Condition and Capacity Assessment Report

Jefferson County Public Sewer District

Festus and Crystal City WWTP and Sanitary Collection System Analysis

Project No. 180792
8/1/2025

Condition and Capacity Assessment Report

prepared for

Jefferson County Public Sewer District
Festus and Crystal City WWTP and Sanitary Collection System Analysis

Project No. 180792
8/1/2025

prepared by

Burns & McDonnell Engineering Company, Inc.

TABLE OF CONTENTS

Page No.

1.0 EXECUTIVE SUMMARY 1-1

2.0 COLLECTION SYSTEM CAPACITY ASSESSMENT 2-1

3.0 WWTP CONDITION AND CAPACITY ASSESSMENT 3-1

4.0 CAPITAL IMPROVEMENT PROJECT SUMMARY 4-1

APPENDIX A - *HYDRAULIC MODEL REPORT*
APPENDIX B – *FESTUS/CRYSTAL CITY WWTP MASTER PLAN*

LIST OF TABLES

Page No.
Table 2-1: Collection System Capital Improvement Project Summary 2-3
Table 3-1: WWTP Capital Improvement Project Summary 3-2
Table 4-1: Capital Improvement Project Summary 4-2

LIST OF FIGURES

Page No.
Figure 2-1: Collection System Capital Improvement Project Overview 2-4
Figure 2-2: Collection System Capital Improvement Project Phasing 2-5

1.0 EXECUTIVE SUMMARY

The Jefferson County Public Sewer District (District) recently acquired ownership of the collection system and wastewater treatment plant (WWTP) for the Festus and Crystal City service area. Upon acquisition, the District has desired to achieve a better understanding of the system through a capacity and condition assessment of the existing assets in the collection system and at the WWTP. The District has retained Burns & McDonnell to complete a comprehensive planning study for the Festus and Crystal City wastewater collection system and treatment plant. This effort supports a 20-year planning horizon to address system capacity, reliability, regulatory compliance, and future growth. The goals of this study include:

- Develop a further understanding of both the collection system and WWTP;
- Identify a framework for potential capital projects in the collection system and at the existing WWTP to facilitate both existing condition and anticipated growth; and,
- Develop a planning-level rough order of magnitude (ROM) pricing for the District's use on future planning for potential rate increases.

The results of this study are provided in the following attachments:

- **Appendix A**: *Hydraulic Model Report* – This report summarizes the field investigations, hydraulic model development, and existing and future conditions analysis for the collection system. It also includes a summary of the eight (8) identified capital improvements in the collection system.
- **Appendix B**: *Festus/Crystal City WWTP Master Plan* – This report summarizes the condition and capacity assessments for the processes at the existing WWTP. It also includes a summary of the seven (7) identified capital improvements at the WWTP.

2.0 COLLECTION SYSTEM CAPACITY ASSESSMENT

The District operates and maintains 89 miles of 6-inch to 30-inch sanitary sewer pipes that serve over 17,000 wastewater customers in Festus and Crystal City. The collection system capacity assessment included development of a hydraulic model to evaluate the available capacity in the existing collection system, calculate flows discharging to the WWTP, and determine improvements for future planning efforts. Additional details related to the collection system capacity assessment can be found in the *Hydraulic Model Report* in **Appendix A**.

A collection system hydraulic model was developed for the District's system using Bentley SewerGEMS software. Following initial data collection efforts, it was determined to reduce the modeled extents to only include main interceptor gravity sewers and three (3) lift stations with known capacity concerns. This was a result of limited elevation data being available for a majority of the system and in an effort to provide an analysis of a more specific area of the system. Once the hydraulic model was developed, historic water use data was incorporated into the model to assign sanitary loadings. An average daily sanitary loading of 1.46 MGD was included in the hydraulic model.

Utilizing the developed hydraulic model, an existing conditions analysis was completed. Following discussion with the District, three (3) distinct peaking factors were selected for analysis: 2.6, 2.7, and 4.0. In addition, a performance target was selected that any pipe for which the model predicts an elevated hydraulic grade line (HGL) above the crown of the pipe is considered to provide an inadequate level of service and is therefore a candidate for capital improvement plan (CIP) development. The hydraulic model estimates that approximately 20%, 21%, and 26% of pipes in the modeled system do not meet the selected performance target for peaking factors of 2.6, 2.7, and 4.0, respectively.

Following existing conditions analysis, a future conditions analysis was completed. This included development of population growth and sanitary loading projections for the 5-year and 20-year planning periods. This data was developed from owner-provided planned expansion in the service area, as well as the addition of a known industrial user that is anticipated to discharge 1 million gallons per day (MGD) of flow to the sanitary sewer. The same peaking factors and performance targets were used to analyze the system considering future growth. Under the full 20-year buildout scenario, the model estimates that approximately 28%, 28%, and 34% of pipes in the modeled system do not meet the selected performance target for peaking factors of 2.6, 2.7, and 4.0, respectively.

Using the results of the existing and future conditions analysis, CIPs were developed for the collection system. For this level of planning, it was assumed that only linear gravity sewer improvements would be

required and that all improvements would be along the same alignment as the existing gravity sewers. A 50% contingency is applied to account for items such as easements, difficult construction, and rail/stream crossings that should be further vetted during detailed engineering design. A total of eight (8) CIP projects were identified in the collection system. These projects, along with the rough order-of-magnitude (ROM) cost, are summarized in **Table 2-1** and shown in **Figure 2-1.**

In addition to project identification, a phased approach was taken for project implementation. All CIPs were divided into priority 1 and priority 2 to assist the District with project phasing and to accommodate budgets and resource allocations. The proposed project phasing is summarized in **Figure 2-2.**

Table 2-1: Collection System Capital Improvement Project Summary

CS-CIP Project No.	Project Name	Length (LF)			Cost		
		2.6 Peaking Factor	2.7 Peaking Factor	4.0 Peaking Factor	2.6 Peaking Factor	2.7 Peaking Factor	4.0 Peaking Factor
1A	Sunset Park Linear Gravity Sewer Improvements Part I	3,300	3,300	3,300	$4,000,000	$4,000,000	$4,000,000
1B	Sunset Park Linear Gravity Sewer Improvements Part II	2,200	2,200	2,200	$2,700,000	$2,700,000	$2,700,000
1C	Sunset Park Linear Gravity Sewer Improvements Part III	2,000	2,000	2,000	$2,400,000	$2,400,000	$2,400,000
2	Holly Drive Linear Gravity Sewer Improvements	900	900	900	$900,000	$900,000	$900,000
3	Chestnut Street Linear Gravity Sewer Improvements	600	600	600	$800,000	$800,000	$800,000
4A	Woodside Creek Drive Linear Gravity Sewer Improvements Part I	800	800	800	$800,000	$800,000	$1,000,000
4B	Woodside Creek Drive Linear Gravity Sewer Improvements Part II	1,800	1,800	1,800	$2,200,000	$2,200,000	$3,000,000
5	Festus Centre Drive Linear Gravity Sewer Improvements	500	500	500	$600,000	$600,000	$600,000
6	Elks Drive Linear Gravity Sewer Improvements	1,100	1,100	1,100	$1,400,000	$1,400,000	$1,400,000
7	Walmart Linear Gravity Sewer Improvements	800	800	800	$1,000,000	$1,000,000	$1,000,000
8	County Road Linear Gravity Sewer Improvements	1,900	1,900	1,900	$1,800,000	$1,800,000	$1,800,000
Total Length		15,900	15,900	16,900	$18,600,000	$18,600,000	$19,600,000

Figure 2-1: Collection System Capital Improvement Project Overview

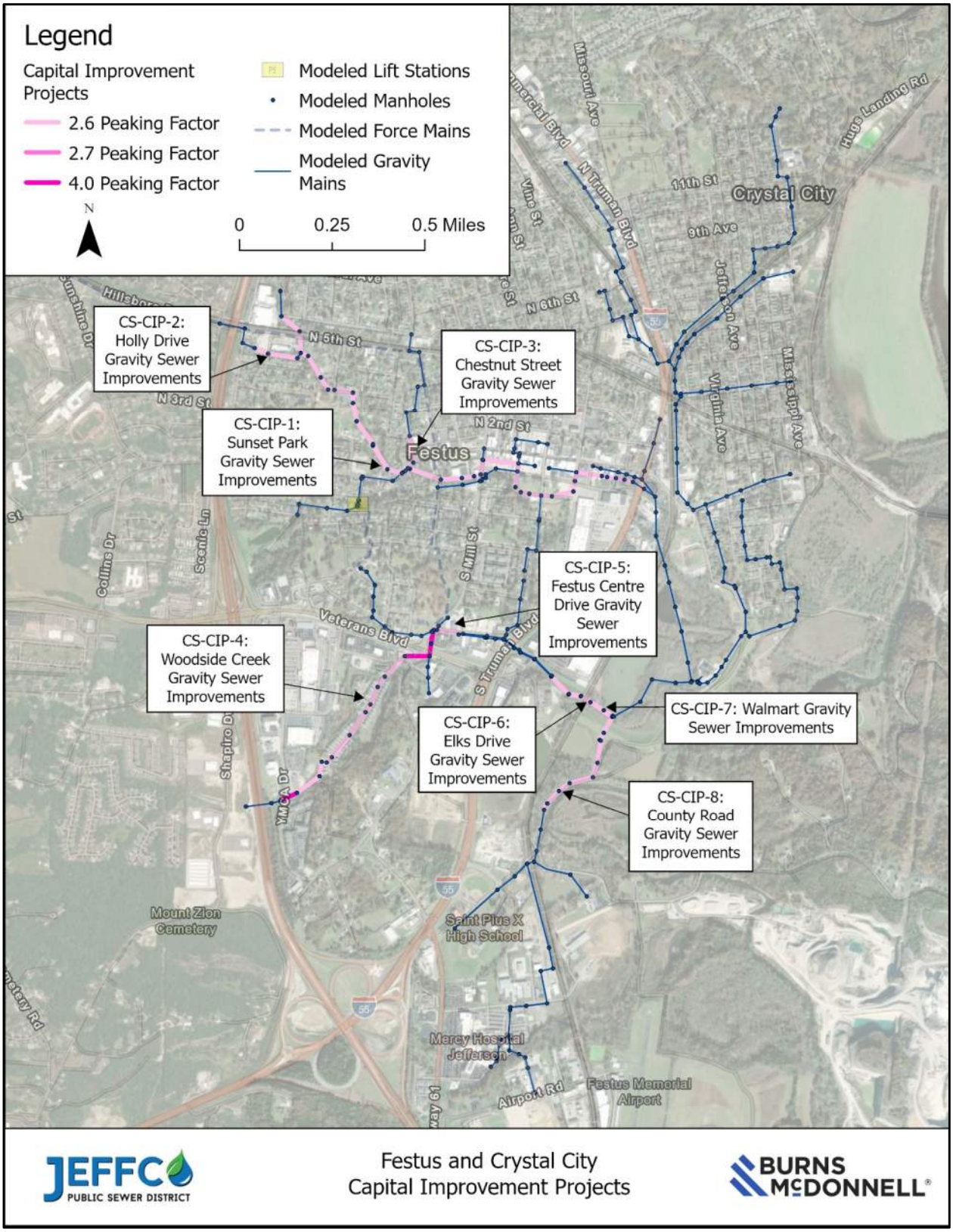
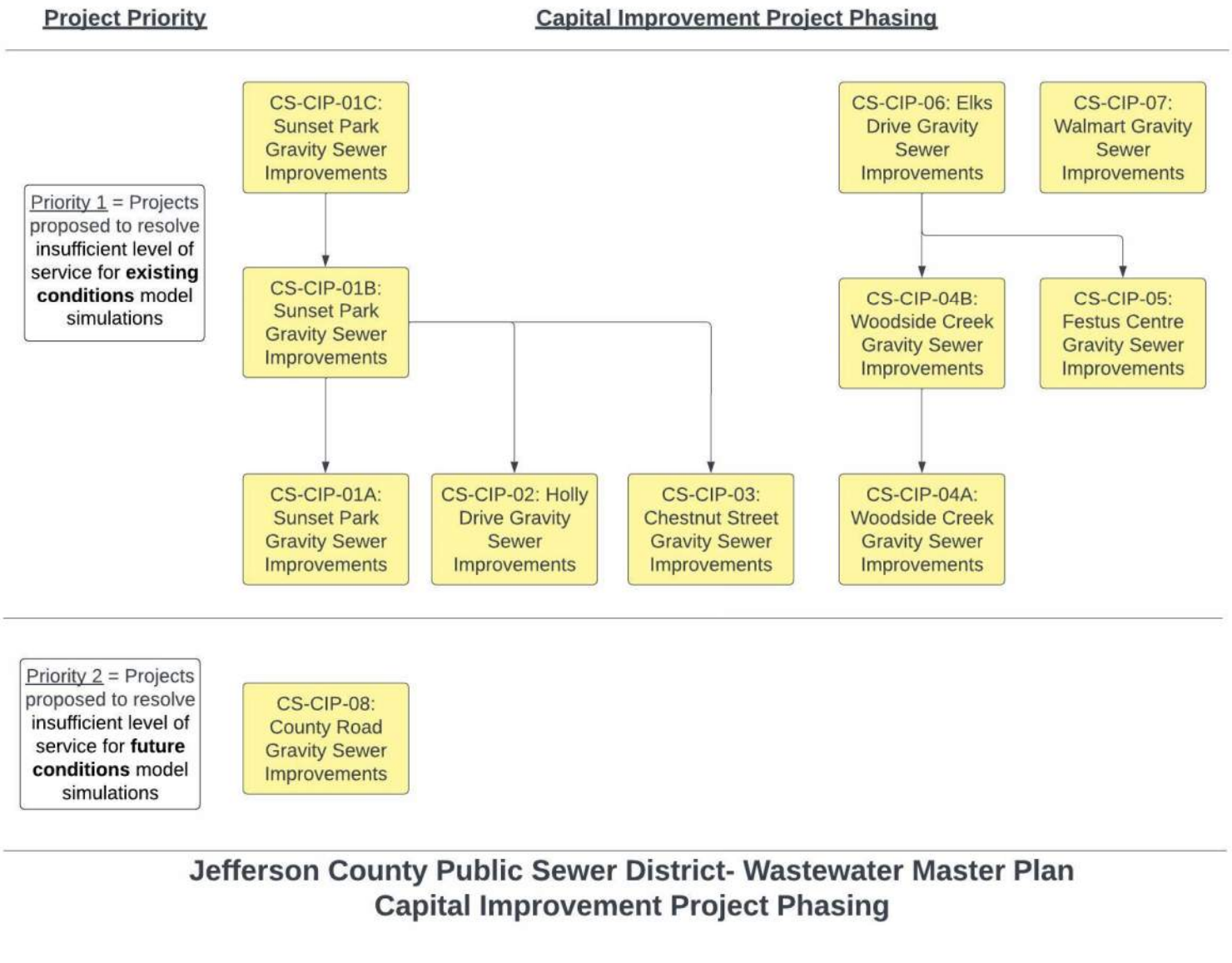


Figure 2-2: Collection System Capital Improvement Project Phasing



3.0 WWTP CONDITION AND CAPACITY ASSESSMENT

The Festus/Crystal City Wastewater Treatment Plant (WWTP), acquired by the District in 2024, was originally constructed in 2001 as a sequencing batch reactor (SBR) facility. Ultraviolet (UV) disinfection was added in 2007, and a finger weir effluent structure was installed in 2020. The master plan, developed by Burns & McDonnell, included an on-site condition assessment, analysis of historical and recent flow and loading data, and projections for future service area growth. A capacity evaluation was conducted to identify hydraulic and loading limitations. The plan provides a roadmap to position the WWTP for future regulatory compliance and capacity needs, while enhancing operational efficiency and reliability. Additional details related to the WWTP condition and capacity assessment can be found in the *Festus/Crystal City WWTP Master Plan* in **Appendix B**.

The facility is designed for an average flow of 3.0 MGD, a peak hourly flow of 12.5 MGD, and a decant effluent capacity of 14.7 MGD. Wastewater enters through the influent pump station and flows through preliminary treatment (screening and grit removal) before entering one of four SBR basins for biological treatment. Decant from the SBRs is treated via UV disinfection, passes through the finger weir structure, and is discharged to a tributary of Plattin Creek. Solids are aerobically digested and hauled offsite without dewatering. Because solids handling improvements are underway by the District, they were not included in the capacity evaluation or CIPs identified in the master plan.

A condition assessment was completed through a facility walkthrough with District staff and operators. Each process area was rated on a scale of 1 to 5 based on observed condition and operator feedback. The evaluation identified several pieces of aging equipment and opportunities for operational improvements, including HVAC restoration, diffuser replacement, screening upgrades, and additional instrumentation.

Influent wastewater characteristics were evaluated using historical Discharge Monitoring Report (DMR) data and a two-week sampling effort in March 2025. Discharge data was compared to the NPDES permit limit for CBOD, TSS, E. coli, ammonia, and oil and grease. All parameters except ammonia were below the permit level for all samples provided. In collaboration with the District, and informed by anticipated industrial growth, projected flows and loadings were developed. Several capital improvement projects are driven by the future full build-out of an anticipated large industrial user.

Hydraulic evaluations were performed for each major process area to identify potential capacity limitations under current and projected conditions. Key constraints were identified in the influent pump station, which lacks firm capacity to meet the design peak flow; the SBR system, which cannot meet projected organic loadings; and the blower system, which is undersized for future air demand.

Based on the condition and capacity assessments, seven capital improvement projects (CIPs) were identified. These include blower replacement, chemical phosphorus removal, the addition of two new SBR basins, miscellaneous SBR improvements, installation of a fourth influent pump, new screening equipment, and upgraded SCADA controls. Projects were prioritized based on criticality and grouped for constructability where appropriate. Rough order-of-magnitude (ROM) costs were developed using a 30% contingency and a 12% engineering fee to aid in the District's budgetary planning. A summary of identified CIPs and ROM costs is provided in **Table 3-1**.

Table 3-1: WWTP Capital Improvement Project Summary

CIP	Area	Priority	Project	ROM Cost
WWTP-CIP-1	SBR	High	Blower Room Improvements	$780,000
WWTP-CIP-2	SBR	High	TP Chem Feed System	$1,900,000
WWTP-CIP-3	SBR	High	SBR Expansion	$13,050,000
WWTP-CIP-4	SBR	Low	Additional Instrumentation	$1,520,000
			Splitter Box Gate Actuators	
			Diffuser Grid Replacement	
WWTP-CIP-5	IPS	Medium	Additional Influent Pump	$720,000
			Concrete Coating	
			HVAC Improvements	
			Influent Pump Valves	
WWTP-CIP-6	Influent Screening	Medium	Screening Equipment Replacement	$960,000
WWTP-CIP-7	SCADA	Low	SCADA Controls	$980,000
Total ROM Cost				**$19,910,000**

4.0 CAPITAL IMPROVEMENT PROJECT SUMMARY

Following the collection system and WWTP capacity and condition assessments, eight (8) CIPs were identified in the collection system and seven (7) CIPs were identified at the WWTP. Together, the identified improvements total approximately $40 million (M) of capital investment in the collection system and at the WWTP. (It should be noted that the total ROM cost estimate for the collection system is dependent on the owner selected peaking factor.) All CIP projects are summarized in **Table 4-1**.

Of the $40M identified capital improvements, approximately $15M of the capital investment is a direct result of addition of new industrial users. The District should maintain close coordination with these potential users to confirm the necessary capital investment required for the addition of these users.

Table 4-1: Capital Improvement Project Summary

	Project No.	Project Name	Low ROM Cost	High ROM Cost
Collection System CIPs	CS-CIP-1A	Sunset Park Linear Gravity Sewer Improvements Part I	$4,000,000	$4,000,000
	CS-CIP-1B	Sunset Park Linear Gravity Sewer Improvements Part II	$2,700,000	$2,700,000
	CS-CIP-1C	Sunset Park Linear Gravity Sewer Improvements Part III	$2,400,000	$2,400,000
	CS-CIP-2	Holly Drive Linear Gravity Sewer Improvements	$900,000	$900,000
	CS-CIP-3	Chestnut Street Linear Gravity Sewer Improvements	$800,000	$800,000
	CS-CIP-4A	Woodside Creek Drive Linear Gravity Sewer Improvements Part I	$800,000	$1,000,000
	CS-CIP-4B	Woodside Creek Drive Linear Gravity Sewer Improvements Part II	$2,200,000	$3,000,000
	CS-CIP-5	Festus Centre Drive Linear Gravity Sewer Improvements	$600,000	$600,000
	CS-CIP-6	Elks Drive Linear Gravity Sewer Improvements	$1,400,000	$1,400,000
	CS-CIP-7	Walmart Linear Gravity Sewer Improvements	$1,000,000	$1,000,000
	CS-CIP-8	County Road Linear Gravity Sewer Improvements	$1,800,000	$1,800,000
		Collection System Total ROM Cost	**$18,600,000**	**$19,600,000**
WWTP CIPs	WWTP-CIP-1	Blower Room Improvements	$780,000	
	WWTP-CIP-2	TP Chem Feed System	$1,900,000	
	WWTP-CIP-3	SBR Expansion	$13,050,000	
	WWTP-CIP-4	Additional Instrumentation	$1,520,000	
		Splitter Box Gate Actuators		
		Diffuser Grid Replacement		
	WWTP-CIP-5	Additional Influent Pump	$720,000	
		Concrete Coating		
		HVAC Improvements		
		Influent Pump Valves		
	WWTP-CIP-6	Screening Equipment Replacement	$960,000	
	WWTP-CIP-7	SCADA Controls	$980,000	
		WWTP Total ROM Cost	**$19,910,000**	**$19,910,000**
		Collection System + WWTP Total ROM Cost	**$38,510,000**	**$39,510,000**

APPENDIX A - *HYDRAULIC MODEL REPORT*

Hydraulic Model Report

Jefferson County Public Sewer District

Festus and Crystal City

Project No. 180792
8/1/2025

Hydraulic Model Report

prepared for

Jefferson County Public Sewer District
Festus and Crystal City

Project No. 180792
8/1/2025

prepared by

Burns & McDonnell Engineering Company, Inc.

TABLE OF CONTENTS

Page No.

1.0 INTRODUCTION 1-1

2.0 HYDRAULIC MODEL DEVELOPMENT 2-1
- **2.1** Collection System Data Summary 2-1
- **2.2** Pipe Network and Manhole Data 2-4
- **2.3** Lift Station Data 2-4
- **2.4** Model Extents 2-5
- **2.5** Sanitary Flows (Loading) 2-8
  - 2.5.1 Subcatchments 2-8
  - 2.5.2 Sanitary Flows Estimation 2-8

3.0 EXISTING CONDITIONS ANALYSIS 3-1
- **3.1** Performance Target 3-1
- **3.2** Peaking Factor Selection 3-1
- **3.3** Dry Weather Capacity Assessment 3-2
- **3.4** Wet Weather Capacity Assessment 3-3

4.0 FUTURE CONDITIONS ANALYSIS 4-1
- **4.1** Future Conditions Population Updates 4-2
- **4.2** 5-Year Planning Period: Dry Weather Capacity Assessment 4-4
- **4.3** 5-Year Planning Period: Wet Weather Capacity Assessment 4-4
- **4.4** 20-Year Planning Period: Dry Weather Capacity Assessment 4-6
- **4.5** 20-Year Planning Period: Wet Weather Capacity Assessment 4-7

5.0 CAPITAL IMPROVEMENT PLAN PROJECTS 5-1
- **5.1** Opinion of Probable Cost 5-4
- **5.2** CIP Priority 5-5

6.0 CONCLUSION 6-1

APPENDIX A - EXISTING CONDITIONS ANALYSIS RESULTS
APPENDIX B - FUTURE CONDITIONS ANALYSIS RESULTS
APPENDIX C – CAPITAL IMPROVEMENT PROJECT MAPS

LIST OF TABLES

Page No.
Table 2-1: Provided Information 2-1
Table 2-2: Hydraulic Model Feature Summary 2-2
Table 2-3: Pipe Material Summary 2-4
Table 2-4: Lift Station Asset Summary 2-4
Table 2-5: Data Asset Summary 2-6
Table 2-6: Collection System Existing Sanitary Loadings 2-9
Table 3-1: Dry Weather Conveyance Assessment Summary 3-2
Table 3-2: Existing Conditions – Design Flow Conveyance Assessment Summary – 2.6 Peaking Factor 3-3
Table 3-3: Existing Conditions – Design Flow Conveyance Assessment Summary – 2.7 Peaking Factor 3-3
Table 3-4: Existing Conditions – Desing Flow Conveyance Assessment Summary – 4.0 Peaking Factor 3-4
Table 4-1: 5-Year Planning Period: Dry Weather Conveyance Assessment Summary 4-4
Table 4-2: 5-Year Planning Period – Desing Flow Conveyance Assessment Summary – 2.6 Peaking Factor 4-5
Table 4-3: 5-Year Planning Period – Flow Conveyance Assessment Summary – 2.7 Peaking Factor 4-5
Table 4-4: 5-Year Planning Period – Flow Conveyance Assessment Summary – 4.0 Peaking Factor 4-5
Table 4-5: 20-Year Planning Period: Dry Weather Conveyance Assessment Summary 4-6
Table 4-6: 20-Year Planning Period – Design Flow Conveyance Assessment Summary – 2.6 Peaking Factor 4-7
Table 4-7: 20-Year Planning Period – Flow Conveyance Assessment Summary – 2.7 Peaking Factor 4-8
Table 4-8: 20-Year Planning Period – Flow Conveyance Assessment Summary – 4.0 Peaking Factor 4-8
Table 5-1: CIP Project Extent Summary 5-3
Table 5-2: CIP Project Cost Estimate Summary 5-5
Table 6-1: CIP Project Cost Estimate Summary 6-2

LIST OF FIGURES

Page No.
Figure 2-1: Existing Collection System Extents 2-3
Figure 2-2: Sanitary Sewer Hydraulic Model Extents 2-7
Figure 2-3: Existing Sanitary Loading Overview 2-10
Figure 4-1: Anticipated Future Growth Areas 4-3
Figure 5-1: CIP Projects Overview 5-2
Figure 5-2: CIP Phasing Diagram 5-7

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
BMcD	Burns & McDonnell Engineering Company, Inc.
CIP	Capital Improvement Project
d/D	Depth of Flow / Diameter of Pipe
Ft	Feet
Ft^2	Square Feet
GIS	Geospatial Information Systems
GPD	Gallons per Day
GPCD	Gallons per Capita per day
HGL	Hydraulic Grade Line
I/I	Inflow and Infiltration
In	Inch
MG	Million Gallons
MGD	Million gallons per day
PVC	Polyvinyl Chloride
q/Q	Design Flow / Full Flow Capacity of Pipe
SSO	Sanitary Sewer Overflow
USGS	US Geological Survey
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

Jefferson County Public Sewer District (District) operates and maintains 89 miles of 6-inch to 30-inch sanitary sewer pipes and a wastewater treatment plant (WWTP) that serves over 17,000 wastewater customers in Festus and Crystal City. The District has hired Burns & McDonnell (BMcD) to develop a hydraulic model to evaluate the available capacity in the existing collection system, calculate flows discharging to the WWTP, and identity capital improvements for future planning efforts.

The purpose of this report is to evaluate capacity in the existing system. This will be accomplished through:

- Hydraulic model development;
- Existing conditions analysis;
- Future conditions analysis considering planned growth for the 5-year and 20-year planning periods; and
- Identification of capital improvement project (CIPs) to understand existing capacity restrictions and planned growth for the 5-year and 20-year planning periods.

2.0 HYDRAULIC MODEL DEVELOPMENT

A collection system hydraulic model is used to simulate wastewater flow through a sewer collection system. The hydraulic model is used to predict the system conditions as wastewater moves through the system, considering system capacity estimated by pipe size, material, and slope.

The purpose of this existing collection system hydraulic model is to identify potential capacity problems in the sewer system, such as capacity bottlenecks, overflows, or backups, and to evaluate the impact of proposed upgrades on the system. By simulating different scenarios, such as increased flow due to population growth or changes in land use, the model can assist with making informed decisions about how to design, operate, and maintain the system.

A hydraulic model can also improve the system's performance by identifying areas where improvements can be made, such as upsizing pipes, adding storage capacity, or adjusting the operation of pumps or other facilities. A collection system hydraulic model is a tool for managing the complex and dynamic wastewater collection and treatment process.

The following sections describe the data provisioned and used to develop the hydraulic model. The software selected for the hydraulic model was SewerGEMS Version 10.03 by Bentley Systems. The hydraulic model was run as a steady state simulation due to limited flow data availability. Additional data, including flow monitoring data, would be required to run an extended period simulation.

2.1 Collection System Data Summary

Manholes, gravity sewers, force main pipes, and lift stations are the most critical components of hydraulic models as they allow flow to be routed through the system. This data was populated from various sources, including Geographic Information System (GIS) data and as-built drawings from the District, as well as collected survey data. The data provided are listed in **Table 2-1**.

Table 2-1: Provided Information

Information Provided	Information Source	Date Received
Manhole Data	GIS Shapefiles: *SanitaryStructures, Festus_MH, CC_MH, Approx_MH_Paper_MAP*	06/22/2023
Pipe Data	GIS Shapefiles: SanitaryGravityMains, SanitaryForceMains, Festus_San, CC_San, Approx_San_Paper_Map	06/20/2023
Pump Station Data	GIS Shapefiles: *F_CC_PS*	1/31/2025
WWTP As-Built Data	Festus Crystal City - As Builts 12-06-04.pdf ("Wastewater Treatment Facility Improvements")	1/31/2025

The shapefiles and as-built drawings consisted of information utilized to develop a functional hydraulic model. The data incorporated into the hydraulic model is summarized below in **Table 2-2.**

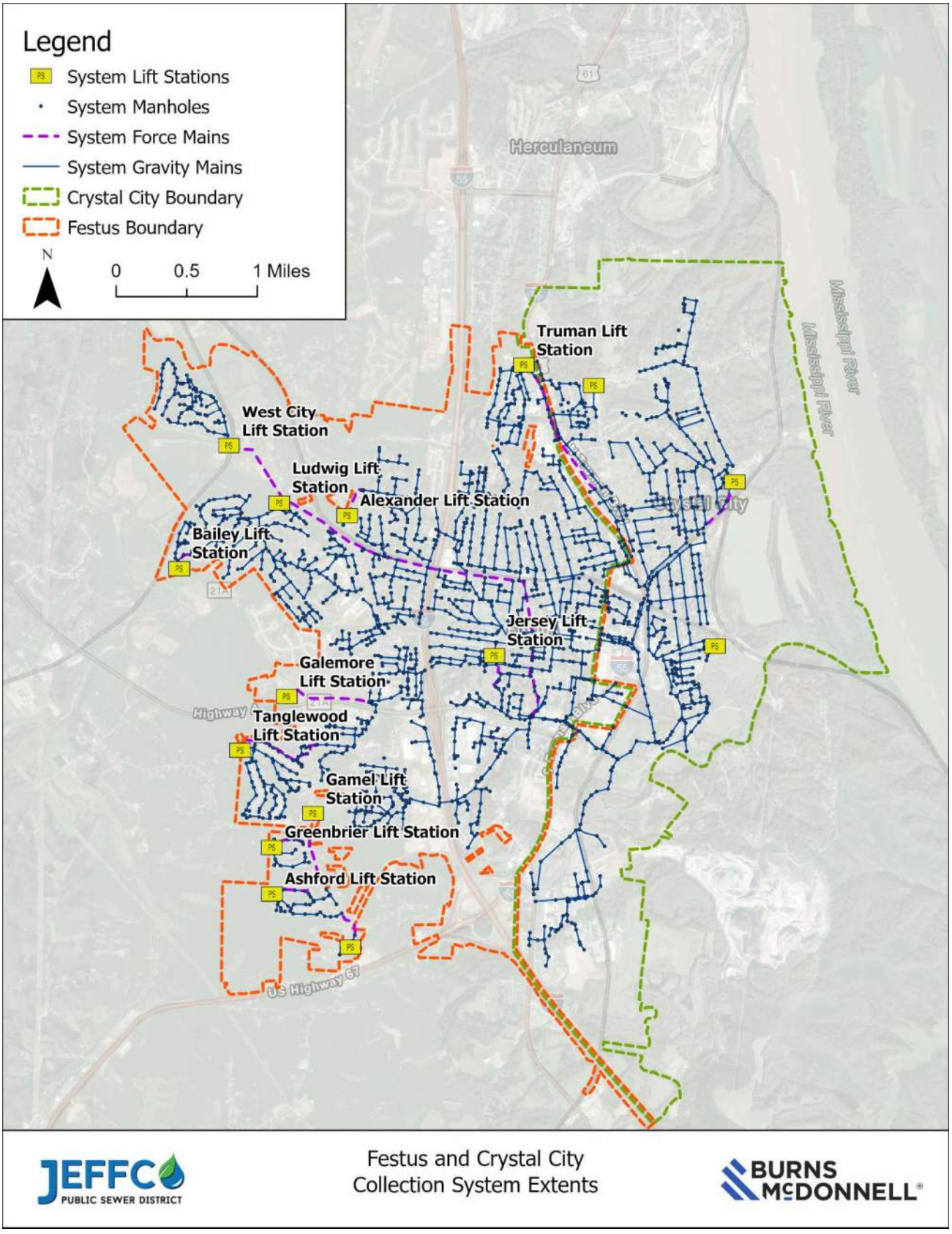
Table 2-2: Hydraulic Model Feature Summary

Feature	Total Count in System	Count Included in Hydraulic Model	% Included in Hydraulic Model	Total Length (ft) in System	Length (ft) Included in Hydraulic Model	% Length Included in Hydraulic Model
Manholes	2,150	321	15%	-	-	-
Gravity Sewer	2,111	321	16%	431,928	70,784	16%
Force Main Pipe	22	3	27%	35,808	14,991	42%

In areas where connectivity or invert elevation conflicts arose, additional field investigations and relative surveys were completed to resolve these issues. In some instances, manholes could not be located in the field. In instances where field investigations still left data gaps in the collected data, assumptions were made using industry standards to populate missing rim and invert data.

The following sections provide details related to the pertinent information required to build the hydraulic model and populate the data. When data was missing, industry standards were used to populate missing data.

Figure 2-1: Existing Collection System Extents



2.2 Pipe Network and Manhole Data

The District provided pipe network data in the form of GIS data with shapefiles. This information included the physical layout of the sanitary sewer gravity sewers, force mains, lift stations, and manholes. Partial attribute data was provided for pipe diameters and depths; however, information on rim elevations, invert elevations, pipe materials, and pipe sizes was limited. No data was provided regarding sanitary flow loads or lift station characteristics. Rim elevations were assumed equal to the ground elevations, which were estimated using the 2021 US Geological Survey (USGS) 1-meter resolution LiDAR data. The horizontal coordinate system is referenced to the North American Datum of 1983 (NAD83), Missouri East Zone, and vertical elevations are based on the North American Vertical Datum of 1988 (NAVD88).

When discrepancies arose, assumptions were made based on adjacent pipe size and materials. A summary of the pipe materials used in the model, along with their assumed Manning's n values, is provided in **Table 2-3**.

