

Typical Percentage of Time (none less than 5%)

1. Evaluates plant treatment processes by monitoring computer software programs pertaining to plant systems and operations.
2. Ensures proper adjustments of plant processes. Evaluates response to changing operational variables. May regularly read gauges and meters. Operates valves and gates. Ensures that processes and equipment are operating in required ranges. Makes adjustments to meet operating conditions and compliance standards.
3. Maintains records, logs, and summary documents required to meet all federal and state permits. Observes and documents variations in the treatment process.

4. May perform inventory spot-checks, monthly count of supplies, groundskeeping, floodwall inspections, and equipment maintenance. Ensures working environment is healthy and safe.
5. Coordinates sampling operations to assure the proper balance of treatment. May collect water/solids samples.

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- High School Diploma or GED.
- Zone I requires a year of maintenance experience, preferably in the performance of utility tasks (Zones II through V will require additional experience and certifications as defined in the broad band program).
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification.

LICENSING, CERTIFICATIONS, and OTHER SPECIAL REQUIREMENTS:

- Incumbents assigned to Zone II require a Commonwealth of Virginia Level 4 Water or Wastewater Operator's License.
- Incumbents assigned to Zone III require a Commonwealth of Virginia Level 3 Water or Wastewater Operator's License.
- Incumbents assigned to Zone IV require a Commonwealth of Virginia Level 2 Water or Wastewater Operator's License.
- Incumbents assigned to Zone V require a Commonwealth of Virginia Level 1 Water or Wastewater Operator's License.

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Principles and practices of wastewater treatment operations
- Operating principles of valves, pumps, and motors
- Principles and methods of bacteriological and chemical wastewater analyses
- Effects of wastewater treatment processes, and potential issues that may arise
- Safety principles and practices
- Applicable federal, state, and local laws, codes, and regulations regarding wastewater treatment
- Computer software used in wastewater plant system controls and operations
- Basic mathematics concepts
- Hand tools and their uses
- Basic physics concepts and their applications in regards to plant operations
- Material Safety Data Sheets

Skills (some combination of the following):

- Understanding diagrams and blueprints
- Reading and interpreting plans and specifications
- Safely using various tools, light trucks, and power driven equipment

- Operating heavy equipment (not all positions)
- Operating and maintaining assigned equipment
- Communicating clearly and concisely, both orally and in writing

Abilities (some combination of the following):

- Prioritize, assign, supervise, and review the work of plant operators
- Appreciate the cultural diversity of the community
- Make decisions

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to balance, stoop, kneel, crouch, crawl, reach, stand, walk, push objects, pull objects, lift, use fingers and grasp objects. The working conditions may include exposure to noise, dust, grease, smoke, fumes, gases and potentially hazardous chemicals, working in or with wastewater. In terms of the physical strength to perform the essential duties, this classification is considered to be medium work, exerting up to 50 pounds of force occasionally, up to 20 pounds of force frequently, and up to 10 pounds of force constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Non-Exempt
EEO Classification: Skilled Craft
Type of Service: Classified
Residency: Not Required
Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:
The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Program and Operations Manager*

CLASS CODE	AS04U	**SALARY**	$46.34 - $77.38 Hourly $3,706.92 - $6,190.46 Biweekly $8,031.67 - $13,412.67 Monthly $96,380.00 - $160,952.00 Annually
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class supervises and manages a city program or operational area. Incumbents serve as a second level supervisor over multiple programs and functions, or over an operational division as a high level individual contributor managing mission critical financial processes and operations. Work involves making interpretive decisions on behalf of the organization regarding the means for executing the goals established by City policy and the supervisor, subject to constraints imposed by available technology and resources. Such interpretive decisions provide context for the work to be accomplished by staff within the units managed. Incumbents oversee daily operations and direct work flow; conduct, attend, and participate in departmental staff meetings and meetings with other departments, city leadership, and citizens; review, prepare, and submit reports; assist in contract negotiations; develop, implement, and monitor policies and procedures; oversee correspondence; manage budgets and approve expenditures; and manage personnel.
Incumbents directly supervise management, professional, paraprofessional, and support staff including conducting performance evaluations, coordinating training, and implementing hiring, discipline, and termination procedures.

