

**CAPITAL REGION WATER  
WASTEWATER SYSTEM  
2023 CONSULTING ENGINEER'S ANNUAL REPORT**

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***Final Report***  
**Dated September 27, 2023**



Prepared for:  
Capital Region Water  
Dauphin County, Pennsylvania



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## 1.0 INTRODUCTION

Gannett Fleming, Inc. (GF) has prepared this Wastewater System Consulting Engineer's Annual Report for Capital Region Water (CRW) as required by Section 7.11 of the Trust Indenture between CRW and The Bank of New York Mellon Trust Company, N.A. originally dated May 1, 2017. This Annual Report is being submitted to comply with the following requirements, as outlined in the Indenture:

*"It shall be the duty of the Consulting Engineers, in addition to the other duties prescribed elsewhere in this Indenture, to prepare and file with the Authority and with the Trustee on or before 90 days prior to the beginning of each Fiscal Year hereafter, a report setting forth the following:*

*a. Their advice and recommendations as to the proper maintenance and repair of the operating and wastewater delivery infrastructure of the Sewer System during the next Fiscal Year;*

*b. Their advice and recommendations as to the Capital Additions that should be made during the next Fiscal Year and their estimate of the amounts of money necessary for such purpose; and*

*c. Their finding whether the operating and wastewater delivery infrastructure of the Sewer System have been maintained in good repair and sound operating condition and their estimate of the amount, if any, required to place such operating and wastewater delivery infrastructure in such condition and the details of such expenditures and the approximate time required therefor."*

The CRW fiscal year runs from January 1 through December 31. The wastewater system is owned and operated by CRW and includes an Advanced Wastewater Treatment Facility (AWTF), a conveyance system, and wastewater and stormwater collection systems located within the City of Harrisburg (City) limits. The wastewater system includes approximately 36 miles of sanitary sewers, 40 miles of stormwater sewers, and 101 miles of combined sanitary and stormwater sewers.

The wastewater collection system serves customers located within the City. The conveyance and treatment systems provide wastewater conveyance and treatment services to the City and Suburban wholesale customers. Suburban wholesale customers are located in Susquehanna Township, Lower Paxton Township, Swatara Township, Paxtang Borough, Penbrook Borough, and Steelton Borough.

### 1.1 Report Methodology and Limitations

In preparing this Annual Report, Gannett Fleming reviewed existing records and documents prepared by or on behalf of CRW to understand, assess, and report on the technical information contained therein as it relates to the Annual Report. The major relevant documents provided by CRW and reviewed as part of the Annual Report include, but are not necessarily limited to, the following:

- Municipal Wasteload Management (Chapter 94) Report and Semi-Annual Report on Consent Decree Implementation, March 2023;
- Design and Operational Parameters Associated with the Wastewater System;
- Monthly Treatment Plant Operating Data (January 2022 through December 2022);
- Historic Wastewater System Expenses (FY 2022); and
- Budgeted FY 2023 Wastewater System Expenses.

The review also included discussions with representatives of CRW and performance comparisons to other comparable wastewater systems and related industries. In addition, on August 2, 2023, Gannett Fleming staff conducted visual site inspections of select components of the Wastewater System, including the Advanced Wastewater Treatment Facility, the Front Street Pump Station and the Spring Creek Pump Station.

This Annual Report summarizes the findings of the inspections, the data and document reviews, and discussions with CRW staff. Gannett Fleming has not independently verified the accuracy of the information provided by CRW and others. However, it is believed such sources are reliable and the information obtained to be appropriate for the analysis undertaken and the conclusions reached herein. In addition, the scope did not include review of any pending or threatened litigation against CRW.

In completing this Annual Report for CRW, Gannett Fleming is not serving in the role of a "municipal advisor" under the regulations of the Securities and Exchange Commission. As such, Gannett Fleming is not recommending any action regarding municipal financial products or the issuance of municipal securities; and is not acting as a registered municipal advisor to CRW and does not owe a fiduciary duty to CRW pursuant to Section 15B of the Securities Exchange Act of 1934, as amended by the Dodd-Frank Wall Street Reform and Consumer Protection Act, with respect to the information and material prepared in connection with this Annual Report. CRW should discuss any information and material prepared in connection with this Annual Report with any and all internal and external financial and other advisors that they may deem appropriate before acting on this information and material.

## **2.0 DESCRIPTION OF WASTEWATER SYSTEM**

### **2.1 Overview**

CRW is a municipal authority that owns and operates an AWTF, a conveyance system, and a wastewater and stormwater collection system within City limits. The AWTF is an activated sludge treatment process that employs biological nutrient removal technology to achieve nitrogen and ammonia requirements. Overall, the wastewater system includes separate sanitary sewers, separate stormwater sewers, and combined sanitary and stormwater sewers. All discharges to surface waters from the ATWF and CSOs are permitted under NPDES Permit Number PA0027197. A summary of the major wastewater system facilities is provided in *Table 1*. The wastewater collection system provides service to customers located within the City. The conveyance and treatment systems provide wastewater conveyance and treatment services to City and Suburban

wholesale customers. The Suburban wholesale customers account for approximately 59% of the flows to the AWTF.

**Table 1.** Summary of Major Wastewater and Stormwater System Facilities

Facility	Description	Design Hydraulic Capacity (mgd)	Design Peak Capacity (mgd)	2022 Average Flow <sup>(1)</sup> (mgd)	2022 Peak Flow <sup>(1)</sup> (mgd)
Advanced Wastewater Treatment Facility	High Purity Oxygen Activated Sludge Plant	45.0	75.4	20.2	28.6 <sup>(2)</sup>
Front Street Pump Station	Pump Station	---	60.0	13.5	55.3
Spring Creek Pump Station	Pump Station	---	28.9	5.30	13.3
City Island North Pump Station	Pump Station	---	0.432	0.006	0.014
City Island South Pump Station	Pump Station	---	0.432		
Market Street Pump Station	Pump Station	---	Unavailable	Unavailable	Unavailable

(1) Flows as reported in the 2022 CRW Municipal Wasteload Management (Chapter 94) Report.

(2) Maximum monthly flow, which occurred in May 2022.

A map of the wastewater system's infrastructure, including stormwater pipe, interceptor sewers, force mains, gravity sewer mains, and pump stations, is shown in *Figure 1*.



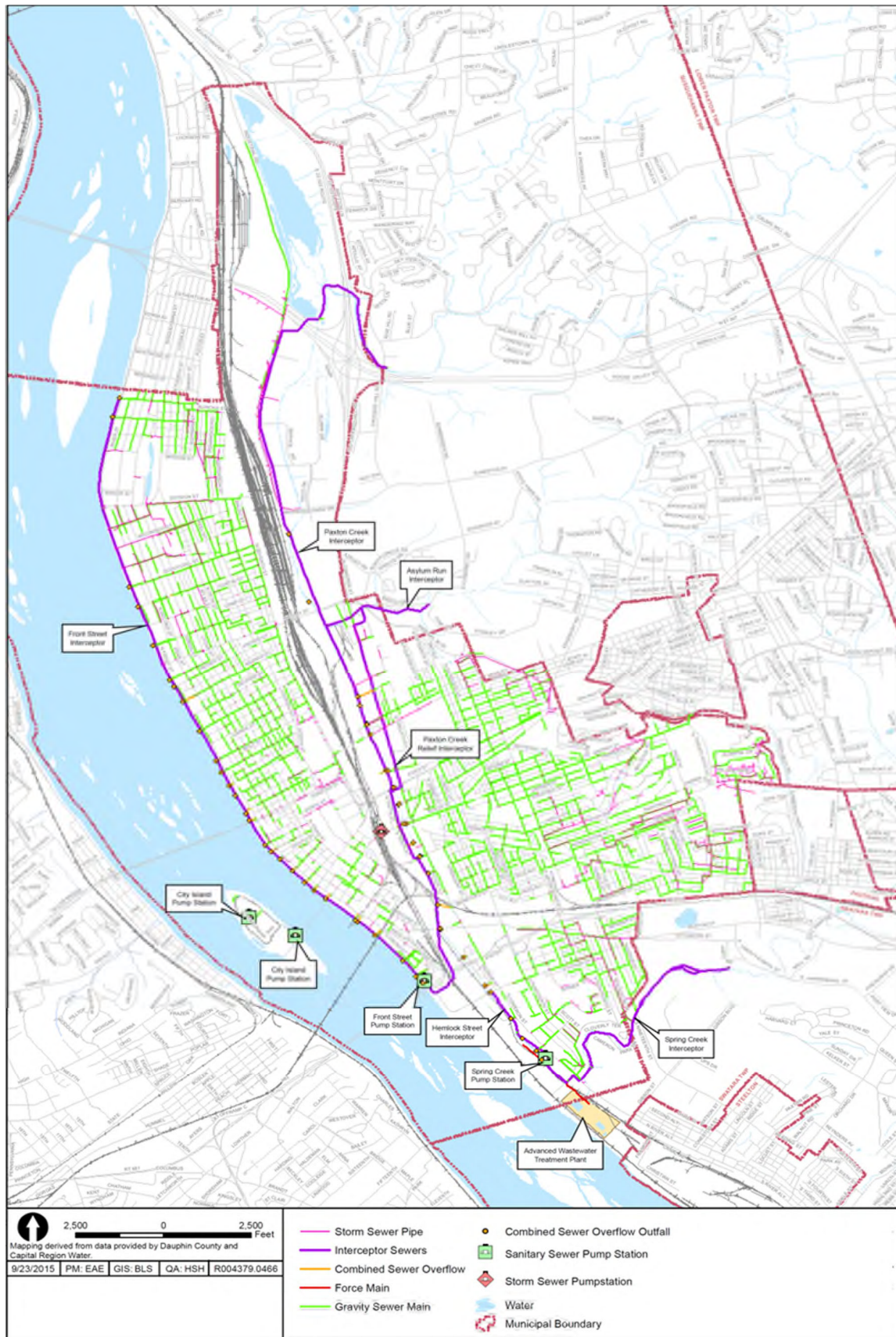
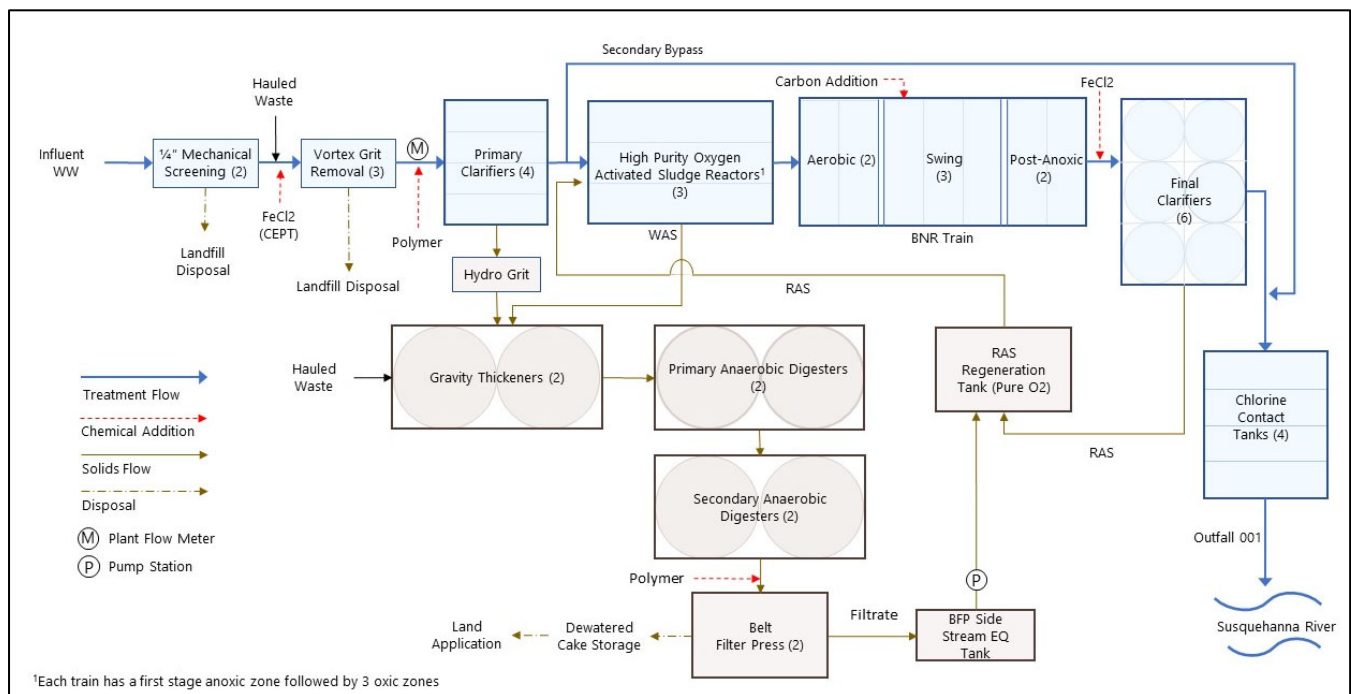


Figure 1. Wastewater System Infrastructure Map

## 2.2 Wastewater Treatment Plant

The AWTF is a high purity oxygen activated sludge WWTP that is permitted for an Annual Average Design Flow of 45.0 million gallon per day (MGD). The treatment process consists of preliminary treatment, including ¼-inch mechanical screening and vortex grit removal; primary clarifiers; high purity oxygen multi-stage BNR activated sludge bioreactors; secondary clarifiers, and chlorine gas disinfection. Solids treatment includes gravity thickening, two-stage anaerobic digestion, and dewatering via a belt filter press. A process flow diagram is shown in *Figure 2*. The dewatered biosolids cake is permitted for land application under General Permit PAG-08-3597.

CRW operates a hauled waste program that accepts septage, landfill leachates, and select industrial wastes. Hauled waste less than 3-4% TS is discharged prior to grit removal and hauled sludges with higher solids content are discharged directly into the gravity thickeners. There was a total of 16 million gallons of hauled waste treated at the AWTF in 2022.



**Figure 2.** CRW AWWTF Process Flow Diagram

## 2.3 Wastewater Pump Stations

CRW maintains four (4) wastewater pump stations: Front Street, Spring Creek, City Island North, and City Island South, as well as the Market Street stormwater pump station.