Table 2-3: Pipe Material Summary

Pipe Material	Assumed Manning's N Value
Cast Iron Pipe	0.015
Clay Pipe	0.013
Polyvinyl Chloride (PVC)	0.013

2.3 Lift Station Data

Three (3) of the fifteen (15) lift stations in the Festus and Crystal City sanitary sewer systems were included in the model. Detailed lift station data was unavailable, so assumptions were made to populate lift station information in the model. These assumptions are listed in **Table 2-4**. Pump capacities were assumed to match the full flow capacity of the upstream pipe. Wet wells were assumed to be 10 feet deep and 10 feet in diameter.

Table 2-4: Lift Station Asset Summary

Lift Station Name	Data Attribute	Assumption
Jersey Lift Station	Number of Pumps	1
	Pump Capacity (MGD)	2.53
	Wet Well Invert Elevation (ft)	415.0
	Wet Well Depth (ft)	10.0

Lift Station Name	Data Attribute	Assumption
	Wet Well Area (sq ft)	78.5
Ludwig Lift Station	Number of Pumps	1
	Pump Capacity (MGD)	2.61
	Wet Well Invert Elevation (ft)	410.0
	Wet Well Depth (ft)	10.0
	Wet Well Area (sq ft)	78.5
West City Lift Station	Number of Pumps	1
	Pump Capacity (MGD)	2.61
	Wet Well Invert Elevation (ft)	413.0
	Wet Well Depth (ft)	10.0
	Wet Well Area (sq ft)	78.5

2.4 Model Extents

The existing collection system includes approximately 89 miles of 6-inch to 30-inch diameter pipe. Following a model build review conducted with BMCD and the District in April 2025, the following criteria were used to determine the hydraulic model extents:

- The model will include all pipes 10-inches in diameter and larger that are currently marked as “In Service”.
- The model will include select pipes less than 10-inches in diameter when required for connectivity purposes (including small diameter forcemain pipes);
- The model will be extended to all known lift station locations of interest as identified by the District and will include three (3) pipes upstream of modeled wet wells.

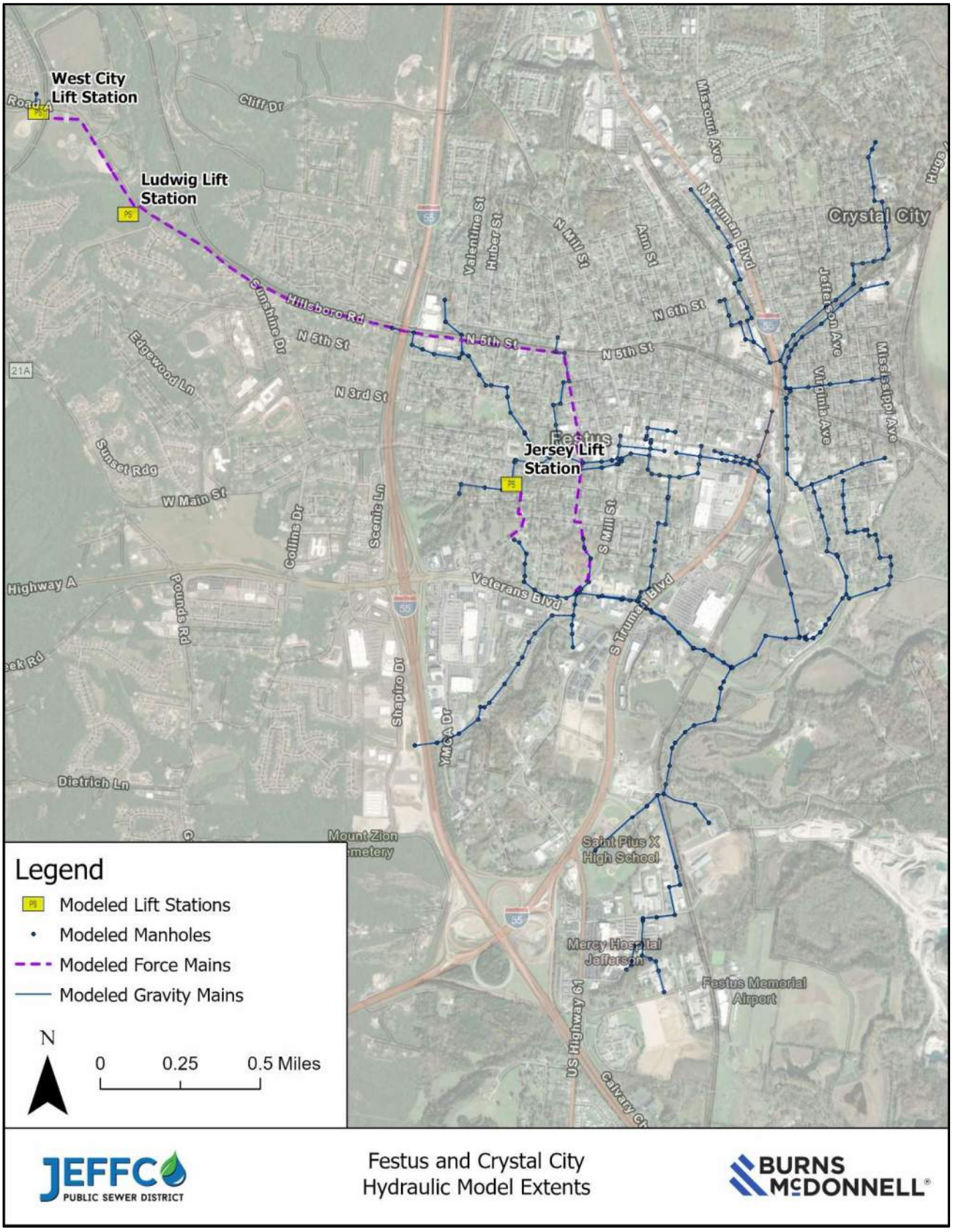
Approximately seventeen (17) miles of pipe, or 19% of the sanitary sewer system, is included in the hydraulic model for analysis.

Table 2-5: Data Asset Summary

Asset Type	Data Attribute	Total Number of Assets Included in Model	Number of Assumed Data Attributes in Model	% Data Attributes Assumed
Manhole	Ground/Rim Elevation	321	321	100%
Gravity Pipe	Diameter	321	149	46%
	Material	321	204	64%
	Upstream Invert Elevation	321	174	54%
	Downstream Invert Elevation	321	143	45%
Force Main	Diameter	3	3	100%
	Material	3	3	100%
	Upstream Invert Elevation	3	3	100%
	Downstream Invert Elevation	3	3	100%

Figure 2-2 provides an overview of the modeled extent of the sanitary sewer system.

Figure 2-2: Sanitary Sewer Hydraulic Model Extents



2.5 Sanitary Flows (Loading)

Sanitary flows (or sanitary loadings) are included in the model by delineation of subcatchments to determine the tributary area to each modeled manhole location and estimation of sanitary flows based on historical usage data.

2.5.1 Subcatchments

Subcatchments were drawn to represent the area that will directly contribute flow to the sanitary sewer system via private sewer laterals and non-modeled pipes. These areas are calculated as the sum of all the developed parcels, excluding large open areas such as parks and parking lots, which do not contribute sanitary flows to the system and are removed from the total subcatchment area. Subcatchments were delineated in the model for all areas contributing flow to the collection system. Sanitary loadings were applied into the model at the same manhole locations where each subcatchment connects. These loadings account for both the flow directly entering at each manhole and any additional upstream flow from areas outside the modeled network. Sanitary loadings are estimated as the total gallons per day usage for the entire subcatchment area.

2.5.2 Sanitary Flows Estimation

Historical water usage data as provided by the District was used to develop sanitary loading in the model. Historical water usage data was provided by the District in the form of Festus billing statements for one month and Crystal City billing statements for one year. The average day water demand for each customer in the collection system was estimated from the billing data. Service addresses from these billing statements were geolocated to spatially distribute water usage across the system. The average water usage per day was then loaded to the subcatchment in which it was located for use in the hydraulic model.

Sanitary loadings in each subcatchment were estimated to be the sum of all geolocated usage points within each subcatchment. For subcatchments that contained no geolocated usage points, average usage per day per acre values were estimated for both Festus and Crystal City, and these were multiplied by the contributing area of these subcatchments to estimate sanitary loading.

A conservative estimate of 100% of water demand returned to the sanitary sewer system during average day conditions was used in the model. The water demands in this area were assumed to be equivalent to sanitary loading. The sanitary loading for individual subcatchments were then assigned to the nearest modeled manhole.

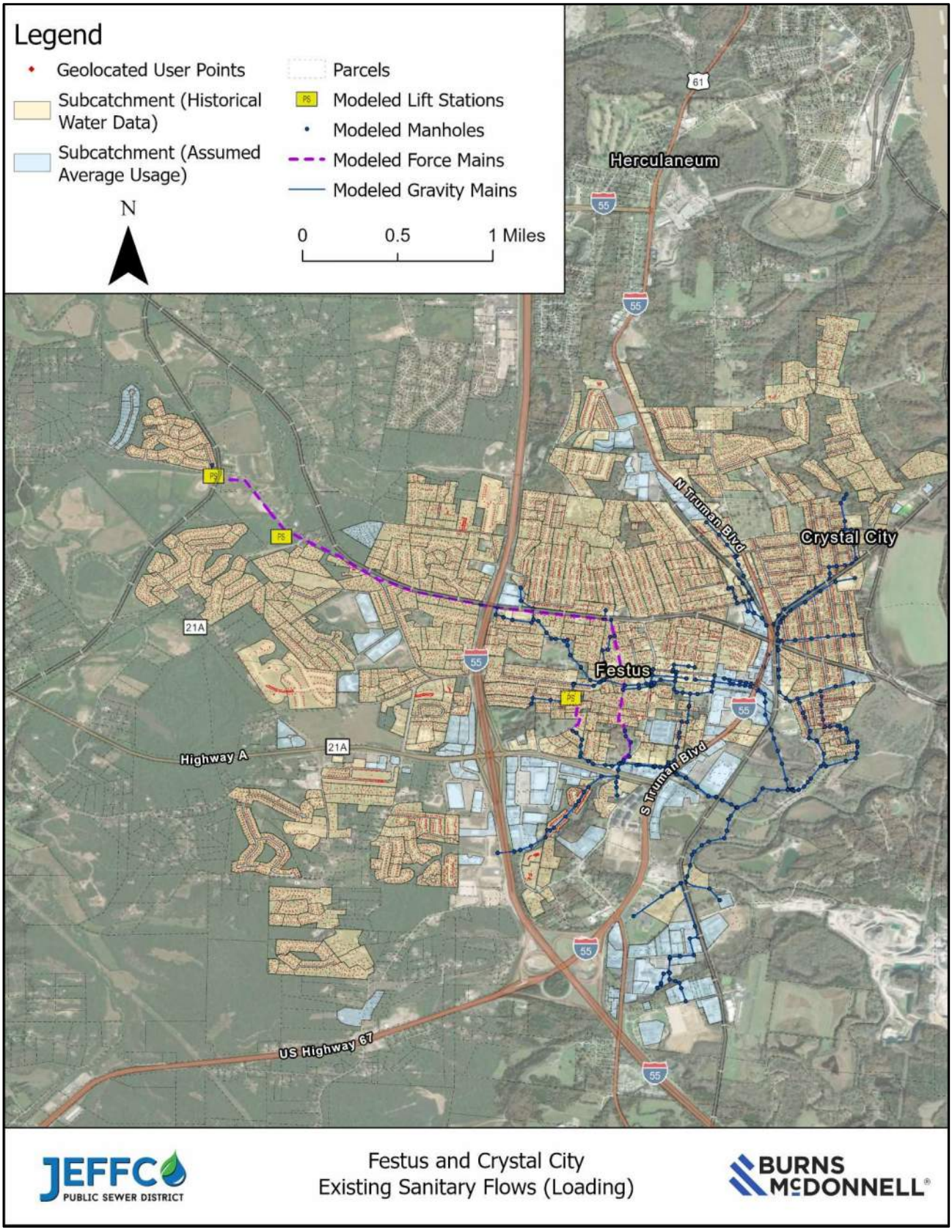
This assumption resulted in a sanitary loading of approximately 1,360,000 gallons per day (GPD) in Festus and 95,000 gallons per day (GPD) in Crystal City, totaling to a sanitary loading of 1,460,000 gallons per day GPD) for existing conditions. This correlates to an average gallons per capita per day value of approximately 85, which is reasonable and follows industry standards for communities of this size. **Table 2-6** summarizes the sanitary flow estimation summary in the collection system.

Table 2-6: Collection System Existing Sanitary Loadings

Area	Sanitary Loading (GPD)
Festus Existing Sanitary Loading	1,360,000
Crystal City Existing Sanitary Loading	95,000
Total Sanitary Loading in Hydraulic Model	**1,460,000**

During a meeting with the District on April 25, 2025, the facility team noted that the average yearly influent flows to the WWTP based on the last year of available data (2024) was estimated at 1.7 MGD. However, this estimate includes both dry weather days and days with elevated flows due to wet weather events. Therefore, it is determined to be reasonable that the total sanitary loadings in the hydraulic model are slightly less than the yearly estimate of 1.7 MGD at the WWTP.

Figure 2-3: Existing Sanitary Loading Overview



3.0 EXISTING CONDITIONS ANALYSIS

Following model development, existing conditions analysis was conducted. Model scenarios for the existing system were evaluated for the following conditions to estimate the sanitary sewer system's ability to convey flow:

- Existing system dry weather flow conditions; and
- Existing system wet weather conditions utilizing a peaking factor to estimate peak wet weather flows.

3.1 Performance Target

The hydraulic model was used to estimate the ability of the collection system to convey flows during dry and wet weather conditions. Performance targets were selected to determine when an asset was to be considered deficient and/or a candidate for CIP development.

Under dry weather conditions, pipe velocities were evaluated using the hydraulic model. The target cleansing velocity for pipes under dry weather flow conditions is 2 feet per second (fps). This is the target velocity to maintain flow to prevent odor issues, stagnant water, and potential biological build-up. Any pipe that the model did not estimate dry weather velocities meeting or exceeding 2 fps was considered to be deficient and did not meet the dry weather performance target.

Under wet weather conditions, the ability for pipes to convey peak wet weather flows was evaluated using the hydraulic model. Pipe capacity was estimated using the d/D ratio (where d is the depth of flow and D is the diameter of the pipe) and q/Q ratio (where q indicates the model predicted flow in the pipe and Q indicates the full flow capacity of the pipe). The d/D and q/Q ratios were used to estimate the capability of the collection system to convey flows. During a workshop hosted in June 2025, the performance target selected was that the hydraulic grade line (HGL) predicted by the model must stay below the crown of the pipe. Because of this, any pipe that exhibited a d/D value greater than or equal to 100% would not meet the selected performance criteria. Pipes that exhibit both a d/D value and q/Q value greater than or equal to 100% are considered to be under capacity and are a candidate for CIP development.

3.2 Peaking Factor Selection

As a steady state hydraulic model was utilized for analysis, peaking factors were applied in the hydraulic model to estimate wet weather flow conditions. In the model, the dry weather flow is multiplied by the

peaking factor to estimate peak wet weather flow conditions. Peaking factors were reviewed with the District during a workshop in June 2025, and three (3) peaking factors were selected for analysis in the hydraulic model:

- 2.6 – A peaking factor of 2.6 was determined from an analysis of the last five (5) years of historical data provided by the District. This peaking factor was also utilized in the wastewater treatment plant (WWTP) capacity analysis.

- 2.7 – A peaking factor of 2.7 was determined from the population curve for peaking factor analysis from Figure 1 in the *Recommended Standards for Wastewater Facilities (Ten States Standards)*.

- 4.0 – A peaking factor of 4.0 was determined based on past BMcD experience for wastewater facility design in the absence of reliable flow or historical data.

3.3 Dry Weather Capacity Assessment

A summary of the average dry weather pipe velocities is provided in **Table 3-1**. Figures showing existing conditions average dry weather flow results can be found in **Appendix A**.

Table 3-1: Dry Weather Conveyance Assessment Summary

Pipe Diameter (in)	Velocity < 2 fps	
	No. of Pipes	Length (ft) of Pipe
8	49	11,786
10	22	3,756
12	123	29,302
15	9	1,898
18	17	3,404
24	9	1,898
30	0	0
Total	229	52,043

There are 229 pipes (approximately 71%) in the modeled system for which the model predicts dry weather velocity less than the typical target of 2 fps. While the model predicts low velocities in these pipes, this does not necessarily indicate a problem with system operations, and these are not candidates for CIP

development. Routine cleaning in these areas should be performed to mitigate the potential for odor issues or biological buildup.

3.4 Wet Weather Capacity Assessment

The three (3) selected peaking factors were applied in the model to evaluate the system. A summary of the capacity assessment is provided in

Table 3-2 through **Table 3-4**. Figures showing existing conditions hydraulic model results can be found in **Appendix C**. It should be noted that since the selected performance requires no surcharging above the crown of the pipe (d/D value stay below 100%), only the d/D value are visualized in the figures in **Appendix C**.

Table 3-2: Existing Conditions – Design Flow Conveyance Assessment Summary – 2.6 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	27	5,392	9	1,831
10	16	2,603	4	1,293
12	15	3,121	12	2,088
15	2	495	1	31
18	3	920	0	0
24	1	14	0	0
30	0	0	0	0
Total	64	12,545	26	5,242

Table 3-3: Existing Conditions – Design Flow Conveyance Assessment Summary – 2.7 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	28	5,819	10	2,218
10	16	2,603	4	1,293
12	18	3,694	12	2,088
15	2	495	1	31
18	3	920	0	0
24	1	14	0	0

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
30	0	0	0	0
Total	68	13,545	27	5,629

Table 3-4: Existing Conditions – Desing Flow Conveyance Assessment Summary – 4.0 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	32	7,183	16	3,456
10	24	4,240	9	2,579
12	20	3,941	14	2,671
15	2	495	1	31
18	5	1,001	0	0
24	1	14	0	0
30	0	0	0	0
Total	84	16,874	40	8,737

Approximately 20%, 21%, and 26% of pipes exhibit model-predicted d/D values of 100% or greater for peaking factors of 2.6, 2.7, and 4.0, respectively. The predicted HGL is above the crown of the pipe, and these pipes do not meet the selected performance criteria. Pipes that also exhibit a q/Q value greater than 100% are candidates for CIP development. Approximately 8%, 8%, and 12% of pipes exhibit model-predicted q/Q values of 100% or greater for peaking factors of 2.6, 2.7, and 4.0, respectively.

4.0 FUTURE CONDITIONS ANALYSIS

Following completion of the existing conditions analysis, the hydraulic model was used to analyze the performance of the collection system for the five-year and twenty-year planning periods. The future conditions analysis incorporates the increase in population due to anticipated growth over the planning periods. It is important to note that this analysis assesses the capacity of the existing infrastructure to convey these future flows. No system improvements or upgrades are included in this evaluation. Model scenarios for the future system were evaluated for the same scenarios as existing conditions to estimate the sanitary sewer system's ability to convey flow:

- Future system dry weather flow conditions; and
- Future system wet weather conditions utilizing a peaking factor to estimate peak wet weather flows.

The same performance targets were used to analyze the future system:

- Under dry weather conditions, the performance target selected is that all pipes convey flow to meet a cleansing velocity of 2 fps; and
- Under wet weather conditions, the performance target selected is that there is no model-predicted surcharging above the crown of the pipe.

In addition, the same peaking factors were used to analyze wet weather flow conditions:

- 2.6 – A peaking factor of 2.6 was determined from an analysis of the last five (5) years of historical data provided by the District. This coincides with the peaking factor used for the capacity analysis of the WWTP.
- 2.7 – A peaking factor of 2.7 was determined from the population curve for peaking factor analysis from Figure 1 in the *Recommended Standards for Wastewater Facilities (Ten States Standards)*.
- 4.0 – A peaking factor of 4.0 was determined based on past BMcD experience for wastewater facility design in the absence of reliable flow or historical data.

4.1 Future Conditions Population Updates

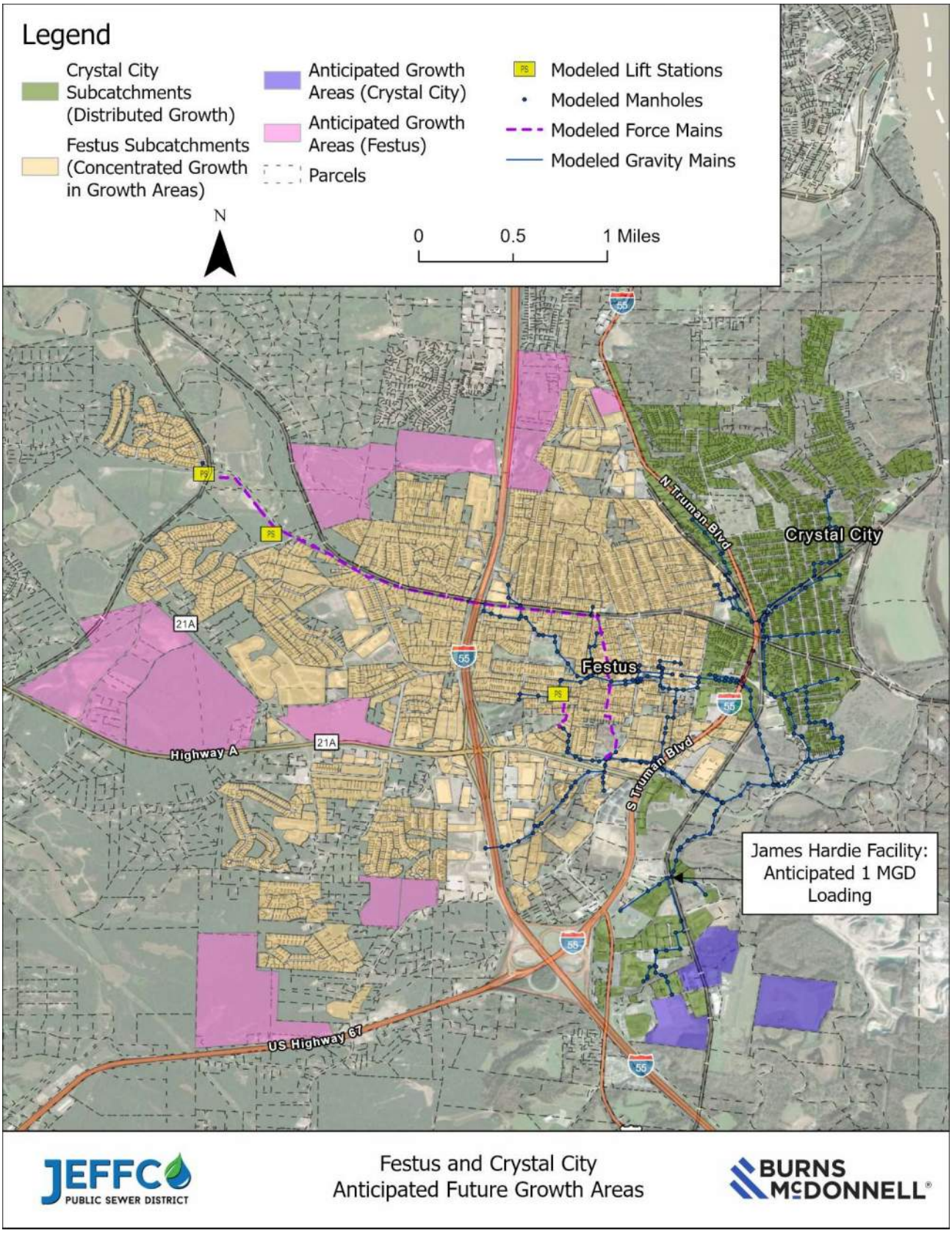
The District and BMcD met in April 2025 to confirm anticipated population growth and water demand loadings for Festus and Crystal City's service areas for the 5- and 20-year planning periods. During this meeting, it was determined by the District that development in both cities was assumed to follow linear growth patterns across the twenty-year planning period, with a 300,000 gpd increase in flow in Festus, and a 50,000 gpd increase in flow in Crystal City.

In Festus, future growth areas were included in the model and drawn as subcatchments that included the entire area as shown in the "City Growth Areas" section in the *Festus Water Master Plan*. **Figure 4-1** shows the proposed growth locations, indicated by the pink polygons.

In Crystal City, future loading was distributed evenly in the system by a weighted average of the area of each subcatchment compared to the total area. The District did not identify any known areas of growth or development, so distributing the water demand projections evenly allows for a more conservative estimate of future flows in the collection system.

In addition to these growth areas, the District anticipates the addition of a large water user with a demand of one million gallons per day (MGD) following the completion of the James Hardie facility. Based on a 2022 memo by Horner and Shifrin, it is anticipated that this facility will tie into the existing system at the intersection of Saint Pius Drive, VFW Drive, and County Road. A unit load of 1 MGD was incorporated into the 5-year planning period at manhole F_CC_MH-2170 to incorporate this user in the future conditions, as shown in **Figure 4-1**. The same unit load was used in the 20-year planning period.

Figure 4-1: Anticipated Future Growth Areas



4.2 5-Year Planning Period: Dry Weather Capacity Assessment

A summary of the dry weather capacity assessment considering the 5-year planning period is provided in **Table 4-1**. Figures showing future conditions average dry weather flow results can be found in **Appendix B**.

Table 4-1: 5-Year Planning Period: Dry Weather Conveyance Assessment Summary

Pipe Diameter (in)	Velocity < 2 fps	
	No. of Pipes	Length (ft) of Pipe
8	49	11,786
10	22	3,756
12	109	26,417
15	9	1,898
18	17	3,404
24	9	1,898
30	0	0
Total	215	49,158

There are 215 pipes (approximately 67%) in the modeled system for which the model predicts dry weather velocity less than the typical target of 2 fps. This indicates a decrease of 14 pipes (4%) that do not meet the target cleansing velocity. As growth occurs and additional flow is added to the system, it is anticipated that velocities will increase throughout the system, resulting in more pipes meeting target cleansing velocity during dry weather conditions as compared to existing system conditions, which is reflected in the model-predicted results.

While the model predicts low velocities in these pipes, this does not necessarily indicate a problem with system operations, and these are not candidates for CIP development. Routine cleaning in these areas should be performed to mitigate the potential for odor issues or biological buildup.

4.3 5-Year Planning Period: Wet Weather Capacity Assessment

The three (3) selected peaking factors were applied in the model to evaluate the system considering the 5-year planning period. A summary of the capacity assessment is provided in **Table 4-2** through **Table 4-4**. Figures showing existing conditions hydraulic model results can be found in **Appendix B**. It should be

noted that since the performance target selected was that there is no surcharging above the crown of the pipe (d/D value stay below 100%), only the d/D value is represented in the figures in **Appendix B**.

Table 4-2: 5-Year Planning Period – Desing Flow Conveyance Assessment Summary – 2.6 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	29	6,372	9	1,831
10	16	2,603	5	1,398
12	29	5,984	21	3,891
15	2	495	1	31
18	3	920	0	0
24	1	14	0	0
30	0	0	0	0
Total	80	16,388	36	7,150

Table 4-3: 5-Year Planning Period – Flow Conveyance Assessment Summary – 2.7 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	29	6,372	10	2,218
10	16	2,603	5	1,398
12	31	6,236	22	4,064
15	2	495	1	31
18	3	920	0	0
24	1	14	0	0
30	0	0	0	0
Total	82	16,640	38	7,710

Table 4-4: 5-Year Planning Period – Flow Conveyance Assessment Summary – 4.0 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	36	8,728	16	3,456
10	25	4,450	9	2,579
12	33	6,616	24	4,666

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
15	2	495	1	31
18	5	1,001	0	0
24	1	14	0	0
30	0	0	0	0
Total	102	21,304	50	10,731

Approximately 25%, 26%, and 32% of pipes exhibit model-predicted d/D values of 100% or greater for peaking factors of 2.6, 2.7, and 4.0, respectively. The predicted HGL is above the crown of the pipe, and these pipes do not meet the selected performance criteria. This indicates that an additional 5% - 6% of the pipes in the modeled system do not meet the selected performance criteria as compared to the existing conditions analysis. Pipes that also exhibit a q/Q value greater than 100% are candidates for CIP development. Approximately 11%, 12%, and 16% of pipes exhibit model-predicted q/Q values of 100% or greater for peaking factors of 2.6, 2.7, and 4.0, respectively.

4.4 20-Year Planning Period: Dry Weather Capacity Assessment

A summary of the dry weather capacity assessment considering the 20-year planning period is provided in **Table 4-5**. Figures showing future conditions average dry weather flow results can be found in **Appendix B**.

Table 4-5: 20-Year Planning Period: Dry Weather Conveyance Assessment Summary

Pipe Diameter (in)	Velocity < 2 fps	
	No. of Pipes	Length (ft) of Pipe
8	46	10,925
10	22	3,756
12	109	26,417
15	8	1,864
18	17	3,404
24	7	1,405
30	0	0
Total	209	47,770

There are 209 pipes (approximately 65%) in the modeled system for which the model predicts dry weather velocity less than the typical target of 2 fps. This indicates a decrease of 20 pipes (6%) that do not meet the target cleansing velocity. As growth occurs and additional flow is added to the system, it is anticipated that velocities will increase throughout the system, resulting in more pipes meeting target cleansing velocity during dry weather conditions as compared to existing system conditions, which is reflected in the model-predicted results.

While the model predicts low velocities in these pipes, this does not necessarily indicate a problem with system operations, and these are not candidates for CIP development. Routine cleaning in these areas should be performed to mitigate the potential for odor issues or biological buildup.

4.5 20-Year Planning Period: Wet Weather Capacity Assessment

The three (3) selected peaking factors were applied in the model to evaluate the system considering the 20-year planning period. A summary of the capacity assessment is provided in **Table 4-6** through **Table 4-8**. Figures showing existing conditions hydraulic model results can be found in **Appendix B**. It should be noted that since the selected performance requires no surcharging above the crown of the pipe (d/D value stay below 100%), only the d/D value are visualized in the figures in **Appendix B**.

Table 4-6: 20-Year Planning Period – Design Flow Conveyance Assessment Summary – 2.6 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	29	6,372	9	1,831
10	21	3,568	8	2,321
12	31	6,236	22	4,064
15	2	495	1	31
18	5	1,001	0	0
24	1	14	0	0
30	0	0	0	0
Total	89	17,686	40	8,247

Table 4-7: 20-Year Planning Period – Flow Conveyance Assessment Summary – 2.7 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	29	6,372	11	2,574
10	22	3,974	9	2,579
12	31	6,236	22	4,064
15	2	495	1	31
18	5	1,001	0	0
24	1	14	0	0
30	0	0	0	0
Total	90	18,092	43	9,248

Table 4-8: 20-Year Planning Period – Flow Conveyance Assessment Summary – 4.0 Peaking Factor

Pipe Diameter (in)	d/D > 100%		q/Q > 100%	
	No. of Pipes	Length (ft) of Pipe	No. of Pipes	Length (ft) of Pipe
8	36	8,728	17	3,762
10	27	4,977	12	3,264
12	37	8,554	28	5,472
15	2	495	1	31
18	7	1,301	2	386
24	1	14	0	0
30	0	0	0	0
Total	110	24,068	60	12,915

Approximately 28%, 28%, and 34% of pipes exhibit model-predicted d/D values of 100% or greater for peaking factors of 2.6, 2.7, and 4.0, respectively. The predicted HGL is above the crown of the pipe, and these pipes do not meet the selected performance criteria. This indicates an increase of approximately 8% of the pipes in the modeled system not meeting the selected performance criteria as compared to the existing conditions analysis. Pipes that also exhibit a q/Q value greater than 100% are candidates for CIP development. Approximately 12%, 13%, and 19% of pipes exhibit model-predicted q/Q values of 100% or greater for peaking factors of 2.6, 2.7, and 4.0, respectively.

5.0 CAPITAL IMPROVEMENT PLAN PROJECTS

Following the completion of the future conditions scenarios, a Capital Improvement Plan (CIP) was developed. The CIP has been developed to do the following:

- Identify linear gravity sewer improvements for areas in the existing collection system that do not meet the prescribed performance target, and
- Outline improvements to the collection system with the goal of meeting the prescribed performance targets during the 5-year and 20-year planning periods.

The gravity sewer system has a performance target of maintaining pipe flow below the crown of the pipe for design conditions within the selected peaking factor. Following discussions with the District in June 2025, three (3) peaking factors were selected for analysis and CIP development in the hydraulic model. The resulting project pipe lengths and costs for each peaking factor are summarized in the following sections. The District should select the peaking factor that best aligns with its long-term operational goals, level of service expectations, and acceptable level of risk related to system capacity and wet weather performance.

Gravity sewer improvements were sized to meet the desired performance targets for collection system conveyance. However, due to the limited amount of information provided for model construction, the reversed slope in pipes may be due to data errors. Existing system conditions, such as pipe size, material and invert elevations, should be confirmed before any CIP projects are considered.