Supervision Exercised/Received:

- **Exercised:** This classification typically supervises other employees.
- **Received:** This classification typically reports to a director or deputy director.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentage of time are a representative sample; position assignments may vary.

Typical Percentage of Time (none less than 10%)

1. Oversees and directs workflow for multiple programs and functions; develops scheduling for assigned work; ensures compliance, accuracy, and functionality. Conducts, attends and participates in departmental staff meetings, meetings with other departments, meetings with City management, and meetings with civic and citizen groups. **25%**
2. Conducts supervisory duties including recruiting, hiring, training, evaluating, etc. **20%**
3. Corresponds and interacts directly with citizens, customers, staff, vendors, etc.; assists management as necessary. **20%**

4. Evaluates and analyzes options; prepares, reviews, and submits routine and specialized technical statistical reports. Provides updates, researches, and gathers necessary information. **15%**
5. Manages and approves budgets, expenditures, etc.**10%**
6. Develops, implements, monitors, and evaluates policies and procedures. Makes recommendations to management. **10%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- Bachelor's degree in business, accounting, finance or public administration or field related to assignment
- Six years of journey-level professional experience in area related to assignment
- Two years of supervisory experience
- A Master's degree in Business or Public Administration or field directly related to assignment is preferred
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification

LICENSING, CERTIFICATIONS and OTHER SPECIAL REQUIREMENTS:

- Some positions may require a FMP (Facilities Management Professional) designation.
- Some positions may require a CFM (Certified Facility Manager) certification or the ability to attain a CFM certification within 12 months of appointment.

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Accounting, budgeting, accounts payable/receivable
- Computer programs such as Microsoft Office Suite
- Cultural development
- Data analysis
- Data management
- Electronic databases and related software applications
- Federal regulations pertaining to assigned area
- Federal, state, and local laws and legal procedures related to focus area
- Processes and procedures related to the assigned area
- Project management
- City guidelines and standards
- In-depth knowledge in area of focus

Skills (some combination of the following):

- Communicating and coordinating with various internal and external departments
- Creating and implementing policies and procedures
- Gathering and interpreting data routinely
- Interpreting and applying federal regulations for programs
- Managing contracts, projects, data, reports, etc.

- Overseeing the daily accounting and procurement functions
- Overseeing the financial and operational aspects of programs of focus
- Overseeing daily operations and directing work flow
- Setting timetables, achieving milestones, tracking progress, and taking corrective actions
- Supervising, including conducting performance evaluations, mentoring, etc.
- Understanding a program's intent and application
- Writing standard operating procedures
- Coaching
- Conducting, attending, and participating in various meetings; providing input as needed
- Reviewing, preparing, and submitting reports
- Customer service
- Oral and written communication

Abilities (some combination of the following):

- Adapt
- Think critically
- Grasp overall objectives and determine steps to achieve the objectives
- Multi-task
- Organize
- Problem solve
- Manage time effectively
- Evaluate and analyze data

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to regularly talk, hear, see, and perform repetitive motions; frequently finger; and occasionally climb, balance, stoop, kneel, crouch, reach, stand, walk, list, grasp, and feel. The working conditions may include environmental hazards. In terms of the physical strength to perform the essential duties, this classification is considered to be light work, exerting up to 20 pounds of force occasionally, up to 10 pounds of force frequently, and a negligible amount of force constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Exempt
EEO Classification: Professional
Type of Service: Unclassified
Residency: Not Required

Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:
The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Program and Operations Supervisor*