The Front Street Sewage Pump Station, located at 830 South Front Street, receives combined sewage flows from the 42-inch by 42-inch Front Street interceptor and 60-inch diameter Paxton Creek interceptor. The Pump Station was constructed in the late 1950s. Rehabilitation of the Front Street Pump Station was completed in July 2021, which replaced the aging infrastructure at the



station and increased peak capacity to 60 mgd. Improvements included replacement of pumps, bar screens, screenings conveyance equipment, controls, and associated improvements to electrical, HVAC, and building systems to meet current code requirements. The Pump Station conveys flow approximately 6,100-feet to the AWTF through a 48-inch diameter cast iron force main joined by the contribution of Spring Creek Pump Station into the force main approximately 2,000-feet upstream of the AWTF. The 2022 annual average daily flow was 13.5 mgd with peak daily flow of 55.3 mgd.

The Spring Creek Pump Station was originally constructed in 1959 and has a peak design capacity of 28.9 mgd. In 2022, it conveyed an average daily flow of 5.30 mgd to the AWTF with a peak daily flow of 13.3 mgd. The pump station is located just southwest of the intersection of South Cameron Street and Magnolia Street and serves the southern portions of the wastewater collection system. It conveys combined wastewater from the Spring Creek Interceptor and the Hemlock Street Interceptor to the AWTF. Wastewater enters the station through a 24-inch diameter cast iron interceptor on the east side of the station and a 27-inch diameter reinforced concrete pipe interceptor on the south side. The station is equipped with three (3) pumps that discharge through a 24-inch diameter cast iron line, which ultimately connects to the 48-inch diameter force main from the Front Street Pump Station. The Spring Creek Pump Station also has a permitted combined sewer overflow (CSO) chamber that relieves the system during high flow events. The Spring Creek Pump Station is nearing the end of its useful life, and CRW has begun evaluating potential improvement options for how to implement improvements to the station. CRW is waiting to determine capacity and screening requirements for upgrading or replacement/relocation of the Spring Creek Pump Station once they have a better idea of how the Front Street Pump Station upgrade affects flow management of the system.

The City Island North Pump Station is located at the north end of City Island in the City of Harrisburg. Wastewater is conveyed from the City Island South Pump Station and elsewhere on City Island to the CRW collection system in Harrisburg.

The City Island South Pump Station is located near the center of City Island in the City. It conveys wastewater from elsewhere on City Island to the CRW collection system in Harrisburg. The pump station continues to be bypassed and flow is being directed to the City Island North Pump Station. This is due to the lack of pumping requirements out of both facilities as pumping is not required at both pump stations to accommodate service flow requirements. Currently CRW operates the pump station but has not accepted ownership of the pump station.

CRW also operates the Market Street Pump Station, which conveys stormwater from a railroad underpass to Paxton Creek.

## **2.4 Wastewater Conveyance**

There are six (6) interceptors in the wastewater conveyance system, which convey collected wastewater from the City and Suburban customers to the AWTF. The interceptors are summarized in *Table 2*. Three (3) of these interceptors convey combined wastewater from trunk lines, and each

trunk line has an associated CSO regulator structure and outfall. The other three (3) interceptors only convey sanitary wastewater. In addition, the wastewater conveyance system also includes approximately 36 miles of sanitary sewers, 40 miles of stormwater sewers, and 101 miles of combined sanitary and stormwater sewers.

**Table 2.** Conveyance System Summary

<b>Interceptor</b>	<b>Type</b>	<b>Size (in)</b>	<b>Length (mi)</b>	<b>Material</b>	<b>Number of CSO Outfalls</b>	<b>CSO Discharge Receiving Waters</b>
Front Street	Combined	39x36; 40; 42	3.95	Concrete, VCP	27	Susquehanna River
Paxton Creek	Combined	59x48; 60	5.53	Concrete	26	Paxton Creek
Hemlock Street	Combined	24	0.52	Concrete, VCP	5	Paxton Creek
Spring Creek	Sanitary	24-36	2.03	Concrete, CMP, DIP	0	N/A
Paxton Creek Relief	Sanitary	48	1.15	Concrete	0	N/A
Asylum Run	Sanitary	24	0.67	Concrete, VCP	0	N/A

## 2.5 Combined Sewage Overflows (CSOs)

CRW operates and maintains 59 CSO regulator structures located along the Front Street, Paxton Creek, and Hemlock Street interceptor sewers, which ultimately direct combined wastewater (sanitary wastewater and stormwater) to the AWTF. The CSO regulators discharge to a total of 58 CSO outfalls (two regulators share an outfall). The receiving waters are the Susquehanna River for regulator structures along the Front Street interceptor and Paxton Creek (a tributary of the Susquehanna) for regulators along the Paxton Creek and Hemlock Street interceptors. Additionally, the Front Street and Spring Creek Pumping Stations have emergency stormwater outfalls that will only activate during a mechanical failure of the pump station or if the station's capacity is exceeded during large storms, for a total of 60 CSO outfalls.

During dry weather conditions, the CSO regulator structures divert all the combined wastewater from the trunk sewer lines to the interceptor sewers. During wet weather, the rate and volume of the sanitary and stormwater flow from the system of collector sewers increases significantly and can exceed the capacity of the downstream interceptor sewers and the AWTF. When this occurs, the CSO regulator structures (oftentimes called diversion structures) divert a controlled volume of flow to the interceptor, while untreated excess combined wastewater is discharged to receiving waters. *Appendix A* summarizes the location, downstream interceptor, and receiving water for each CSO outfall.

### 3.0 WASTEWATER COLLECTION AND CONVEYANCE SYSTEM PERFORMANCE

#### 3.1 Service Area and Customer Base

The wastewater system provides service to City residential and retail customers as well as suburban community wholesale customers. The suburban communities account for approximately half of the revenues of the conveyance and treatment systems and include Susquehanna Township, Lower Paxton Township, Swatara Township, Paxtang Borough, Penbrook Borough, and Steelton Borough, all of which are located in Dauphin County. A map of the wastewater system's service area is included in *Appendix B*.

CRW maintains approximately 16,545 active connections within the City. Suburban communities are billed on a wholesale basis with their allocation based on an estimate of individual account data for customers located in these communities. Some suburban customers are billed based on metered water consumption, while others are billed based on the estimated number of equivalent dwelling units within their customer base. During FY 2022, suburban communities were billed for approximately 2.143 billion gallons of wastewater flow. The number of customers and billed wastewater flow by class for customers located within the City are shown in *Table 3*. The total billed wastewater flow for Suburban communities is also shown in the table. This information is based on FY 2022 customer and billing data as provided by CRW.

**Table 3.** FY 2022 Customer Information

<b>Description</b>	<b>Accounts</b>	<b>Billed Wastewater Flow (x1,000 gal)</b>
City of Harrisburg		
Residential	14,847	769,623
Commercial	1,493	328,362
Industrial	21	58,671
Public / Institutional	184	233,573
Total	16,545	1,390,229
Suburban Communities		
Penbrook Borough	N/A	68,585
Paxtang Borough	N/A	35,471
Swatara Township	N/A	464,626
Lower Paxton Township	N/A	803,845
Susquehanna Township	N/A	638,076
Steelton Borough	N/A	133,370
Total	N/A	2,143,973
<b>Combined Total</b>	<b>N/A</b>	<b>3,534,202</b>

### 3.2 Sanitary Sewer Overflows

CRW maintains a combined sanitary and stormwater system, which conveys wastewater and stormwater runoff during wet weather periods. Regulators and diversion chambers divert excess flow to Paxton Creek or Susquehanna River during wet weather events. Wet weather events occur when the combined flow exceeds the dry weather peak flow capacity. CRW's NPDES Permit authorizes discharges from regulators and diversion chambers; however, it does not authorize overflows from sanitary sewers or discharges from other than identified combined sewer regulators and diversion chambers. A summary of the Sanitary Sewer Overflow (SSO) events and combined sewer unauthorized discharges during the 2022 reporting period are listed in *Table 4*. This information is summarized from the 2022 Municipal Wasteload Management (Chapter 94) Report, and the March 2023 Semi-Annual Report on Consent Decree Implementation for July 1, 2022 to December 31, 2022.

**Table 4.** 2022 Sewer System Overflows and Unauthorized Discharges

<b>Date</b>	<b>Location</b>	<b>SSO or UD</b>	<b>Issue</b>	<b>Duration (Hrs.)</b>
1/20/2022	2340 N. 5th Street Harrisburg, PA	UD	Basement backup due to stone blockage in manhole from water main break	7
1/25/2022	385 Rumson Drive Harrisburg, PA	SSO	Basement backup due to grease/wipe blockage in main	1
2/9/2022	2203 Kensington Street Harrisburg, PA	UD	Basement backup and manhole overflow due to grease blockage in main	3
3/2/22; 3/3/2022	2267 Kensington Street Harrisburg, PA	UD	Basement backup due to grease/rag buildup in main and dislodged top hat liner blockage	2
4/27/2022	Mulberry Street & Crescent Street Harrisburg, PA	UD	Leaking bypass pump hose	1
5/10-17/22	SSP-006569 Harrisburg, PA	SSO	Pipe collapse resulted in wastewater to enter a storm pipe	30
5/15/2022	Amity Road & Sycamore Street Harrisburg, PA	SSO	Manholes overflowed due to bypass pump suction blockage	3

Date	Location	SSO or UD	Issue	Duration (Hrs.)
5/15/2022	Elliot Street Harrisburg, PA	SSO	Manhole overflow due to Spring Creek Pump Station lag pump failure	-
5/16/2022	2741 Paxton Street & 2771 Paxton Street Harrisburg, PA	SSO	Basement backup, likely due to surcharged main from bypass pump suction blockage	-
12/10/2022	1202 Mulberry Street Harrisburg, PA	UD	Basement backup due to construction material blockage in main	27
12/11/2022	1519 S. 12th Street Harrisburg, PA	SSO	Basement backup due to grease blockage in main	2
12/16/2022	1948 & 1950 Derry Street Harrisburg, PA	UD	Basement backup due to grease/root blockage in main	5
12/29/2022	2260 Kensington Street Harrisburg, PA	UD	Basement backup due to grease/wipe blockage in main	3

### 3.3 Partial Consent Decree

In August 2015, CRW entered into a partial Consent Decree with the U.S. Department of Justice, the U.S. Environmental Protection Agency, and PADEP concerning the operation of its collection system, pump stations, and AWTF. The Consent Decree requires CRW to complete a Long-Term Control Plan (LTCP) for its combined sewer system, update the Combined Sewer System Operations and Maintenance Manual and Nine Minimum Controls, obtain a MS4 Permit and establish a Stormwater Management Program, and implement early action projects. In 2022, CRW fulfilled its partial Consent Decree requirements for deadlines due during this reporting period, including the following:

- Completion of its 2022 Annual Update of the Nine Minimum Controls Plan;
- Completion of its 2022 Semi-Annual Reports on Consent Decree Implementation;
- Completion of the 2022 Municipal Wasteload Management (Chapter 94) Report;
- Preparation of its updated Long-Term Control Plan (City Beautiful H2O Program Plan) in March 2018. The following have been completed in support of the LTCP:
  - Substantial completion of two green stormwater infrastructure projects (now called Stormwater Control Measures (SCM)) in 2022 with Landscape Plantings completed in Spring 2023, for a total of nine total SCMs.
  - Completed the CSO/wet weather alternatives evaluation in April 2018.
  - Conducted community stakeholder workshops.
  - CRW is continuing to coordinate with USDOJ / USEPA / PADEP on the proposed modification to the partial Consent Decree. In February 2023, the Modification to



the Partial Consent Decree was lodged with the United States District Court for the Middle District of Pennsylvania.

- Performed a Financial Capabilities Assessment (FCA) in April 2016 according to U.S. EPA protocol. CRW has begun revising the FCA and will be required to submit the revisions within 6 months of the effective date of the Modification to the Partial Consent Decree.

CRW has met compliance dates for the semi-annual reporting periods from January 1, 2022 to June 30, 2022 and July 1, 2022 to December 31, 2022 corresponding to the Semi-Annual Reports on Consent Decree Implementation and the 2022 Chapter 94 Annual Wasteload Management Report.

### **3.4 Wet Weather Program**

CRW's progress during FY 2022 and FY 2023 under its Wet Weather Program included the following accomplishments:

- Continued to provide updates and review to the Operations and Maintenance Manual (OMM) to implement improvements in the 2022 and 2023 Annual Updates (Version 7 currently).
- Continued to expand the development of the sewer maintenance management system, including the GIS and Cityworks systems, including development of training protocol for all Cityworks users and is incorporating additional reporting related to maintenance and regulatory activities within the sewer system from the Cityworks data. CRW continues to update their GIS database, and recent additions include incorporating capital projects.
- CRW continued to implement their CSO Hotline with the status of CSO events and continued to conduct public outreach, education, and notification programs.
- CRW received a new MS4 permit in 2020. CRW partnered with Lower Paxton Township and Susquehanna Township to prepare a Joint Pollutant Reduction Plan which was approved by PADEP in 2020. Minimum control measure implementation continued through 2022.
- Continued to monitor eight (8) precipitation gauging sites as well as gauge-adjusted radar rainfall, four (4) flow meters monitoring flow from the satellite communities, and eight (8) combined sewer interceptor flow meters.
- Continued maintenance and inspections of Green Stormwater Infrastructure (GSI) Projects at the following sites: Cloverly Heights, Penn & Sayford, Royal Terrace, Summit Terrace, and 3rd Street in Harrisburg.

CRW assumed responsibility for street sweeping activities in August 2020. CRW had purchased three (3) street sweepers and typically operates two (2) sweepers daily. Sweepings are dewatered and dried at the AWTF and then hauled to the Harrisburg Incinerator for disposal. Since 2021, citizen complaints have decreased dramatically due to the program. During heavy rain events, street sweeping is cancelled, and staff perform checks of storm inlets around the city to make sure they are not blinded by trash or debris.

### 3.5 Nine Minimum Controls Plan

CRW developed a detailed approach to achieve future compliance with each of the Nine Minimum Controls (NMCs), which was submitted in the August 2015 NMC Plan and has been updated annually. In many cases, the compliance measures have already been implemented, such as daily CSO regulator inspections. In other areas, additional information is required to implement some of the NMCs, and CRW has undertaken efforts necessary to collect the data. Efforts related to the NMC Plan that have been completed include the following:

- Prepared the 2022 NMC Plan Update (Version 8.0);
- Identified critical trunk sewers and completed manhole inspection data review;
- Refined the sewershed and catchment delineations using the manhole investigation data;
- Updated the GIS system with collection system manhole investigation and rapid assessment data;
- Advanced CRW's risk-based asset condition/criticality rating system to be used to establish priorities for closed circuit televisual (CCTV) inspections and subsequent cleaning and repair projects.
- Completed an internal force main inspection and found no critical deficiencies. Routine force main monitoring continues.
- Continued to implement and optimize Cityworks for the management of complaints and service requests and operations and maintenance of AWTF and pumping stations;
- Continued to perform daily regulator inspections at each regulator.