A total of eight (8) CIP projects were identified. These are shown in **Figure 5-1**. The extents of each project are summarized in **Table 5-1.**

Figure 5-1: CIP Projects Overview

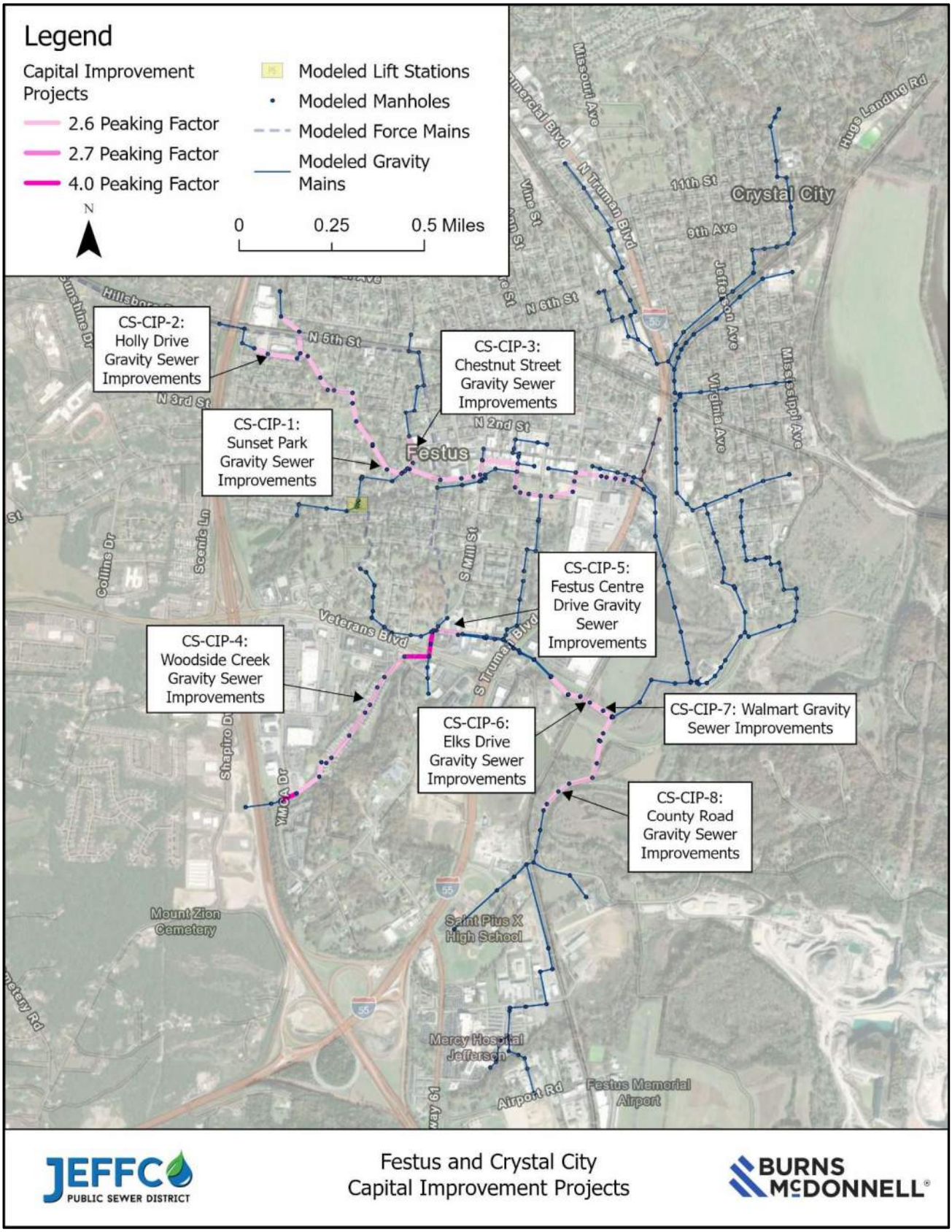


Table 5-1: CIP Project Extent Summary

CS-CIP Project No.	Project Name	Length (LF)		
		2.6 Peaking Factor	2.7 Peaking Factor	4.0 Peaking Factor
1A	Sunset Park Linear Gravity Sewer Improvements Part I	3300	3300	3300
1B	Sunset Park Linear Gravity Sewer Improvements Part II	2200	2200	2200
1C	Sunset Park Linear Gravity Sewer Improvements Part III	2000	2000	2000
2	Holly Drive Linear Gravity Sewer Improvements	900	900	900
3	Chestnut Street Linear Gravity Sewer Improvements	600	600	600
4A	Woodside Creek Drive Linear Gravity Sewer Improvements Part I	800	800	800
4B	Woodside Creek Drive Linear Gravity Sewer Improvements Part II	1800	1800	1800
5	Festus Centre Drive Linear Gravity Sewer Improvements	500	500	500
6	Elks Drive Linear Gravity Sewer Improvements	1100	1100	1100
7	Walmart Linear Gravity Sewer Improvements	800	800	800
8	County Road Linear Gravity Sewer Improvements	1900	1900	1900
Total Length		15,900	15,900	16,900

5.1 Opinion of Probable Cost

Estimates, forecasts, projections, and schedules prepared by BMcD related to costs, quantities, demand, or pricing (including, but not limited to, property costs, construction, operations, maintenance costs, and/or energy or commodity demand and pricing), are opinions based on BMcD's experience, qualifications, and judgement. BMcD has no control over weather, cost and availability of labor, material and equipment, labor productivity, energy or commodity pricing, demand or usage, population demographics, market conditions, changes in technology, and other economic or political factors affecting such estimates or projections. In addition, BMcD has no control over the uncertainty and potential disruptions to the labor and work force and supply chain caused by a regional, national, or global outbreak and spread of an infectious disease, such as COVID-19. Additionally, the uncertainty and potential disruptions to material pricing and supply chain caused by tariffs may have an impact on these projects, the exact cost of which can neither be predicted nor controlled. At this time, it is impossible to foresee or to predict the full impact of tariffs around the world and, therefore, no additional cost nor contingency specifically for tariffs were included. It should be acknowledged that actual results may vary significantly from the representations and opinions herein, and nothing herein shall be construed as a guarantee or warranty of conclusions, results, or opinions. BMcD makes no guarantee or warranty (actual or implied) that costs, schedules, quantities, and related items will not vary from the opinions contained in the estimates, schedules, results, or other statements or opinions prepared by BMcD.

For unit costs on new sewer construction, regional costs were used based on BMcD's experience on similar projects. Opinions of probable costs have been developed for each of the planning level CIPs and should be verified during detailed design. It should be noted that costs are in 2025 dollars. Costs were not inflated for CIPs based on project priority or anticipated phasing. Subtotal costs have been rounded up to the nearest $100,000 prior to adding engineering, administration, or contingency. A 20-percent cost (based on the project subtotal) was included to account for engineering and administration fees. A 30-percent contingency (based on the project subtotal) was applied to all CIPs to account for the construction cost and design efforts due to the planning level of detail.

Linear gravity sewer improvements were estimated at a cost of $600 per linear foot, assuming typical open-cut construction under standard conditions. This rate reflects projects without specialized construction challenges such as road, rail, or stream crossings. For projects involving these items, a higher unit cost of $800 per linear foot was applied to account for added construction effort, permitting, and restoration. The estimates presented in the following sections represent planning-level estimates and should be refined during detailed design based on site-specific conditions and constructability constraints.

Eight (8) CIPs have been identified as part of this report. This includes seven (7) Priority 1 projects and one (1) Priority 2 project. The Opinion of Probable Cost for all projects is summarized in **Table 5-2**.

Table 5-2: CIP Project Cost Estimate Summary

CIP Project No.	Project Name	Cost		
		2.6 Peaking Factor	2.7 Peaking Factor	4.0 Peaking Factor
1	Sunset Park Linear Gravity Sewer Improvements	$4,000,000	$4,000,000	$4,000,000
1B	Sunset Park Linear Gravity Sewer Improvements Part II	$2,700,000	$2,700,000	$2,700,000
1C	Sunset Park Linear Gravity Sewer Improvements Part III	$2,400,000	$2,400,000	$2,400,000
2	Holly Drive Linear Gravity Sewer Improvements	$900,000	$900,000	$900,000
3	Chestnut Street Linear Gravity Sewer Improvements	$800,000	$800,000	$800,000
4	Woodside Creek Drive Linear Gravity Sewer Improvements Part I	$800,000	$800,000	$1,000,000
4B	Woodside Creek Drive Linear Gravity Sewer Improvements Part II	$2,200,000	$2,200,000	$3,000,000
5	Festus Centre Drive Linear Gravity Sewer Improvements	$600,000	$600,000	$600,000
6	Elks Drive Linear Gravity Sewer Improvements	$1,400,000	$1,400,000	$1,400,000
7	Walmart Linear Gravity Sewer Improvements	$1,000,000	$1,000,000	$1,000,000
8	County Road Linear Gravity Sewer Improvements	$1,800,000	$1,800,000	$1,800,000
Total Cost		$18,600,000	$18,600,000	$19,600,000

5.2 CIP Priority

A priority level was assigned to each CIP to assist the District with project phasing and to accommodate budgets and resource allocations. The following project priorities have been proposed to assist with project phasing:

- Priority 1 = Projects proposed to resolve insufficient level of service for existing conditions.
- Priority 2 = Projects proposed to resolve insufficient level of service for future conditions.

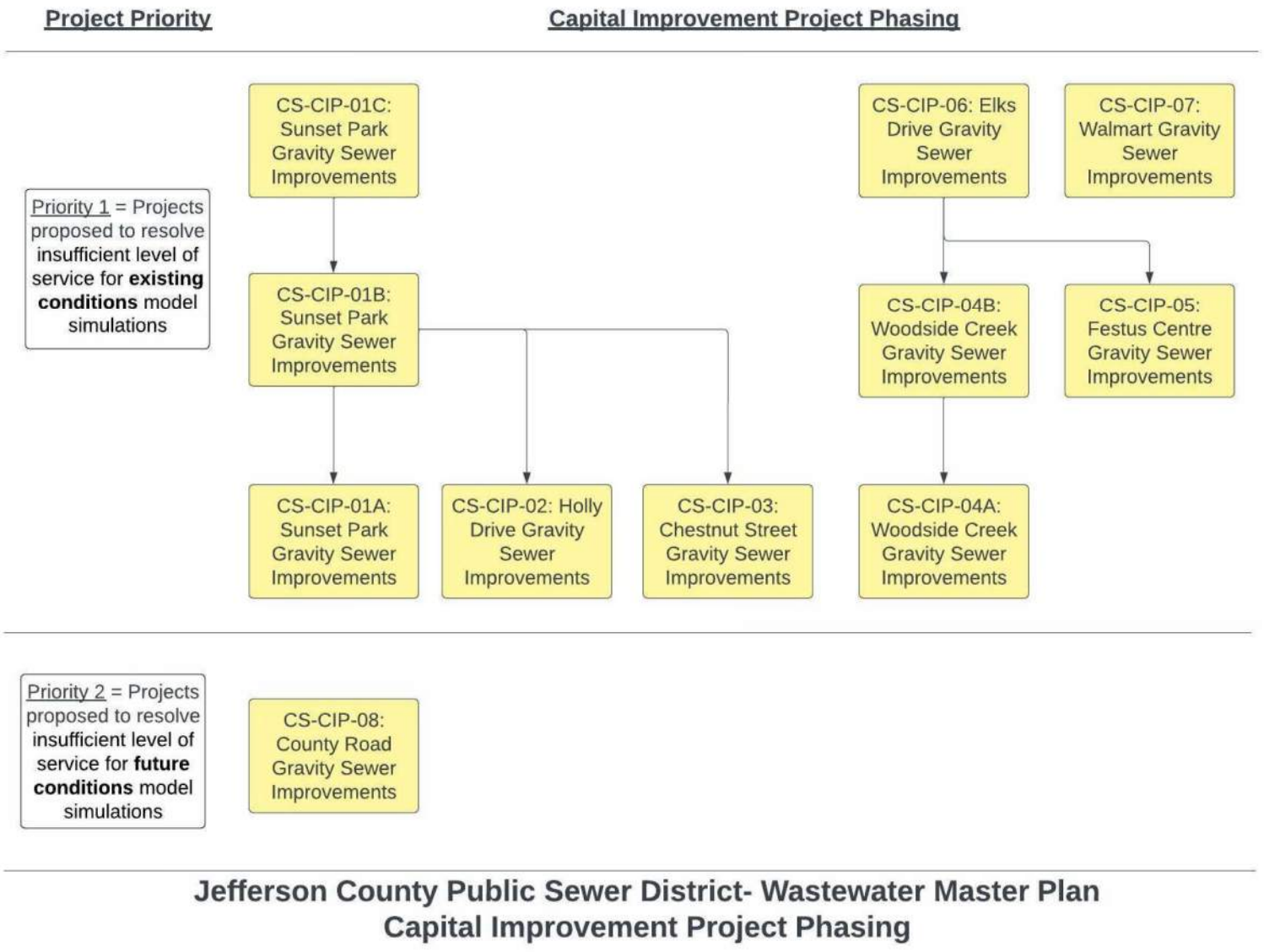
Each CIP has been assigned one of the above project priorities. These priorities can assist the District in determining which project(s) are a higher priority to complete and can be phased based on budget and resource availability. A specific year of completion (e.g., complete by 2030 or complete within 5-years) was not provided to allow more flexibility. Projects should be implemented downstream to upstream in an effort to provide capacity in the downstream system. In addition, this will help prevent backups from moving from one area of the system to another. Projects that need to be completed prior to other projects beginning are shown by solid lines with arrows in the CIP figures.

Priority 1 projects are intended to be completed before Priority 2 projects. Ideally, Priority 1 and 2 projects are completed within the 20-year planning period as included in this report. Following the 20-year planning period, any projects not completed should be reassessed to determine changes in the system and if these projects are still required.

It should be noted that Project CS-CIP-08 is proposed to facilitate the addition of the James Hardie facility. This project should be completed prior to the facility coming into service. Close coordination should be conducted with the facility to confirm the exact discharge location, development schedule, flow allocations, and flow discharge timings.

Figure 5-2 provides a summary of CIP priority and phasing.

Figure 5-2: CIP Phasing Diagram



6.0 CONCLUSION

A hydraulic model was developed to evaluate the capacity of the Festus and Crystal City sanitary sewer systems during the five (5) year and twenty (20) year planning periods. The capacity analysis showed that the collection system experiences capacity restrictions and model predicted overflows for existing conditions and both the five (5) year and twenty (20) year planning periods. For existing conditions, the model predicts that approximately 20%, 21%, and 26% of gravity pipes within the collection system exceed the predicted d/D values of 100% for peaking factors of 2.6, 2.7, and 4.0, respectively. These pipes have adverse slopes and can be resolved with linear improvements in these areas, and eight (8) CIP projects have been developed to address these issues. However, due to the limited amount of information provided for model construction, the reversed slope in pipes may be due to data errors. System conditions should be confirmed before any CIP projects are considered.

It should be noted that assumptions were required to populate some data items in the model that may impact the modeled results presented in this report. A list of key assumptions with possible areas of refinement is included below.

- The rim and invert elevations in both the Festus and Crystal City sanitary systems were largely unknown and assumed through engineering judgment. Model refinement can be obtained by conducting survey and/or manhole inspections of both sanitary systems to confirm connectivity and profile data.

- In addition to rim and invert elevations, pipe diameters and materials were largely unknown and spot verified through field investigations for the Crystal City sanitary system. Similar to the inverts, pipe materials and diameters can be refined in the model by conducting survey or CCTV condition assessment of the system.

- The model was developed as a steady-state simulation due to the lack of continuous flow and rainfall monitoring data. If the District desires a more detailed understanding of system performance during wet weather events, the implementation of a flow monitoring program in the future would facilitate such analysis. This would allow for identification of potential sources of inflow and infiltration (I/I) and enable the District to better evaluate system response to variable flow conditions and storm events, supporting more refined CIP development.

Planning-level Opinions of Probable Cost were developed for the eight (8) identified CIPs using regional unit pricing and engineering judgment. All estimates are presented in 2025 dollars and include a 20%

allowance for engineering and administration, along with a 30% contingency to reflect the preliminary level of design. Unit rates for linear gravity sewer construction range from $600 to $800 per linear foot, depending on complexity and site conditions. The Opinion of Probable Cost for all projects is summarized in **Table 6-1**.

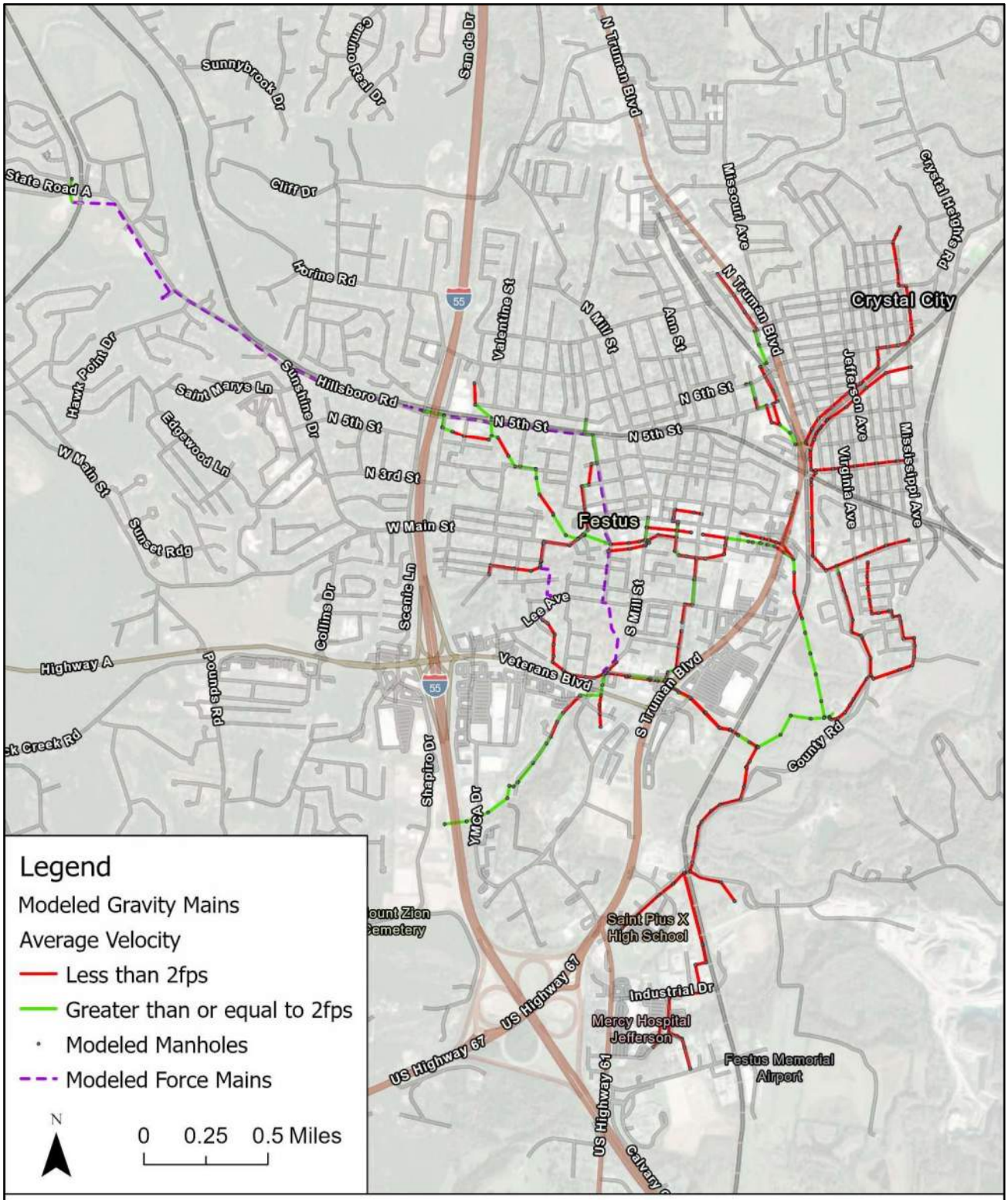
The total estimated CIP cost is approximately $18.6 million for peaking factors of 2.6 and 2.7, and $19.6 million for a peaking factor of 4.0. These estimates are intended to serve as a starting point for capital planning and are subject to change pending further design development, permitting, and site-specific investigations.

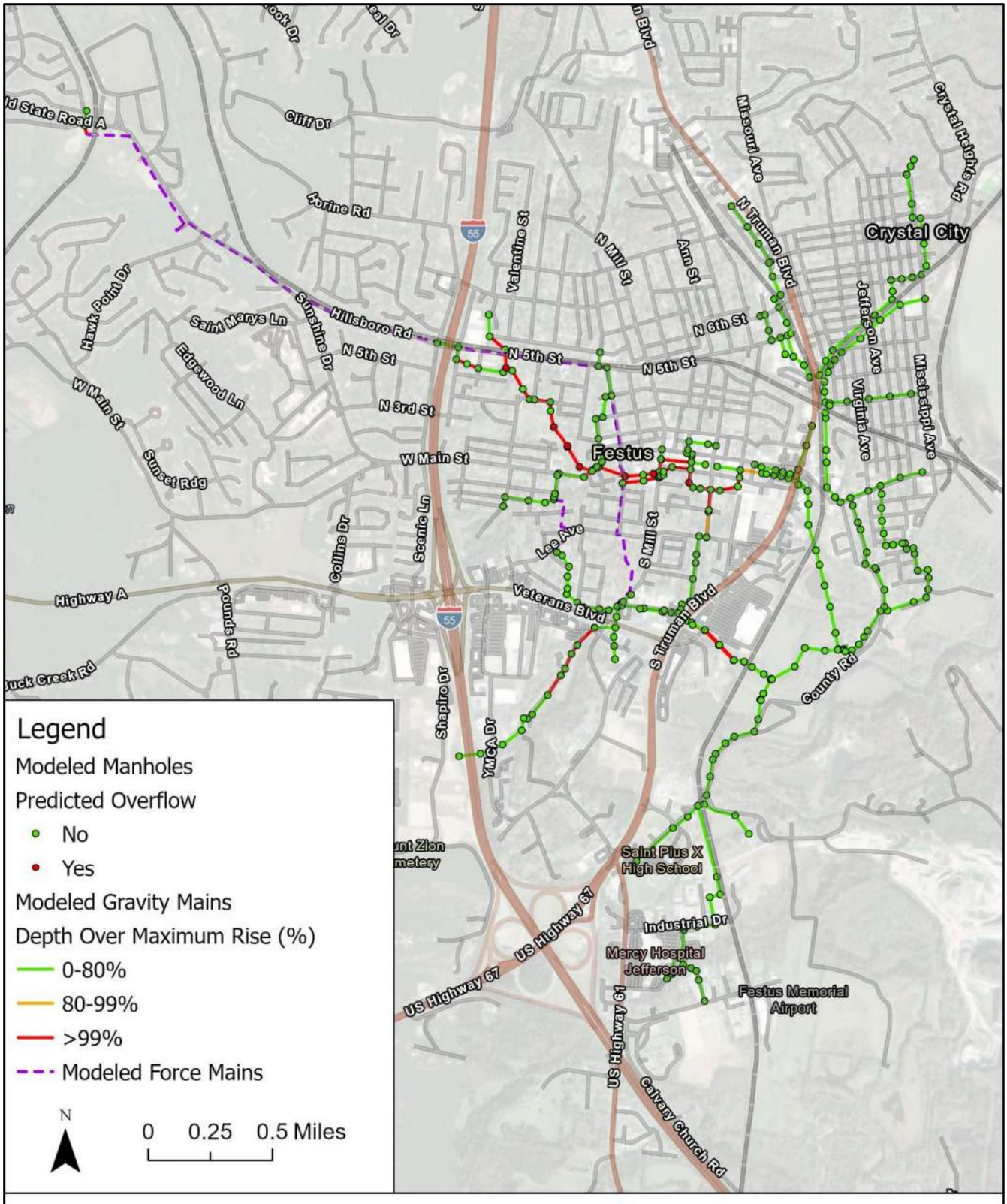
Table 6-1: CIP Project Cost Estimate Summary

CIP Project No.	Project Name	Cost		
		2.6 Peaking Factor	2.7 Peaking Factor	4.0 Peaking Factor
1	Sunset Park Linear Gravity Sewer Improvements	$4,000,000	$4,000,000	$4,000,000
1B	Sunset Park Linear Gravity Sewer Improvements Part II	$2,700,000	$2,700,000	$2,700,000
1C	Sunset Park Linear Gravity Sewer Improvements Part III	$2,400,000	$2,400,000	$2,400,000
2	Holly Drive Linear Gravity Sewer Improvements	$900,000	$900,000	$900,000
3	Chestnut Street Linear Gravity Sewer Improvements	$800,000	$800,000	$800,000
4	Woodside Creek Drive Linear Gravity Sewer Improvements Part I	$800,000	$800,000	$1,000,000
4B	Woodside Creek Drive Linear Gravity Sewer Improvements Part II	$2,200,000	$2,200,000	$3,000,000
5	Festus Centre Drive Linear Gravity Sewer Improvements	$600,000	$600,000	$600,000

CIP Project No.	Project Name	Cost		
		2.6 Peaking Factor	2.7 Peaking Factor	4.0 Peaking Factor
6	Elks Drive Linear Gravity Sewer Improvements	$1,400,000	$1,400,000	$1,400,000
7	Walmart Linear Gravity Sewer Improvements	$1,000,000	$1,000,000	$1,000,000
8	County Road Linear Gravity Sewer Improvements	$1,800,000	$1,800,000	$1,800,000
Total Cost		$18,600,000	$18,600,000	$19,600,000

APPENDIX A - EXISTING CONDITIONS ANALYSIS RESULTS

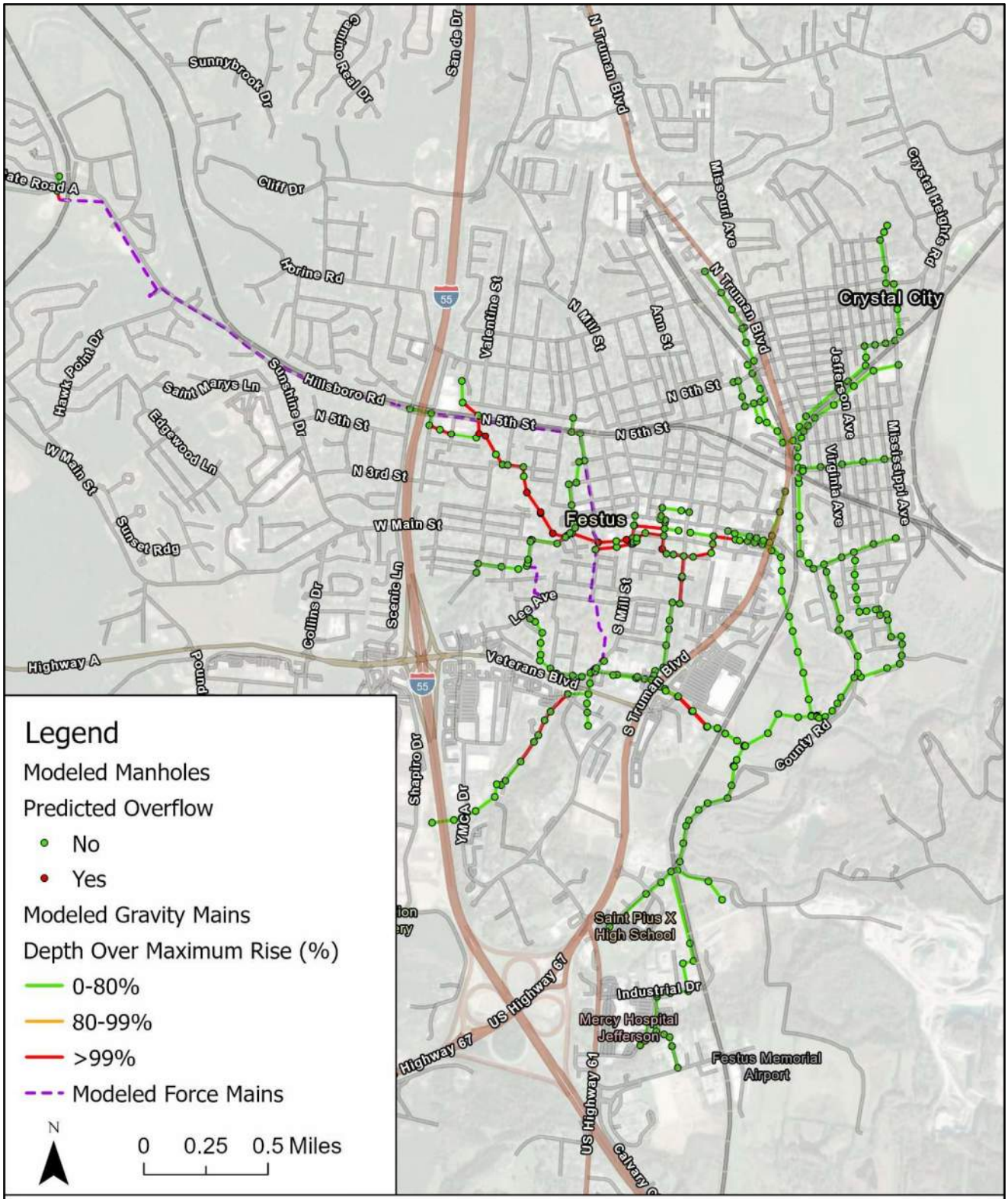

Legend
Modeled Gravity Mains
Average Velocity
Less than 2fps
Greater than or equal to 2fps
Modeled Manholes
Modeled Force Mains
N
0 0.25 0.5 Miles
Crystal City
Festus
Saint Pius X High School
Mercy Hospital Jefferson
Festus Memorial Airport
Industrial Dr
US Highway 67
US Highway 61
Veterans Blvd
S Truman Blvd
N Truman Blvd
W Main St
N 5th St
N 3rd St
N 6th St
Lee Ave
S Mill St
N Mill St
Ann St
Valentine St
Missouri Ave
Jefferson Ave
Virginia Ave
Mississippi Ave
Crystal Heights Rd
Hillsboro Rd
Sunshine Dr
Saint Marys Ln
Edgewood Ln
Sunset Rdg
Hawk Point Dr
State Road A
Cliff Dr
Morine Rd
Sunnybrook Dr
Cinnamon Reel Dr
San de Dr
Collins Dr
Scenic Ln
Pounds Rd
Highway A
Shapiro Dr
YMCA Dr
County Rd
Mount Zion Cemetery
JEFFCO PUBLIC SEWER DISTRICT
Existing Conditions
Cleansing Velocity
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Existing Conditions
2.6:1 Capacity Assessment

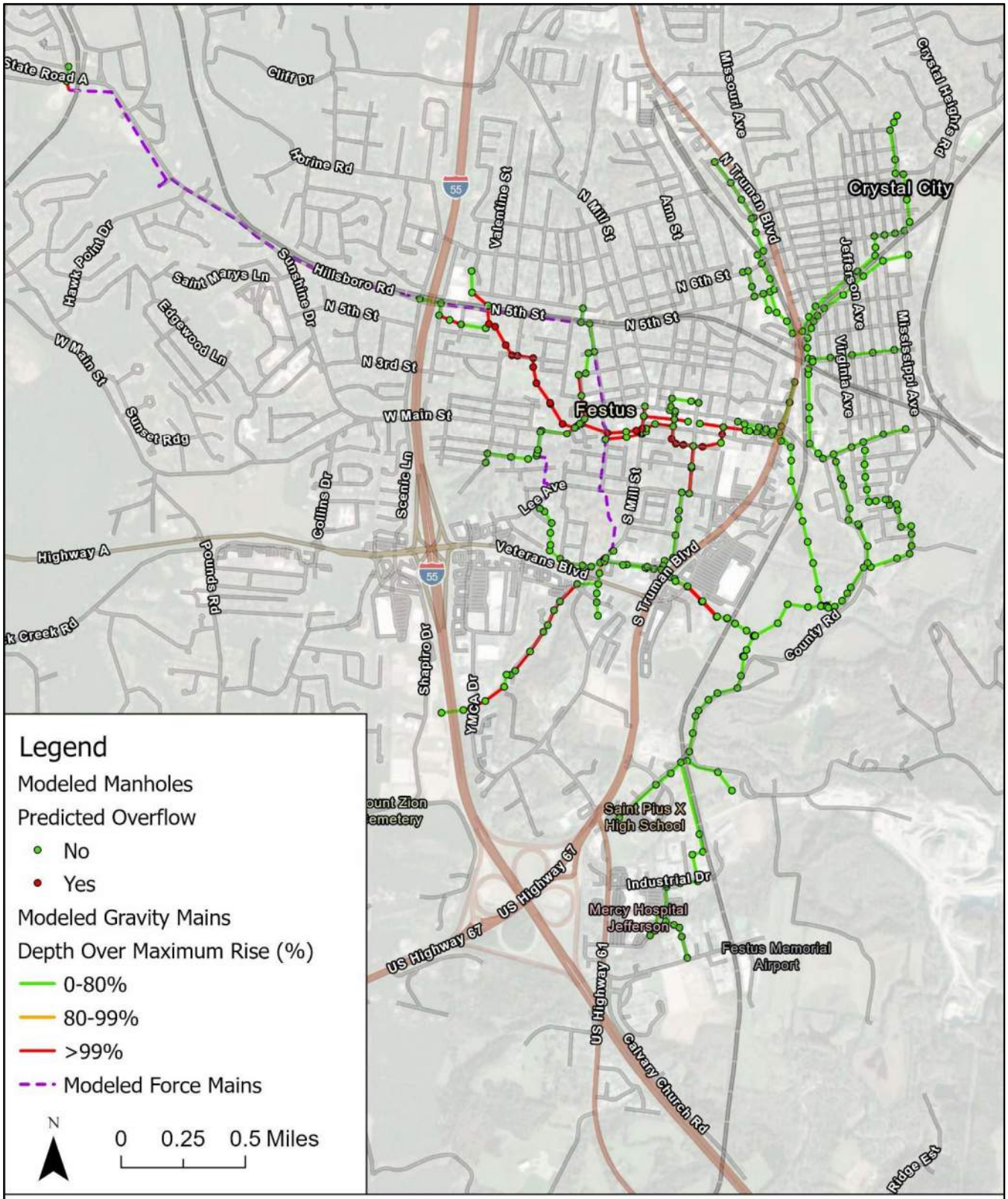
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Existing Conditions
2.7:1 Capacity Assessment