CLASS CODE	AS02C	**SALARY**	$36.07 - $58.13 Hourly $2,885.77 - $4,650.77 Biweekly $6,252.50 - $10,076.67 Monthly $75,030.00 - $120,920.00 Annually
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class supervises and manages a City program or operational area. Incumbents oversee the financial and operational aspects of an assigned program, providing first level supervision of employees. Incumbents supervise staff; set program goals, objectives, and standards; plan and monitor programs for progress towards objectives; oversee changes in policies and procedures; oversee the maintenance of equipment; participate in special projects; prepare and monitor budgets and budget projections; oversee daily accounting and procurement functions; coordinate with clients, peers, the community, and other agencies; manage contracts as well as financial and performance data; and prepare reports.

Incumbents assigned to the Department of Planning and Development Review oversee the financial and operational aspects of the Community Assisted Public Safety (CAPS) Program. This class oversees and coordinates a cross departmental program responsible for identifying and eliminating blight, implementing state and local codes, monitoring compliance with program requirements, and assessing relevant community needs. Incumbents supervise two or more professional level staff members, as well as paraprofessional and support level staff. Supervisory duties include conducting performance evaluations, coordinating training, and implementing hiring, discipline, and termination procedures.

Supervision Exercised/Received:

- **Exercised:** This classification typically supervises other employees.
- **Received:** This classification typically reports to a director, deputy director or manager, or the Building Commissioner.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentage of time are a representative sample; position assignments may vary.

Typical Percentage of Time (none less than 10%)

1. Reviews programs and corresponding reports; ensures compliance, accuracy, and functionality. **25%**
2. Plans, oversees, maintains, monitors and updates various program initiatives; provides support where needed. **25%**

3. Reports on various aspects of programs via meetings, documents, forms, budgets, and spreadsheets. **20%**
4. Supervises staff; performs duties such as hiring, mentoring, reviewing, evaluating, etc.; creates procedures to increase staff efficiency. **15%**
5. Communicates and coordinates with staff, other departments, outside agencies, contractors, and others. **15%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- Bachelor's degree in business or public administration, or field related to assignment
- Four years of journey-level professional experience in area related to assignment
- A Master's degree in business, public administration, or field directly related to assignment may be preferred
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification

LICENSING, CERTIFICATIONS, and/or OTHER SPECIAL REQUIREMENTS:

- A certification as a Property Maintenance Inspector or a Property Maintenance Code Official through the Virginia Department of Housing and Community Development is required for certain Planning and Development Review positions.
- Some assignments may require a valid Driver's License with a satisfactory driving record and a valid Commonwealth of Virginia Driver's License within 30 days of hire.

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Accounting, budgeting, accounts payable/receivable
- Computer programs such as Microsoft Office Suite
- Cultural development
- Data analysis
- Data management
- Electronic databases and related software applications (such as RAPIDS financial system, EIS eXpress reporting/ GL Connect)
- Federal regulations pertaining to assigned area
- General knowledge of the laws and legal procedures related to focus area
- Implementation of Evidence Based Programs
- Permit and plan review, processes, and procedures
- Project management
- Rule Based Applications
- Surveillance services, including GPS
- Virginia Juvenile Community Crime Control Act

Skills (some combination of the following):

- Communicating and coordinating with various internal and external departments
- Creating and implementing policies and procedures

- Gathering and interpreting data routinely
- Interpreting and applying federal regulations for programs
- Managing contracts, projects, data, reports, etc.
- Overseeing daily accounting and procurement functions
- Overseeing the financial and operational aspects of programs of focus
- Supervising including conducting performance evaluations, mentoring, etc.
- Understanding a program's intent and application
- Writing standard operating procedures
- Oral and written communication

Abilities (some combination of the following):

- Pay attention to detail
- Organize
- Set timetables, achieve milestones, track progress, and take corrective actions