### 3.6 Operations and Maintenance Manual

CRW reviewed ongoing maintenance and operation efforts and developed improved practices for compilation in the new Operations and Maintenance (O&M) Manual. The O&M Manual defines the critical equipment and facilities for the AWTF and collection/conveyance systems. The O&M Manual also includes detailed procedures with checklists, for the following system components: CSO regulators, outfalls and backflow prevention gates, pump stations, interceptors, force mains, collection system and manholes, and inlets and catch basins. The O&M Manual also outlines emergency procedures, citizen complaint tracking, sinkhole remediation, and education programs. The O&M Manual document was originally submitted on August 10, 2015, and the latest version (V7.0) was released in March 2023.

### 3.7 Data Management Systems

CRW has developed and implemented a Cityworks™ data management system for their sewer system. This software is the recordkeeping tool for maintenance activities and assists in the reporting requirements of the partial Consent Decree. From January to December 2022 the following items have been documented in Cityworks for sewer system maintenance and inspection activities and reported in the Semi-annual Report on Consent Decree Implementation (September 2022 and March 2023):

- Replaced 9 inlets or inlet tops;

- Inspected 1,533 inlets;
- 1,590 inlets were cleaned and 262 were repaired;
- 78 sinkholes were investigated and/or repaired;
- 4,198 work orders completed, including pipe flushing, cleaning out manholes and repairing manholes;
- 0 linear feet of collection system sewer were cleaned and televised, due to the program being paused in 2023 as the entire sanitary sewer system has been cleaned and televised since 2019;
- 1,558 hotspot inspections; and
- 21,170 daily CSO inspections.

## 4.0 WASTEWATER TREATMENT PLANT PERFORMANCE

### 4.1 AWTF Operations

Effluent limits established under NPDES Permit No. PA0027197 for the CRW AWTF Outfall No. 001 to the Susquehanna River are included in *Table 5*. A summary of the WWTP operating data for calendar year 2022 is provided in *Appendix C*. *Appendix D* provides a graphic representation of key NPDES Permit and other parameters. Effluent limits established under the NPDES Permit are included in *Appendices C* and *D* for comparison with operating data. Overall, WWTP final effluent quality was exceptional during the review period, and the WWTP continued to operate at a high standard. Based on the data supplied by CRW staff and reported to PADEP, the monthly average and maximum week average effluent parameters were in compliance with NPDES Permit limits throughout the period, with the exceptions noted below.

During 2022, the average daily flow to the AWTF was 20.207 million gallons per day (mgd). A maximum average monthly flow of 28.635 mgd was reported in May 2022, and a maximum day flow of 69,500 mgd occurred on May 7, 2022. The annual average hydraulic loading to the WWTP during this period was approximately 45% of the design WWTP Annual Average Flow of 45.0 mgd.

The collection system organic loading to the WWTP averaged 136 milligrams per liter (mg/L) (21,814 lbs/day) as Biochemical Oxygen Demand (BOD<sub>5</sub>) throughout 2022 with a maximum month organic loading of 27,448 lbs/day in March 2022. The maximum month organic loading to the WWTP during this period was approximately 40% of the WWTP's Design Organic Capacity of 68,257 lbs/day. Final effluent Carbonaceous BOD<sub>5</sub> (CBOD<sub>5</sub>) averaged 3 mg/L (596 lbs/day) during this same period.

The collection system total suspended solids (TSS) averaged approximately 170 mg/L (27,577 lbs/day) during 2022. Final effluent TSS averaged 4 mg/L (676 lbs/day) throughout 2022. Based on WWTP loadings, this equates to an approximately 97.5% TSS removal efficiency.

During 2022, the collection system raw influent Ammonia Nitrogen (NH<sub>3</sub>-N) averaged approximately 15.5 mg/L (2,416 lbs/day). The average NH<sub>3</sub>-N concentration in the final effluent was

1.1 mg/L (205 lbs/day) during this period. Based on WWTP loadings, NH<sub>3</sub>-N removal efficiency was 91.5% over this same period.

**Table 5.** NPDES Permit Discharge Limitations for WWTP Outfall No. 001

Discharge Parameter	Discharge Limitations								Monitoring Requirements	
	Mass Units (lbs)		Mass Units (lbs/day)		Concentrations (mg/L)				Minimum Measurement Frequency	Required Sample Type
	Annual	Monthly	Monthly Average	Weekly Average	Minimum	Monthly Average	Weekly Average	Inst. Max.		
Flow (mgd)	XXX	XXX	Report	Report Daily Max	XXX	XXX	XXX	XXX	Continuous	Measured
pH (s.u.)	XXX	XXX	XXX	XXX	6.0	XXX	XXX	9.0	3/Week	Grab
Dissolved Oxygen	XXX	XXX	XXX	XXX	5.0	XXX	XXX	XXX	1/Day	Grab
Total Residual Chlorine	XXX	XXX	XXX	XXX	XXX	0.5	XXX	1.6	1/Day	Grab
CBOD <sub>5</sub>	XXX	XXX	7,860	12,577	XXX	25	40	50	3/Week	24-hour Comp
Total Suspended Solids	XXX	XXX	9,433	14,149	XXX	30	45	60	1/Day	24-hour Comp
Ammonia-Nitrogen (May 1 to Oct 31)	XXX	XXX	3,458	XXX	XXX	11	XXX	22	1/Day	24-hour Comp
Ammonia-Nitrogen (Nov 1 to Apr 30)	XXX	XXX	Report	XXX	XXX	Report	XXX	Report	1/Day	24-hour Comp
Total Phosphorus	XXX	XXX	629	XXX	XXX	2.0	XXX	4.0	1/Day	24-hour Comp
Fecal Coliform (5/1 to 9/30)	XXX	XXX	XXX	XXX	XXX	200	XXX	XXX	1/Day	Grab
Fecal Coliform (10/1 to 4/30)	XXX	XXX	XXX	XXX	XXX	2,000	XXX	XXX	1/Day	Grab
Kjeldahl-N	Report	XXX	XXX	XXX	XXX	Report	XXX	XXX	1/Week	24-hour Comp
Nitrate-Nitrite as N	Report	XXX	XXX	XXX	XXX	Report	XXX	XXX	1/Week	24-hour Comp
Total Nitrogen	Report	Report	XXX	XXX	XXX	Report	XXX	XXX	1/Month	24-hour Comp
Net Total Nitrogen	688,575	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1/Month	Calculation
Net Total Phosphorus	91,810	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1/Month	Calculation

The WWTP also has TN and TP annual mass load limits implemented in its NPDES Permit. The limits are enforced on a 12-month "Compliance Year" basis from October 1 through September 30. The mass load limits identified in the current NPDES Permit are 688,575 lbs TN/compliance year and 91,810 lbs TP/compliance year. A TN loading of 338,154 lbs/year as reported for Compliance Year 2022, which is about 49% of the NPDES Permit TN limit. Likewise, a TP loading of 70,075 lbs/year was reported for Compliance Year 2022, which is about 76% of the annual mass load limit. The WWTP was well within the TP and TN nutrient load limits during Compliance Year 2022.

The chlorine gas disinfection system performed satisfactorily throughout the period. The maximum monthly summertime Fecal Coliform geometric mean between May 2022 and September 2022 was 4 colonies/100 milliliter (mL), well below the summer NPDES Permit limit of 200 colonies/100 mL.

Likewise, the maximum monthly wintertime Fecal Coliform geometric mean between January-April 2022 and October-December 2022 was 7 colonies/100 mL, well below the winter NPDES Permit limit of 2,000 colonies/100 mL.

### **4.3 Solids Handling**

Solids generated at the AWTF are processed through a high rate 2-stage Anaerobic Digester system and dewatered via Belt Filter Presses (BFPs). Primary Sludge from the primary clarifiers and Waste Activated Sludge (WAS) from the biological process are pumped to one of two (2) Gravity Thickeners. Co-thickened WAS and Primary Sludge is then pumped directly into one of two (2) Primary Anaerobic Digesters. The Primary Digesters provide volatile solids reduction stabilization. Flow is hydraulically displaced from the Primary Digesters to the two (2) Secondary Digesters, which are unheated and unmixed. Feed sludge from the Secondary Digesters is dewatered on the BFPs, as necessary.

An average of 162,000 gallons per day (gpd) of thickened solids, equating to approximately 33,350 lbs/day, were processed by the anaerobic digestion system between January and December 2022. Based on reported temperature and solids retention time records, the theoretical volatile solids destruction was estimated to be approximately 56% in the Primary Anaerobic Digesters.

Approximately 56.240 Mgals of digested feed sludge were dewatered through the BFPs in 2022. At an average concentration of 1.7% Total Solids (TS), this equates to approximately 3,726 dry tons of biosolids. Dewatered biosolids generated by CRW are land applied for beneficial use on qualified farmland. Biosolids hauling to the farms is provided by a contracted hauler. The 15,175 wet tons of biosolids produced by CRW requires approximately 760 acres of beneficial use (assuming an average of 20 wet tons applied per acre). CRW has approximately 1,327 qualified acres, which provides a buffer of 568 acres.

### **4.4 Hauled Waste Program**

The hauled waste program provides an additional source of revenue for the AWTF. A total of 24 hauled waste generators were served in 2022. The hauled waste received at the AWTF consists of landfill leachate, municipal sludge from wastewater treatment plants, residential septage/holding tank wastes, and other process wastewater (primarily food, restaurant, and composting wastes). The hauled waste program provided a total revenue of \$484,293.48 for the 2022 operating year.

A summary of the volume and average percent total solids (%TS) from the main categories of hauled wastes received throughout 2022 is shown in *Table 6*. Additionally, the discharge location within the AWTF for each category is listed.



**Table 6.** CRW 2022 Hauled Waste Summary

<b>Hauled Waste</b>	<b>Discharge Location</b>	<b>Gallons/Year</b>	<b>% TS</b>
Process WW	Headworks	4,908,600	0.6%
Landfill Leachate	Headworks	5,019,500	1.0%
Septage/Holding Tank	Headworks	3,113,200	0.6%
Municipal Sludge	Thickeners	2,971,100	1.4%
<b>Total</b>		<b>16,012,400</b>	<b>---</b>

#### 4.5 Industrial Pretreatment Program

CRW operates a USEPA-approved Industrial Pretreatment Program in conjunction with the requirements of Code of Federal Register Title 40 Part 403. The Program is intended to ensure that industrial users comply with federal state, and local pretreatment program effluent discharge limitations and regulations. Industrial user compliance minimizes interference to the conveyance and treatment system, passthrough of pollutants through the AWTF to the receiving stream, contamination of biosolids which could limit disposal or reuse options, and the exposure of personnel to chemical, explosion or fire hazards. Presently, eight (8) Significant Industrial Users (SIUs) are regulated through the CRW's Municipal Industrial Pretreatment Program, as outlined in *Table 7*. Of these SIUs, one (1) is considered a Categorical Industrial User (CIU).

**Table 7.** Municipal Industrial Pretreatment Program Permitted Industries

<b>Industrial User</b>	<b>Description</b>	<b>Categorical Standards</b>	
		<b>Classification</b>	<b>Categorical Standard</b>
Boyd State Hospital, LLC	Landfill Leachate	---	---
Harrisburg Dairies, Inc.	Fluid Milk Products and Drinks	---	---
Harrisburg Creamery Company	Ice Cream Products and Novelties	---	---
Lancaster County Solids Waste Management Authority	Landfill Leachate	---	---
Norfolk Southern Railway Company	Fueling Pad Spill Pan Runoff	---	---
Rebert E. Young Water Services Center	Water Treatment Residuals	---	---
Swatara Township Landfill	Landfill Leachate	---	---
The AMES Companies, Inc.	Lawn and Garden Products	Part 433	Metal Finishing

Inspection and sampling activities performed during the year included facility inspections, self-monitoring inspections, and compliance sampling. During 2022, no permitted industrial users were on a formal compliance schedule for non-compliance. However, there were four (4) Letters of Violation (LOV) and one Notice of Violation (NOV) issued during the 2022 calendar year. LOVs were issued for exceedances that were not considered Significant Non-Compliance (SNC). The NOV was issued for SNC due to an oil/grease Technical Review Criteria (TRC) violation. A TRC violation for oil and grease occurs when 33% or more of all measurements taken during a six-month window exceed 1.4 times the permitted limit.

## **5.0 WASTEWATER SYSTEM CONDITION ASSESSMENT**

### **5.1 Overview**

CRW staff aim to ensure the entire Wastewater System is properly operated and maintained. The cost to provide routine and preventative maintenance is included in CRW's annual operating budget. CRW uses a proactive preventative maintenance program and a systematic replacement policy for inventory parts to minimize downtime.

Additionally, CRW has developed a comprehensive asset management program for the wastewater system which will further enhance preventative maintenance and increase system reliability. Asset registries have been developed for all CRW treatment plants, pumping stations, storage facilities, and the DeHart Dam facility. CRW has developed a risk register for CRW's buried assets and established high-level replacement, rehabilitation, and condition assessment cost estimates.

Development of the Wastewater Collection System Asset Management Plan was completed in January 2020. The plan provided CRW with strategies for operations, maintenance, capital investments, and funding.

### **5.2 Condition Assessment**

Gannett Fleming conducted a limited condition assessment of the key components of CRW Wastewater System, which included a review of existing information provided by CRW, discussions with CRW staff, and visual observations during field visits held on August 2, 2023. Based on the type of facilities, available documents related to the facilities, and previous experience with similar facilities, a representative sample of facilities was inspected on a limited basis to visually confirm the information provided, identify any apparent capital improvement needs, and discuss reliability and O&M performance with the operation and maintenance staff. No field investigations were conducted for buried infrastructure.

The condition assessment of the facilities in the Wastewater System was based on numerical ratings for the following criteria: 1. Appearance of mechanical, structural, and electrical components; 2. Reliability; 3. O&M performance; 4. Capacity; and 5. Regulatory compliance.