BURNS McDONNELL

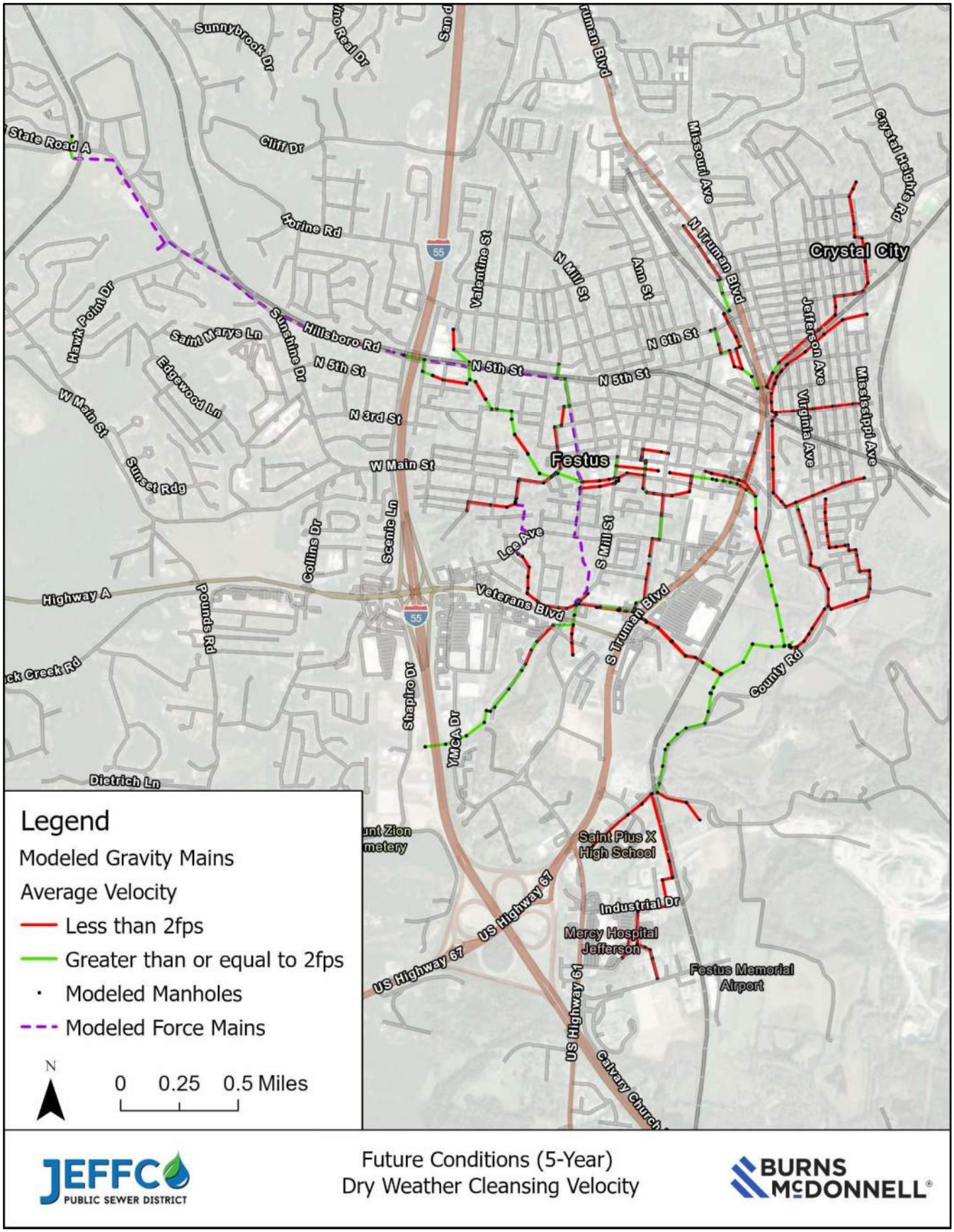


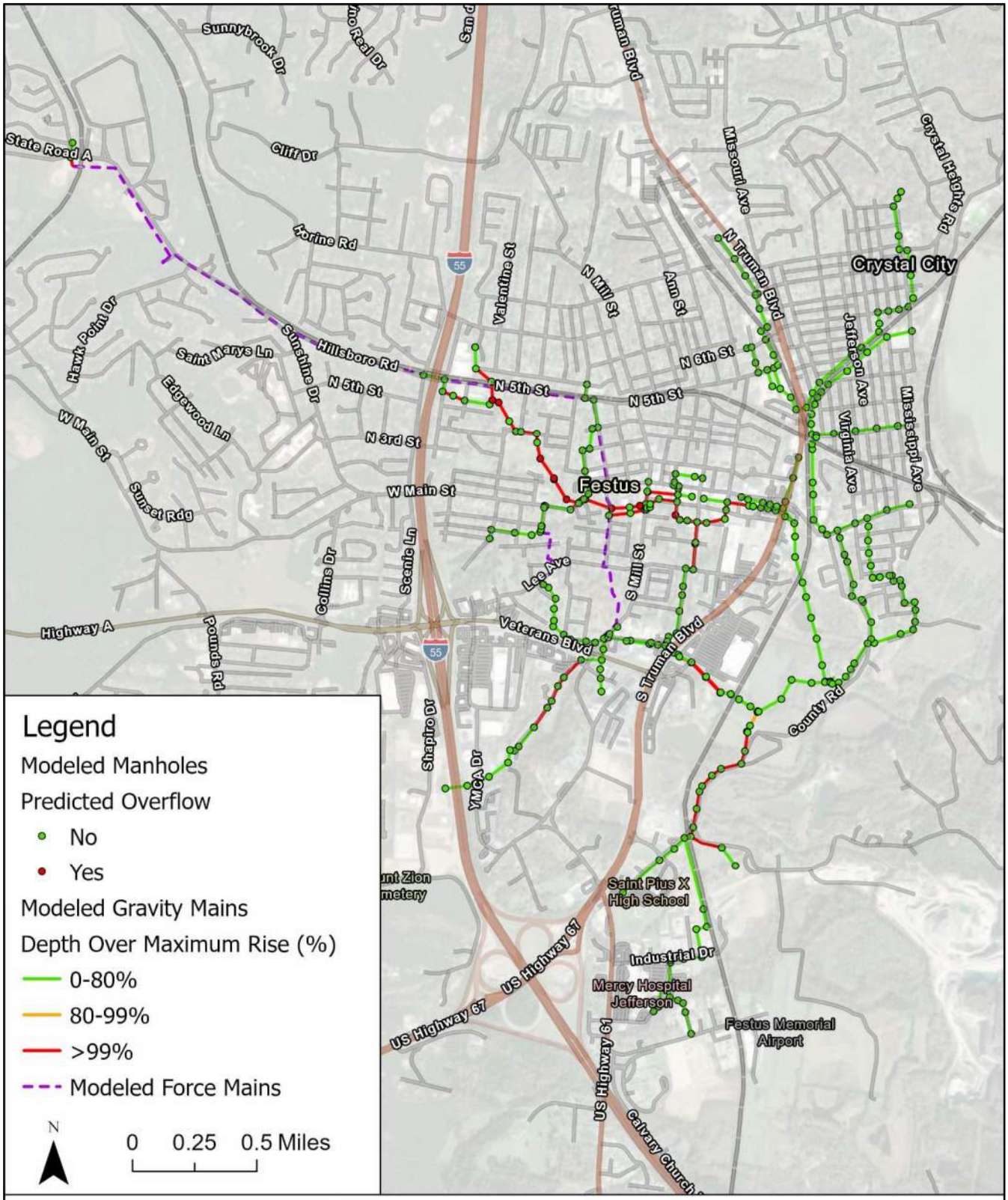
JEFFCO PUBLIC SEWER DISTRICT

Existing Conditions
4:1 Capacity Assessment

BURNS McDONNELL

APPENDIX B - FUTURE CONDITIONS ANALYSIS RESULTS

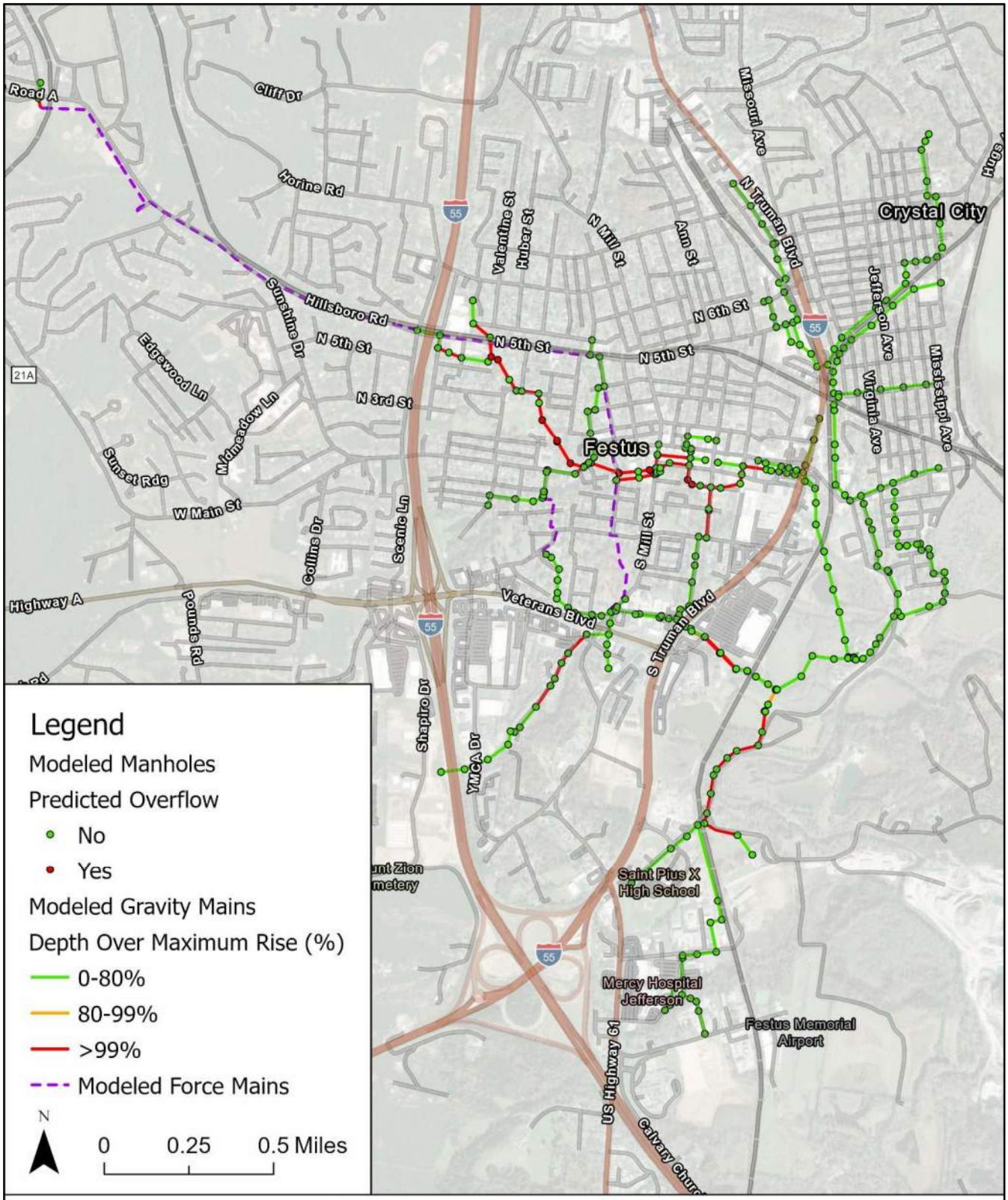

Legend
Modeled Gravity Mains
Average Velocity
Less than 2fps
Greater than or equal to 2fps
Modeled Manholes
Modeled Force Mains
N
0 0.25 0.5 Miles
Crystal City
Festus
Sunnybrook Dr
Cliff Dr
Horine Rd
State Road A
Hillsboro Rd
Saint Marys Ln
Sunshine Dr
Hawk Point Dr
Edgewood Ln
W Main St
Sunset Rdg
N 3rd St
N 5th St
Valentine St
N Mill St
Ann St
Missouri Ave
N Truman Blvd
Crystal Heights Rd
Jefferson Ave
Virginia Ave
Mississippi Ave
N 6th St
Collins Dr
Scenic Ln
Lee Ave
S Mill St
Veterans Blvd
S Truman Blvd
County Rd
Shapiro Dr
YMCA Dr
Highway A
Pounds Rd
Dietrich Ln
Saint Pius X High School
Industrial Dr
Mercy Hospital Jefferson
US Highway 67
US Highway 61
Festus Memorial Airport
Calvary Church
55
JEFFCO PUBLIC SEWER DISTRICT
Future Conditions (5-Year)
Dry Weather Cleansing Velocity
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Future Conditions (5-Year)
2.6:1 Capacity Assessment

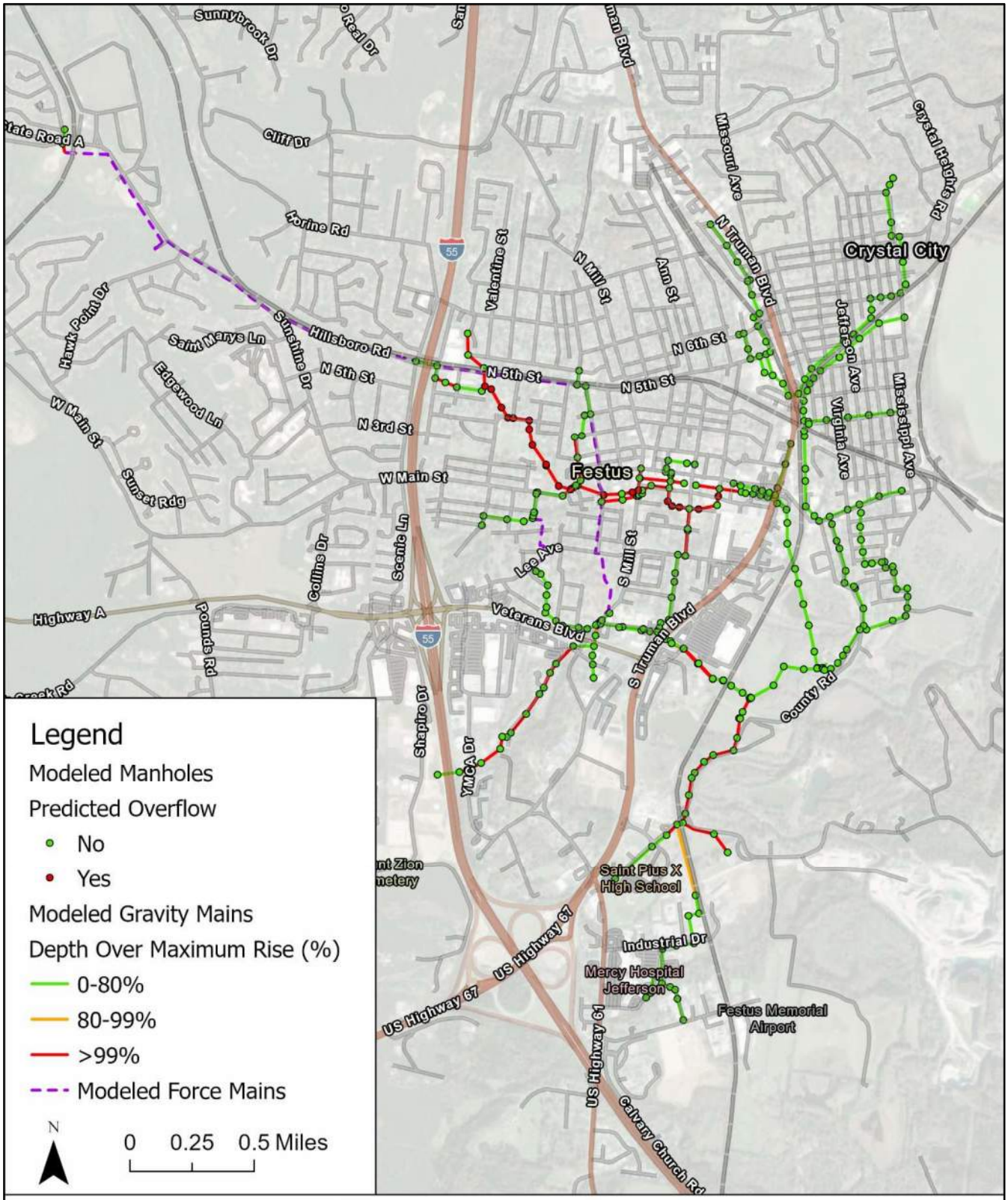
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Future Conditions (5-Year)
2.7:1 Capacity Assessment

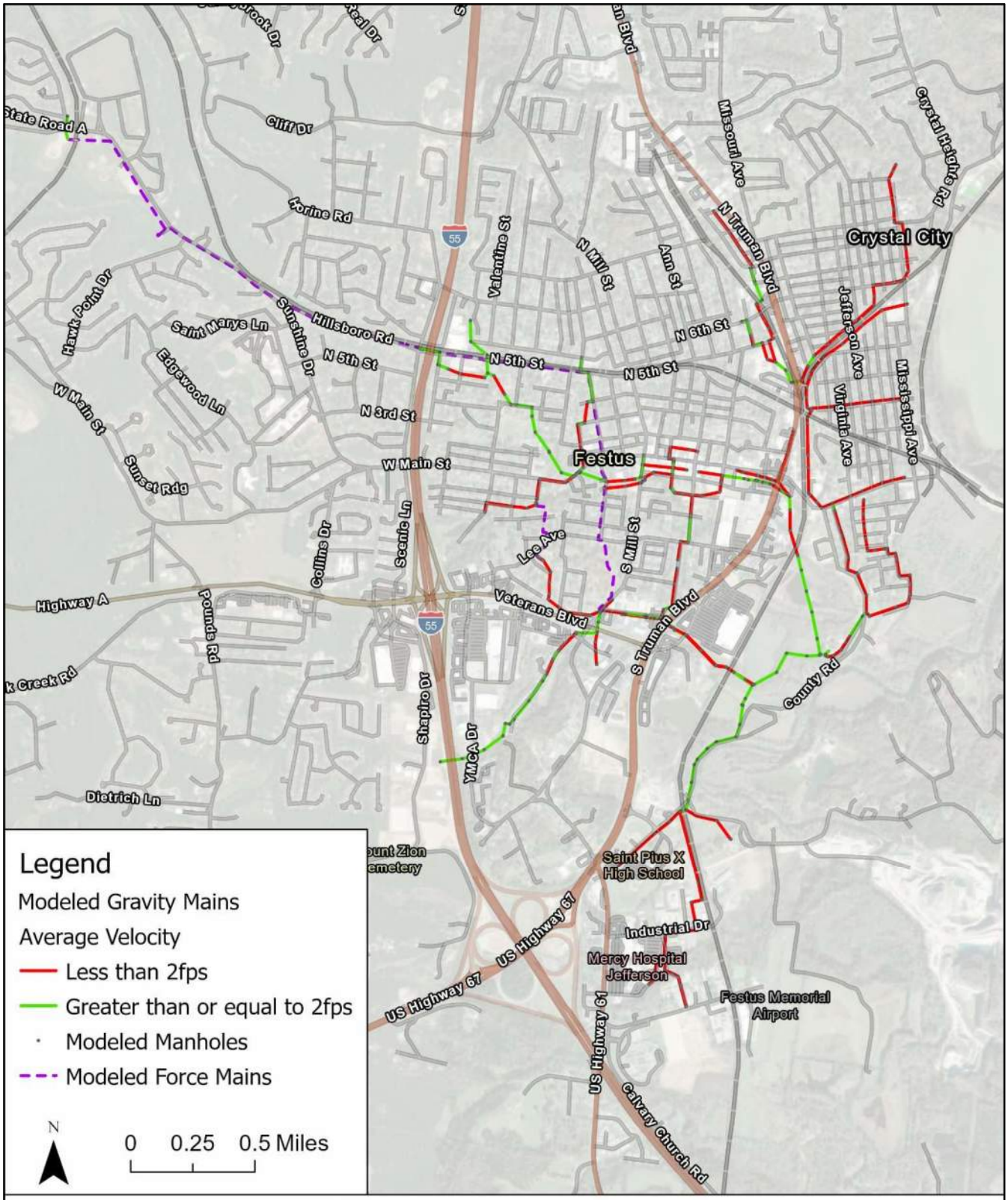
BURNS McDONNELL

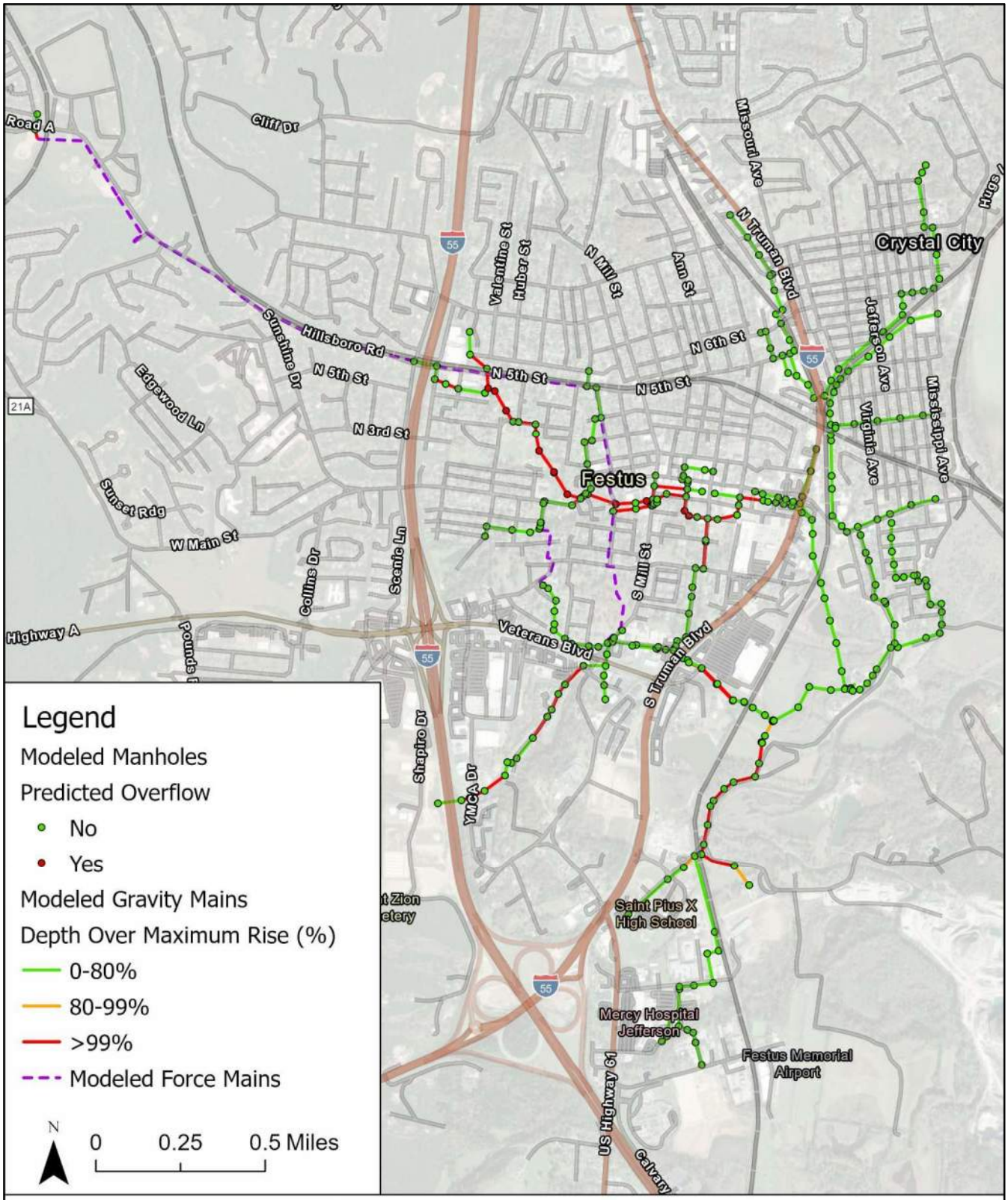


JEFFCO PUBLIC SEWER DISTRICT

Future Conditions (5-Year)
4:1 Capacity Assessment

BURNS McDONNELL

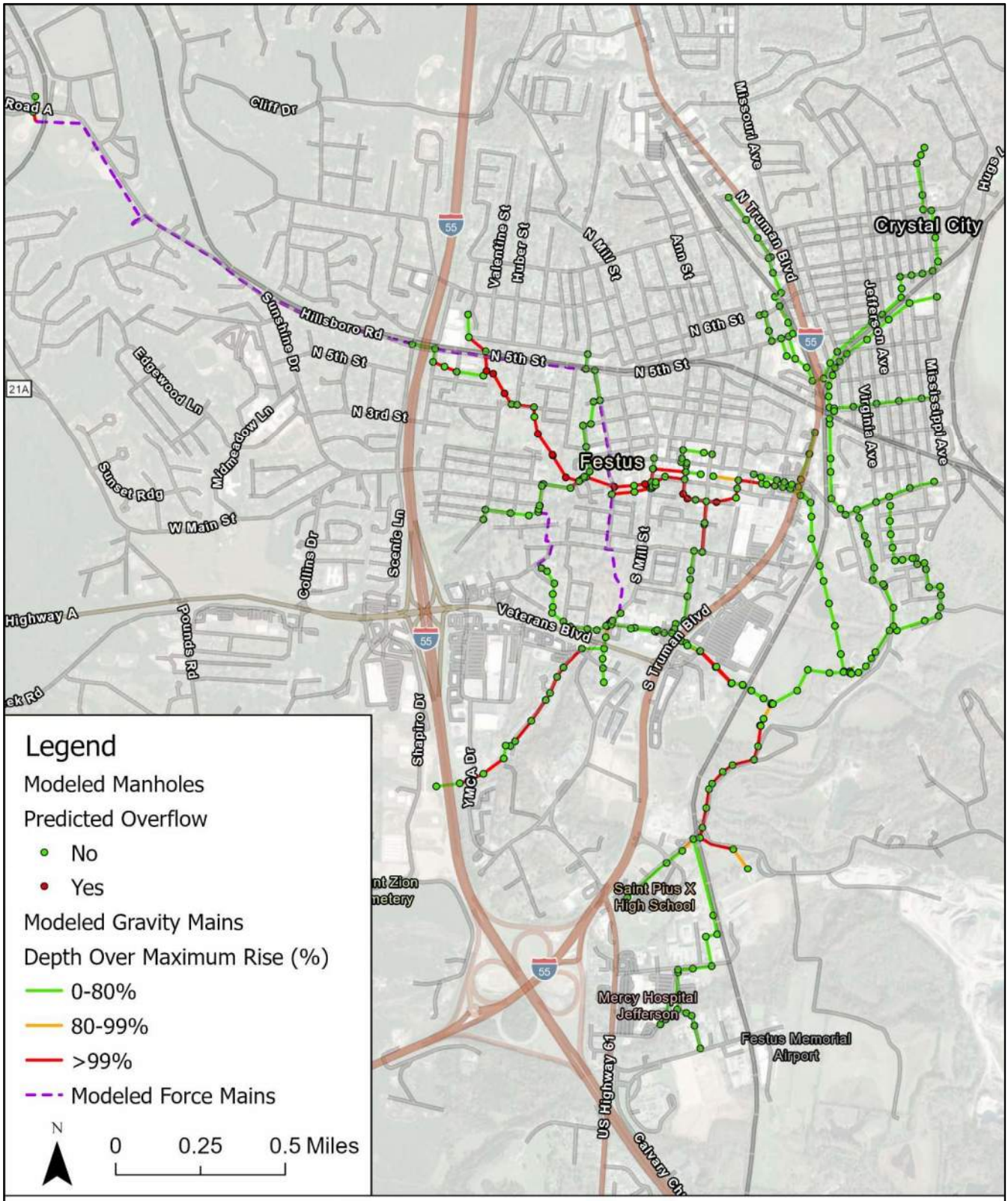

Legend
Modeled Gravity Mains
Average Velocity
Less than 2fps
Greater than or equal to 2fps
Modeled Manholes
Modeled Force Mains
N
0 0.25 0.5 Miles
Crystal City
Festus
Cliff Dr
Forine Rd
Hillsboro Rd
Sunshine Dr
Saint Marys Ln
Hawk Point Dr
Edgewood Ln
W Main St
Sunset Rdg
N 3rd St
N 5th St
Valentine St
N Mill St
Ann St
N Truman Blvd
Missouri Ave
Crystal Heights Rd
N 6th St
Jefferson Ave
Virginia Ave
Mississippi Ave
Lee Ave
S Mill St
S Truman Blvd
Veterans Blvd
Collins Dr
Scenic Ln
Highway A
Pounds Rd
Shapiro Dr
YMCA Dr
County Rd
Dietrich Ln
Saint Pius X High School
Industrial Dr
Mercy Hospital Jefferson
US Highway 67
US Highway 61
Festus Memorial Airport
Calvary Church Rd
JEFFCO PUBLIC SEWER DISTRICT
Future Conditions (20-Year)
Dry Weather Cleansing Velocity
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Future Conditions (20-Year)
2.6:1 Capacity Assessment

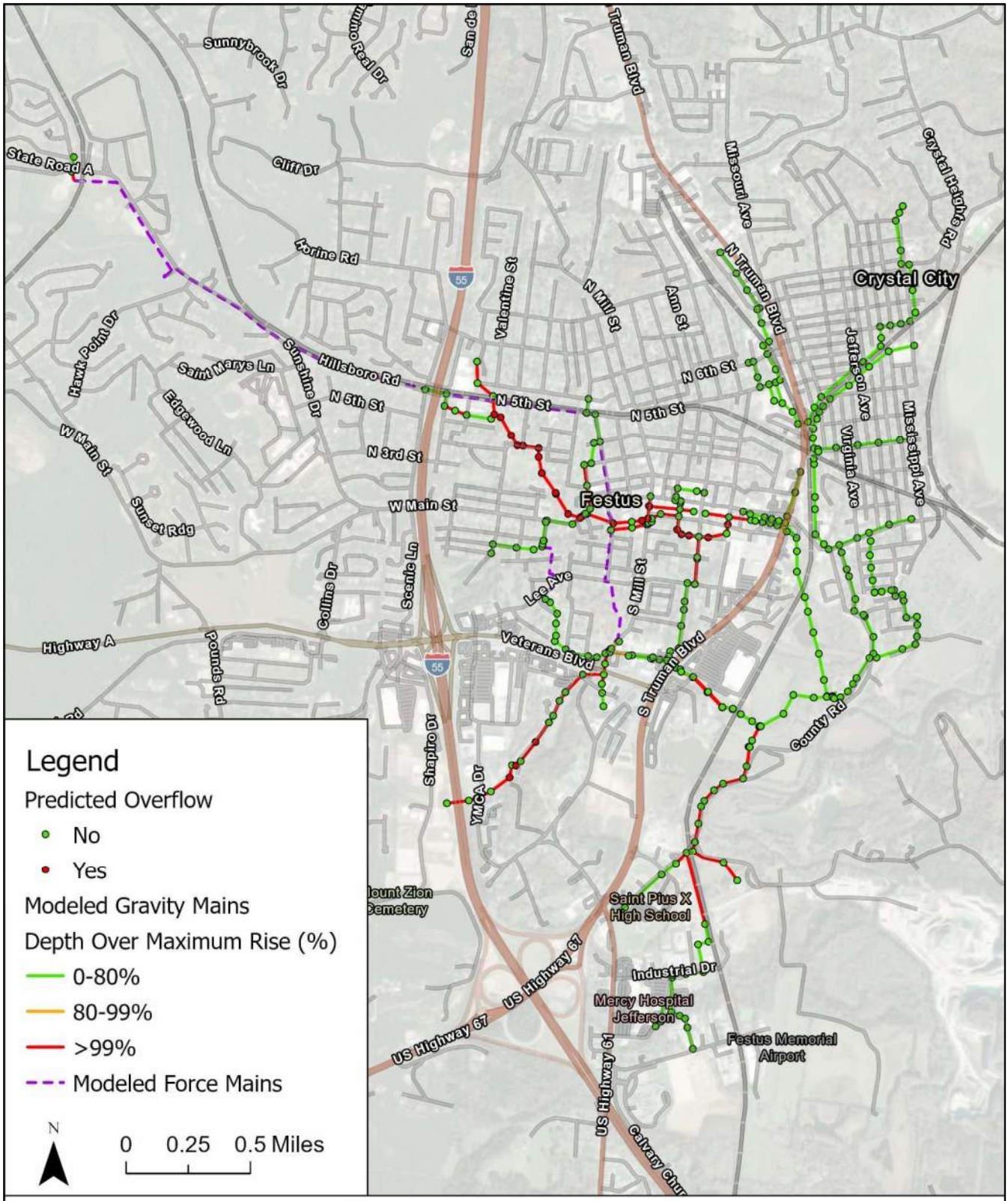
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Future Conditions (20-Year)
2.7:1 Capacity Assessment

BURNS McDONNELL

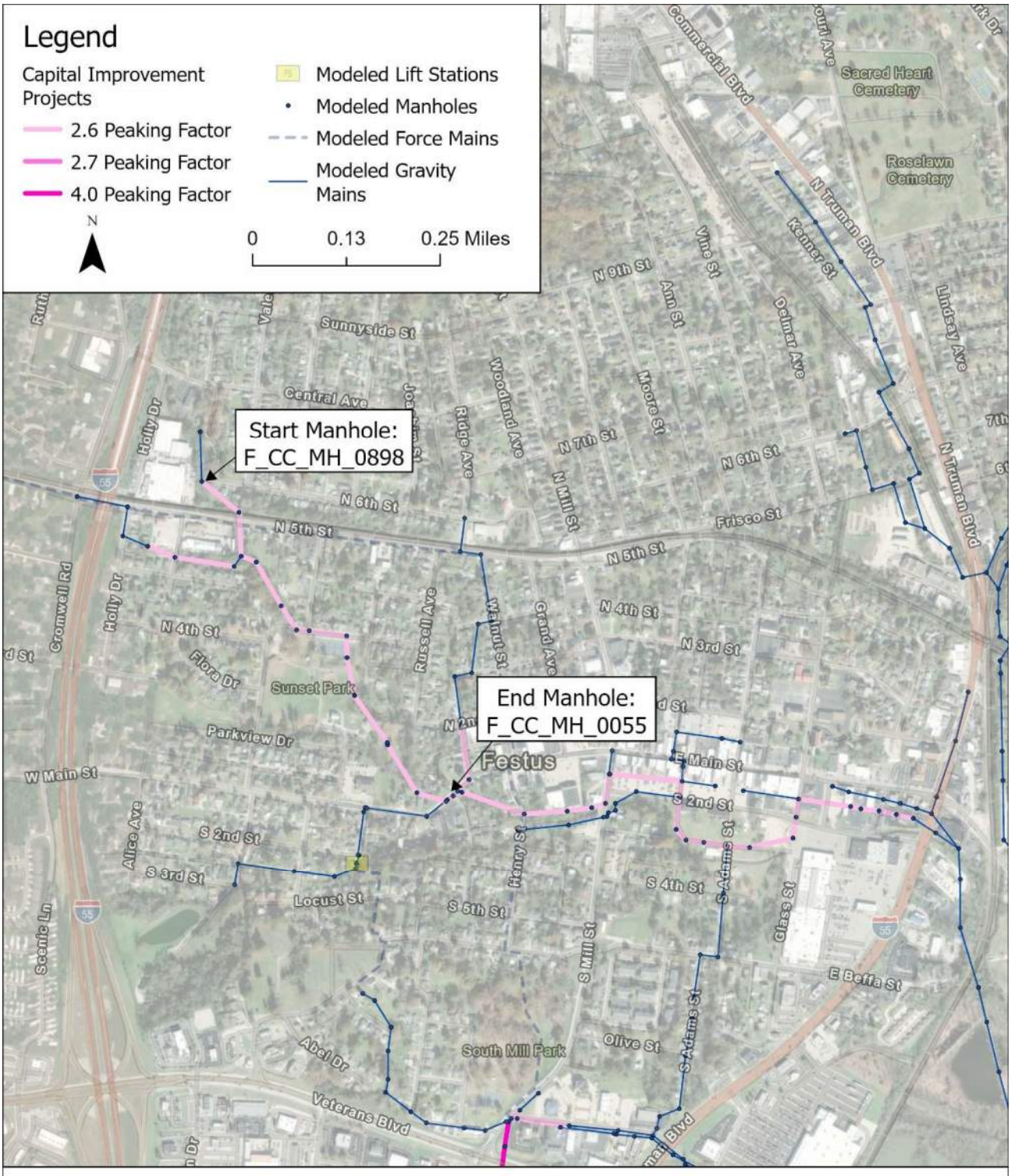


JEFFCO PUBLIC SEWER DISTRICT

Future Conditions (20-Year)
4:1 Capacity Assessment

BURNS McDONNELL

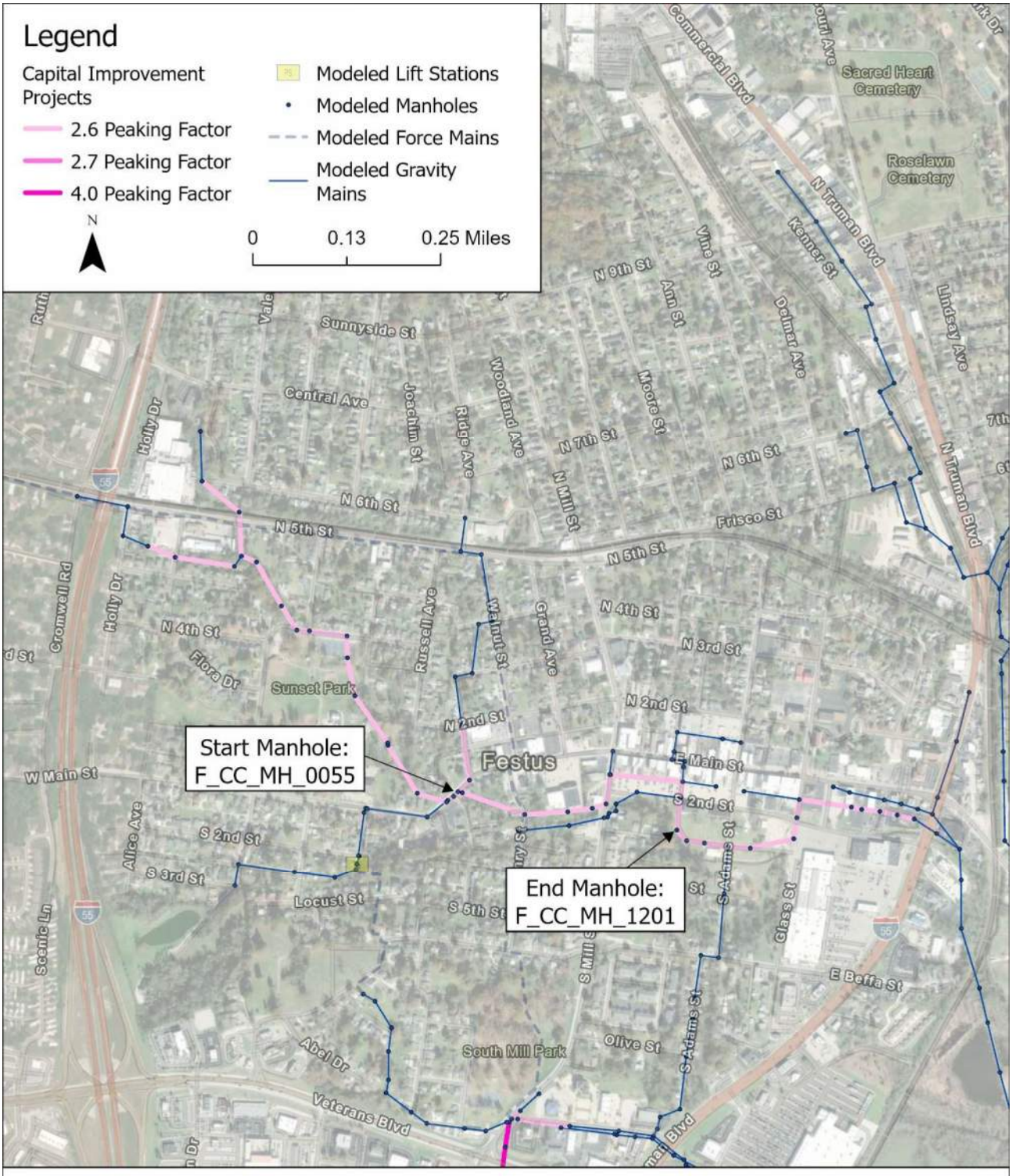
APPENDIX C – CAPITAL IMPROVEMENT PROJECT MAPS