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to regularly talk, hear, see, and perform repetitive motions; and occasionally climb, stoop, crouch, reach, stand, walk, push, pull, lift, finger, grasp, and feel. The working conditions may include environmental hazards. In terms of the physical strength to perform the essential duties, this classification is considered to be light work, exerting up to 20 pounds of force occasionally, up to 10 pounds of force frequently, and a negligible amount of force constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Exempt
EEO Classification: Professional
Type of Service: Classified
Residency: Not Required
Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:
The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Utility Plant Specialist*

CLASS CODE	LP12C	**SALARY**	$21.45 - $35.39 Hourly
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class works in the City's water or wastewater treatment plants and ensures that the plant and equipment are functioning properly. Incumbents utilize knowledge and skills in multiple trades, such as mechanical or electrical work, to perform the assigned duties. Duties include conducting preventative maintenance, troubleshooting and repairing equipment, and monitoring equipment and other functional aspects in the plant/ Incumbents use their knowledge to ensure that work performed is in compliance with State, Federal, and local laws, regulations, and policies.

This broad banded class includes incumbents from an entry-level (who work according to set procedures under direct supervision) to highly skilled level (who work with minimal supervision). Specialists may be assigned to Zones I through IV, with each Zone requiring performance of progressively responsible duties along with possession of commensurate competency and certification requirements.

As assigned, incumbents may serve as lead workers, assigning work and monitoring work completion. As assigned, incumbents may act as supervisors in the supervisors' absence.

Supervision Exercised/Received:

- **Exercised:** This classification typically does not supervise other employees but may act as lead for lower level employees.
- **Received:** This classification typically reports to a supervisor.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentage of time are a representative sample; position assignments may vary.

Typical Percentage of Time (none less than 10%)

1. Conducts preventive maintenance on treatment plant, wastewater pump, or water booster station equipment; performs repairs and maintenance of hazardous chemical equipment/systems, boilers, water treatment equipment, and corrosion control chemical dosing equipment; and conducts electrical equipment, system corrective, and preventive maintenance. **60%**
2. Performs administrative tasks, such as composing work orders and inventorying; procures warehouse supplies and parts via requisitions in CMMS; updates files and maintenance logs, prepares periodic reports; and attends safety meetings. **20%**

3. Conducts general housekeeping and buildings/grounds maintenance at treatment plants, pump stations, or booster stations. Takes part in snow removal operations as needed. **20%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- High School Diploma or GED
- No experience required
- Prefer two years of experience in a related field
- Advancement through the broadband depends in part on additional experience (Zone II, minimum of 12 additional months of experience; Zone III, minimum of 18 additional months of experience; and Zone IV minimum of 36 additional months of experience
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification

LICENSING, CERTIFICATIONS, and OTHER SPECIAL REQUIREMENTS:

- Requires a valid Commonwealth of Virginia Driver's License with a satisfactory driving record or must obtain a valid Commonwealth of Virginia Driver's License within 30 days of hire.
- Zone II requires all the above plus Forklift certification OR the ability to obtain Forklift certification within 90 days of hire.
- Zone III requires all the above plus VA Contractor Board Journeyman license.
- Zone IV requires all the above plus VA Contractor Board Master License.

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Conduit bending and installation
- Electric motor/wiring Megger testing
- National Electrical Code
- NFP 70E and Arc Flash Hazards
- Principals of boiler maintenance and operations
- Principles of HVAC
- Centrifuges
- Chemical metering
- Electrical and mechanical equipment used at a utility plant (e.g. water purification, pumping, and wastewater equipment)
- CMMS automated system
- Utility plant operations
- Safety practices and principles

Skills (some combination of the following):

- Troubleshooting electrical circuits
- Updating, repairing, and replacing plant lighting systems

- Maintaining and repairing electrical systems ranging from 120 volts to 4160 high voltage
- Disassembling pumps
- Carpentry and plumbing
- Reading and understanding drawings, blueprints, and maps
- Using and operating various equipment safety and correctly
- Using chemicals properly
- Working with vendors

Abilities (some combination of the following):