Based on the evaluations using the above categories, an overall risk rating was assigned to each of the major assets. The risk ratings for each of the five (5) categories above are outlined in *Table 8*.

**Table 8.** Summary of Rating System

<b>Numerical Rating</b>	<b>Interpretation of Rating</b>	<b>Description</b>
1	Little to no risk	Relatively new and in good physical and operating condition.
2	Some risk	Good condition, no known capital requirements.
3	Moderate risk	Aged or worn but generally in good operating condition may require capital investment within five years.
4	Significant risk	Operational but nearing end of life and/or requires investment to bring to full operating condition.
5	High risk	Should be on high priority for renewal and/or replacement.

*Table 9* presents a summary of the risk ranking for each of the major facilities based on a review of the available information and limited visual inspections.

**Table 9.** Major Assets Risk Rating

<b>Major Asset</b>	<b>Risk Rating</b>	<b>Change from Prior Year</b>
Advanced Wastewater Treatment Facility (AWTF)	2.0	Increased
Pump Stations and CSO Regulators Front Street Pump Station (1.0) Spring Creek Pump Station (3.0) City Island North Pump Station (2.0) City Island South Pump Station (2.0) Market Street Stormwater Pump Station (2.1) Combined Sewer Overflow Regulators (2.0)	2.1	No Change
Interceptor Sewers Front Street Interceptor (4.1) Paxton Creek Interceptor (4.8) Hemlock Street Interceptor (3.0) Spring Creek Relief Interceptor (3.0) Asylum Run Interceptor (3.0)	3.5	No Change
Collection System	3.0	No Change
Separate Stormwater Collection System	3.0	No Change
<b>Overall System Rating</b>	<b>2.7</b>	<b>No Change</b>

Overall, the Wastewater System is in fair condition; however, some components are aged and will require investigation and capital investment to preserve the asset and maintain appropriate system performance and delivery of services.

The following provides a summary of the current condition of the major components, the rationale for the risk scores assigned, and the improvements needed to address moderate, significant, and high risks.

### **5.2.1 AWTF**

The AWTF appears to be in fair overall physical condition based on the available documents and an inspection by Gannett Fleming on August 2, 2023. However, some capital investments and minor additional O&M expenditures should be made within the next five (5) years to ensure continued compliance with effluent limits and reduce operating costs.

An energy audit was performed for the AWTF in July 2017. The audit was intended to outline a comprehensive list of energy efficiency improvements that CRW could perform to reduce overall energy consumption. Based on the results of the audit, CRW has been implementing select energy efficiency improvements at the AWTF over the past several years. The next phase of these improvements is the AWTF Energy Recovery Improvements project, which will be advertised for bid in fall 2023 with Notice to Proceed planned for early 2024 and project completion by late 2025. The project will modify existing piping in the waste activated sludge (WAS) and return activated sludge (RAS) pump stations to allow for RAS to be wasted instead of mixed liquor suspended solids (MLSS). By wasting RAS instead of MLSS, the pumping requirements will be significantly reduced due to the increased solids concentration of the RAS compared to the MLSS.

Additionally, CRW is in the process of implementing improvements to the existing primary clarifiers. Some work has been completed by CRW staff while the structural repairs will be completed under a capital construction project in 2024-2025. The improvements to be made include the following:

- Structural repairs and rehabilitation of all clarifier tanks
- Primary clarifier mechanism replacement of all tanks (inclusive of main and cross collector drive units, chain and flight scrapers, influent gates, effluent weirs).
- Replacement of miscellaneous piping, valves, and actuators.
- Primary sludge pump replacement (2 units).
- Replacement of decant pump in the decant pump vault.

In March 2017, a Biosolids Facilities Existing Conditions Report was completed by Whitman, Requardt & Associates (WRA). The purpose of this report was to provide an assessment of the current conditions of the solids treatment and handling systems at the AWTF. Based on the Biosolids Facilities Existing Conditions Report, WRA submitted in June 2017, a Preliminary Biosolids Facilities Improvement Plan for CRW, which included several recommendations as part of the improvement plan, including:

- Process modifications to separately thicken waste activated sludge and primary sludge;

- Upgrade of the primary digesters;
- Replacement of gravity thickener facilities;
- Upgrade of the dewatering facilities;
- Construction of a hauled waste facility;
- Replacement of the boiler building;
- Replacement of the combined heat and power (cogeneration) system equipment; and
- Replacement of the gas collection, storage and pretreatment systems.

CRW completed the primary digester improvements, with the first digester on-line in 2020 and the second digester on-line in July 2022. The project also included an electrical building to help facilitate the replacement of old electrical gear and provide a central power distribution facility to serve the southern part of the AWTF. This electrical building was completed in 2021.

CRW intends to prioritize work on the secondary digesters following completion of the primary digester improvements. Remaining biosolids facility projects will be evaluated for priority as the above projects are completed.

### **5.2.2 Pump Stations**

CRW maintains four (4) wastewater pump stations: Front Street, Spring Creek, City Island North, and City Island South, as well as the Market Street stormwater pump station.

Upgrades were completed at the Front Street Pump Station in 2021 which included replacement of pumps, bar screens, screenings conveyance equipment, controls, and associated improvements to electrical, HVAC, and building systems to meet current code requirements.

The Spring Creek Pump Station appears to be in fair overall physical condition based on the available documents and an inspection by Gannett Fleming on August 2, 2023. Many of the pump station components are near the end of their useful life, including the pumps, HVAC system, and electrical and control systems. Capital investments should be made within the next five years to ensure continued operation and to reduce operating costs. Spring Creek Pump Station will be evaluated as part of a CIP project in FY 2026 to determine if additional improvements will be made to the existing Spring Creek Pump Station or if a new Pump Station will be constructed along with CSO storage.

The City Island North Pump Station was not inspected by Gannett Fleming but appears to be in good overall physical condition based on the available documents. Currently CRW operates the pump station but has not accepted ownership of the facility.

The City Island South Pump Station was not inspected by Gannett Fleming but appears to be in good overall physical condition based on the available documents. The pump station continues to be bypassed and flow is being directed to the City Island North Pump Station. This is due to the lack of pumping requirements out of both facilities as pumping is not required at both pump



stations to accommodate service flow requirements. Currently CRW operates the pump station but has not accepted ownership of the pump station.

Although Gannett Fleming did not inspect the Market Street Pump Station, it appears to be in good to fair overall physical condition based on the available documents. However, some additional O&M expenditures should be made within the next five (5) years to ensure continued operation and to reduce operating costs. Based on previous inspections of the Pump Station, recommended rehabilitation includes concrete repairs of the floor surfaces in the generator building, along the east side of the exterior of the building, and at the stairs leading to the entrance to the Pump Station.

### **5.2.3 Collection System**

CRW wastewater collection system includes approximately 160 miles in total including 33 miles of sanitary sewers, 40 miles of stormwater sewers, and 87 miles of combined sanitary and stormwater sewers. Approximately 80% of the collection system was installed prior to 1940. Regulators and diversion chambers allow for a portion of the wet weather flows to be treated at the AWTF with excess flows diverted to the Paxton Creek or the Susquehanna River during wet weather events.

The collection system was not inspected by Gannett Fleming during its August 2023 field visit; however, CRW has completed several inspection efforts associated with its collection system. In April 2017, CRW issued a Collection System Rapid Assessment Findings and Recommendations Report, where the findings of the assessments performed in 2012, 2015, and 2016 were summarized and recommendations were provided. The Report recommended that CRW complete the immediate sewer repairs that were identified and to continue to televise the collection system over the next 4 to 6 years. The information from this Report was used as a baseline to populate CRW's GIS system for high level condition assessment and CRW continues to gather more accurate and thorough information via CCTV inspections. This information is then coalesced into CRW's Sewer Collection System Asset Management Program (AMP); CRW is implementing Info Asset Planner as the software to help prioritize work. Priorities for sewer pipe repairs change annually as CRW continues to CCTV the collection system. The highest priorities are addressed under their emergency and maintenance sewer contracts and others are addressed through annual Sewer System Improvement Projects.

CRW completed CCTV inspections of 16 miles of collection system sewer in 2022, as part of the comprehensive prioritized CCTV inspection of the collection system being conducted from 2016-2024.

In 2021, Herbert, Rowland & Grubic, Inc. (HRG) was retained by CRW to evaluate potential cost savings for the Arsenal Boulevard Area Sewer Improvements – Phase 1 project prepared by CDM Smith. The original estimate for the work was valued at \$4.4M. Through their evaluation of the bid documents and review of available information with several utility contractors to identify construction risks and overall constructability, HRG identified four (4) recommendations for

consideration to potentially save approximately \$2.2M. These four recommendations were incorporated into the project re-design performed by HRG.

In 2021, CRW engaged KCI Technologies to provide CCTV inspection of approximately 35,500 feet of collection and conveyance pipe. KCI provided a memo on September 30, 2021, summarizing the methodology and findings of the CCTV inspections, as well as the associated data management work using Cityworks and GIS. The goal of this work was to obtain quality CCTV to aid CRW in the development of future Sewer System Improvement Projects separate from those originally captured in the Rapid Assessment Reports.

### **5.2.3.1 Sewer Interceptors**

The May 2017 "Capital Region Water Interceptor Cleaning and Rehab Improvements Update" memorandum prepared by CDM Smith provided CRW with an update of the interceptor cleaning and rehabilitation improvements. As the interceptor cleaning was completed, additional inspections of the interceptors were conducted providing better detail and evaluation of the existing conditions than the initial inspections. In some cases, this resulted in expanding the scope of proposed improvements for sewer and manhole rehabilitation. Additional areas were recommended for rehabilitation within the Paxton Creek Interceptor and the Front Street Interceptor. The opinion of probable construction cost for the Paxton Creek Interceptor was estimated to be \$7.3 million, \$1.6 million for the Asylum Run Interceptor, \$9.4 million for the Front Street Interceptor, and \$2.5 million for the Spring Creek Interceptor. CRW completed rehabilitation and replacement of the Asylum Run Interceptor in 2018 (substantial completion was issued in January 2019). However, until the upgrades of the Spring Creek Pump Station are confirmed, the schedule and design of the Spring Creek Interceptor improvements that feeds the pump station cannot be determined.

The Paxton Creek Interceptor rehabilitation project was initiated in 2017 utilizing spin-cast applied geopolymer due to the irregular shape of the pipe. Construction was halted when the condition of the pipe worsened and efforts to control active leakage was beyond the scope of the project. In November 2019, JMT issued a memo which reviewed alternate rehabilitation technologies and recommended slip lining due to potential cost savings of above ground feature restoration. At this time, the current CIP shows construction beginning in 2026; however, the project approach is still unknown pending the Paxton Creek Stream De-channelization project in coordination with PennDOT, Dauphin County, and the City of Harrisburg. Until a schedule for the creek project is determined, preliminary design will not proceed.

In March 2019 CDM Smith performed a two-phase evaluation of the rehabilitation/lining alternatives under consideration for the Front Street Interceptor. Phase 1 of this project included rehabilitation of approximately 1,730 LF was completed under CRW's emergency and maintenance contract in October and November 2019. In August 2020, CRW engaged AECOM to develop contract documents to rehabilitate the remaining non-circular portion of the Front Street Interceptor (14,400-LF) by either Cured- In-Place-Pipe or Segmented-Slip-Lining (competitively). AECOM provided a memorandum in December 2020 recommending the Front Street Interceptor

be rehabilitated with Cured-In-Place Pipe. Bids were advertised for the Phase 2 rehabilitation project in April 2022 with Notice to Proceed being issued in August 2022. Construction is anticipated to be complete by fall 2023.

### **5.2.3.2 CSO Outfalls and Regulators**

CRW operates and maintains 59 CSO regulator structures discharging to 58 outfalls located along the Front Street, Paxton Creek, and Hemlock Street Interceptors, which ultimately direct combined flows of wastewater and stormwater to the AWTF. During dry weather, the CSO regulators divert all of the combined flows from the trunk sewer lines to the interceptor sewers. During wet weather, the CSO regulator structures divert a controlled volume of flow to the interceptors, while untreated excess combined flow is discharged to receiving waters. In addition to the CSO regulator structures and outfalls, there are two additional CSO outfalls at the Front Street pumping station and the Spring Creek pumping station that activate only during mechanical failure of the pump stations or if the pump station capacities are exceeded.

Each CSO regulator and diversion chamber is inspected by CRW once per day, 7 days per week to ensure proper operation, identify combined sewer overflows, identify river intrusion into the interceptor system, identify and correct operational problems, and to identify and schedule required maintenance. CRW continues to develop recommendations for early action projects to address critical structural deterioration and river intrusion. There are two (2) remaining CSO outfalls scheduled for repair that will be repaired in combination with the Paxton Creek Interceptor rehabilitation project.

## **6.0 PLANNING AND MANAGEMENT**

### **6.1 Management and Staffing**

CRW is governed by a five-member Board of Directors whose members are appointed by the Mayor of Harrisburg and approved by City Council. A management team headed by the Chief Executive Officer is responsible for technical and administrative operations of CRW, as well as the implementation of programs, policies, and procedures, and the execution of contracts upon approval by the Board. In addition to providing wastewater services, CRW also provides drinking water services. CRW operates as one entity; however, CRW separately tracks and records the provision of services associated with the drinking water and wastewater utilities that it manages and operates.

CRW's organizational chart is made up of eight (8) departments as well as an Executive Team. The eight departments are: Finance, Engineering, Drinking Water Operations, Wastewater Operations, Shared Services, Strategic Initiatives, Human Resources, and Safety and Risk Management.

## 6.2 Organizational Structure Description

The Wastewater and Drinking Water Departments are responsible for operation and maintenance (O&M) of facilities, permit compliance, tracking and reporting, energy management, monitoring, long-term planning, repair and construction, and assistance in budget preparation and tracking. There are 58 positions in the Wastewater Department, with 57 positions filled as of September 5, 2023. The Wastewater Operations organizational chart is included in *Figure 3*.

The services provided by the other departments at CRW are summarized below:

- Executive Team - legal services;
- Finance - accounting, payroll, and benefits;
- Shared Services - provides office management, information technology, billing and customer service, and procurement services;
- Engineering - provides engineering support, project management, construction and project coordination, asset, and GIS management services, and operates a stormwater and wet weather control program;
- Human Resources – recruiting and retaining staff, employee engagement, and managing benefits;
- Safety and Risk Management – compliance with safety laws and regulations, assesses and mitigates potential risks to employee and community safety; and
- Strategic Initiatives - diversity and inclusion, community relations, community outreach, and external affairs.