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-1A:
Sunset Park Gravity Sewer Improvements Part I

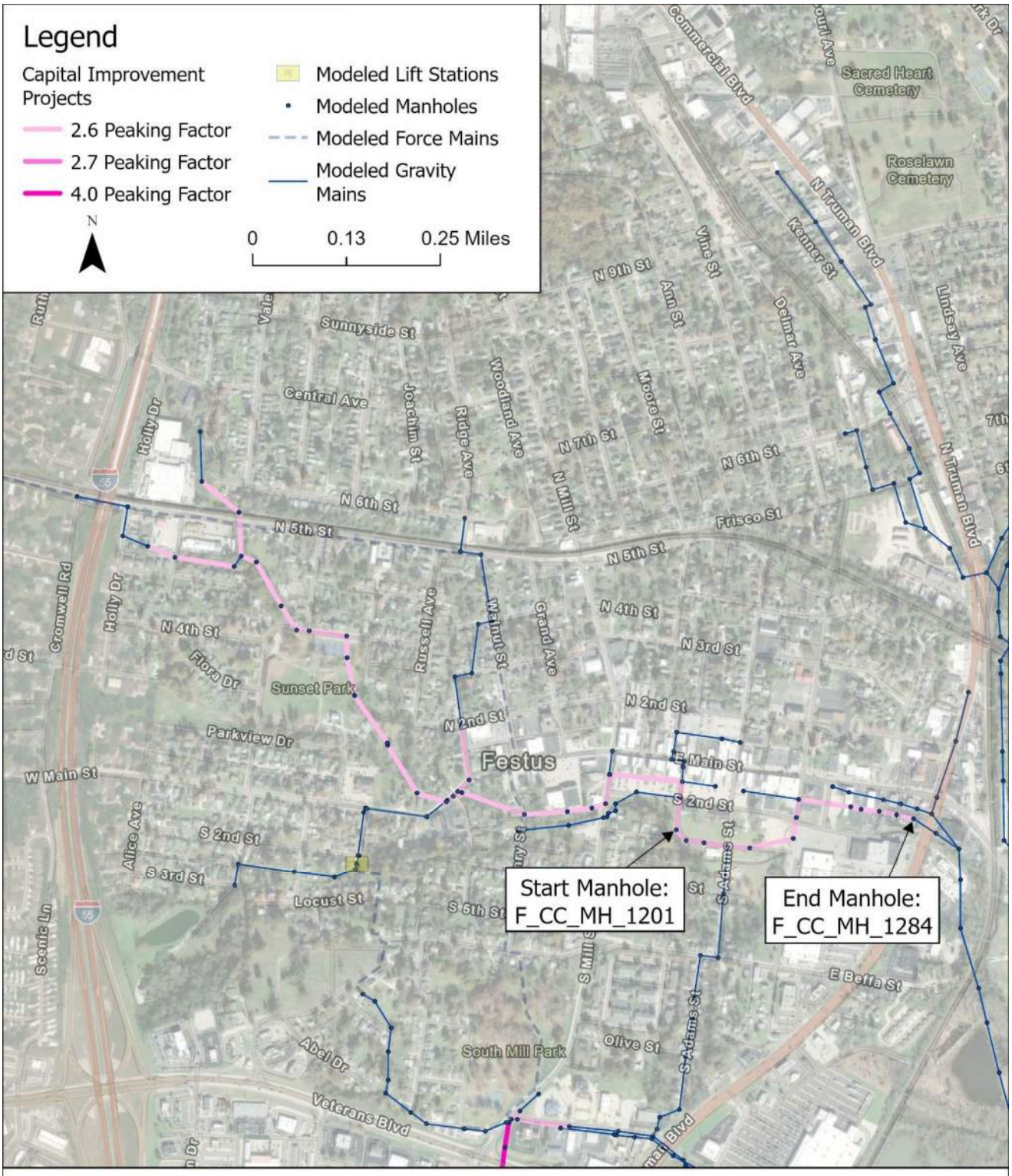
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-1B:
Sunset Park Gravity Sewer Improvements Part II

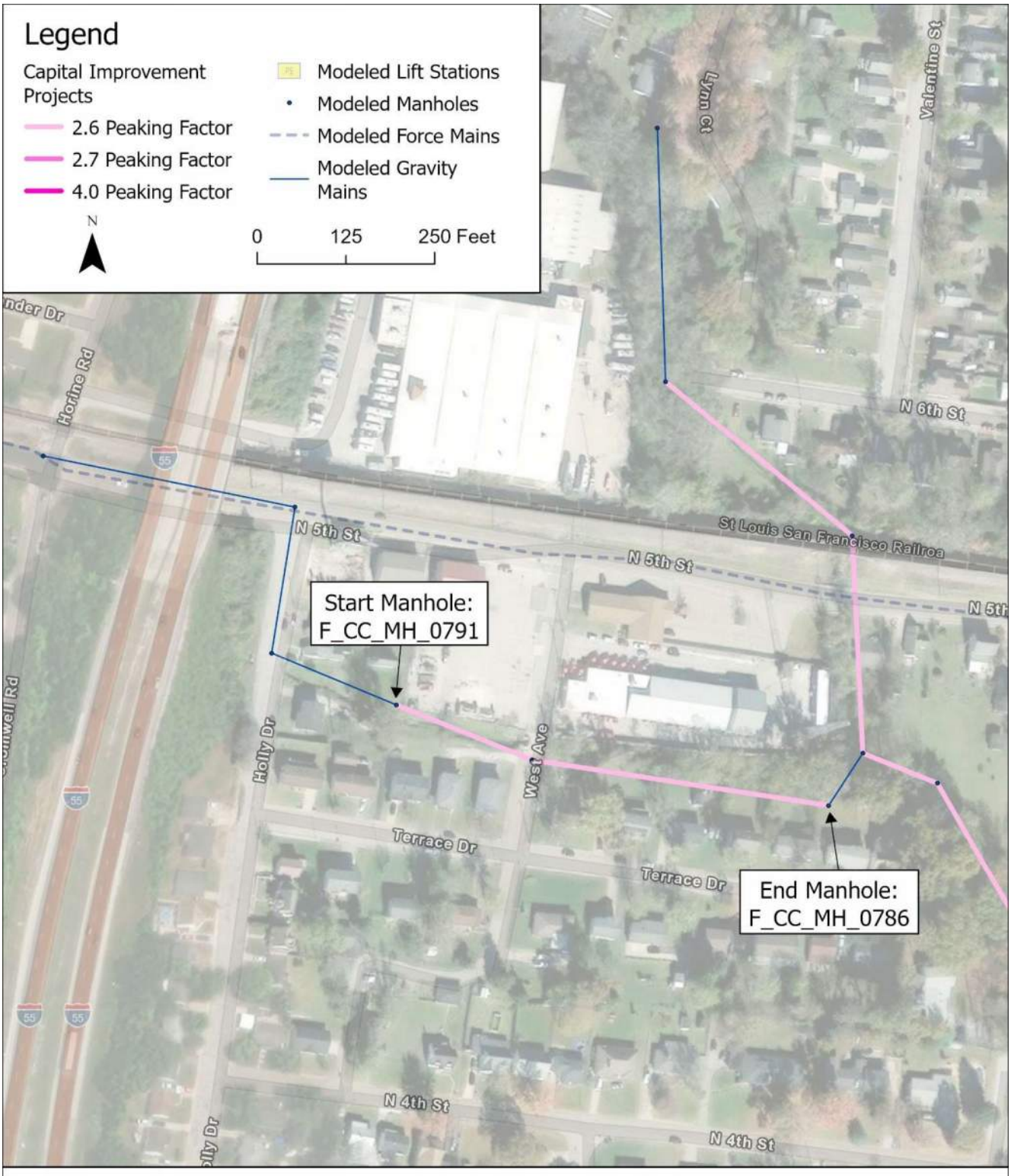
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-1C:
Sunset Park Gravity Sewer Improvements Part III

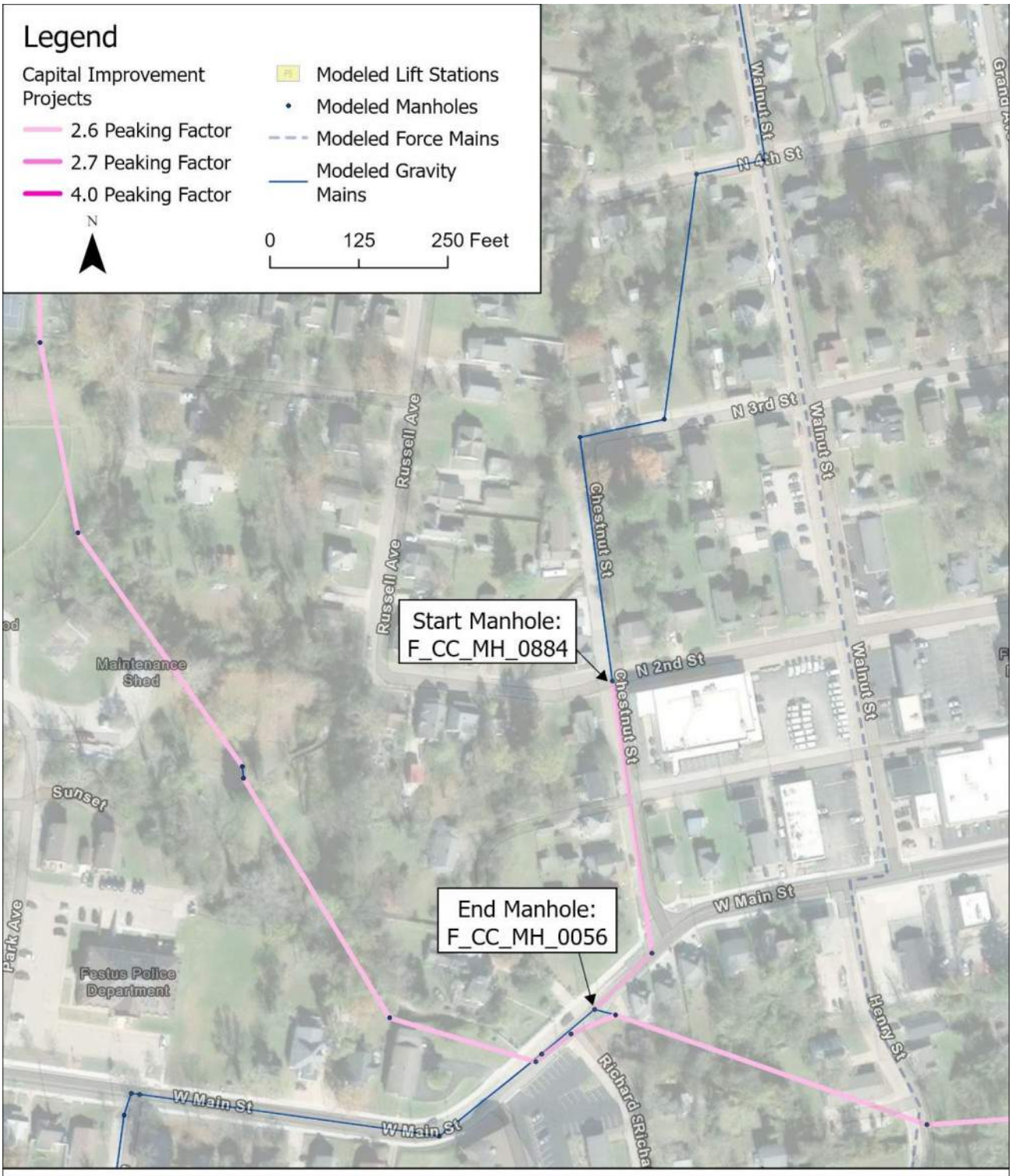
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-2:
Holly Drive Gravity Sewer Improvements

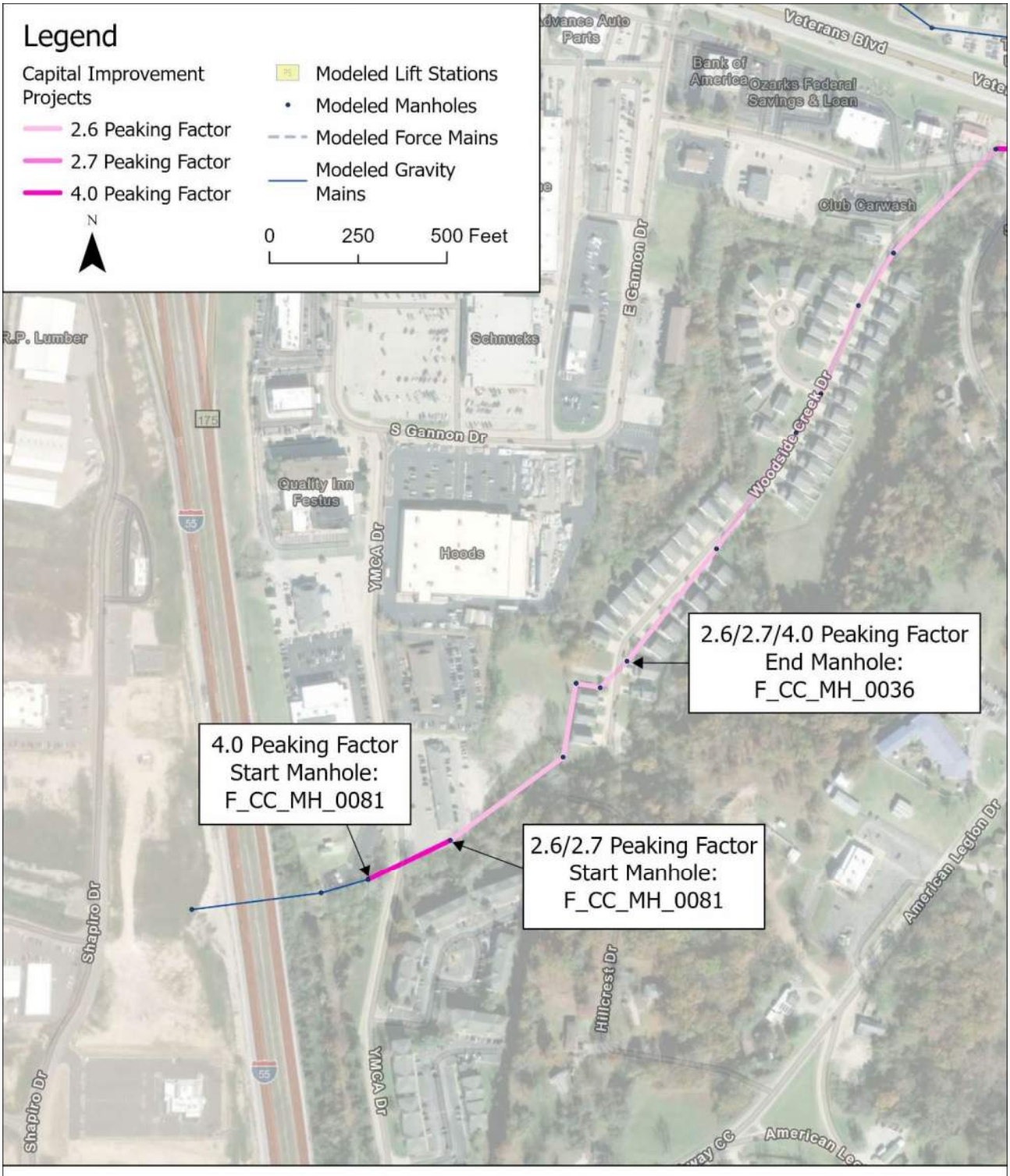
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-3:
Chestnut Street Gravity Sewer Improvements

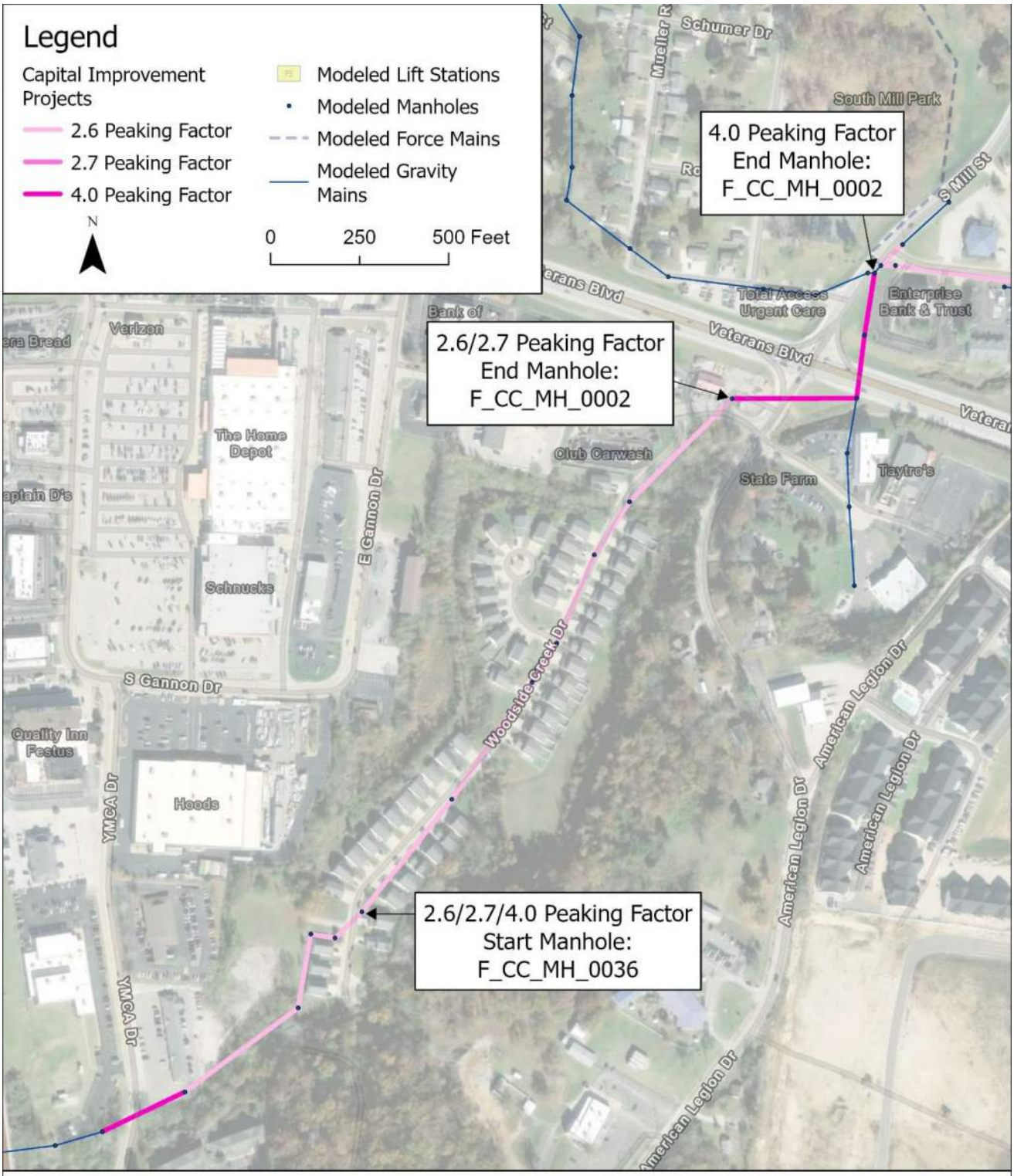
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-4A:
Woodside Creek Drive Gravity Sewer Improvements Part I

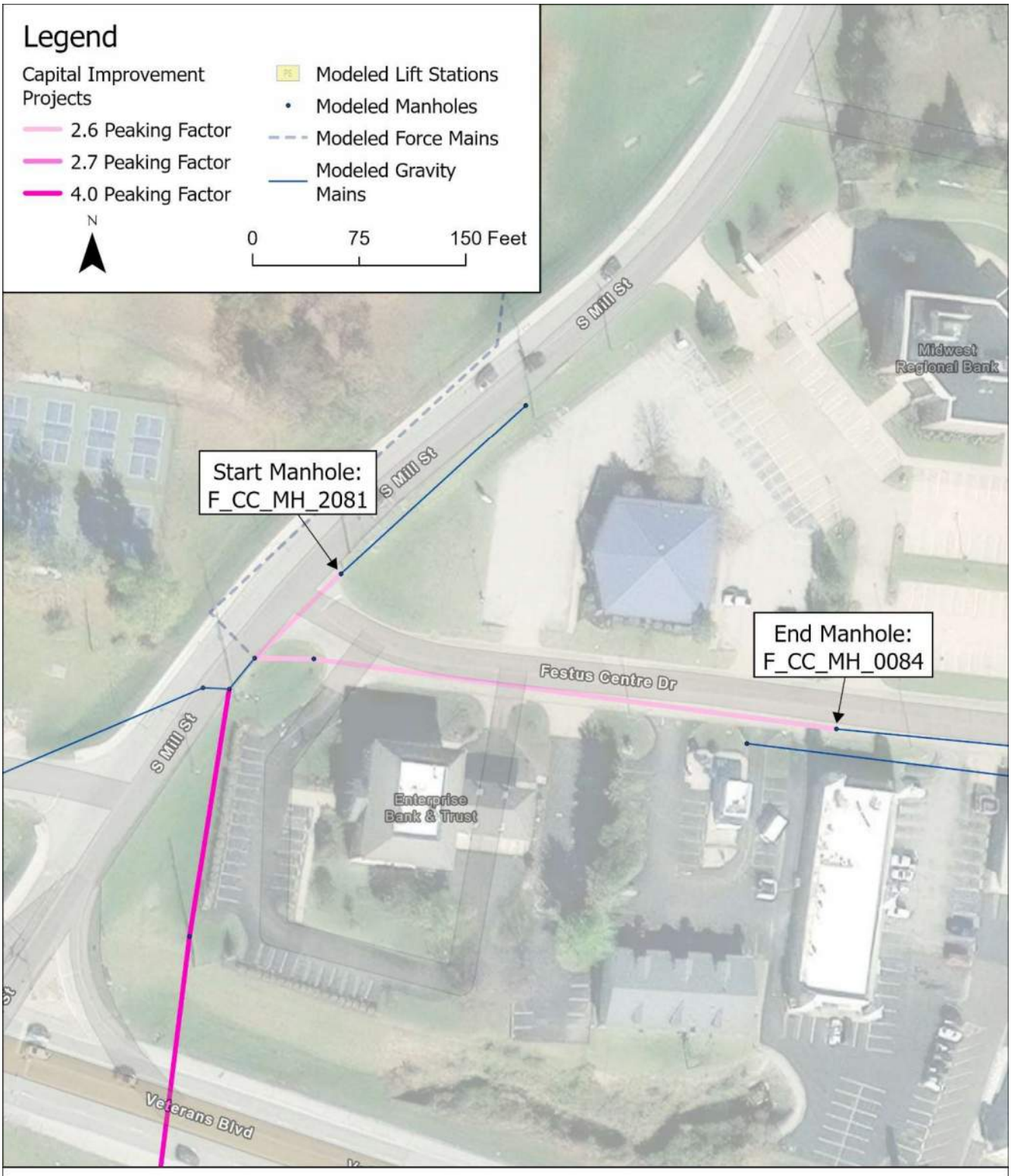
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-4B:
Woodside Creek Drive Gravity Sewer Improvements Part II

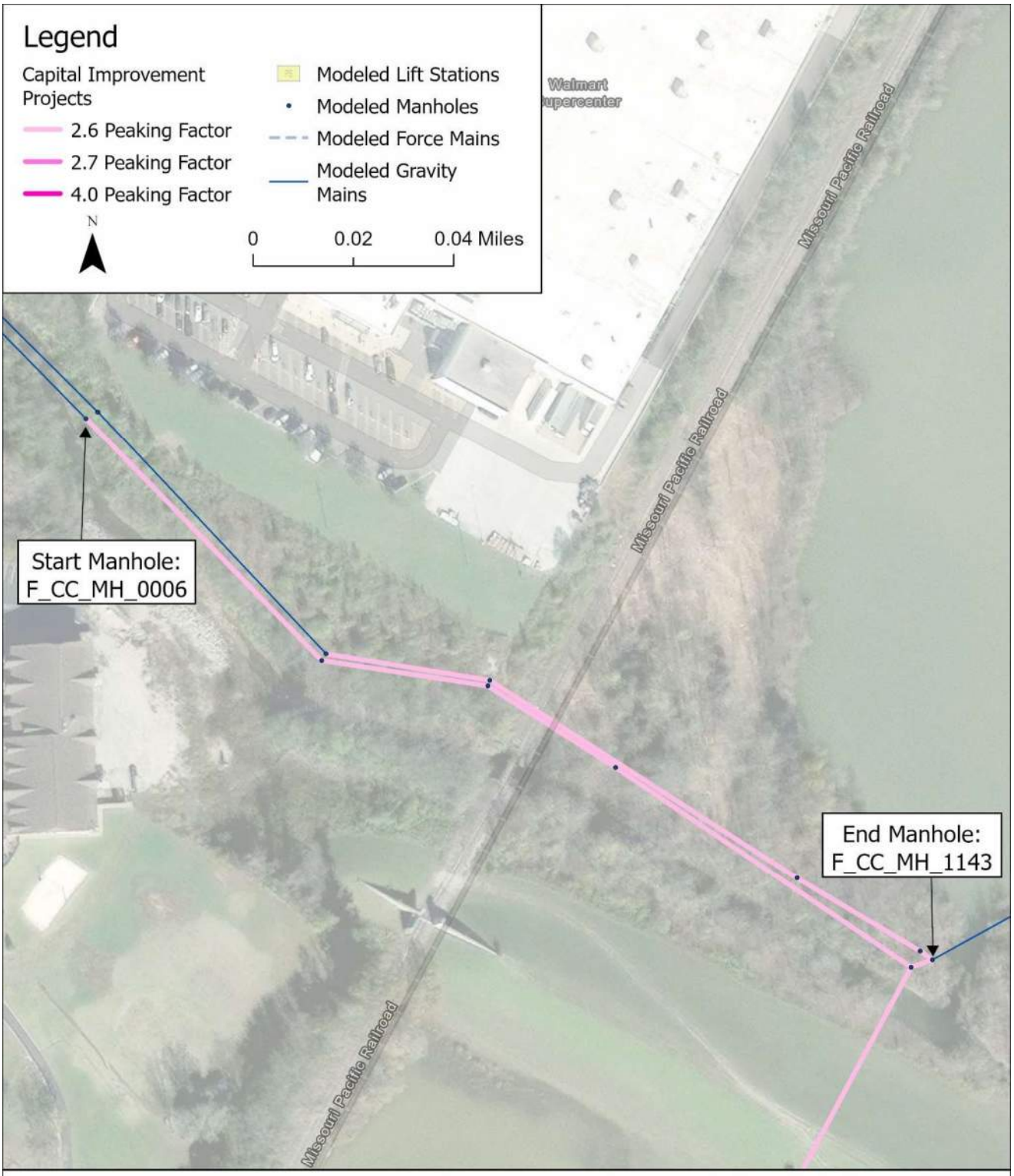
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-5:
Festus Centre Drive Gravity Sewer Improvements

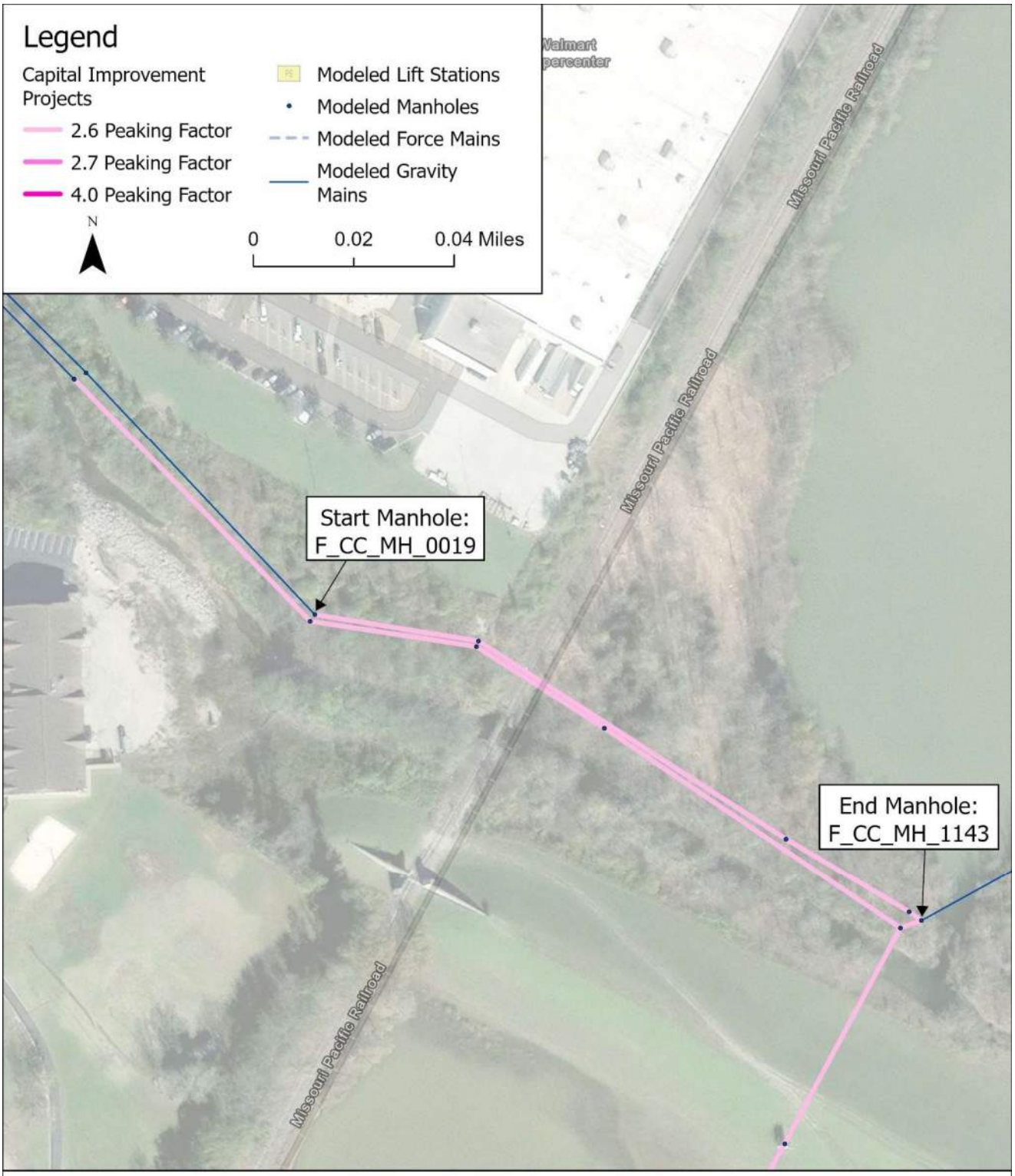
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-6:
Elks Drive Gravity Sewer Improvements

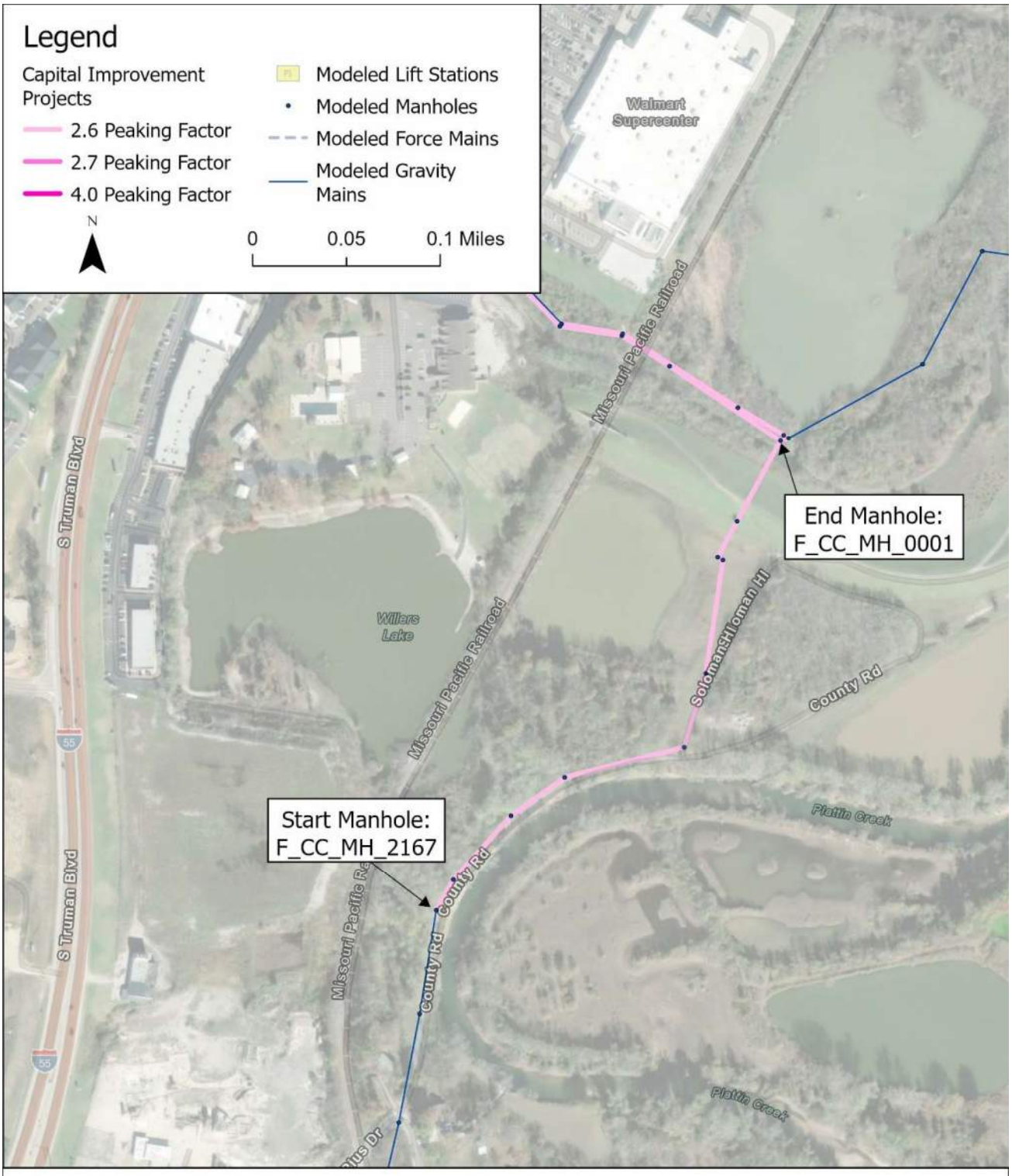
BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-7:
Walmart Gravity Sewer Improvements

BURNS McDONNELL



JEFFCO PUBLIC SEWER DISTRICT

Festus and Crystal City
Capital Improvement Project CS-CIP-8:
County Road Gravity Sewer Improvements

BURNS McDONNELL

BURNS McDONNELL

CREATE AMAZING.