- Operate equipment such as bucket trucks and forklifts
- Operate back-flow testing equipment
- Operate plumbing equipment such as sewer snakes and drain cleaners
- Operate power washers, chain saws, lawn mowers, weed eaters, and pruners
- Operate cranes and other equipment for hoisting and pulling equipment
- Operate equipment for laser alignment of pumps and motors
- Operate and use basic hand and power tools
- Operate drill press
- Operate torches
- Operate refrigerant equipment such as gauges, recovery machines, leak detectors, and scales
- Operate electrical and electro-mechanical equipment
- Problem solve and troubleshoot

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to regularly talk, hear, see, and perform repetitive motions; frequently climb, balance, kneel, crouch, reach, stand, walk, push, pull, lift; and occasionally stoop, crawl, finger, grasp, and feel. The working conditions may include environmental hazards. In terms of the physical strength to perform the essential duties, this classification is considered to be heavy work, exerting up to 100 pounds of force occasionally, up to 50 pounds of force frequently, and up to 20 pounds of force constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Non-Exempt
EEO Classification: Skilled Craft worker
Type of Service: Classified
Residency: Not Required

Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:
The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.

DEPARTMENT OF HUMAN RESOURCES

City of Richmond

Utility Plant Specialist, Instrument and Control*

CLASS CODE	LP13C	**SALARY**	$24.95 - $46.81 Hourly
ESTABLISHED DATE	January 04, 2019	**REVISION DATE**	January 04, 2019

Description

This class maintains and repairs instrumentation and control equipment associated with public utility systems. Incumbents are responsible for performing skilled technical work in troubleshooting, repairing, calibrating, and installing instrumentation and electronic control devices. As assigned, work may include: troubleshooting, maintaining, and repairing various brands and voltages of Variable Frequency Drives (VFD's) and logic controllers; performing preventative maintenance such as cleaning and calibrating electronic and electrochemical sensors to factory specifications; troubleshooting, maintaining, calibrating, and repairing various electronic control equipment such as electronic and electrochemical sensors, motors, switchgears, transmitters, chart recorders, measurement and safety monitoring equipment, etc.; documenting electrical and layout drawings; writing maintenance and test procedures; documenting equipment statuses and performance; coordinating repair needs with equipment manufacturers; maintaining equipment maintenance and performance records; monitoring performance of computerized control system and networks; maintaining a clean work area; and adhering to safety policies and procedures.

Incumbents may be assigned to Zones with each Zone requiring performance of progressively responsible duties, along with possession of commensurate competency and certification requirements.

As assigned, more experienced incumbents may serve as lead workers, assigning work and monitoring work completion.

Incumbents may act as supervisors in the absence of a supervisor.

Supervision Exercised/Received:

- **Exercised:** This classification typically does not supervise other employees but may act as lead for lower level employees.
- **Received:** This classification typically reports to a supervisor.
- **Note:** Other reporting relationships may apply.

Example of Duties

TYPICAL CLASS ESSENTIAL DUTIES: These duties and percentage of time are a representative sample; position assignments may vary.

Typical Percentage of Time (none less than 10%)

1. Repairs electronic and electrochemical sensors and analyzers, computerized control systems, programmable components, Variable Frequency Drives, uninterruptible power supplies, and computerized valve and gate actuators. Determines the best evaluation method and cost effectiveness of repairing versus replacing. **30%**
2. Performs preventative maintenance of electronic and electrochemical sensors and analyzers. Cleans and calibrates equipment to factory specifications. Monitors performance of the computerized control system and networks. **20%**
3. Creates electrical and layout drawings. Documents maintenance and test procedures. Creates reports documenting equipment statuses and performance. **15%**
4. Creates panel fabrications and performs tests on electronic equipment and gauges. **20%**
5. Researches upgrade or replacement options. Designs equipment or process improvements and determines equipment standards. Compares performance specifications, cost, effectiveness of the equipment and the ability to maintain it. Orders parts and finds replacements for obsolete items. Performs design, development, implementation, support, and maintenance activities for the SCADA System to include data analysis, display development, database configuration, point to point verification and documentation. **15%**