When all positions are filled, the combined total staffing levels for these departments will be a total of 48 positions (2 for Executive excluding department heads, 9 for Finance, 18 for Shared Services, 10 for Engineering, 3 for Human Resources, 1 for Safety and Risk Management, and 5 for Strategic Initiatives). As of August 2023, there are a total of 42 positions currently filled. Personnel expenses associated with these departments are allocated to each of the utilities based on budgeted time allocated to each of the services. CRW's FY 2023 Wastewater System budget, which will be further discussed in Section 6, includes estimated costs associated with the current and future staffing levels for employees dedicated to the Wastewater System and the Wastewater System's share of costs associated with staff positions under the Shared Services, Engineering, Strategic Initiatives, Finance Department, Human Resources, and Risk and Safety Departments as well as the Executive Team, which all provide support to CRW's water and wastewater utilities. These employees are all employees of CRW, with the majority belonging to a collective bargaining unit.

The organizational structure of CRW provides strong opportunities for economies of scale through the sharing of shared services, engineering, finance, and executive services between the water and wastewater utilities. The structure is generally consistent with similar-sized, combined utilities and it appears that all required Wastewater System functions of CRW are adequately staffed without excessive vacancies.

Additionally, changes in the hauled waste program made due to COVID-19 were made permanent due to their success. These changes included haulers collecting their own samples for analysis

and using a drop box to submit paperwork in order to limit contact between drivers and CRW operations staff.

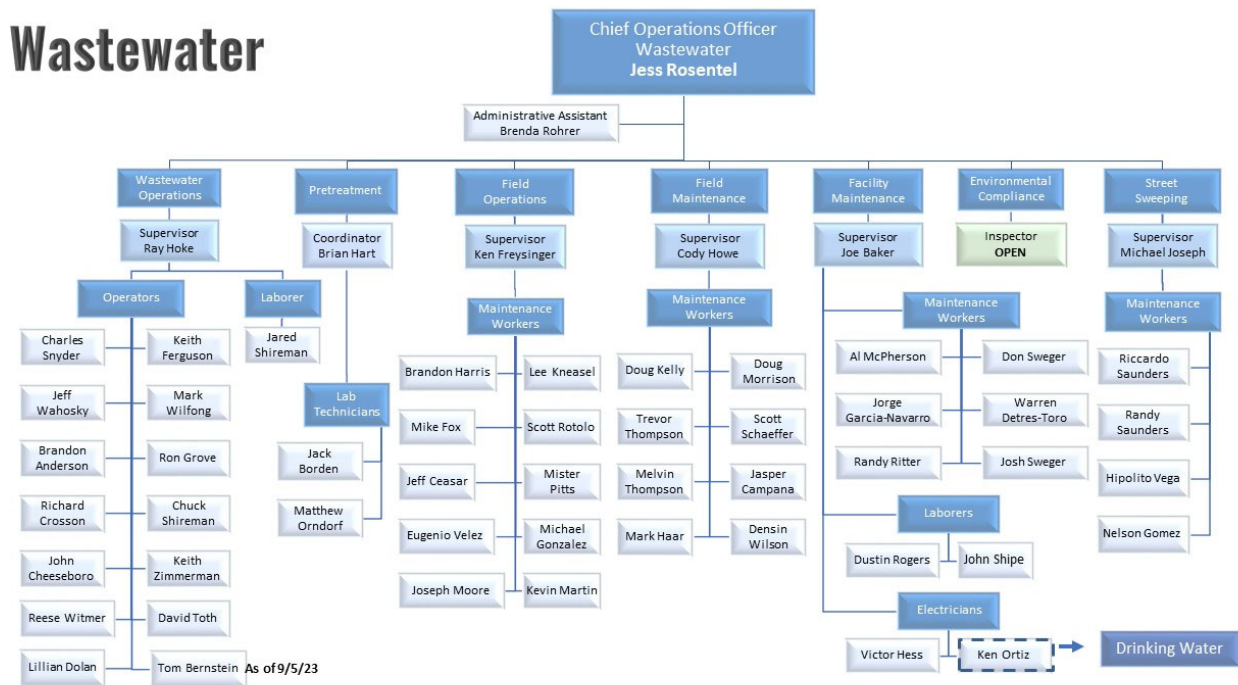


Figure 3. Wastewater Operations Division Organizational Chart

### 6.3 Capital Improvement Plan

CRW maintains and updates a Capital Improvement Plan (CIP) that identifies the major planned projects and initiatives for the Wastewater System. The CIP includes projects that are required to replace aging infrastructure, enhance or expand services to customers, provide resiliency and redundancy, and increase cost effectiveness and efficiency. Portions of the CIP are related to repair and replacement of assets that are beyond their useful life and other portions address requirements under the Consent Decree, the CSO LTCP, and other regulatory driven projects. CRW's most current 5-year CIP is summarized in Table 10. The following is a brief discussion of the capital projects and a summary of the review findings.

**Table 10. CRW 5-Year Wastewater Capital Improvement Plan**

Location	Description	Fiscal Year					Project Total
		2023	2024	2025	2026	2027	
AWTF	Primary Digester Insulation	\$500,000	-	-	-	-	\$500,000
AWTF	AWTF Energy Recovery Improvements - Construction	\$7,684,562	\$12,225,439	-	-	-	\$19,910,001
AWTF	AWTF Energy Recovery Improvements - Eng/Cont Mgmt	\$390,000	\$600,000	-	-	-	\$990,000
AWTF	Primary Clarifier Improvements - Construction	\$0	\$3,560,000	\$2,972,000	-	-	\$6,532,000
AWTF	Primary Clarifier Improvements - Eng & Const Mgmt	\$168,000	\$400,000	\$438,000	-	-	\$1,006,000
AWTF	Rubber Roof for Control Building	\$45,000	-	-	-	-	\$45,000
AWTF	Switchgear and New Line for Cyro Compressors	\$200,000	-	-	-	-	\$200,000
AWTF	Hydrogritter Roof	\$35,000	-	-	-	-	\$35,000
AWTF	Cyro Plant Cooling Tower	\$20,000	-	-	-	-	\$20,000
AWTF	Garage Door Replacements	\$50,000	-	-	-	-	\$50,000
AWTF	Other Plant Upgrades - Placeholder	\$0	-	\$300,000	\$400,000	\$400,000	\$1,100,000
AWTF	Gravity Thickeners - Equipment Replacement	\$0	-	\$190,000	\$1,900,000	-	\$2,090,000
AWTF	Secondary Digesters Conversion	\$0	\$500,000	-	-	-	\$500,000
AWTF	Belt Filter Press Rehab	\$60,000	-	-	-	-	\$60,000
AWTF	New Field Equipment Building	\$500,000	-	-	-	-	\$500,000
AWTF	AWTF Administrative Building Improvements	\$400,000	-	-	-	-	\$400,000
AWTF	AWTF Laptops	\$8,000	\$8,240	\$8,487	-	-	\$24,727
AWTF	Automated Chlorine Feed System	\$20,000	-	-	-	-	\$20,000
AWTF	AWTF SCADA Firmware & PLC Upgrade	\$29,000	-	-	-	-	\$29,000
AWTF	HPO Tank Repair	\$82,000	-	-	-	-	\$82,000
	<b>SUBTOTAL AWTF</b>	<b>\$10,191,562</b>	<b>\$17,293,679</b>	<b>\$3,908,487</b>	<b>\$2,300,000</b>	<b>\$400,000</b>	<b>\$34,093,728</b>
Collection	Collection System Rehab - Construction	\$3,567,881	\$6,921,541	\$6,457,327	-	-	\$16,946,749
Collection	Collection System Rehab - Eng & Const Mgmt	\$426,000	\$692,154	\$645,733	-	-	\$1,763,887
Collection	Collection System Rehab	\$1,707,000	\$1,707,000	\$1,707,000	\$1,707,000	\$2,500,150	\$9,328,150
Collection	Collection System Rehab	-	-	-	-	\$1,500,000	\$1,500,000
Conveyance	Paxton Creek Interceptor - Construction	\$0	-	-	\$10,000,000	\$10,000,000	\$20,000,000
Conveyance	Paxton Creek Interceptor - Eng & Const Mgmt	\$465,000	\$465,000	\$465,000	-	-	\$1,395,000
Conveyance	Arsenal Blvd. - Construction	\$2,541,000	\$1,694,000	-	-	-	\$4,235,000
Conveyance	Arsenal Blvd. - Eng & Const Mgmt	\$148,400	\$66,000	-	-	-	\$214,400
Collection	Other Multi-Model CCTV Investigations (0065)	\$500,000	-	-	-	-	\$500,000
Conveyance	Front St. Interceptor Rehab P2 - Construction	\$15,450,653	-	-	-	-	\$15,450,653
Conveyance	Front St. Interceptor Rehab P2 - Eng & Const Mgmt	\$567,173	-	-	-	-	\$567,173
Conveyance	Asylum Run & Hemlock Interceptor Rehab	\$0	-	\$500,000	-	-	\$500,000
Collection	Street Restoration	\$211,150	\$217,485	\$224,009	\$230,729	\$237,651	\$1,121,024
Collection	4 Inch Trash Pumps	\$0	-	\$27,000	\$28,000	-	\$55,000
Collection	10 Inch Trash Pumps	\$0	-	\$45,000	-	-	\$45,000
Collection	PennDOT I-83 Expansion - Engineering	\$405,000	\$44,000	\$50,000	\$50,000	\$50,000	\$599,000
Collection	PennDOT I-83 Expansion - Construction	\$0	-	-	\$423,500	-	\$423,500
Collection	SW PennDOT I-83 Expansion - Construction	\$0	-	\$6,000,000	\$6,100,000	-	\$12,100,000
Collection	SW PennDOT I-83 Expansion - Eng & Const Mgmt	\$0	\$400,000	\$205,000	-	-	\$605,000
Conveyance	Spring Creek Interceptor Rehab/Storage/Pump Station	\$0	\$500,000	\$1,400,000	\$4,700,000	\$4,700,000	\$11,300,000
Conveyance	CSO Regulator Modifications	\$0	\$1,155,000	-	-	-	\$1,155,000
Collection	3rd & Wiconisco Separation	\$230,000	\$276,000	-	-	-	\$506,000
Collection	CSO Signage	\$3,000	-	-	-	-	\$3,000
Collection	Fleet Renewal	\$702,500	\$677,500	\$374,000	\$287,500	\$307,000	\$2,348,500
	<b>SUBTOTAL COLLECTION &amp; CONVEYANCE</b>	<b>\$26,924,757</b>	<b>\$14,815,680</b>	<b>\$18,100,069</b>	<b>\$23,526,729</b>	<b>\$19,294,801</b>	<b>\$102,662,036</b>
	<b>TOTAL</b>	<b>\$37,116,319</b>	<b>\$32,109,359</b>	<b>\$22,008,556</b>	<b>\$25,826,729</b>	<b>\$19,694,801</b>	<b>\$136,755,764</b>

CRW's capital plan is in general alignment with Gannett Fleming' observed requirements for the Wastewater System. Once the improvements to the Paxton Creek Interceptor and improvements to the Spring Creek Pump Station that is fed by the Spring Creek Interceptor are finalized, the



capital plan should be revised as necessary. CRW generally has a good understanding of capital project needs and should prioritize projects based on urgency and affordability. CRW may proceed to reschedule and reprioritize various projects to balance the capital needs over the next several years. It is recommended that CRW update its cost estimates and capital funding plans for these projects as additional information becomes available.

### **6.3.1 AWTF Upgrades**

In March 2016, CRW completed an upgrade to its AWTF, adding biological nutrient removal in order to comply with the Chesapeake Bay Tributary Strategy and meet new NPDES permit discharge requirements.

In addition, the following maintenance projects were completed at the AWTF in 2022:

- Install new Divert Pumps and Heat Trace supply piping.

### **6.3.2 Pump Station Capital Improvements**

CRW plans to evaluate options for potential upgrades of the Spring Creek Pumping Station in FY 2026 to determine if additional improvements will be made to the existing Spring Creek Pump Station

### **6.3.3 Conveyance Capital Improvements**

CRW has included several conveyance capital improvements in its CIP for FY 2024 shown in *Table 10*. These include the Paxton Creek, Front Street, and the Arsenal Boulevard sewer improvements.

The Paxton Creek Interceptor rehabilitation experienced unexcepted high costs due to difficult site conditions and was stopped in December 2018. The project approach is pending the Paxton Creek Stream De-channelization Project in coordination with PennDOT, Dauphin County, and the City of Harrisburg. Until a schedule for the creek project is determined, preliminary design will not proceed.

CRW will evaluate the schedule and design for Spring Creek Interceptor improvements after the upgrades of the Spring Creek Pump Station are confirmed.

In addition, collection system cleaning, rehabilitation, and replacement work is expected to be an ongoing annual capital need. In addition to the conveyance capital improvements, CRW plans to implement multiple CSO Long Term Control Plan related capital projects, including several green stormwater infrastructure projects, as shown on the "SW" line in *Table 10*.

## **6.4 Financial Overview**

The Trust Indenture (Section 7.12) requires CRW to adopt a Wastewater System budget each year. CRW typically adopts a finalized budget in November, two (2) months prior to the start of the new

fiscal year. CRW utilizes the capital plan and O&M recommendations in this Annual Report to assist in establishing the budget. However, it should be noted that this Annual Report only serves to provide advice and recommendations regarding capital additions and amount of funds that should be expended to meet incremental O&M expenses. CRW must then establish a realistic funding and financing plan that serves to meet these goals, which may necessitate reprioritization of projects and programs.

A summary of CRW's historical actual O&M expenses for Fiscal Years 2021 through FY 2022 as well as the budgeted O&M expenses for FY 2023 are shown in *Table 11* (as provided by CRW). These expenses were reviewed and determined to be in general alignment with overall O&M needs of the Wastewater System.