APPENDIX B – *FESTUS/CRYSTAL CITY WWTP MASTER PLAN*

Festus/Crystal City WWTP Master Plan

Jefferson County Public Sewer District

Festus and Crystal City

Project No. 180792
8/1/2025

Festus/Crystal City WWTP Master Plan

prepared for

Jefferson County Public Sewer District
Festus and Crystal City

Project No. 180792
8/1/2025

prepared by

Burns & McDonnell Engineering Company, Inc.

TABLE OF CONTENTS

Page No.

1.0 EXECUTIVE SUMMARY 1-1

2.0 INTRODUCTION 2-1
2.1 Project Background 2-1

3.0 EXISTING CONDITIONS 3-1
3.1 System Summary 3-1
3.1.1 Influent Pump Station 3-2
3.1.2 Preliminary Treatment 3-2
3.1.3 SBR System 3-3
3.1.4 UV Disinfection 3-5
3.1.5 Solids Handling 3-5
3.1.6 SCADA 3-6
3.2 Historical Flows and Loadings 3-6
3.2.1 Discharge Monitoring Report (DMR) Data 3-6
3.2.2 Sampling Data 3-7
3.2.3 Effluent Summary 3-7

4.0 BASIS OF DESIGN 4-1
4.1 Residential and Industrial Growth 4-1
4.2 Regulatory Review 4-2

5.0 CONDITION ASSESSMENT FINDINGS 5-1
5.1 Summary 5-1
5.2 Influent Pump Station 5-2
5.3 Preliminary Treatment 5-3
5.3.1 Screening 5-3
5.3.2 Grit Removal System 5-5
5.4 SBR System 5-7
5.4.1 SBR Basins 5-7
5.4.2 Process Blowers 5-10
5.5 UV Disinfection 5-12
5.6 Solids Handling 5-14
5.7 SCADA 5-15

6.0 CAPACITY ASSESSMENT FINDINGS 6-1
6.1 Influent Pump Station 6-1
6.2 Preliminary Treatment 6-1
6.3 SBR System 6-1
6.3.1 Organic Loadings 6-1

6.3.2 Aeration Demands 6-3
6.4 UV Disinfection 6-3

7.0 CAPITAL IMPROVEMENT PROJECTS 7-1
7.1 WWTP-CIP-1 – 4: SBR 7-3
7.2 WWTP-CIP-5: Influent Pump Station 7-4
7.3 WWTP-CIP-6: Influent Screening 7-4
7.4 WWTP-CIP-7: SCADA 7-5

APPENDIX A – PROJECT REDBIRD PRETREATED WASTEWATER DISCHARGE TO FESTUS CRYSTAL CITY WWTP MEMO, HORNER SHIFRON, 2022
APPENDIX B – FESTUS/CRYSTAL CITY WWTP NPDES PERMIT
APPENDIX C – SANITAIRE ICEAS DETAILED DESIGN CALCULATIONS
APPENDIX D – ALUM FEED CONCEPTUAL DESIGN
APPENDIX E – PROPOSED SBR EXPANSION PIPING CONCEPTUAL DESIGN
APPENDIX F – NATIONAL FLOOD HAZARD LAYER FIRMETTE

LIST OF TABLES

Page No.
Table 1-1: Summary of Projects 1-1
Table 3-1: Influent Pump Station Capacity 3-2
Table 3-2: Preliminary Treatment Capacity 3-3
Table 3-3: SBR System Capacity 3-4
Table 3-4: UV Disinfection Capacity 3-5
Table 3-5: Statistical Analyses Used for Flow and Loading Conditions 3-6
Table 3-6: Influent DMR Data Summary 3-6
Table 3-7: Influent Sampling Data Summary 3-7
Table 4-1: Future Flows and Loading Projections (Residential Only) 4-1
Table 4-2: Anticipated Industrial Influent From 2022 Horner Shifrin Memo 4-2
Table 4-3: Future Flows and Loading Projections (Residential + Industrial) 4-2
Table 4-4: Permit Final Effluent Limitations 4-3
Table 5-1: Condition Assessment Ratings Legend 5-1
Table 5-2: Condition Assessment Ratings Summary 5-1
Table 6-1: Summary of Loading Capacity For Projected Scenarios 6-3
Table 7-1: Detailed Summary of Projects 7-2

LIST OF FIGURES

Page No.
Figure 3-1: Process Flow Diagram of Liquid Treatment 3-1
Figure 3-2: Site Plan 3-1
Figure 3-3: CBOD Effluent vs Daily Max Permit 3-8
Figure 3-4: CBOD Effluent vs Monthly Average Permit 3-8
Figure 3-5: TSS Effluent vs Weekly Average Permit 3-9
Figure 3-6: TSS Effluent vs Monthly Average Permit 3-9
Figure 3-7: E.Coli Effluent vs. Weekly Average Permit Level 3-10
Figure 3-8: E.Coli Effluent vs. Monthly Average Permit 3-11
Figure 3-9: Ammonia as N Effluent vs. Daily Max Permit Level 3-12
Figure 3-10: Ammonia as N Effluent vs. Monthly Average Permit Level 3-12
Figure 3-11: Oil & Grease Effluent vs. Daily Max Permit Level 3-13
Figure 3-12: Oil & Grease Effluent vs. Monthly Average Permit Level 3-13
Figure 5-1: Influent Pump Station 5-2
Figure 5-2: Influent Screening 5-3
Figure 5-3: Manual Bypass Screen 5-4
Figure 5-4: Parshall Flume 5-4
Figure 5-5: Grit Chamber 5-5
Figure 5-6: Grit Classifier and Washer 5-6
Figure 5-7: Grit Blower 5-6
Figure 5-8: SBR Basins 5-7
Figure 5-9: SBR Basin During Aeration Cycle 5-8
Figure 5-10: Typical SBR Basin Decanter 5-8
Figure 5-11: SBR Splitter Structure Manual Gates 5-9
Figure 5-12: Temporary Decanter Motor Shelter 5-9
Figure 5-13: Positive Displacement Blower 5-10
Figure 5-14: Screw Blower Enclosure 5-11
Figure 5-15: Standby Centrifugal Blower 5-11
Figure 5-16: UV Building and Finger Weir Structure 5-12
Figure 5-17: UV Disinfection Channel and Bulbs 5-13
Figure 5-18: UV Jib Crane 5-13
Figure 5-19: Solids Handling Tank and Walkway 5-14
Figure 5-20: Future Dewatering Equipment Area 5-15
Figure 5-21: Existing SCADA Screen 5-16

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
AD	Average Day
AGS	Aerobic Granular Sludge
CBOD	Carbonaceous Biochemical Oxygen Demand
CIP	Capital Improvement Project
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
FEMA	Federal Emergency Management Agency
H_2S	Hydrogen Sulfide
HMI	Human Machine Interface
MM	Max Month
MD	Max Day
MG	Milligrams
MGD	Million Gallons per Day
MLSS	Mixed Liquor Suspended Solids
NPW	Non-Potable Water
ORP	Oxidation-Reduction Potential
PD	Positive Displacement
PLC	Programable Logic Controller
POTW	Publicly Owned Treatment Works
ROM	Rough Order of Magnitude
SCFM	Standard Cubic Foot per Minute
SBR	Sequencing Batch Reactor
TKN	Total Kjeldahl Nitrogen

Abbreviation	Term/Phrase/Name
TP	Total Phosphorus
TSS	Total Suspended Solids
UV	Ultraviolet
UVT	Ultraviolet Transmittance
VFD	Variable Frequency Drive
WWTP	Wastewater Treatment Plant
WAS	Waste Activated Sludge

1.0 EXECUTIVE SUMMARY

Jefferson County Public Sewer District (District) acquired the Festus/Crystal City Wastewater Treatment Plant (WWTP) in 2024, originally constructed in 2001 as a sequencing batch reactor (SBR) facility. The plant serves primarily residential customers, with additional commercial and industrial customers and an anticipated large industrial contributor in the future. It is designed for an average flow of 3 MGD, a peak hourly flow of 12.5 MGD, with a peak of 14.7 MGD when decanting.

The District engaged Burns & McDonnell to develop a WWTP Master Plan as part of a broader planning effort including the collection system to evaluate current conditions and identify capital improvements over a planning period of 20 years. The master plan included an on-site condition evaluation, operator and District staff input, review of historical flow and loading data, projections for future service area growth with input from the District, and a capacity evaluation to identify potential hydraulic and loading constraints. This Master Plan is intended to provide a budgetary plan for the Festus/Crystal City WWTP to position for future regulatory and capacity needs while improving operational reliability and efficiency.

Improvements are grouped into seven Capital Improvement Projects (CIPs), with high-priority projects focused on expanding treatment capacity to treat projected organic and nutrient loadings. Table 1-1 provides a summary of the CIPs and rough order of magnitude (ROM) opinions of probable costs (OPC) with a more detailed table including project descriptions and drivers provided in Section 7.0.

Table 1-1: Summary of Projects

CIP	Area	Priority	Project	ROM Cost
WWTP-CIP-1	SBR	High	Blower Room Improvements	$780,000
WWTP-CIP-2	SBR	High	TP Chem Feed System	$1,900,000
WWTP-CIP-3	SBR	High	SBR Expansion	$13,050,000
WWTP-CIP-4	SBR	Low	Additional Instrumentation	$1,520,000
			Splitter Box Gate Actuators	
			Diffuser Grid Replacement	
WWTP-CIP-5	IPS	Medium	Additional Influent Pump	$720,000
			Concrete Coating	
			HVAC Improvements	
			Influent Pump Valves	
WWTP-CIP-6	Influent Screening	Medium	Screening Equipment Replacement	$960,000
WWTP-CIP-7	SCADA	Low	SCADA Controls	$980,000
Total ROM Cost				**$19,910,000**

2.0 INTRODUCTION

2.1 Project Background

The District owns and operates wastewater and water systems throughout Jefferson County. The Festus/Crystal City WWTP, acquired by the District in 2024, was constructed as an SBR facility in 2001, while repurposing the previous plant infrastructure for solids handling. Ultraviolet (UV) disinfection was added in 2007, and a UV effluent finger weir control structure was constructed in 2020. The plant is designed for an average flow of 3 million gallons per day (MGD), a peak hourly flow of 12.5 MGD, and a decant effluent flow of 14.7 MGD. It primarily serves residential customers throughout the Cities of Festus and Crystal City, with some commercial and industrial customers. The WWTP operates under NPDES permit number MO-0080632.

The District contracted with Burns & McDonnell to develop a WWTP master plan as part of a broader planning initiative that also includes a collection system master plan. The purpose of this report is to evaluate existing facility conditions, assess hydraulic and loading capacities, and identify capital improvements over a 20-year planning horizon. The focus of this evaluation is on the treatment process and does not include detailed electrical, HVAC, mechanical, and structural evaluations of all buildings at the plant.

3.0 EXISTING CONDITIONS

3.1 System Summary

Influent wastewater first enters the influent pump station, where it is pumped to preliminary treatment consisting of screening and an aerated grit chamber. It then flows to one of four SBR basins for biological treatment. Decant from the SBRs is directed to UV disinfection, passes over a finger weir structure, and is then discharged to a tributary of Plattin Creek. A summary of this liquid treatment flow is shown in Figure 3-1. Solids are sent to aerobic digestion and are hauled off site without dewatering. An overall site plan is show in Figure 3-2.

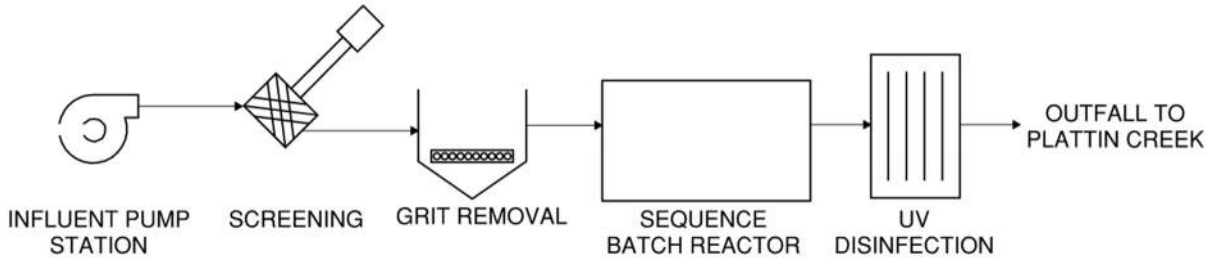


Figure 3-1: Process Flow Diagram of Liquid Treatment

Figure 3-2: Site Plan

3.1.1 Influent Pump Station

The influent pump station receives wastewater into a wet well equipped with submersible pumps, currently operating with two large (65 HP) and one smaller (45 HP) rental pump that the District intends to purchase. The station is designed to accommodate four pumps on variable frequency drives and wet well levels are monitored by a Doppler sensor with float backups. The wet well is a confined space, and while ventilation was originally installed, the supply fan is non-functional, preventing operator entry and requiring contracted support for maintenance. Each pump contains a dedicated discharge into a common effluent channel box, which then flows into the headworks for screening through a common header pipe. The dedicated pump discharge piping is arranged such that the discharge is above the operating water levels without backflow during pump off conditions in lieu of traditional isolation valve and check valves. The capacities of the influent pump station are summarized in Table 3-1.

Table 3-1: Influent Pump Station Capacity

Area	Parameter	Value	Units
Large Pumps	No.	2	#
	Pump Type	Submersible	--
	Motor Size	65	HP
	Flow Rate	2882	GPM
	Total Dynamic Head	45	FT
	Controls	VFD	--
Small Pumps	No.	1	#
	Pump Type	Submersible	--
	Motor Size	45	HP
	Flow Rate	2700	GPM
	Total Dynamic Head	46.9	FT
	Controls	VFD	--

3.1.2 Preliminary Treatment

Preliminary treatment consists of screening and grit removal. The screening area includes a Parshall flume for flow measurement and a drum screen that washes, dewaters, and conveys screenings into a dumpster for landfill disposal. While the screen mechanism for debris removal and conveyance out of the channel is intended to be automated, operators have experienced mechanical issues requiring manual cleaning of debris. A bypass channel with a manually raked screen is available for use when the automatic screen is out of service or during primary channel overflow conditions.

The grit removal system is an aeroductor system manufactured by Lakeside Inc., consisting of a grit chamber and a grit classifier. Grit is dewatered and conveyed to a dumpster for landfill disposal, which operators typically replace weekly, although it is not full at the time of replacement. A new grit blower was installed in 2019. The grit removal room also houses a septic receiving station with a flow meter for customer billing, but it is currently not in use. Plant staff indicated that recent improvements to the grit removal mechanism were completed and the grit removal efficiency since the new improvements are unknown at the time of this study. Table 3-2 summarizes the preliminary treatment capacity.

Table 3-2: Preliminary Treatment Capacity

Area	Parameter	Value	Units
Parshall Flume	No.	1	#
	Throat Width	18	inches
	Max Readout	15.87	MGD
Bar Screen	No.	1	#
	Hydraulic Rating	12.5	MGD
Grit Chamber	Length	21	FT
	Width	21	FT
	Liquid Depth	14	FT
	Volume	46,185	gal
Grit Classifier	Motor Size	0.75	HP

3.1.3 SBR System

The SBR system consists of four SBR basins complete with air diffuser discs and decanter arms, blowers and air piping, and waste activated sludge (WAS) pumps. The four equal-sized SBR basins are continuously fed and operate in a sequence of aeration, settling, and decanting, all within the same tank. Influent enters through a central splitter structure with four gates, distributing flow to each basin. The system runs one of three operating cycles based on flow conditions, with the normal cycle involving 2 hours of aeration, 1 hour of settling, and 1 hour of decanting, repeated six times per day. The SBR control system is also equipped with an intermediate cycle mode and a storm cycle mode, depending on the influent flow where cycle times are adjusted accordingly.

Aeration is provided by three blowers: one positive displacement (PD) blower and one screw blower (each dedicated to two basins), and one centrifugal blower used as a backup. The blower room is attached to the main control building, with an air header piping conveying air to the SBR tanks. Fine bubble membrane diffusers are installed within each tank to distribute diffused air during the aeration cycle. Each duty blower is assigned to two tanks such that only one of the two tanks is in the aeration cycle at once,

therefore open/close air header isolation valves control which tanks are receiving air. The backup centrifugal blower is on standby if one of the duty blowers goes offline, however, the blower is not connected to the SBR programmable logic controller (PLC) and therefore would require manual operation in the event of a duty blower failure.

There are no secondary clarifiers; instead, a settling phase is utilized in the SBR. WAS is removed directly from the SBR basins after decanting. One submersible WAS pump per basin (four total) transfers the settled sludge to solids handling, while the supernatant flows to UV disinfection. The WAS pumps operate at an operator-adjustable time interval each cycle. The SBR system capacity is summarized in Table 3-3.

Table 3-3: SBR System Capacity

Area	Parameter	Value	Units
Original SBR Design Capacity	Average Daily Flow	3	MGD
	BOD	3753	lb/day
	TSS	6005	lb/day
	TKN	651	lb/day
SBR	No. of tanks	4	#
	Tank width	70	ft
	Tank length	79	ft
	Tank operating depth	18	ft
	Tank volume	744,611	gal/basin
	Normal Cycle Time - Air	2	hr
	Normal Cycle Time - Settle	1	hr
	Normal Cycle Time - Decant	1	hr
	Normal Cycle Time - Total	4	hr
WAS Pumps	No.	4	#
	Pump Type	Submersible	--
	Motor Size	5	HP
	Flow Rate	300	GPM
	Total Dynamic Head	35	FT
	Controls	On/Off - Modulating Valve	
Process Blowers	PD - Air Flow	1625	scfm
	PD - Motor Size	100	HP
	Screw - Air Flow	2242	scfm
	Screw - Discharge Pressure	7.5	PSIG
	Screw - Motor Size	100	HP
	Centrifugal - Air Flow	Unknown	scfm
	Centrifugal - Motor Size	100	HP

3.1.4 UV Disinfection

The UV disinfection system, constructed in 2010, receives decant flow from the SBR basins. Disinfection uses Ozonia vertical UV bulbs and includes an acid bath cleaning system and a jib crane. While bypass piping is available outside the building, operators typically continue to use the main channel, even during the non-recreational season (November – March) when UV disinfection is not required. An actuated gate originally used for level control was abandoned due to its inability to handle intermittent high decant flows; it was replaced with a finger weir structure in 2020. As a result of this change, the flow meter between the SBRs and UV is no longer in use because it is no longer needed to control the actuated gate. Following UV treatment and passage through the finger weirs, flow is discharged into Plattin Creek. Table 3-4 summarizes the UV system disinfection capacity.

Table 3-4: UV Disinfection Capacity

Area	Parameter	Value	Units
UV	No.	2	Modules
	Lamps per Module	36	Lamps
	Headloss at peak flow (14.7 MGD)	6.05	inches
	UV Transmittance	70	%
	Design Dose	30	mJ/cm2

3.1.5 Solids Handling

The original plant, which existed prior to the construction of the SBR facility, was repurposed into the current solids handling facility with aerobic digestion. The system includes two tanks, and at the time of this study, no dewatering equipment was in place. Solids are hauled off-site by a contracted hauler approximately twice per year, and decant from the solids storage tanks is manually pumped by plant staff via lowering submersible pumps into the solids storage tanks and returned to the plant headworks. The District is actively working to improve the solids handling system, including the planned installation of a screw press for dewatering and the conversion of an unused room into laboratory space. Given these ongoing efforts by the District, this master plan does not contemplate specific solids handling improvements.

3.1.6 SCADA

The plant's SCADA system is limited in functionality, with control capabilities restricted to the SBR PLC. Overall, the system serves primarily as a monitoring tool rather than providing full remote operational control across the facility. Monitoring and control of the SBR tanks is done at the SBR control panel human machine interface (HMI).

3.2 Historical Flows and Loadings

3.2.1 Discharge Monitoring Report (DMR) Data

DMR data from January 1, 2020, to November 30, 2024, was analyzed to characterize current wastewater characteristics received at and discharged from the Festus/Crystal City Wastewater Treatment Plant. Daily flow data was available, while influent concentrations of carbonaceous biochemical oxygen demand (CBOD) and total suspended solids (TSS) were provided approximately weekly and converted to loadings based on the flow rate. Influent ammonia, total Kjeldahl nitrogen (TKN), and total phosphorous (TP) were not historically measured. Data outliers (greater than two standard deviations) were excluded, and the median was used to represent average day flow and loading to minimize the influence of extreme values. The 91.7th percentile (11/12) was used to determine maximum month conditions, and the 99.7th percentile (364/365) was used for maximum day conditions. The statistical analyses used are summarized in Table 3-5 while results of the DMR characterization is summarized in Table 3-6. Refer to the Hydraulic Model Report for additional information on influent flow.

Table 3-5: Statistical Analyses Used for Flow and Loading Conditions

Parameter	Method
Average Day (AD)	50 Percentile
Max Month (MM)	91.7 Percentile
Max Day (MD)	99.7 Percentile

Table 3-6: Influent DMR Data Summary

Constituent	Average Day		Max Month		Max Day	
Flow (MGD)	1.7		2.9		4.4	
CBOD (lb/day | mg/l)	1,228	85	3,246	175	5,516	271
TSS (lb/day | mg/l)	1,681	112	3,977	219	6,514	298

3.2.2 Sampling Data

Sampling was conducted Monday through Friday over a two-week period from March 17 to March 28, 2025, and included flow, CBOD, TSS, TKN, ammonia, and TP. Given the limited dataset, no outliers were removed; instead, minimum, average, and maximum values were calculated, with the average representing the true mean. This sampling effort confirmed trends observed in the DMR data and provided additional information for TKN, ammonia, and TP. The results of the sampling are summarized in Table 3-7.

Table 3-7: Influent Sampling Data Summary

Constituent	No. Of Samples	Minimum		Average		Maximum	
Flow (MGD)	10	1.7		1.8		2.0	
CBOD (lb/day | mg/l)	2	1,415	96	1,435	97	1,455	99
TSS (lb/day | mg/l)	10	1,152	80	2,122	139	2,603	182
TKN (lb/day | mg/l)	9	300	20	487	32	615	41
Ammonia (lb/day | mg/l)	10	227	15	405	26	564	39
Total Phosphorus (lb/day | mg/l)	10	59	4.0	112	7.3	168	11

3.2.3 Effluent Summary

This section includes a summary of the effluent DMR data compared to the permit levels for the WWTP. See Table 4-4 for a summary of the permit limit levels in Section 4.2.

CBOD

The average effluent CBOD concentration was 3.5 mg/L, based on 246 sample points collected approximately weekly. As shown in the Figure 3-3 and Figure 3-4, all DMR sampling results were below the permitted limit. Between January 2022 and March 2024, the detection limit for CBOD was 4.0 mg/l which explains why most of the data points in the graph during that time are 4.0. Monthly averages were calculated using all samples collected within each respective month.

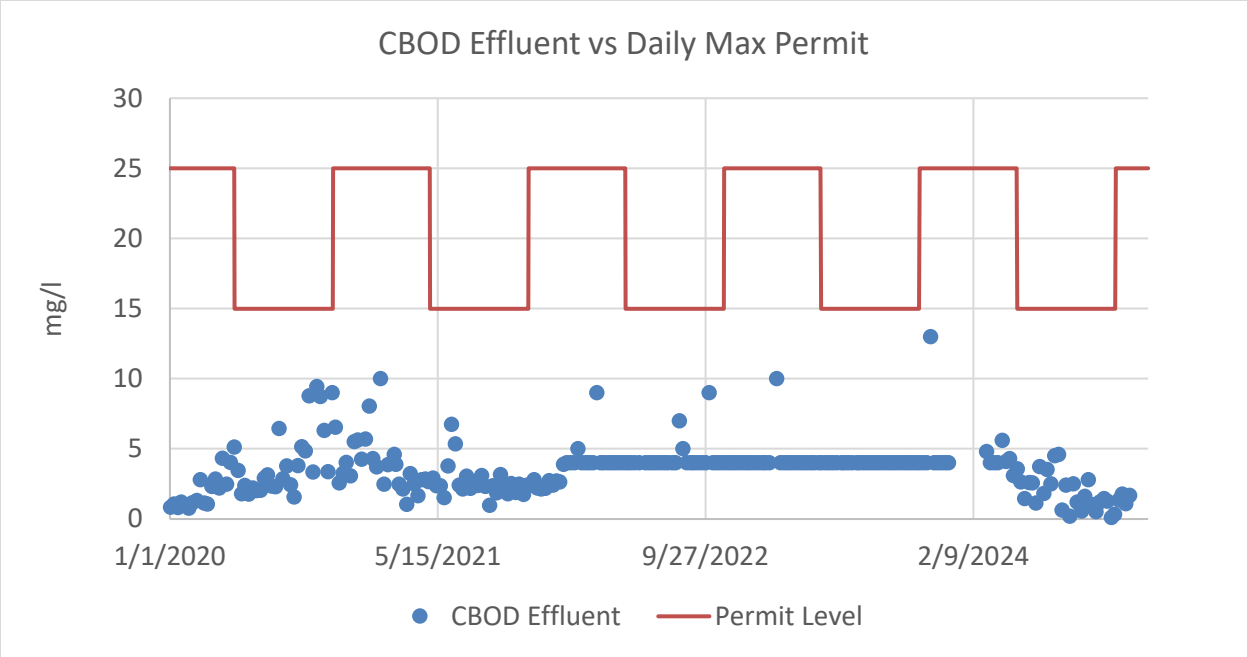


Figure 3-3: CBOD Effluent vs Daily Max Permit

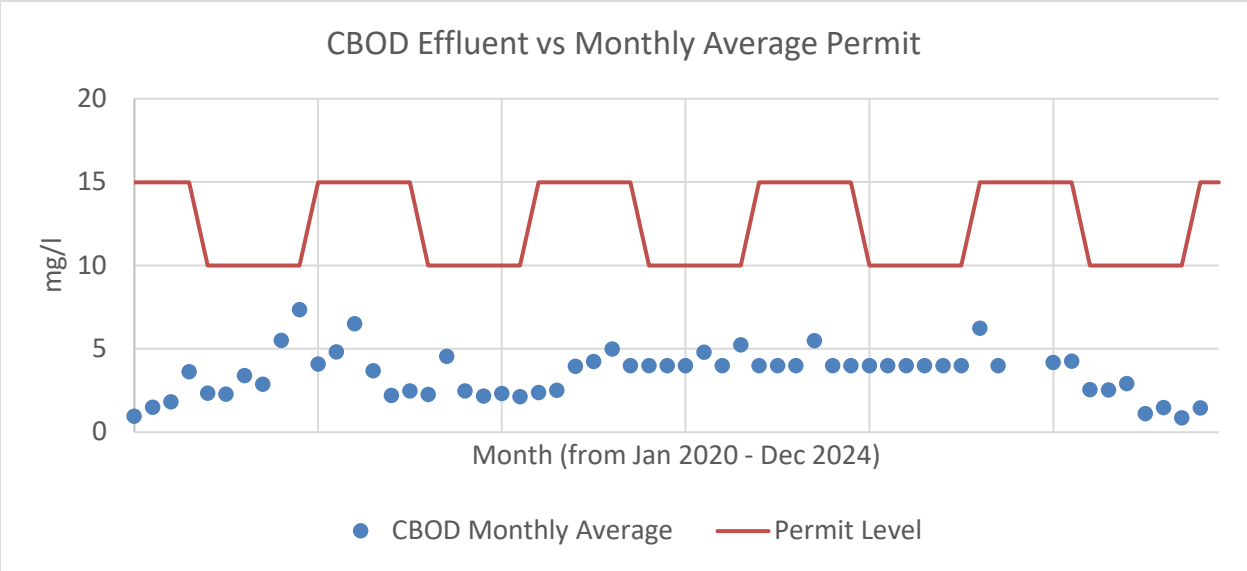


Figure 3-4: CBOD Effluent vs Monthly Average Permit

TSS

The average effluent TSS concentration was 2.6 mg/L, based on 243 samples collected approximately weekly. Each sample was assumed to be representative of a weekly average for the permit compliance

review. As shown in Figure 3-5 and Figure 3-6, all DMR sampling results were below the permitted limit. Monthly averages were calculated using all samples collected within each respective month.

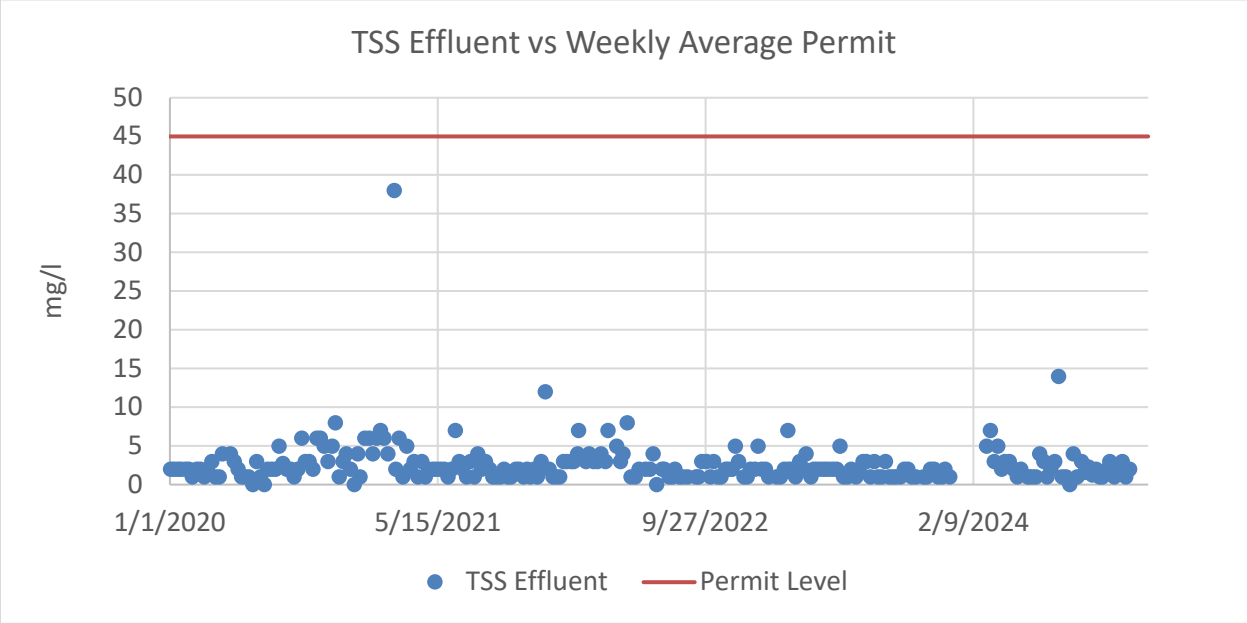


Figure 3-5: TSS Effluent vs Weekly Average Permit

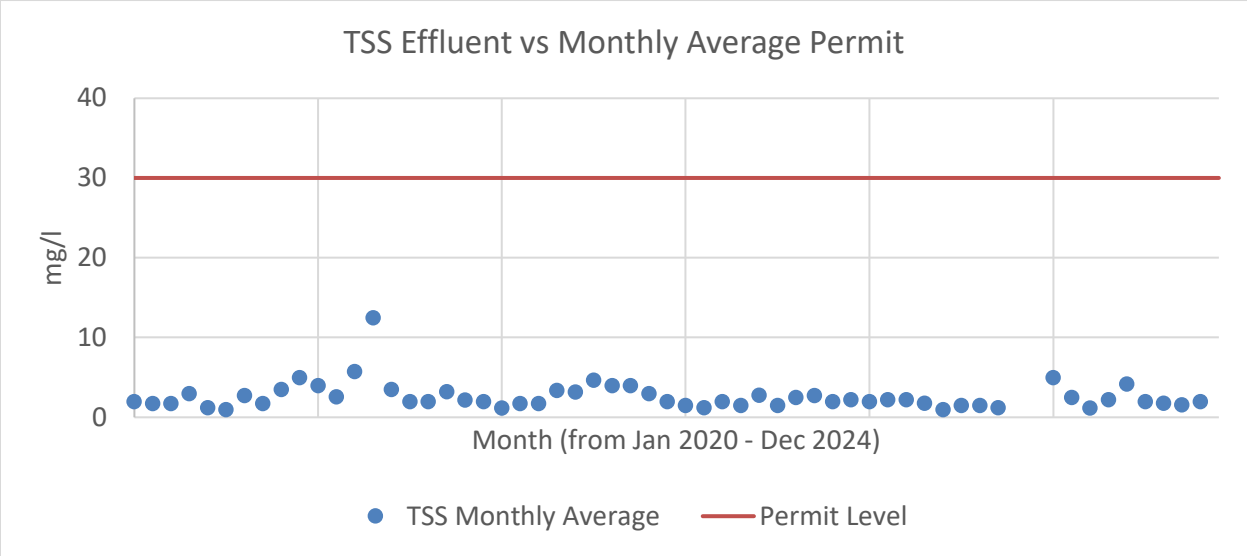


Figure 3-6: TSS Effluent vs Monthly Average Permit

E.Coli

The average effluent E.Coli was 5.4 #/100ml, based on 152 samples collected approximately weekly. Each sample was assumed to be representative of a weekly average for the permit compliance review. As shown in Figure 3-8 and Figure 3-7, all DMR sampling results were below the permitted limit. Monthly averages were calculated using all samples collected within each respective month.