Qualifications, Special Certifications and Licenses

MINIMUM TRAINING AND EXPERIENCE:

- High School Diploma or GED
- One year of experience for entering the lowest zone. As set up in the Broad Band program, additional experience is required for higher zones.
- An equivalent combination of training and experience (as approved by the department) may be used to meet the minimum qualifications of the classification

LICENSING, CERTIFICATIONS, and OTHER SPECIAL REQUIREMENTS:

- Valid Driver's License with a satisfactory driving record and a valid Commonwealth of Virginia Driver's License within 30 days of hire

KNOWLEDGE, SKILLS, AND ABILITIES:

TYPICAL KNOWLEDGE, SKILLS, AND ABILITIES: These are a representative sample; position assignments may vary.

Knowledge (some combination of the following):

- Electronic and electrical principles
- Pneumatic and hydraulic principles
- Reading electronic, electrical, pneumatic, and hydraulic schematics and loop drawings
- Calibration principles, measurement accuracy, and motor theory
- Motor speed controls such as variable frequency drives, soft starts, DC drives and step transformers
- Sensors used in a water treatment facility, transmitter calibration, spanning, and communication via current loops and digital communication
- Digital communication and networks
- Natural gas industry standard regulations
- Pipelines found in gas distribution
- Methods and techniques of a SCADA Systems database management and administration
- Odorant Injection Systems found in gas distribution

Skills (some combination of the following):

- Troubleshooting electrical circuits
- Reading and understanding drawings, blue prints, and maps
- Reading electronic, electrical, pneumatic, and hydraulic schematics and loop drawings
- Using and operating various equipment safety and correctly
- Basic use of a computer

Abilities (some combination of the following):

- Use appropriate hand tools
- Perform circuit board repairs
- Follow ladder logic, structured text programs, and Boolean logic.
- Prepare flowcharts and diagrams to specify in detail the order of each operation
- Create schematics/diagrams/drawings in support of documentation.
- Problem solve

Supplemental Information

Reasonable accommodations may be made to enable qualified individuals with disabilities to perform the essential functions of the job. Prospective and current employees are invited to discuss accommodations.

ENVIRONMENTAL HAZARDS: Working conditions may include exposure to travel to other locations within the City of Richmond as well as outside of the City of Richmond; exposure to hazardous physical conditions such as mechanical parts, electrical currents, vibrations, etc.; atmospheric conditions such as fumes, odors, dusts, gases, and poor ventilation; inadequate lighting; intense noise; and environmental hazards such as disruptive people, imminent danger, and a threatening environment.

PHYSICAL REQUIREMENTS AND WORKING ENVIRONMENT: Due to the nature of work assignments, incumbents must be able to perform detailed work on multiple, concurrent tasks, with frequent interruptions and under time constraint. The essential duties of this classification may require the ability to balance, stoop, kneel, crouch, crawl, reach, stand, walk, push objects, pull objects, lift, use fingers and grasp objects. The working conditions may include exposure to noise, dust, grease, smoke, fumes, gases and potentially hazardous chemicals, hazardous physical conditions and extreme temperatures. In terms of the physical strength to perform the essential duties, this classification is considered to be medium work, exerting up to 50 pounds of force occasionally, up to 20 pounds of force frequently, and up to 10 pounds of force constantly to move objects.

* Internal use: HR Generalist to review.

General Information

FLSA Classification: Non-Exempt
EEO Classification: Technician
Type of Service: Classified
Residency: Not Required
Classification Approved: January 2019
Job Specification Revised:
Revision Approved by:

NOTE:

The above class description is intended to represent only the key areas of responsibilities; specific position assignments will vary depending on the business needs of the department. The employee may perform other duties of a similar nature or level.