**Table 11.** Historical Wastewater and Stormwater System Operation and Maintenance Expenses

O&M Expense Descriptions	Actual Expenses		Budgeted Expenses
	FY 2021	FY 2022	FY 2023
Salaries and Wages	3,483,596	3,595,983	3,810,297
Benefits and Taxes	1,566,039	2,122,719	2,070,031
Contracted and Professional Services	1,463,317	1,771,698	2,859,250
Repairs, Maintenance, and Supplies	565,888	681,166	621,541
Electricity	811,100	955,066	906,246
Chemicals	333,656	471,237	526,000
Water	193,031	237,536	229,000
Refuse	832,327	1,106,248	844,000
Insurance	419,651	453,374	504,863
Administrative Fee	2,899,923	3,089,391	3,452,357
Street Sweeping	122,478	103,599	253,120
Other Operating Expenses	341,309	372,478	352,323
<b>Total Annual O&amp;M Expenses</b>	<b>13,032,315</b>	<b>14,960,495</b>	<b>16,429,028</b>

## 7.0 CONCLUSIONS

Based on Gannett Fleming's review of the Wastewater System and associated information provided by CRW, the following primary conclusions are offered:

1. In 2022, the AWTF had no hydraulic or organic overloads recorded as the monthly average flow did not exceed the design capacity and no hydraulic or organic overload conditions are expected through 2027.

2. There were 28 reported secondary bypass events during 2022, 12 of which resulted in flow bypassing secondary treatment at the AWTF. Sixteen bypass events triggered the bypass gate to open but with no flow bypassing secondary treatment. With one exception, all bypasses were due to wet weather. One bypass event was due to a power outage in August 2022, and the AWTF received a Notice of Violation for that bypass.
3. Based on Gannett Fleming' field inspections and review of documentation, the AWTF, Spring Creek Pump Station, Front Street Pump Station, City Island Pump Stations, Market Street Pump Station, and combined sewer overflow regulators are in good condition with no known capital requirements currently. Overall, the Wastewater System is in fair condition requiring capital investment within five 5 years.
4. CRW's Capital Plan is in general alignment with Gannett Fleming' observed requirements for the Wastewater System. CRW generally has a good understanding of capital project needs and should prioritize projects based on urgency and affordability. Once CRW completes the evaluation of improvements to the Spring Creek Pump Station and Spring Creek Interceptor, the capital plan should be revised.

This Annual Report summarizes the work completed up to the date of the issuance of this Report. Changed conditions occurring or becoming known after such date could affect the material presented to the extent of such changes. Gannett Fleming has no responsibility for updating this CEAR for changes that occur after the date of this report.

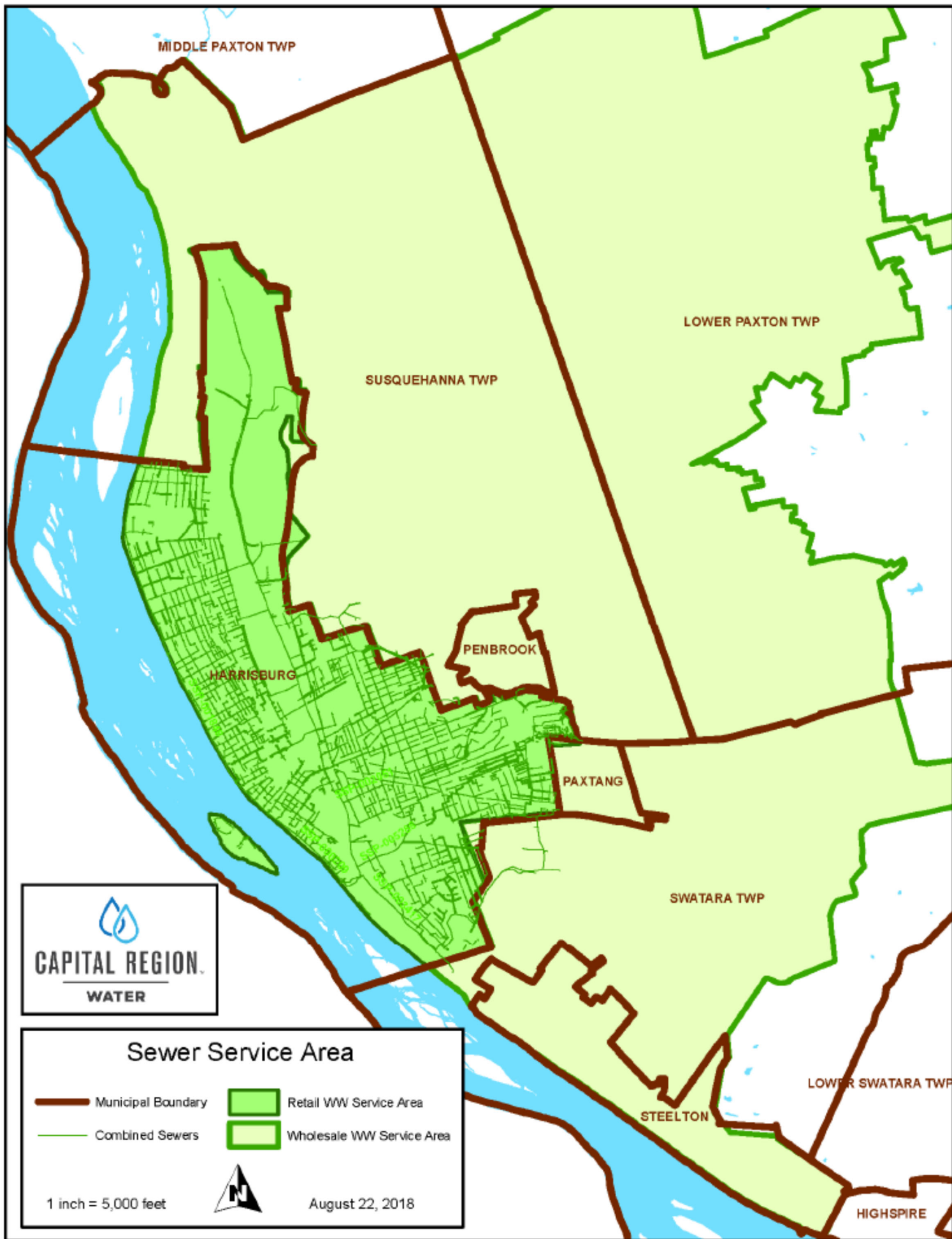
In preparation of this Annual Report, Gannett Fleming has relied upon financial, engineering and operational data, and assumptions prepared by and / or provided by CRW. In addition, information and projections have been provided by other entities working on behalf of CRW. We believe such sources are reliable and the information obtained to be appropriate for the review undertaken and the conclusions reached in this CEAR. To the best of our knowledge, information and belief, the information does not omit material facts necessary to make the statements herein. However, Gannett Fleming has not independently verified the accuracy of the information provided by CRW and others. To the extent that the information is not accurate, the findings and recommendations contained in this Annual Report may vary and are subject to change.

Gannett Fleming devoted effort in making such opinions consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under same or similar circumstances and the time and budget available for its work in its efforts to endeavor to provide such opinions. The opinions are based on information provided by and consultations with CRW. No responsibility was assumed for inaccuracies in reporting by CRW or any third-party data source used in preparing such opinions. Gannett Fleming's opinions represent its professional judgment. Neither Gannett Fleming nor its parent corporation, or their respective subsidiaries and affiliates, makes any warranty, expressed or implied, with respect to such opinions.

*Appendix A*

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**Wastewater System Service Area Map**



MIDDLE PAXTON TWP

LOWER PAXTON TWP

SUSQUEHANNA TWP

HARRISBURG

PENBROOK

PAXTANG

SWATARA TWP

LOWER SWATARA TWP

STEELTON

HIGHSPIRE



### Sewer Service Area

-  Municipal Boundary
-  Combined Sewers
-  Retail WW Service Area
-  Wholesale WW Service Area

1 inch = 5,000 feet



August 22, 2018

*Appendix B*

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**Permitted Combined Sewer Overflow List**



**Capital Region Water  
Combined Sewer Overflow (CSO) System  
Calendar Year 2022**

<b>CSO No.</b>	<b>Interceptor</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Location</b>	<b>Receiving Waters</b>	<b>Drainage Area (acres)</b>
CSO-002	AWTF	40 15 3.99	-76 52 25.23	Front Street PS	SUSQUEHANNA RIVER	
CSO-003	AWTF	40 14 40.85	-76 51 41.47	Spring Creek PS	PAXTON CREEK	
CSO-004	FS	40 18 0.42	-76 54 14.54	FRONT & VAUGHN	SUSQUEHANNA RIVER	34
CSO-005	FS	40 17 54.57	-76 54 17.1	FRONT & LEWIS	SUSQUEHANNA RIVER	74
CSO-006	FS	40 16 35.48	-76 53 57.1	FRONT & GEIGER	SUSQUEHANNA RIVER	19
CSO-007	FS	40 16 33.32	-76 53 55.57	FRONT & PEFFER	SUSQUEHANNA RIVER	16
CSO-008	FS	40 16 28.93	-76 53 52.48	FRONT & MUENCH	SUSQUEHANNA RIVER	40
CSO-009	FS	40 16 20.1	-76 53 46.26	FRONT & HAMILTON	SUSQUEHANNA RIVER	67
CSO-010	FS	40 16 11.13	-76 53 40.48	FRONT & REILY	SUSQUEHANNA RIVER	42
CSO-011	FS	40 16 7.54	-76 53 38.31	FRONT & CALDER	SUSQUEHANNA RIVER	31
CSO-012	FS	40 16 3.58	-76 53 35.63	FRONT & VERBEKE	SUSQUEHANNA RIVER	25
CSO-013	FS	40 16 0.7	-76 53 33.45	FRONT & CUMBERLAND	SUSQUEHANNA RIVER	16
CSO-014	FS	40 15 55.29	-76 53 29.41	FRONT & BOAS	SUSQUEHANNA RIVER	30
CSO-015	FS	40 15 53.19	-76 53 28.24	FRONT & FORSTER	SUSQUEHANNA RIVER	20
CSO-016	FS	40 15 45.67	-76 53 22.73	FRONT & LIBERTY	SUSQUEHANNA RIVER	8
CSO-017	FS	40 15 29.65	-76 53 0.49	FRONT & MARKET	SUSQUEHANNA RIVER	6
CSO-018	FS	40 15 22.65	-76 52 49.07	FRONT & MULBERRY	SUSQUEHANNA RIVER	31
CSO-019	FS	40 15 18.41	-76 52 42.49	FRONT & PAXTON	SUSQUEHANNA RIVER	41
CSO-020	FS	40 15 6.17	-76 52 27.56	FRONT & HANNA	SUSQUEHANNA RIVER	16
CSO-021	Pax	40 17 19.12	-76 53 12.65	CAMERON & SCHUYLKILL	PAXTON CREEK	149
CSO-022	Pax	40 16 58.75	-76 53 5.58	FORREST & CAMERON	PAXTON CREEK	20
CSO-023	Pax	40 16 29.84	-76 52 47.74	CAMERON & CALDER	PAXTON CREEK	16
CSO-024	Pax	40 16 27.36	-76 52 47.15	HILL CHAMBER T.R.W.	PAXTON CREEK	158
CSO-025	Pax	40 16 21.75	-76 52 44.67	N. CAMERON & CUMBERLAND	PAXTON CREEK	10
CSO-026	Pax	40 16 21.53	-76 52 44.59	S. CAMERON & CUMBERLAND	PAXTON CREEK	51
CSO-027	Pax	40 16 21.47	-76 52 44.83	9TH & CUMBERLAND	PAXTON CREEK	8
CSO-028	Pax	40 16 18.63	-76 52 43.42	9TH & HERR	PAXTON CREEK	54
CSO-029	Pax	40 16 7.56	-76 52 37.2	E. CAMERON & NORTH	PAXTON CREEK	43
CSO-030	Pax	40 16 7.92	-76 52 37.69	W. CAMERON & NORTH	PAXTON CREEK	40
CSO-031	Pax	40 16 2.64	-76 52 35.02	CAMERON & STATE	PAXTON CREEK	220

**Capital Region Water  
Combined Sewer Overflow (CSO) System  
Calendar Year 2022**

<b>CSO No.</b>	<b>Interceptor</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Location</b>	<b>Receiving Waters</b>	<b>Drainage Area (acres)</b>
CSO-032	Pax	40 15 57.56	-76 52 33.45	W. CAMERON & WALNUT	PAXTON CREEK	14
CSO-033	Pax	40 15 57.66	-76 52 33.17	E. CAMERON & WALNUT	PAXTON CREEK	20
CSO-034	Pax	40 15 51.71	-76 52 30.58	S. MARKET & CAMERON	PAXTON CREEK	62
CSO-037	Pax	40 15 51.8	-76 52 31.27	10TH & MARKET	PAXTON CREEK	77
CSO-038	Pax	40 15 46	-76 52 28.03	10TH & CHESTNUT	PAXTON CREEK	19
CSO-039	Pax	40 15 42.02	-76 52 25.43	S. MULBERRY & CAMERON	PAXTON CREEK	21
CSO-040	Pax	40 15 42.16	-76 52 25.51	N.MULBERRY & CAMERON	PAXTON CREEK	12
CSO-041	Pax	40 15 41.93	-76 52 25.72	W. MULBERRY & CAMERON	PAXTON CREEK	12
CSO-042	Pax	40 15 36.99	-76 52 22.62	N. KITTATINNY & CAMERON	PAXTON CREEK	6
CSO-043	Pax	40 15 36.88	-76 52 22.55	S. KITTATINNY & CAMERON	PAXTON CREEK	6
CSO-044	Pax	40 15 27.64	-76 52 19.3	CAMERON & BERRYHILL	PAXTON CREEK	47
CSO-045	Pax	40 15 20.17	-76 52 18.49	S. PAXTON STREET	PAXTON CREEK	10
CSO-046	Pax	40 15 20.26	-76 52 18.55	N. PAXTON STREET	PAXTON CREEK	9
CSO-048	Pax	40 15 11.52	-76 52 10.24	10TH & SHANNON	PAXTON CREEK	766
CSO-049	FS	40 17 3.64	-76 54 11.52	FRONT & SCHUYLKILL	SUSQUEHANNA RIVER	28
CSO-050	FS	40 16 57.74	-76 54 8.56	SENECA & SUSQUEHANNA	SUSQUEHANNA RIVER	42
CSO-051	FS	40 16 46.03	-76 54 2.95	WOODBINE & GREEN	SUSQUEHANNA RIVER	79
CSO-052	FS	40 15 43.81	-76 53 20.26	FRONT & STATE	SUSQUEHANNA RIVER	22
CSO-053	FS	40 15 41.57	-76 53 17.27	FRONT & SOUTH	SUSQUEHANNA RIVER	10
CSO-054	FS	40 15 38.06	-76 53 12.63	FRONT & PINE	SUSQUEHANNA RIVER	8
CSO-055	FS	40 15 34.55	-76 53 8.11	FRONT & LOCUST	SUSQUEHANNA RIVER	14
CSO-056	FS	40 15 31.96	-76 53 4.66	FRONT & WALNUT	SUSQUEHANNA RIVER	10
CSO-057	FS	40 15 23.84	-76 52 50.89	FRONT & CHERRY	SUSQUEHANNA RIVER	16
CSO-058	FS	40 15 10.79	-76 52 32.53	FRONT & TUSCARORA	SUSQUEHANNA RIVER	22
CSO-059	Pax	40 15 36.96	-76 52 22.61	E. KITTATINNY & CAMERON	PAXTON CREEK	154
CSO-060	HS	40 15 3.1	-76 52 2.12	SALMON STREET	PAXTON CREEK	16
CSO-061	HS	40 15 1.16	-76 52 0.12	10TH & SYCAMORE	PAXTON CREEK	56
CSO-062	HS	40 14 53.23	-76 51 52.5	SHANNOIS STREET	PAXTON CREEK	10
CSO-063	HS	40 14 47.16	-76 51 48.39	CAMERON & HANOVER	PAXTON CREEK	40
CSO-064	HS	40 14 43.38	-76 51 43.34	CAMERON & MAGNOLIA	PAXTON CREEK	11