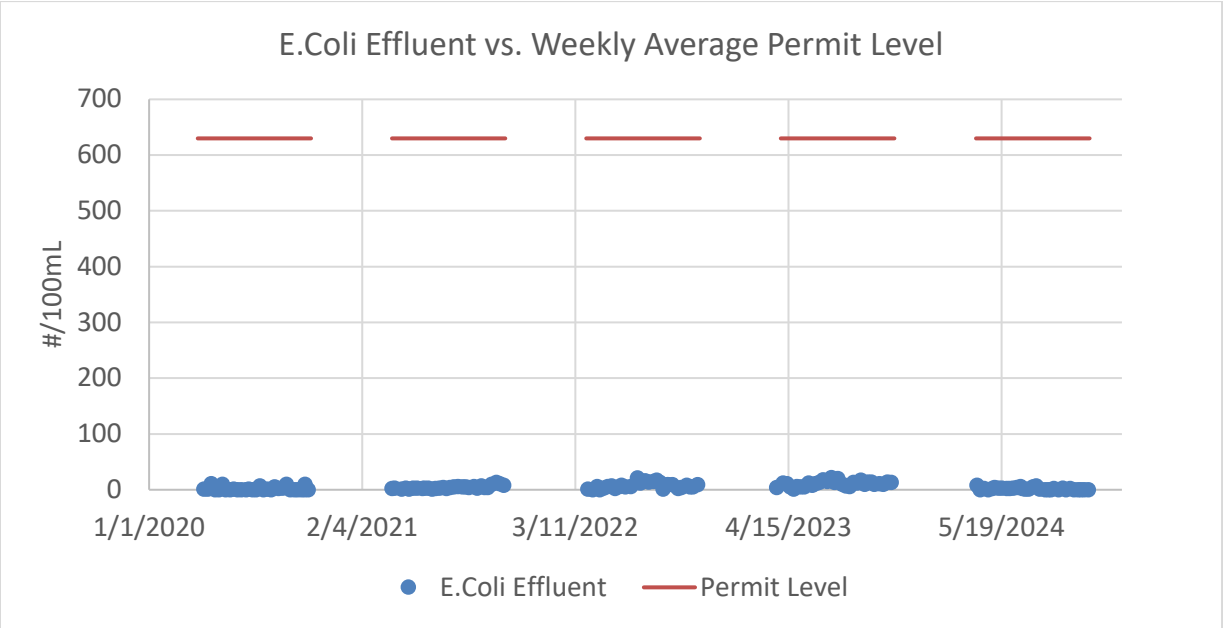


Figure 3-7: E.Coli Effluent vs. Weekly Average Permit Level

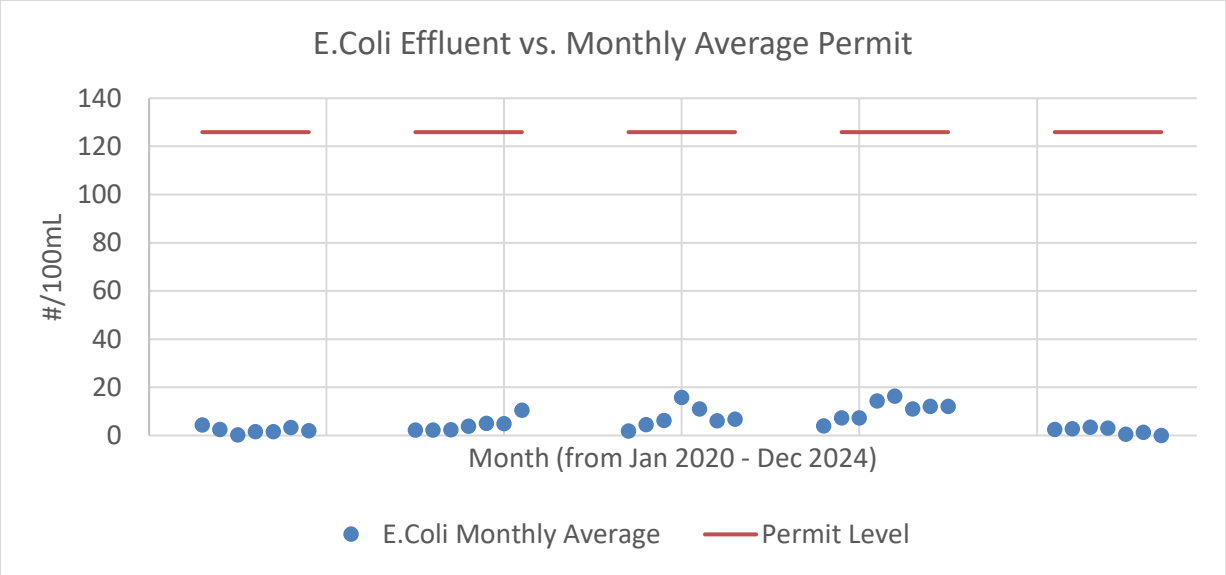


Figure 3-8: E.Coli Effluent vs. Monthly Average Permit

Ammonia as N

The average effluent Ammonia as N (NH3-N) concentration was 2.3 mg/l, based on 283 samples. As shown in Figure 3-9 and Figure 3-10, some samples were above the permitted limit. Plant staff noted changes were made to the SBR cycle sequencing and performance has been improved since. The last instance of permit level exceedance in the provided data set occurred in November 2023. Monthly averages were calculated using all samples collected within each respective month.

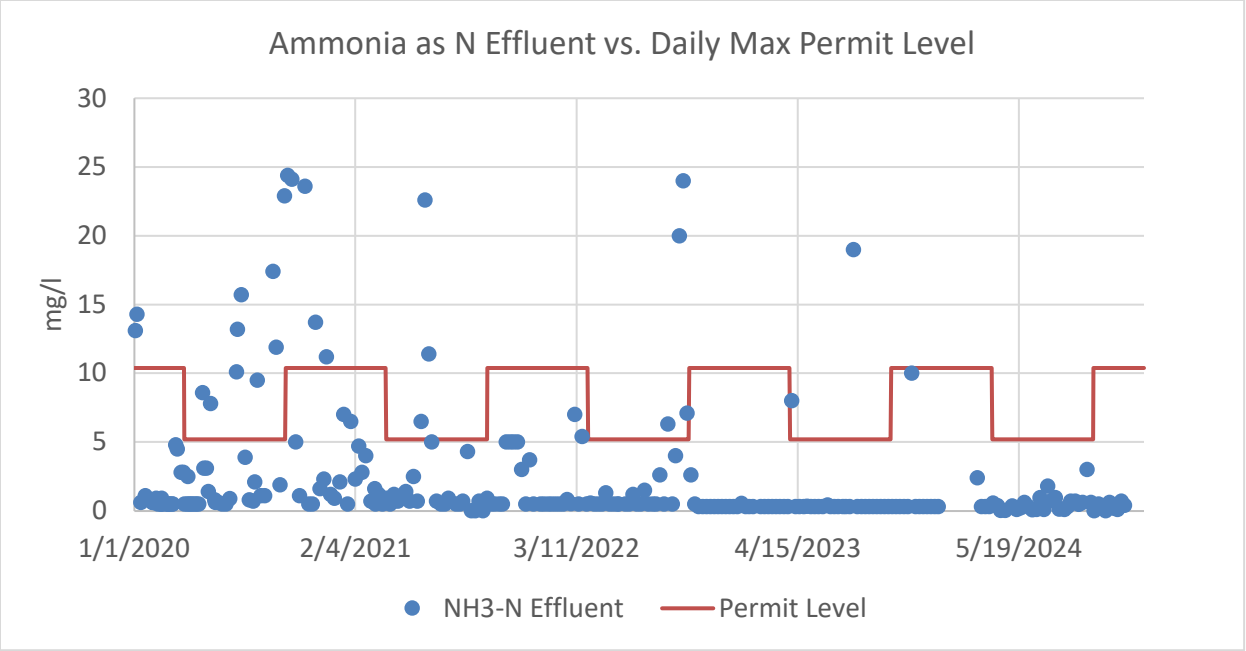


Figure 3-9: Ammonia as N Effluent vs. Daily Max Permit Level

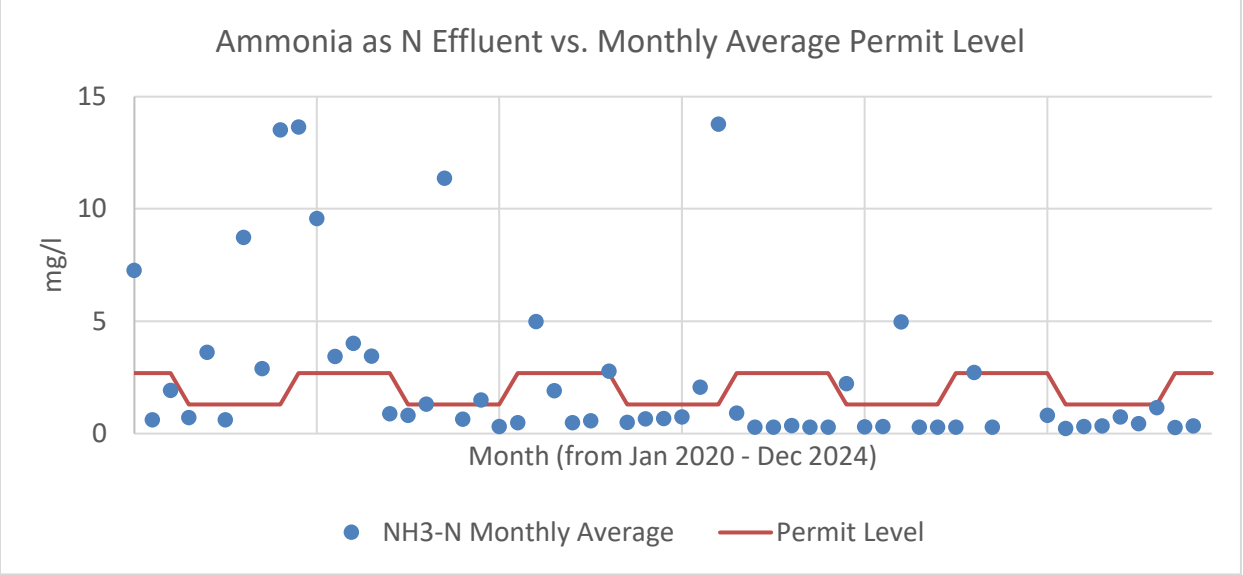


Figure 3-10: Ammonia as N Effluent vs. Monthly Average Permit Level

Oil & Grease

The average effluent oil and grease concentration was 4.8 mg/L, based on 18 samples collected approximately once per quarter. Each sample was assumed to represent the monthly average. As shown in Figure 3-11 and Figure 3-12, all DMR sampling results were below the permitted limit.

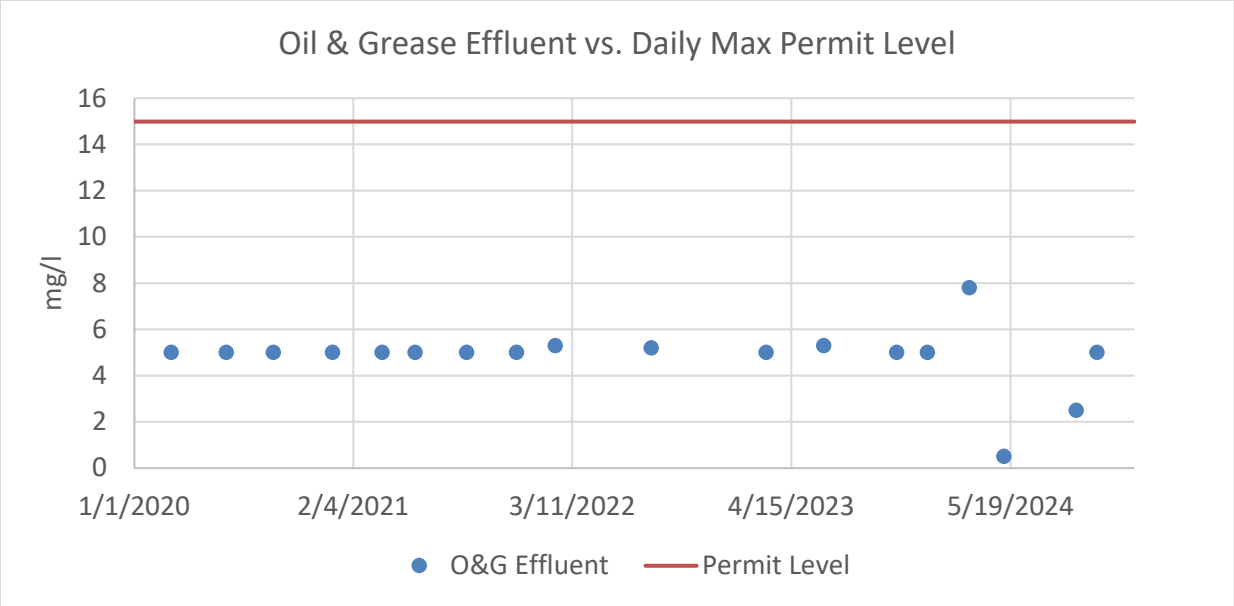


Figure 3-11: Oil & Grease Effluent vs. Daily Max Permit Level

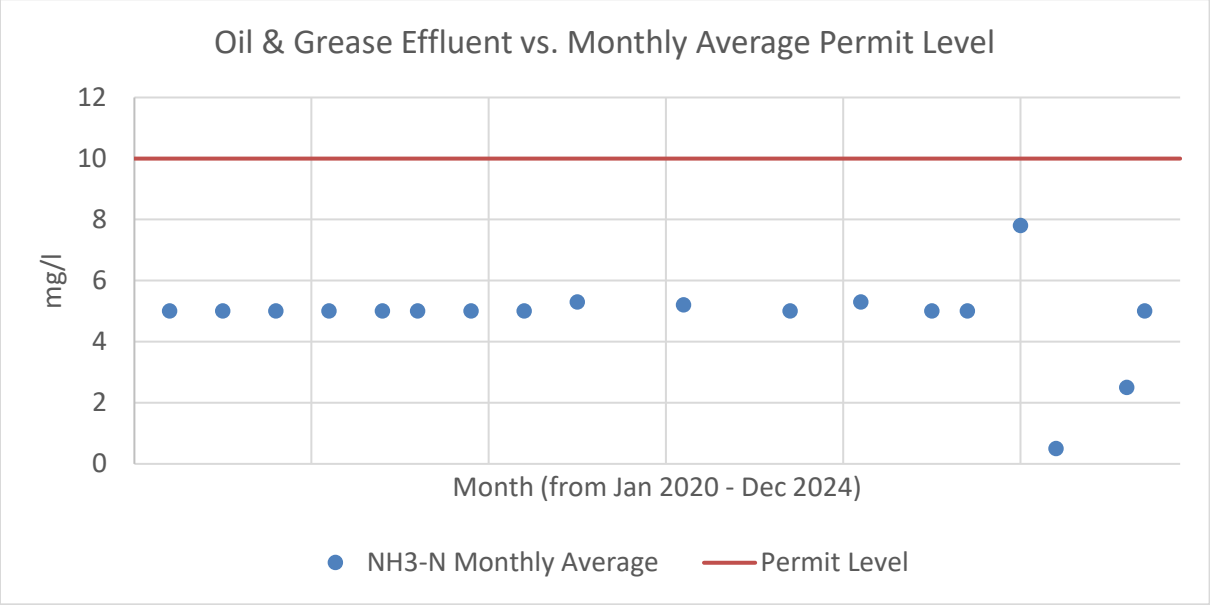


Figure 3-12: Oil & Grease Effluent vs. Monthly Average Permit Level

4.0 BASIS OF DESIGN

4.1 Residential and Industrial Growth

The District and Burns & McDonnell met in April 2025 to confirm anticipated population growth for Festus and Crystal City's service areas for the 20-year planning period. During this meeting, it was determined by the the District that development in both cities was assumed to follow linear growth patterns across the twenty-year planning period, with a 300,000 gpd increase in flow in Festus, and a 50,000 gpd increase in flow in Crystal City. In total, the service area is anticipated to grow by 0.35 MGD from residential growth over the next 20 years, which correlates to an approximate 20% increase in average flow.

Table 4-1 summarizes the projected flow and loading based on the future conditions considering residential growth only. Future loadings for CBOD and TSS were calculated by increasing the historical DMR data average day, max month, and max day loadings by the expected average day increase in flow of approximately 20%. This assumes a similar wastewater makeup for future flows. The average loadings for TKN and TP were calculated by increasing the average loadings from the sampling plan summary by the same proportion. The average ammonia loading was calculated using the observed Ammonia/TKN ratio of 0.8 from the sampling plan data. The max month and max day loadings for TKN, ammonia, and TP were then calculated using the max month to average day (MM:AD) and max day to average day (MD:AD) ratios observed from the DMR dataset of 2.6 and 4.5, respectively. This observed MM:AD ratio of 2.6 is on the higher end of typical MM:AD ratios for municipal wastewater systems and could be attributed to low velocities in the collection system piping during dry weather flows, allowing for solids deposition in piping. During wet weather flows, these solids would then be conveyed to the plant with higher velocities. This could contribute to lower strength wastewater under dry weather conditions and increased loadings during wet weather conditions.

Table 4-1: Future Flows and Loading Projections (Residential Only)

Parameter	Avg. Day	Max Month	Max Day
Flow (MGD)	2.05	3.5	5.3
CBOD (lbs/day)	1,480	3,920	6,660
TSS (lbs/day)	2,030	4,800	7,850
TKN (lbs/day)	590	1,530	2,650
NH3-N (lbs/day)	470	1,210	2,100
TP (lbs/day)	130	350	590

Note: Flows above 5.3 MGD were observed during wet weather conditions. Influent pump station capacity will be sized as described in Section 6.1.

A significant industrial user, with facilities currently under construction, is expected to come online in the future and contribute additional flow and loading to the WWTP. A 2022 memo from Horner & Shifrin, included as Appendix A, summarizes the anticipated flows and loads from this industrial user. Table 4-2 presents the projected influent values to the WWTP, taken directly from the memo, which were used to further develop the future conditions basis of design for this planning effort.

Table 4-2: Anticipated Industrial Influent From 2022 Horner Shifrin Memo

Parameter	Units	Industrial Influent
Flow	MGD	1
BOD	mg/l	240
TSS	mg/l	100
TKN	mg/l	12
TP	mg/l	1
Sulfates	mg/l	600
Alkalinity	mg/l, as CaCO3	398
Ca	mg/l	140
Mg	mg/l	40
Temperature	Degrees F	104

It was assumed all industrial growth for the service area comes from this one industrial user. Table 4-3 summarizes the projected flows and loads when the new industrial user is fully operational based on the anticipated flows and loads from the 2022 Horner Shifrin Memo. The industrial user is expected to develop the site in two phases, however, the expected timing of the two phases is currently unknown.

Table 4-3: Future Flows and Loading Projections (Residential + Industrial)

Parameter	Avg. Day	Max Month	Max Day
Flow (MGD)	3.05	5.1	7.8
CBOD (lbs/day)	3,480	5,920	8,660
TSS (lbs/day)	2,860	5,630	8,680
TKN (lbs/day)	690	1,630	2,750
NH3-N (lbs/day)	550	1,290	2,180
TP (lbs/day)	140	360	600

Note: Flows above 7.8 MGD were observed during wet weather conditions.
Influent pump station capacity will be sized as described in Section 6.1.

4.2 Regulatory Review

Table 4-4 summarizes the final effluent limitations from the current NPDES permit. In addition, the plant is required to monitor and report effluent daily maximum and monthly average effluent limits for flow, TP, total nitrogen, lead, and zinc. The full NPDES permit can be found in Appendix B.

Table 4-4: Permit Final Effluent Limitations

Effluent Parameter	Units	Date Range	Daily Maximum	Weekly Average	Monthly Average
CBOD	mg/l	May 1 - Oct 31	15		10
		Nov 1 - Apr 30	25		15
TSS	mg/l			45	30
E.coli	#/100ml			630	126
Ammonia as N	mg/l	Apr 1 - Sep 30	5.2		1.3
		Oct 1 - Mar 31	10.4		2.7
Oil & Grease	mg/l		15		10

While the exact timing and limit is uncertain, TP limits for all major publicly owned treatment works (POTWs) in Missouri are anticipated to take effect in 2033. Major POTWs are defined as facilities with flows over 1 MGD, which includes the Festus/Crystal City WWTP. For this planning effort, a future TP limit of 1 mg/L was assumed. Currently, there is no dedicated phosphorus treatment provisions, either biological or chemical, at the plant and additional treatment will likely be needed to meet this anticipated future permit limit. At this time, there are no known or anticipated changes for the current limits on CBOD, TSS, E. coli, ammonia, or oil and grease; however a future effluent target of 1 mg/L of ammonia as nitrogen was assumed for this study.

Future flow conditions from residential and one industrial user are projected to reach 3.05 MGD, which exceeds the current plant's permitted average day capacity of 3.0 MGD. As a result, an increase in the permitted average day capacity will be required. It is generally recommended to evaluate capacity upgrades once average flows exceed 80% of the permitted capacity, a threshold the facility is projected to surpass.

5.0 CONDITION ASSESSMENT FINDINGS

5.1 Summary

Representatives from Burns & McDonnell and the District conducted a facility walkthrough on January 29, 2025. The team evaluated all major process areas, gathered operator feedback, and documented observations with photos. Each area was then assigned a condition rating on a scale of 1 to 5 in coordination with the District, with the ratings legend outlined in Table 5-1. Table 5-2 summarizes the ratings for each process area, with additional details provided in the following sections.

Table 5-1: Condition Assessment Ratings Legend

Physical Condition	Performance Level of Service (LOS)	Rating
Excellent: No deterioration, normal maintenance. >80% of useful life remains.	Exceeds LOS	1
Good: Minor deterioration, function well, minor maintenance required. 60-80% of useful life remains.	Meets LOS	2
Fair: Moderate deterioration, function partially limited, significant maintenance required. Refurbishment in next 10 years. 40-60% of useful life remains.	Meet LOS with limitations	3
Poor: Severely deteriorated, cannot function well, significant renewal required in next 5 years. 20-40% of useful life remains.	Difficult to meet LOS	4
Failing: Cannot function, less than 20% of useful life remains.	Cannot meet current or near-future (within 5 years) LOS	5

Table 5-2: Condition Assessment Ratings Summary

Process Area	Condition Rating
Influent Pump Station	2
Screening	3
Grit Removal System	2
SBR Basins	2
Process Blowers	3
UV Disinfection	2
Solids Handling	4
SCADA	3

5.2 Influent Pump Station

The influent pump station, as shown in in Figure 5-1, received an overall condition rating of 2, with the infrastructure generally functioning well for its intended purpose. The effluent pumping chamber is exposed to significant levels of hydrogen sulfide (H_2S), for which a protective coating can be applied to preserve the integrity of the concrete. Minor piping corrosion was observed throughout the area. Additionally, the ventilation system is currently inoperable, preventing operators from safely entering the station; as a result, contractors are hired to perform maintenance. The team was not able to enter the wet well to visually inspect the pumps due to this safety limitation. Replacing the supply fan is identified as a project to restore proper ventilation. The pumps currently lack check and isolation valves on the discharge lines; these can be installed to provide future design flexibility. While the station was originally designed for four pumps, only three are currently installed. As discussed in Section 6.1, adding a fourth pump will restore the station to its intended capacity. Operators indicated that the existing monorail hoist system functions well for removing the pumps.

Figure 5-1: Influent Pump Station

5.3 Preliminary Treatment

5.3.1 Screening

The screening area received a condition rating of 3 due to operational limitations. Operators reported frequent issues with rags and debris making it past the screen, particularly accumulating in the UV system, indicating that the current screen is not effectively removing unwanted debris. Additionally, the screen requires frequent manual debris removal, which increases operational burden. As a result, it is identified as a project to replace the screen and upgrade the non-potable water system to allow for automatic screen cleaning. A photo of the screen is shown in Figure 5-2 and the manual bypass screen in Figure 5-3. The parshall flume and flow meter, and shown in Figure 5-4, appeared to be in good condition and serving its intended purpose.

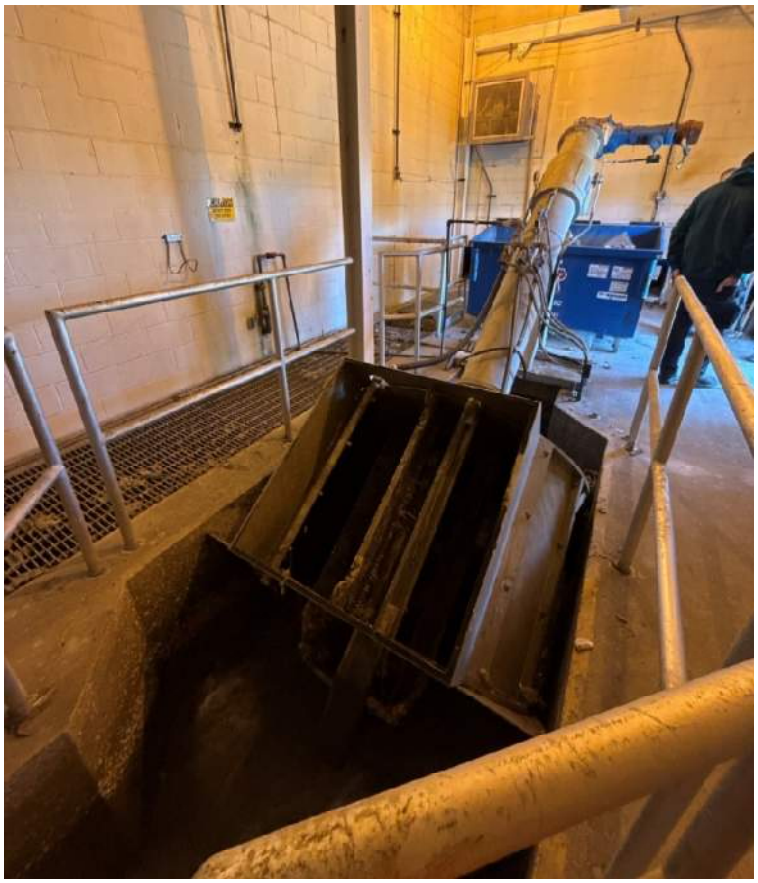


Figure 5-2: Influent Screening

Figure 5-3: Manual Bypass Screen

Figure 5-4: Parshall Flume

5.3.2 Grit Removal System

The grit removal system received an overall condition rating of 2 due to recent rehabilitation efforts and noted removal efficiency by operations staff. The blower (Figure 5-7), installed in 2019, is reported by operators to function well, though it lacks the ability to modulate airflow. At the time of the site visit, operators noted that grit removal performance was poor; however, they were experiencing unusually high flows at the time. It was later discovered that the increase in influent flow was caused by an open drain valve in the grit tank causing recirculating flow back to the influent pump station. Since resolving this issue, operators have observed improved grit removal performance and normal influent flows. Photos of the grit chamber and grit classifier can be seen in Figure 5-5 and Figure 5-6 respectively.

Figure 5-5: Grit Chamber

Figure 5-6: Grit Classifier and Washer

Figure 5-7: Grit Blower

5.4 SBR System

5.4.1 SBR Basins

The SBR basins received an overall condition rating of 2 and seemed to be in good operating condition at the time of the site visit (Figure 5-8). The splitter box gates are manually operated, and operators indicated that actuated gates would improve functionality (Figure 5-11). During cold weather, the decant motors are prone to freezing, prompting operators to construct temporary shelters for freeze protection as shown in Figure 5-12. While not listed as a CIP, the District may consider covering the motors with insulated, removable jackets or adding a heat trace to prevent the motors from freezing. Typical SBR basin during aeration can be seen in Figure 5-9 and the decanter can be seen in Figure 5-10. At the time of the visit, all basins contained flow, so the team was unable to visually inspect the disc diffusers; however, operators noted they were installed in 2004 and since then only a couple hundred in basin 4 have been replaced. Because disc diffusers typically have a life span of less than 20 years, a project was identified to replace the diffuser grids within all tanks. Two of the four WAS pumps were recently replaced, and the District is currently planning to replace the remaining two. Due to this ongoing effort by the District, there are no additional projects for the WAS pumps identified as part of this Master Plan. Currently, there are dissolved oxygen (DO) probes in the basins, but the operators indicated it would be beneficial to have additional instrumentation such as analyzers for pH, TSS, and ammonia. It was noted that the existing instrument controllers have spare ports for additional instrumentation implementation.

Figure 5-8: SBR Basins

Figure 5-9: SBR Basin During Aeration Cycle

Figure 5-10: Typical SBR Basin Decanter

Figure 5-11: SBR Splitter Structure Manual Gates

Figure 5-12: Temporary Decanter Motor Shelter

5.4.2 Process Blowers

The blowers received an overall condition rating of 3 due to limited functionality. There are three types of blowers on site—PD (Figure 5-13), screw (Figure 5-14), and centrifugal (Figure 5-15)—each with different intake configurations. The screw and centrifugal blowers draw intake air from the process room, while the PD blower pulls air from outside. The screw blower was noted to be loud and is enclosed in a sound enclosure for hearing protection; as a result, it was unable to be visually inspect beyond the enclosure. The centrifugal blower serves as a standby backup, requires manual operation, and has an unknown design airflow, although it has the same motor size as the other blowers (100 HP). Additionally, the blower room contains electrical equipment for the blowers, including variable frequency drives (VFDs), and lacks air conditioning, which operations staff mentioned can cause operational challenges in hot weather. HVAC improvements are identified to maintain temperatures within the blower room at recommended levels for the blower and associated electrical equipment. Air conditioning is a more practical solution when all blowers draw inlet air from the outside, as opposed to from the room.

Figure 5-13: Positive Displacement Blower

Figure 5-14: Screw Blower Enclosure

Figure 5-15: Standby Centrifugal Blower

5.5 UV Disinfection

The UV disinfection system received an overall condition rating of 2. Figure 5-16 shows the outside of the UV building and part of the finger weir structure. Operators reported that the UV system is functioning well and is generally in good condition as seen in Figure 5-17. However, the most significant challenges include the presence of rags, attributed to ineffective upstream screening, and difficulties operating the jib crane due to issues with the hoist (Figure 5-18). While not listed as a CIP, the District may consider replacing the jib crane motor to address existing hoist issues. Based on operator feedback, the crane structure itself is in acceptable condition and does not require replacement, only the motor needs to be addressed. Additionally, operators noted ongoing issues with birds inside the building. The District may consider installing soffit panels or bird repellent strips to deter birds and reduce associated maintenance concerns.

The finger weir structure was not evaluated during the site walk but operators indicated that it has been functioning well. It was constructed within the last five years and is assumed to be in good condition.

Figure 5-16: UV Building and Finger Weir Structure

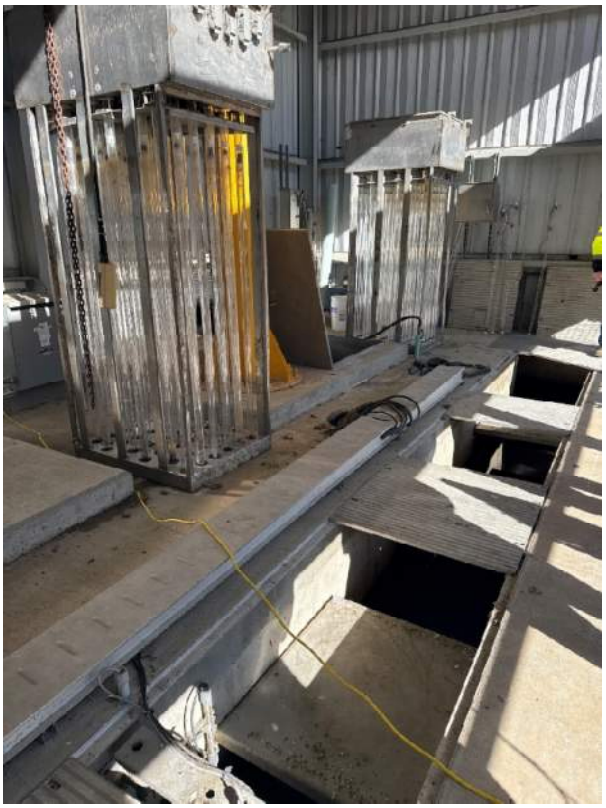


Figure 5-17: UV Disinfection Channel and Bulbs

Figure 5-18: UV Jib Crane

5.6 Solids Handling

The solids handling system received a condition rating of 4. The infrastructure is aging, as it was repurposed from the original plant, and shows visible signs of wear (Figure 5-19). Additionally, the available storage volume and lack of dewatering capability may be insufficient during times when land application is not feasible. However, due to ongoing improvement projects already being implemented by the District, no additional upgrades were identified for inclusion in the capital improvement plan as part of this master planning effort. Space is available for future dewatering equipment as seen in Figure 5-20. Operations staff indicated there is one screw blower, lacking a sound enclosure unlike the SBR process blower, and one centrifugal blower similar to the backup process blower for solids handling back up. In addition to the planned installation of dewatering equipment, the District should consider replacing the existing tanks, verifying sufficient blower sizes, and providing identical blowers for improved operational efficiency and maintenance.

Figure 5-19: Solids Handling Tank and Walkway

Figure 5-20: Future Dewatering Equipment Area

5.7 SCADA

The plant SCADA system, as seen in Figure 5-21, received an overall condition rating of 3. It currently has limited control capabilities and is primarily used for monitoring. Most control functions are tied directly to the SBR PLC and HMI screen. It was identified as a CIP to connect the SBR controls to the SCADA system, as well as improved monitoring and desired remote controls for additional equipment such as the additional SBR instrumentation, actuated slide gates, influent screen, influent pump, and UV equipment to expand overall control capabilities to improve operational efficiency and system integration.