*Appendix C*

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**Wastewater Treatment Plant -  
Operations Summary Tables**

**Capital Region Water  
Advanced Wastewater Treatment Facility Operations Summary  
Calendar Year 2022**

PARAMETER	NPDES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG	TOTAL
<b>FLOW</b>															
Average Daily Flow, mgd	Report	18,355	25,146	20,326	25,943	28,635	19,413	17,742	15,316	17,017	16,916	16,217	21,458	20,207	---
Maximum Day Flow, mgd		29,600	58,300	30,600	52,600	69,500	31,300	27,200	18,500	32,800	27,300	30,800	52,700	69,500	<-- Max
Max. Day to Ave. Daily Flow Ratio		1.61	2.32	1.51	2.03	2.43	1.61	1.53	1.21	1.93	1.61	1.90	2.46	1.85	---
Instantaneous Maximum Flow, mgd		58,000	73,300	68,000	70,500	74,300	80,000	80,000	55,900	73,200	61,200	71,700	79,200	70	---
Flow from Suburban Customers		11,198	13,595	11,290	13,969	14,290	10,315	9,806	9,050	10,058	9,468	10,314	17,774	12	---
% Flow from Suburban Customers		61%	54%	56%	54%	50%	53%	55%	59%	59%	56%	64%	83%	59%	---
Precipitation, inches		2.20	2.82	2.66	3.54	6.14	4.69	5.12	2.56	3.58	3.73	2.82	4.60	3.71	44.46
<b>BIOCHEMICAL OXYGEN DEMAND</b>															
Raw Influent BOD (Avg.), mg/L	Report	175	134	163	121	128	138	149	159	117	113	135	96	136	---
Raw Influent BOD Loading (Avg), lbs/day	Report	26,349	26,463	27,448	24,626	27,086	22,254	21,804	20,269	15,993	15,614	17,508	16,348	21,814	---
Effluent CBOD (Ave. Month), mg/L	25	3	3	3	3	3	4	3	4	3	2	3	3	3	---
Effluent CBOD Loading (Ave. Month), lbs/day	7,860	520	876	572	722	952	637	446	536	474	334	432	655	596	---
<b>SUSPENDED SOLIDS</b>															
Raw Influent TSS, mg/L	Report	181	155	212	144	137	153	184	174	161	194	196	151	170	---
Raw Influent Loading TSS, lbs/day	Report	27,430	30,804	36,020	29,979	29,657	25,607	27,053	22,409	22,298	26,446	26,437	26,782	27,577	---
Raw Influent VSS, mg/L		149	127	178	123	118	133	158	168	158	170	175	133	149	---
Raw Influent Loading VSS, lbs/day		22,750	25,168	30,278	25,594	23,464	21,961	23,202	22,603	20,525	23,144	23,440	23,420	23,796	---
VSS / TSS Influent Ratio, %		82.9%	81.7%	84.1%	85.4%	79.1%	85.8%	85.8%	100.9%	92.0%	87.5%	88.7%	87.4%	86.8%	---
Effluent TSS (Ave. Month), mg/L	30	4	5	3	2	3	3	3	7	5	2	2	3	4	---
Effluent Loading TSS (Ave. Month), lbs/day	9,433	715	1,447	499	552	990	650	468	863	725	299	315	585	676	---
% TSS Reduction		97.4	95.3	98.6	98.2	96.7	97.5	98.3	96.1	96.7	98.9	98.8	97.8	97.5	---
<b>AMMONIA NITROGEN</b>															
Raw Influent, mg/L		15.6	12.6	14.7	11.2	10.7	14.5	15.7	18.8	20.2	18.3	19.1	15.0	15.5	---
Raw Influent Loading, lbs/day		2,390	2,419	2,450	2,283	2,235	2,321	2,296	2,376	2,756	2,499	2,511	2,456	2,416	---
Effluent, mg/L	(2)	< 0.7	1.9	2.3	0.7	1.6	0.6	0.8	0.5	1.0	1.2	1.1	1.3	1.1	---
Effluent Loading, lbs/day	(2)	114	402	411	157	364	99	125	58	137	173	154	261	205	---
% Reduction		95.3	83.4	83.2	93.1	83.7	95.7	94.5	97.5	95.0	93.1	93.9	89.4	91.5	---
<b>TOTAL NITROGEN</b>															
Raw Influent, mg/L		25.9	24.1	25.5	20.1	22.6	23.9	25.0	27.0	26.0	30.2	33.2	28.8	26.0	---
Raw Influent Loading, lbs/day		3,824	3,849	3,955	4,266	4,480	3,718	3,578	2,327	3,822	4,218	4,132	4,397	3,880	---
Effluent, mg/L		3.1	4.3	2.3	5.0	5.6	4.5	3.2	4.8	5.3	4.8	5.3	7.0	4.6	---
Effluent Loading, lbs/day		489	719	411	1,066	1,170	704	449	648	879	720	153	1,062	706	---
% Reduction		87.2	81.3	89.6	75.0	73.9	81.1	87.4	72.1	77.0	82.9	96.3	75.8	82	---
Effluent Loading, lbs/month		15,162	20,146	12,747	31,986	36,273	21,108	13,931	20,088	26,382	22,314	4,581	32,934	21,471	---
<b>TOTAL PHOSPHORUS</b>															
Raw Influent, mg/L		3.5	2.8	3.6	2.9	2.9	3.5	4.0	4.9	4.2	4.0	3.7	3.0	3.6	---
Raw Influent Loading, lbs/day		529	546	599	592	18,217	565	582	618	586	548	488	489	2,030	---
Effluent, mg/L	2.0	0.9	1.0	1.6	1.1	1.2	1.5	0.7	2.3	1.8	1.3	1.3	0.9	1.3	---
Effluent Loading, lbs/day	629	144	206	274	219	7,479	240	102	296	247	178	176	158	810	---
% Reduction		72.8	62.2	54.3	63.0	58.9	57.5	82.5	52.1	57.8	67.5	63.9	67.7	63.4	---
Effluent Loading, lbs/month		4,464	5,774	8,494	6,570	231,849	7,203	3,162	9,185	7,410	5,518	5,280	4,898	24,984	---
<b>DISINFECTION</b>															
Chlorine Residual, Average (mg/L)	0.5	0.20	0.20	0.19	0.21	0.41	0.41	0.42	0.42	0.40	0.18	0.18	0.18	0.18	---
Chlorine Residual, Max Day (mg/L)	1.6	0.29	0.36	0.27	0.27	0.59	0.58	0.59	0.59	0.53	0.28	0.28	0.43	0.27	---
Fecal Coliform (Geo. Mean), MPN/100 ml	(3)	6	6	2	4	2	3	2	2	4	6	6	7	2.0	---
Fecal Coliform (Max. Instan.), MPN/100 ml	(3)	6,000	2,600	17	6,000	48	31	60	5	2,420	43	59	4,200	6,000	<-- Max

**Notes:**

- (1) TN and TP Compliance Year Effluent Loading limits are enforced from Oct 1 thru Sep 30.
- (2) Ammonia Nitrogen limits are 11 mg/L and 3,458 lbs/day (May 1 thru Oct 31) and Report Only (Nov 1 thru Apr 30)
- (3) Fecal Coliform Monthly Geometric Mean limits are 200 MPN / 100 ml (May 1 thru Sep. 30) and 2,000 MPN / 100 ml (Oct. 1 thru Apr. 31)

NPDES Permit No. PA0027197 was effective on 01/01/10 and expires on 12/31/14

**Capital Region Water  
Advanced Wastewater Treatment Facility Operations Summary  
Calendar Year 2022**

PARAMETER		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVERAGE	TOTAL
<b>DISSOLVED OXYGEN</b>															
Effluent, mg/L (Min.)	5.0	8.9	8.5	8.7	8.4	8.0	7.7	7.6	7.6	7.6	8.2	8.1	8.6	7.6	<-- Min
<b>pH</b>															
Influent, s.u. (Min.)		7.2	7.1	7.1	7.3	7.2	7.3	7.3	7.5	7.4	7.4	7.4	7.4	7.1	<-- Min
Influent, s.u. (Max.)		7.6	7.5	7.6	7.5	7.4	7.6	7.5	8.0	7.9	7.8	7.6	7.5	8.0	<-- Max
Effluent, s.u. (Min.)	6.0	6.8	6.7	6.9	6.9	7.0	7.0	7.1	7.7	7.5	7.4	7.4	7.3	6.7	<-- Min
Effluent, s.u. (Max.)	9.0	7.2	7.0	7.4	7.0	7.1	7.1	7.2	8.1	8.2	7.8	7.8	7.7	8.2	<-- Max
<b>BIOREACTOR OPERATIONS</b>															
Activated Sludge Process															
MLSS, mg/L		3,817	3,430	3,319	2,129	1,918	2,291	1,906	1,791	2,088	2,210	2,168	2,236	2,442	---
MLVSS, mg/L		3,145	2,680	2,629	1,608	1,533	1,803	1,888	1,451	1,613	1,725	1,725	1,785	1,965	---
% VSS		82.4%	78.1%	79.2%	75.5%	79.9%	78.7%	99.1%	81.0%	77.3%	78.1%	79.6%	79.8%	80.7%	---
Settleable Solids, mL/L		516	444	429	256	322	351	168	145	198	184	169	222	284	---
Sludge Volume Index, mL/gm		135	129	129	120	168	153	88	81	95	83	78	99	113	---
Return Activated Sludge															
RAS, mgd		15.6	17.7	16.2	18.1	18.2	16.0	14.5	12.5	13.4	14.7	13.8	16.3	15.6	---
RAS : Forward Flow Ratio		85.0%	70.4%	79.7%	69.8%	63.6%	82.4%	81.7%	81.6%	78.7%	86.9%	85.1%	76.0%	78.4%	---
RAS TSS, mg/L		8,352	8,041	7,190	5,080	4,594	5,076	4,285	3,584	3,889	4,894	5,209	5,203	5,450	---
RAS VSS, mg/L		6,559	6,263	5,536	3,825	3,563	3,951	3,434	2,915	3,032	3,798	4,155	4,169	4,267	---
<b>SOLIDS HANDLING AND DISPOSAL</b>															
<i>GRAVITY THICKENER</i>															
Feed Sludge															
Primary Waste Sludge, mgd		0.795	0.427	0.432	0.436	0.432	0.435	0.446	0.424	0.435	0.442	0.432	0.440	0.465	169,603
Waste Activated Sludge, mgd		1.609	1.543	1.489	1.447	1.406	1.440	1.243	0.871	0.910	0.937	0.891	0.988	1.231	449,376
Waste Activated Sludge, lbs/day		51,221	44,139	41,216	25,693	22,491	27,514	19,759	13,010	15,847	17,270	16,110	18,424	26,058	---
Hauled Sludge, mgd		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Combined, mgd		2.40	1.97	1.92	1.88	1.84	1.88	1.69	1.30	1.35	1.38	1.32	1.43	1.696	619
Feed Sludge, % TS		0.1	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	---
Thickened Sludge															
Thickened Sludge, % TS		2.7	3.1	2.9	2.9	2.6	1.9	2.4	2.7	2.2	2.3	2.0	2.3	2.5	---
Thickened Sludge, mgd		0.130	0.120	0.184	0.187	0.173	0.239	0.166	0.119	0.157	0.168	0.175	0.125	0.162	58,373
Thickened Sludge, lbs/day		29,230	31,600	44,560	45,230	37,540	37,890	33,140	26,870	28,740	32,260	29,180	23,960	33,350	---
Thickened Sludge, lbs/month		906,149	884,724	1,381,413	1,356,901	1,163,839	1,136,842	1,027,363	833,083	862,189	1,000,149	875,475	742,679	1,014,230	12,170,806
<b>BELT FILTER PRESS</b>															
Feed Sludge															
Secondary Digester, mgd		0.119	0.070	0.146	0.167	0.154	0.209	0.114	0.141	0.172	0.181	0.205	0.171	0.154	56,240
Feed Sludge, % TS		1.7	1.7	2.0	1.8	2.0	1.4	1.6	1.3	1.6	1.7	1.5	1.5	1.7	---
Feed Sludge, dry lbs/month		470,134	392,473	755,546	743,036	777,730	703,079	293,668	450,218	640,612	803,751	744,695	677,408	621,030	7,452,350
Dry Cake (lb/month)		76,568	333,725	624,713	590,090	562,127	558,550	220,481	329,488	476,788	530,705	465,109	449,410	434,810	5,217,754
Dry Cake (tons/month)		38.28	166.86	312.36	295.05	281.06	279.28	110.24	164.74	238.39	265.35	232.55	224.71	217.41	2,608.88
Wet Cake (tons/month)		246.33	1,068.95	1,857.05	1,674.20	1,508.18	1,571.52	646.34	948.93	1,335.77	1,545.89	1,390.79	1,381.02	1,264.58	15,174.97
% Total Solids		15.5	15.6	16.8	17.6	18.6	17.8	17.1	17.4	17.8	17.2	16.7	16.3	17.0	---

Notes:

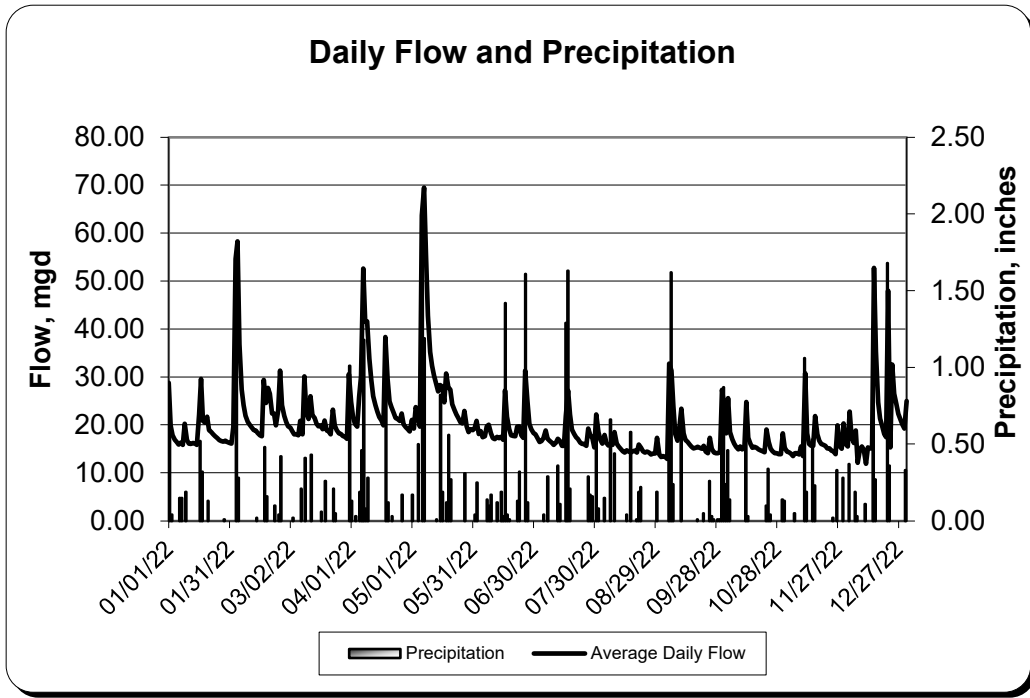
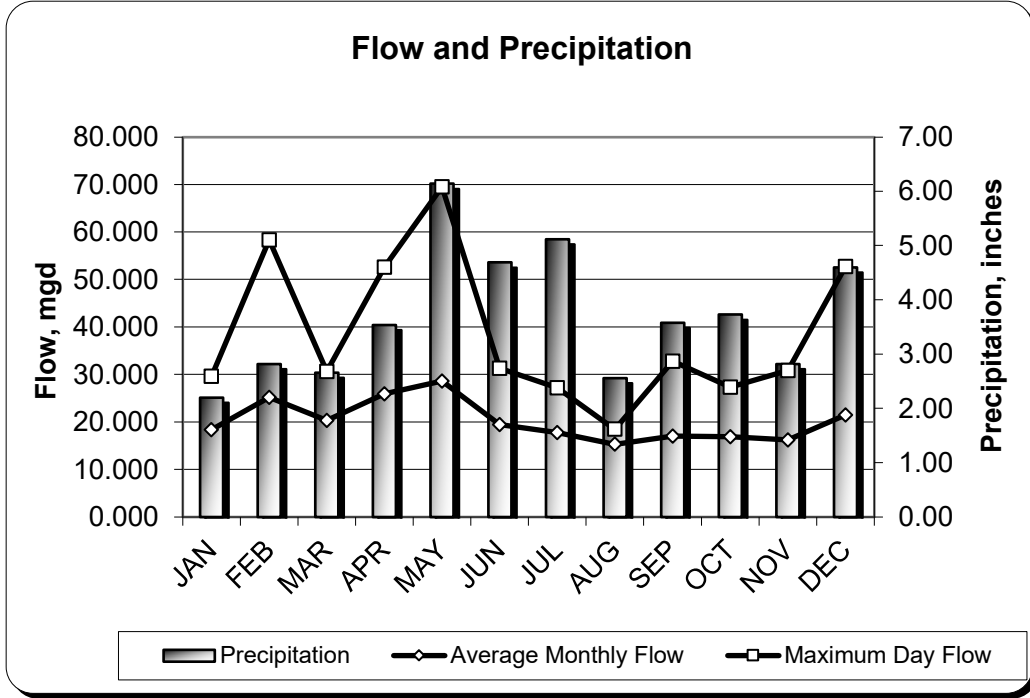
*Appendix D*

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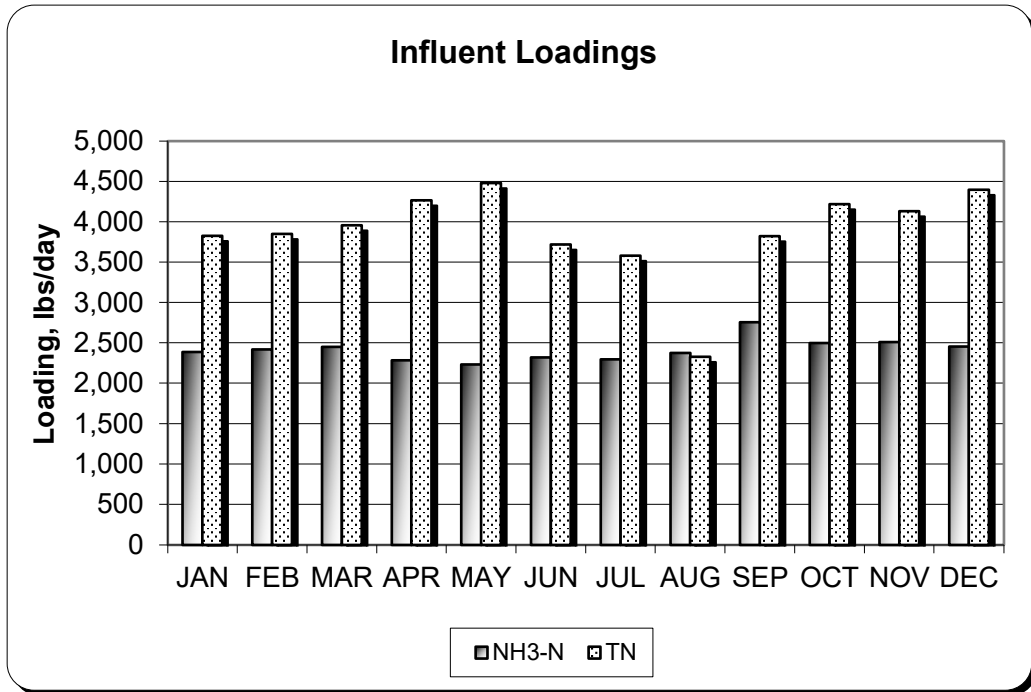
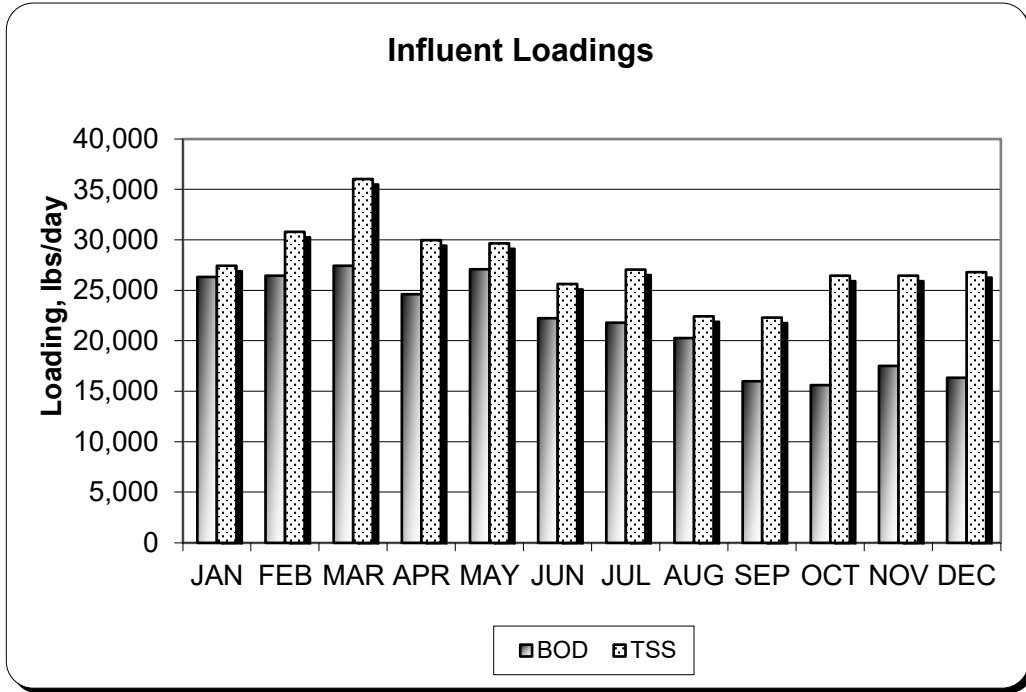
**Wastewater Treatment Plant -  
Operations Summary Graphs**



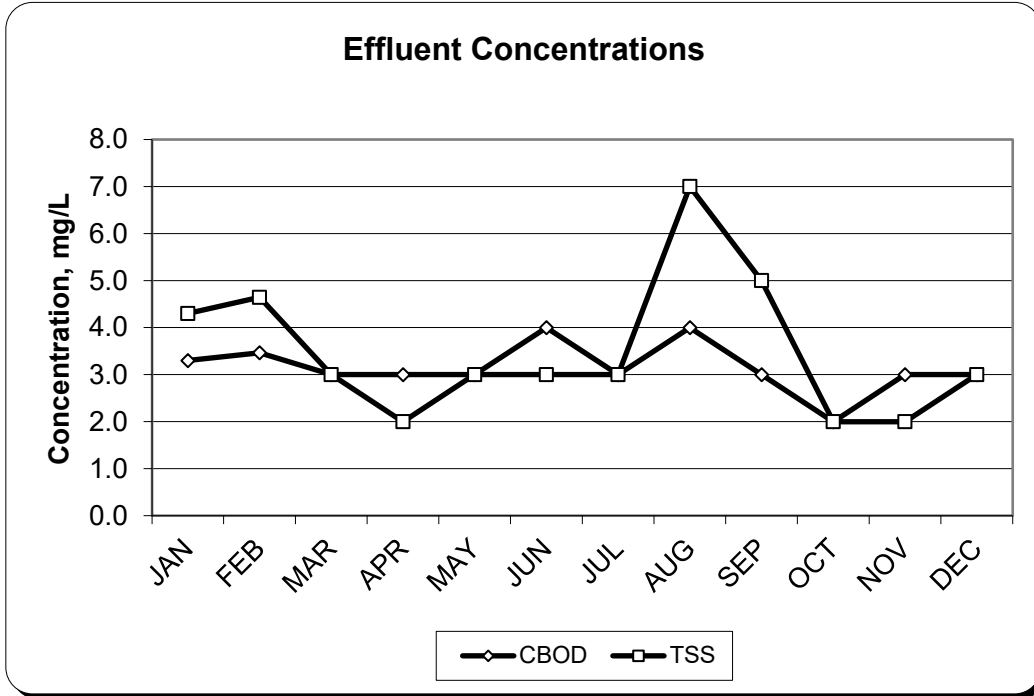
## Capital Region Water Wastewater Treatment Plant Calendar Year 2022



## Capital Region Water Wastewater Treatment Plant Calendar Year 2022

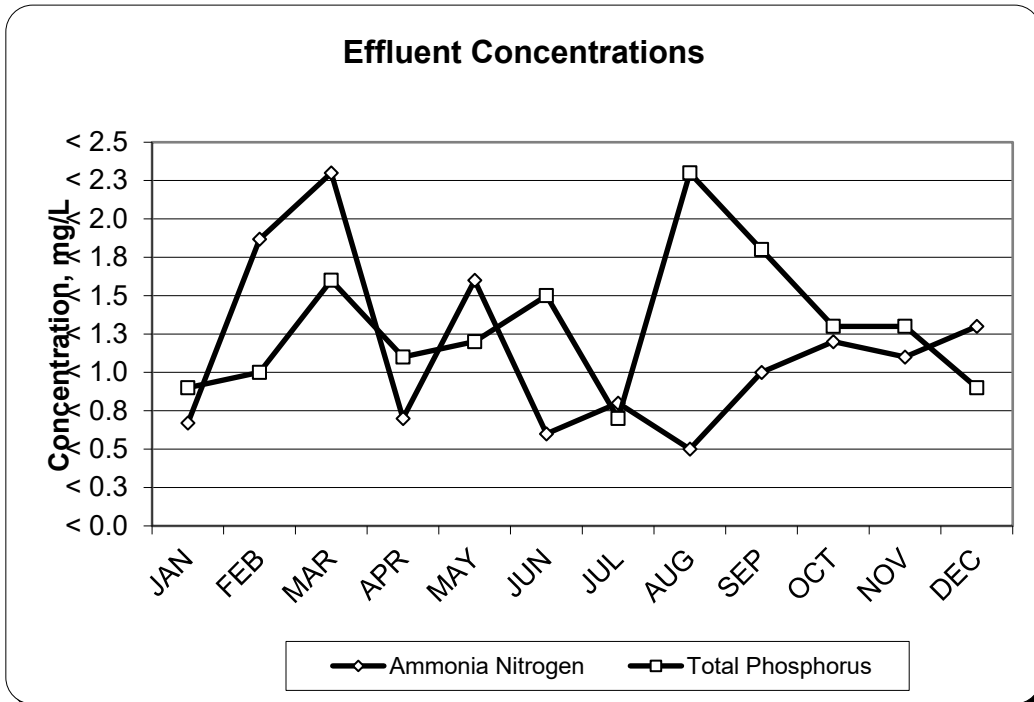


## Capital Region Water Wastewater Treatment Plant Calendar Year 2022



CBOD Monthly Average Discharge Limit: 25 mg/L

TSS Monthly Average Discharge Limit: 30 mg/L





**Capital Region Water  
Wastewater Treatment Plant  
Calendar Year 2022**