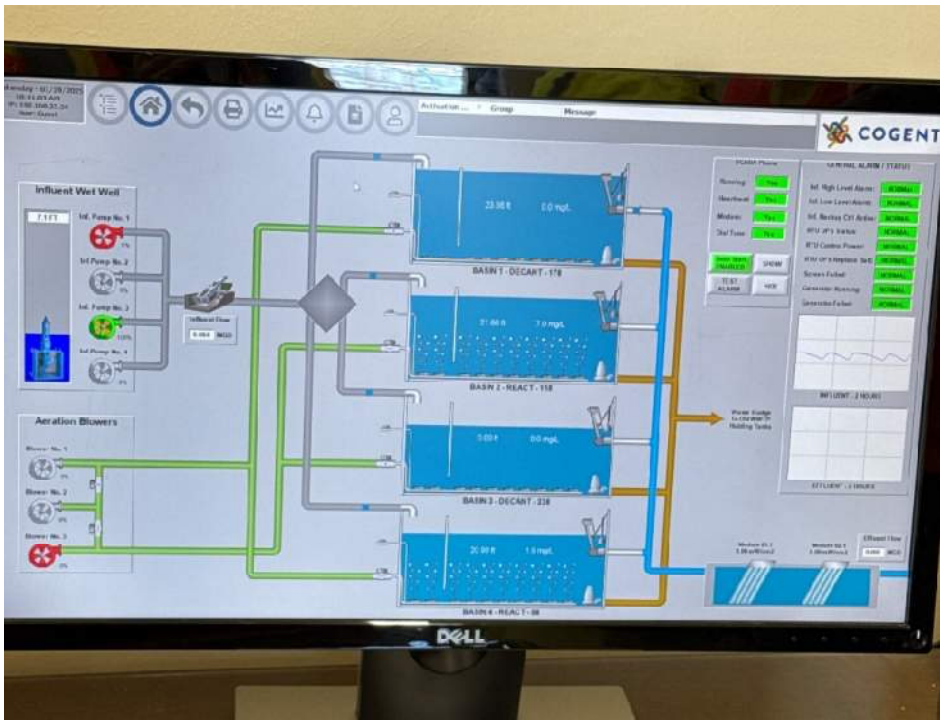


Figure 5-21: Existing SCADA Screen

6.0 CAPACITY ASSESSMENT FINDINGS

A hydraulic evaluation was conducted to determine the apparent capacity of each unit process and identify potential bottlenecks throughout the WWTP. The evaluation focused on hydraulic throughput and organic treatment capacity for key unit processes, including pumping systems, influent screening, grit removal, SBR basins, and disinfection. Existing capacities for each system are detailed in Section 3.0 Existing Conditions. The plant was originally designed to accommodate a peak instantaneous hydraulic capacity of 12.5 MGD.

6.1 Influent Pump Station

The influent pump station was originally designed for a peak flow of 12.5 MGD with four pumps; however, the current configuration does not meet this capacity under a firm capacity scenario. The station currently operates with two large pumps rated at 2,882 GPM and one smaller pump rated at 2,700 GPM. With one large pump out of service, the resulting firm capacity is 8 MGD, highlighting the need for an additional pump. If one additional large pump is installed while retaining the smaller pump, the firm capacity would increase to 12.2 MGD, still slightly below the design peak flow. To achieve the full firm capacity of 12.5 MGD, all four pumps would be required to be the larger size.

6.2 Preliminary Treatment

The screening and grit removal systems were hydraulically designed for a peak flow of 12.5 MGD, which appears to be sufficient for future flow scenarios.

6.3 SBR System

The SBR basins were designed to handle a peak wet-weather influent flow of 12.5 MGD and a decant flow of 14.7 MGD. From a hydraulic standpoint, the secondary treatment system is well-sized, and there are no hydraulic concerns at this time.

6.3.1 Organic Loadings

Table 6-1 summarizes the original SBR design capacity in terms of flow and organic loadings compared against existing conditions, future projections for residential growth only, and future conditions for residential growth and anticipated industrial loadings. Existing maximum month conditions are within the existing SBR design capacity, with the exception of the TKN loading, which is noted to be significantly higher. This likely contributes to the historical instances of ammonia exceedances. Future maximum

month conditions for residential growth only is similar, but with BOD loadings exceeding the original capacity as well. The existing SBR manufacturer (now Xylem), noted that at these maximum month loadings would stress the existing SBR tanks but with operational updates and higher mixed liquor suspended solids (MLSS) concentrations, but would likely be able to maintain effluent compliance. However, there would be little flexibility for the addition of anoxic/anaerobic time for denitrification and/or biological phosphorus removal thus a chemical feed system for the precipitation of phosphorus was identified as a CIP.

For the future residential growth and anticipated industrial contribution scenario, maximum month conditions well exceed existing plant capacity. Alternatives for process intensification were explored to achieve additional treatment out of the existing treatment volumes. Process intensification alternatives explored included BioMag (Xylem), InDense + miGRATE (World Water Works), and AquaNereda (Aqua-Aerobics). Each alternative generally consisted of selective sludge wasting to promote the growth of aerobic granular sludge (AGS) to achieve improved settling rates (to decrease the duration of the settling phase) and promote intensified biological treatment through sludge granules, acting similar to a fixed film process or attached growth process. However, with each alternative considered, a significant amount of new infrastructure would be required to fully implement the intensification process on top of the capital-intensive equipment provided by manufacturers. Additionally, intensification alternatives did not fully meet future maximum month conditions within the existing treatment volume. While intensification could be further explored if full buildout conditions are determined to be unlikely for the planning period, the intensification alternatives require substantial additional infrastructure such as WAS holding tanks, chemical storage and feed systems, compressed air systems, pumping, equipment skids, media retention screening, and control system upgrades; depending on the technology.

In addition to process intensification within the existing tank volume, construction of additional SBR tanks was considered. Due to the considerations noted above, the addition of two additional SBR tanks adjacent to the existing basin was selected for additional treatment volume and similar operations for the full buildout conditions. With the increased TKN and CBOD loadings, there is again limited flexibility for anoxic or anaerobic conditions and the addition of an alum feed system for phosphorus precipitation is still included as a CIP for phosphorus removal and/or trimming in the future. A detailed process report provided by Xylem for the SBR with 6 tanks at the future maximum month conditions is provided in Appendix C.

Table 6-1: Summary of Loading Capacity For Projected Scenarios

Parameter	Original Design Capacity (SBR)	Existing Conditions		Future (Residential Only)		Future (Residential + Industrial)	
		Average	Max Month	Average	Max Month	Average	Max Month
Average Daily Flow (MGD)	3	1.7		2.05		3.05	
BOD Loading (lbs/day)	3753	1230	3250	1480	3920	3480	5920
TSS Loading (lbs/day)	6005	1680	3980	2030	4800	2860	5630
TKN Loading (lbs/day)	651	490	1270	590	1530	690	1630

6.3.2 Aeration Demands

The existing blower firm capacity is unknown due to the lack of air flow data for the centrifugal blower. The PD blower provides 1,625 standard cubic feet per minute (SCFM), and the screw blower provides 2,242 SCFM, totaling 3,867 SCFM. Currently, one blower supplies air to two basins (one at a time), with the centrifugal blower serving as a swing blower for redundancy. With the proposed addition of two new basins (for a total of six basins), maintaining the same control configuration would require a fourth blower to allow each blower to serve two basins with one blower for redundancy. However, the existing blower room lacks space to accommodate a fourth blower, and expanding the room would require relocating the transformer outside the building. Constructing a new blower room, potentially attached to the proposed chemical feed building northeast of the new basins, was also considered. However, that area is limited by the floodplain boundary and may require a higher capital investment. Given these limitations and feedback from the District, this report considers maintaining the current configuration of three blowers, two duty and one standby, with each blower supplying air to three basins (serving up to two at a time).

Under projected maximum month TKN and CBOD loadings, each blower must deliver at least 1,890 SCFM for oxygen transfer demands. While the existing screw blower can meet this future demand, the PD blower cannot. Therefore, the corresponding CIP includes replacing the PD and centrifugal blowers with screw blowers, similarly sized to the existing, to meet the projected capacity requirements and provide equipment consistency.

6.4 UV Disinfection

The UV disinfection system is sized to handle flows up to 14.7 MGD and a UV dosage of 30 mJ/cm2 at a UV transmittance of 70% UVT. With the peak decant flow rate not anticipated to increase for future conditions even with the addition of two SBR tanks, there appears to be sufficient hydraulic and disinfection capacity, assuming a 70% UVT or higher is maintained.

7.0 CAPITAL IMPROVEMENT PROJECTS

Based on the existing conditions evaluation, input from operators, District staff, and the capacity evaluation, this section outlines the identified CIPs for the facility. Table 7-1 summarizes each project along with its priority, primary driver, and ROM cost. Where appropriate, projects are grouped into a single CIP for constructability and budgeting efficiency. The following sections provide additional details on each CIP.

Estimates, forecasts, projections, and schedules prepared by Burns & McDonnell related to costs, quantities, demand, or pricing (including, but not limited to, property costs, construction, operations, maintenance costs, and/or energy or commodity demand and pricing), are opinions based on Burns & McDonnell's experience, qualifications, and judgement. Burns & McDonnell has no control over weather, cost and availability of labor, material and equipment, labor productivity, energy or commodity pricing, demand or usage, population demographics, market conditions, changes in technology, and other economic or political factors affecting such estimates or projections. In addition, Burns & McDonnell has no control over the uncertainty and potential disruptions to the labor and work force and supply chain caused by a regional, national, or global outbreak and spread of an infectious disease, such as COVID-19. Additionally, the uncertainty and potential disruptions to material pricing and supply chain caused by tariffs may have an impact on these projects, the exact cost of which can neither be predicted nor controlled. At this time, it is impossible to foresee or to predict the full impact of tariffs around the world and, therefore, no additional cost nor contingency specifically for tariffs were included. It should be acknowledged that actual results may vary significantly from the representations and opinions herein, and nothing herein shall be construed as a guarantee or warranty of conclusions, results, or opinions. Burns & McDonnell makes no guarantee or warranty (actual or implied) that costs, schedules, quantities, and related items will not vary from the opinions contained in the estimates, schedules, results, or other statements or opinions prepared by Burns & McDonnell.

For costs on new construction, regional costs were used based on Burns & McDonnell's experience on similar projects. Opinions of probable costs have been developed for each of the planning level CIPs and should be verified during detailed design. It should be noted that costs are in 2025 dollars. Costs were not inflated for CIPs based on project priority or anticipated phasing. Subtotal costs have been rounded up to the nearest $10,000 prior to adding engineering and contingency. A 12-percent cost (based on the project subtotal) was included to account for engineering fees. A 30-percent contingency (based on the project subtotal) was applied to all CIPs to account for the construction cost and design efforts due to the planning level of detail.

Table 7-1: Detailed Summary of Projects

CIP	Area	Priority	Project	Project Description	Project Rationale	ROM Cost
WWTP-CIP-1	SBR	High	Blower Room Improvements	Replace current blower configuration with three identical blowers each sized for at least 2000 SCFM. Also install a full HVAC system in blower room	Current configuration will not meet future demand and presents operational challenges with various blower types	$780,000
WWTP-CIP-2	SBR	High	TP Chem Feed System	Install a chem feed system to dose alum in SBR basins	Current configuration will not meet anticipated phosphorus limits with biological removal only so chemical addition is necessary	$1,900,000
WWTP-CIP-3	SBR	High	SBR Expansion	Construct two new additional SBR basins including a new splitter box, influent and effluent piping, air piping, extending the existing walkway, instruments, diffuser grid, and process intensification.	Current configuration will not meet anticipated loading from new industrial user	$13,050,000
WWTP-CIP-4	SBR	Low	Additional Instrumentation	Add new pH, TSS, and NH3 analyzers in each basin	Additional information will allow operators to optimize the process	$1,520,000
			Splitter Box Gate Actuators	Install electric actuators on the gates in the splitter box structure	Improved operations and maintenance control	
			Diffuser Grid Replacement	Replace the diffuser grid in all basins	Operator noted some need replacement and they are past their useful life	
WWTP-CIP-5	IPS	Medium	Additional Influent Pump	Install a fourth pump to provide a firm capacity of 12.5 MGD	Current pumps cannot meet max flow demand	$720,000
			Concrete Coating	Coat the concrete in the influent pump station	Concrete in head tank appears to be deteriorating	
			HVAC Improvements	Repair HVAC equipment including the originally designed supply fan	Operators cannot currently enter the confined space due to safety concerns	
			Influent Pump Valves	Install isolation valves and check valves on each influent pump discharge line	Future design flexibility	
WWTP-CIP-6	Influent Screening	Medium	Screening Equipment Replacement	Replace the existing screen with a new one and complete updates to non-potable water system	Current screen is ineffective in preventing debris from getting through and often requires manual cleaning	$960,000
WWTP-CIP-7	SCADA	Low	SCADA Controls	Integrate controls into existing SCADA system	Existing SCADA is limited to monitoring only	$980,000
Total ROM Cost						**$19,910,000**

7.1 WWTP-CIP-1 – 4: SBR

The highest priority projects identified in this master plan focus on expanding treatment capacity to accommodate projected loading increases and are addressed through WWTP-CIP-1 to WWTP-CIP-3. WWTP-CIP-4 includes operational enhancements that, while not critical, would improve efficiency and ease of maintenance.

WWTP-CIP-1 includes replacing the existing positive displacement and centrifugal blowers with new screw blowers to meet future aeration demands. This is discussed in more detail in Section 6.3.2 Aeration Demands. An alternative option is to install turbo blowers, although operators noted past issues with that technology. Improvements also include connecting all blowers to a common air header and installing modulating valves on individual basin air lines to each existing and future SBR tank. The District may consider adding flow meters on the air lines during detailed design; however, they were not included at this time. With future SBR expansion provisions, a single blower may be assigned to three tanks and would require air distribution to two tanks at once. With differing water levels anticipated in individual tanks, modulating valves and flow measurement would be required to distribute airflow equally. Additionally, pulling intake air from outside the room and upgrading the HVAC in the blower room can help protect equipment from extreme temperatures. During the full design, the District may also review the equipment pad sizing to confirm they are sized appropriately for all blowers.

WWTP-CIP-2 addresses future phosphorus limits (anticipated by 2033) by installing an alum feed system for chemical precipitation. The conceptual design system includes a 6,100-gallon tank for 30-days storage under average condition, four chemical feed pumps (3 duty, 1 stand by), and a new approximately 32’x20’ chemical storage building with an electrical room. Conceptual design of the chemical storage building and site plan are available in Appendix D. Because alum use for phosphorus precipitation typically increases sludge production by up to 20%, the District should take this into consideration for ongoing and future solids handling improvements. The District may also want to consider supplemental alkalinity for pH adjustment with the alum feed system.

WWTP-CIP-3 is intended to address the increased organic loadings anticipated for full future build-out of residential growth and anticipated industrial contributions. The project involves constructing two new SBR basins northeast of the existing tanks; demolishing and rerouting existing air, SBR effluent, and non-potable water (NPW) piping; and constructing a new splitter box with actuated gates. Additional improvements include installing SBR equipment such as decanters, membrane disc diffusers, instrumentation within the tanks, as well as extension of the existing walkway. Appendix E provides a

conceptual layout of the proposed piping and basin modifications. The site is currently protected by a levee, and all existing structures are located outside the designated floodplain. A FEMA floodplain map is included in Appendix F. The proposed additional SBR basins should be reviewed and confirmed with the local floodplain authority during detailed design to confirm compliance prior to construction.

WWTP-CIP-4 groups several operational improvements with respect to the SBR basins: installing new analyzers/probes (pH, TSS, and ammonia) in each existing basin, retrofitting the splitter box gates with electric actuators, and replacing aging fine bubble diffusers (based on operator feedback). Additionally, the District can consider addressing the freezing issues at the decanter motors as described in Section 5.4.1. The District may also consider installing analyzers for oxidation-reduction potential (ORP) and orthophosphate for additional monitoring.

7.2 WWTP-CIP-5: Influent Pump Station

WWTP-CIP-5 includes several improvements to the influent pump station to address both capacity and condition concerns. As detailed in Section 6.1, the current pump configuration has a firm capacity of only 8 MGD and cannot achieve the design peak hour flow of 12.5 MGD. Therefore, this project includes installing one additional large pump (2,882 GPM) in the existing empty space. However, if the smaller pump is retained, the firm capacity would only reach 12.2 MGD, just below the peak hour flow design. To achieve the full 12.5 MGD firm capacity, the smaller pump would also need to be replaced with a larger unit, resulting in four equal-capacity pumps. During the condition assessment, visible deterioration of the concrete at the influent pump station was noted, particularly in the discharge channel. At a minimum, the effluent channel should be coated using a high-performance concrete coating. Concrete rehabilitation may be required prior to application of the coating. Additionally, the original pump station construction included supply fans for wet well ventilation in the confined space, but they are currently nonfunctional. Replacing these fans and restoring HVAC functionality would allow operator access for maintenance and potentially reduce reliance on third-party contractors for wet well access. Lastly, the pump discharge lines currently lack valves; installing both isolation and check valves on each line would provide future flexibility if the District decides to install a piped header instead of discharging into the concrete channel.

7.3 WWTP-CIP-6: Influent Screening

The current screen is ineffective, as indicated by the presence of rags reaching the UV disinfection system and requires frequent manual debris removal. The identified project includes replacing the existing screen with a new drum screen to improve solids removal. Alternatively, a different type of screen technology

can be considered if desired but may require channel modifications. Additionally, improving the non-potable water (NPW) system to reliably supply cleaning water to the screen is included in this CIP to reduce the operational burden on staff for manual cleaning. The District may consider replacing the influent screening at the same time as WWTP-CIP-3 to protect new SBR equipment installed.

7.4 WWTP-CIP-7: SCADA

The SCADA system currently has limited control capabilities and is primarily used for monitoring. This CIP includes connecting the SBR PLC and controls to the plant SCADA system, as well as improved monitoring and desired controls for additional WWTP equipment, to expand overall plant control capabilities and improve operational efficiency and system integration. The District noted cybersecurity concerns for a fully remote capable plant, however, so considerations for limited authorized users and cybersecurity protection should be included.

APPENDIX A – PROJECT REDBIRD PRETREATED WASTEWATER DISCHARGE TO FESTUS CRYSTAL CITY WWTP MEMO, HORNER SHIFRON, 2022

HORNER SHIFRIN

THE POWERHOUSE AT UNION STATION ● 401 S. 18th ST., STE. 400 ● SAINT LOUIS, MISSOURI 63103-2296
314-531-4321 ● FAX 844-339-2910 ● www.HornerShifrin.com

Memorandum

TO: Sean Parks, Sr. Manager Capacity Planning, James Hardie

FROM: Jim McCleish, PE, Sean Mickey, Rachel Dixon, PE

SUBJECT: Project Redbird Pretreated Wastewater Discharge to Festus Crystal City WWTP

DATE: 04/21/22

H&S JOB NO.: P220108

CC: Jason Eisenbeis, Matt Unrein, Frank Steward, Charlie Goodwin

Horner & Shifrin was retained to evaluate the incorporation of an industrial wastewater into the Festus Crystal City STP. Flow analysis of the existing STP showed that average daily flows are 2.25 MGD, and average dry weather flows are 1.85 MGD. Blended influent flows were evaluated to be the following, mostly representative of a typical sewage treatment plant influent. The BOD and TKN are slightly above the original plant design however, so the aeration system will need further evaluation to confirm organic capacity of the plant.

	STP Influent	Industrial Influent	Blended Influent	Plant Design Capacity	
Flow	1.85	1	2.85	3	MGD
BOD	136	240	172	150	mg/L
TSS	192	100	160	240	mg/L
TKN	40	12	30	26	mg/L
TP	6.5	1	5	8	mg/L
Sulfates	74	600	259	N/A	mg/L
Alkalinity	277	398	319	N/A	mg/L, as CaCO3
Ca	80	140	101	N/A	mg/L
Mg	15	40	24	N/A	mg/L
Temp.	63.5	104	78	N/A	°F

The only atypical component noted was sulfates, which are significantly increased. The level of sulfates can increase concrete corrosion, but this concentration only requires Type II cement where more resistant Type IV is typically used in STPs. Sulfates can cause issues with enhanced biological phosphorus removal; however, normal activated sludge phosphorus removal can still be attained, and additional removal can be mitigated with alum dosing if needed in the future. The dosing system would be required regardless of whether enhanced biological

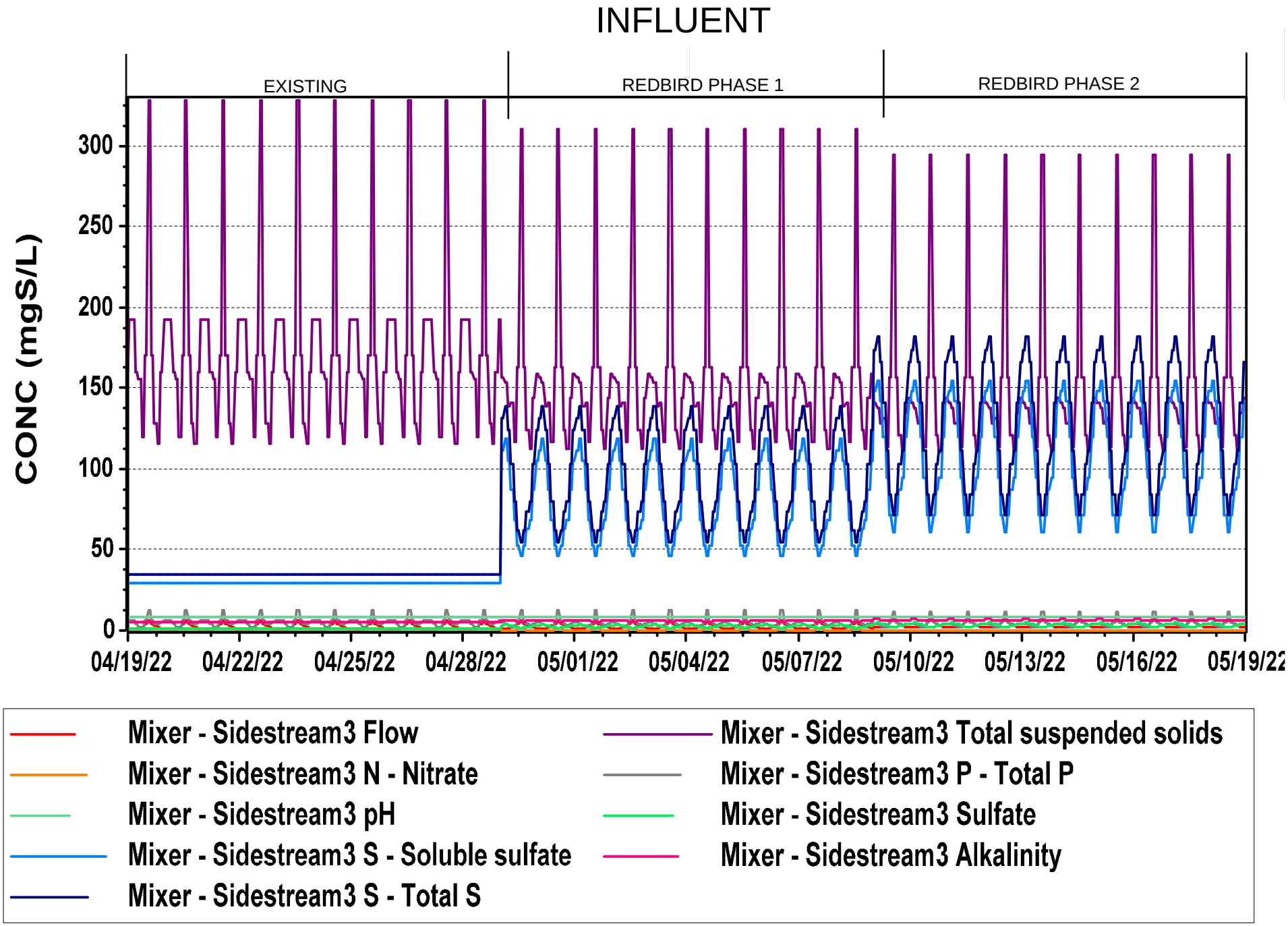
phosphorus removal is achieved, it only changes operating costs for chemical consumption. The next permit cycle is about 5 years out and regulatory changes are in the implementation stage which will mostly likely result in a phosphorous effluent limit of 1 mg/l.

The process was modeled at a high-level utilizing diurnal domestic flows and the constant industrial flow blended together in a BioWin model. Effluent flow parameters can be seen in the attached figures. Although the additional flows did slightly increase discharge values, permitted pollutants were still held within permitted ranges. This model can be tuned to better reflect the specific plant biology and process operations modified to a greater degree to show a more detailed model if required for further study.

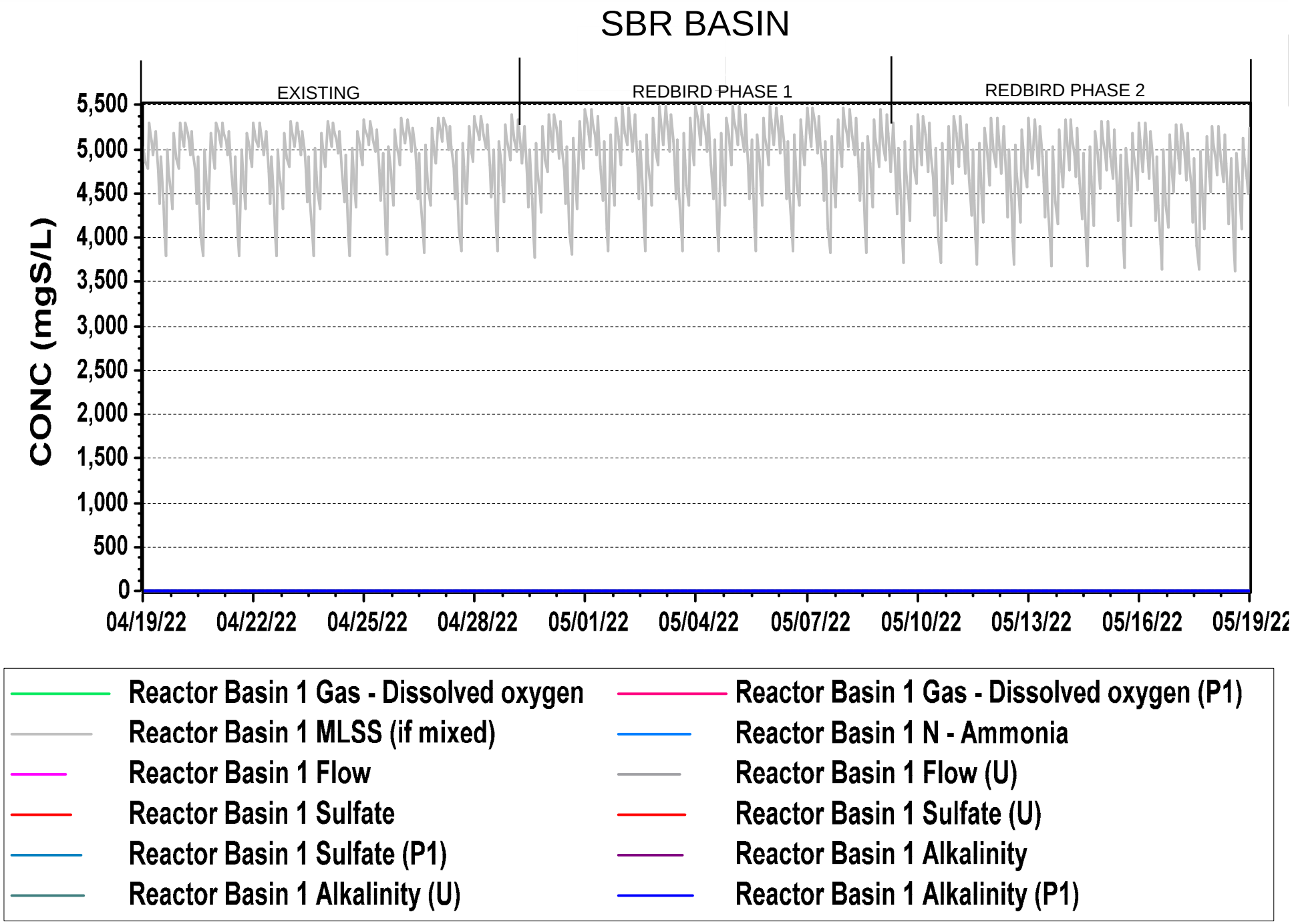
An analysis of the headworks loading at the Festus-Crystal City STP was performed to estimated influent concentrations of pollutants of concern and determine the available capacity of the facility to accept additional loading. No influent sampling data at the STP was available. The 2021 Annual Water Quality Reports for the City of Crystal City Public Water Supply and the Festus Public Water Supply, provided by the Jefferson County Water Authority, were used to develop background concentrations of the existing domestic flow to the STP. Form S reports from the STP were also used to back-calculate influent concentrations where data was not available from the drinking water system reports, or where the influent concentration estimated from the sludge reports was more conservative. The blending of the existing influent domestic flow with effluent from the Redbird facility was estimated using a weighted average. Reported effluent data from an existing Redbird facility was used with an average flow of 1.0 MGD. The average dry-weather domestic flow is 1.85 MGD. Chromium is the only pollutant of concern where the allowable headworks loading was exceeded. Horner & Shifrin understands that the concentration of chromium in the processes and wastewater from Redbird facilities is very site specific and is related to concentration of chromium in the cement used. Additional investigation on the presence of chromium at the Crystal City location is recommended to gain a better understanding of anticipated loading. The influent concentration at which the STP reaches 100% of its allowable loading is 0.143 mg/L. Spreadsheets attached show the results of this preliminary effort.

In summary, we believe there are no process or regulatory concerns with taking this industrial flow. Taking this flow will consume the remaining capacity of the treatment plant, both hydraulically and biologically, based on data from other facilities currently in operation. Chromium loading is the only pollutant of concern and is an unknown until cement proposed for use in plant production is analyzed. Limited data was available to fully vet this issue. The risk is low for this being an issue and it would only affect biosolids land application. At chromium levels used in the analysis, it is possible biosolids may need to be disposed of in a local landfill. The plant has a belt filter press that can be used to dewater and haul biosolids.

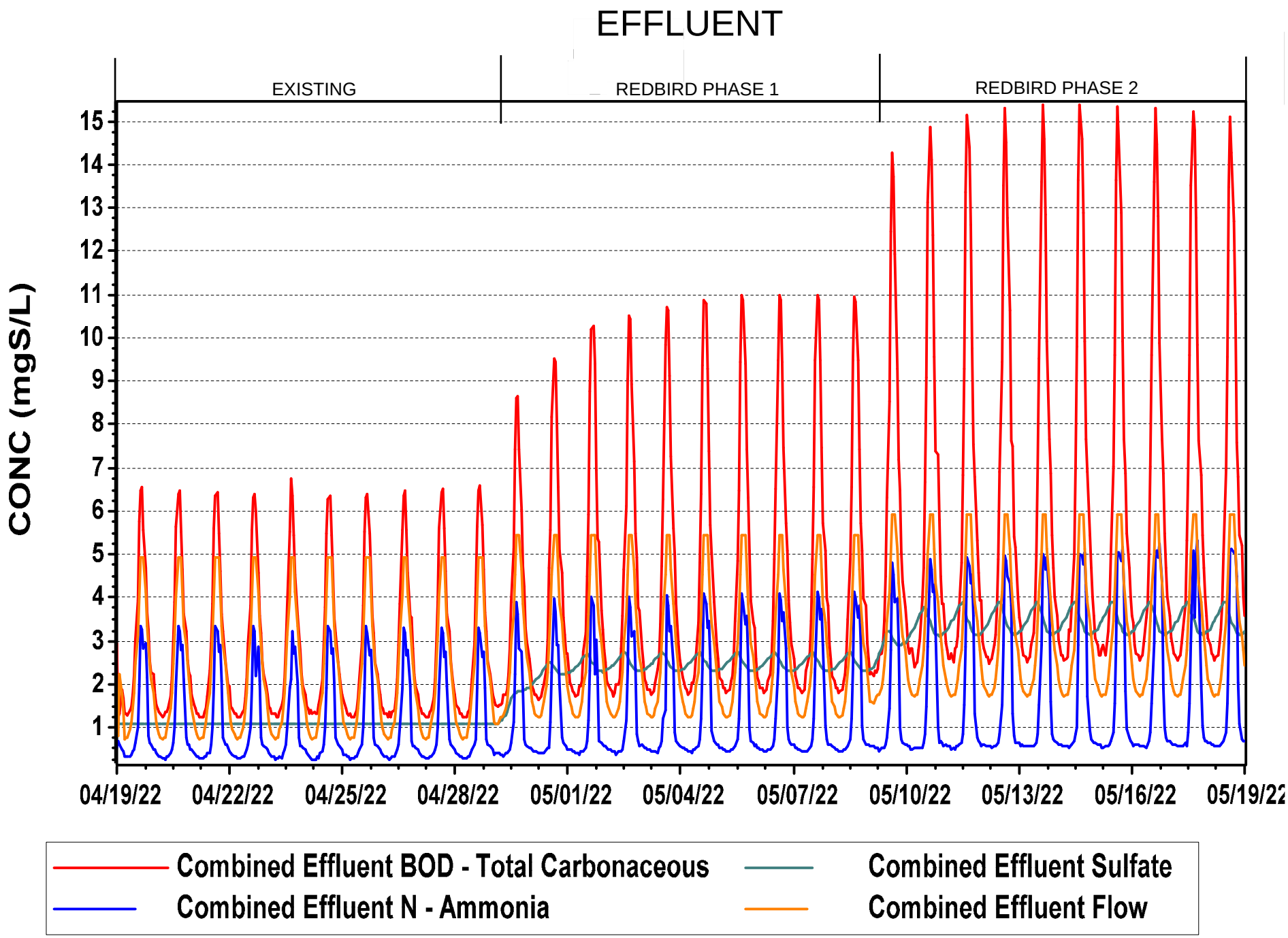
File M:\Opportunities\NotAssisted\P220108_CrystalCityWaterSystemExa\Design\N\Modeling\Ind Discharge Model.bwc



File M:\Opportunities\NotAssisted\P220108_CrystalCityWaterSystemExa\Design\N\Modeling\Ind Discharge Model.bwc



File M:\Opportunities\NotAssisted\P220108_CrystalCityWaterSystemExa\Design\N\Modeling\Ind Discharge Model.bwc



CITY: **Festus-Crystal City, MO** 04/21/22

LOCAL LIMITS CALCULATOR - AVERAGE DATA

Plant Data:

Non SIU Flow, MGD:	**1.85**	SLDG To Disposal,MGD:	**0.0048**
TOTAL Flow, MGD:	**2.85**	SLDG Disposal %Solids:	**2.10**
7Q10, MGD:	**0.0001**	SITE Use, Years:	**10**
Flow To Digsr: MGD:	**0.1**	SITE Size, Acres:	**100**

	NPDES Limit	Removal Efficiencies Primary	Removal Efficiencies Plant	Domestic Level	Red Bird Conc.	WQS	Safety Factor	Avg. Infl. Cncntrn	AS Inhibition	Digestion Inhibition
Ag*	NA	NA	75%	0.005	ND	0.01667	20%	**0.0025**	0.25	13
As	NA	NA	45%	0.00257	ND	0.15	20%	**0.00257**	0.1	1.6
Cd*	NA	NA	67%	0.003	ND	0.00147	20%	**0.00015**	1	20
CN	NA	NA	69%	0.041	0.0095	0.0052	20%	**0.02995**	0.1	4
Cr	NA	NA	82%	0.002	0.25	0.16212	20%	**0.08902**	1	100
Cu*	NA	NA	86%	0.097	0.0069	0.02026	20%	**0.06539**	1	40
Hg	NA	NA	60%	0.0003	0.00011	0.00077	20%	**0.00023**	0.1	NA
Ni*	NA	NA	42%	0.021	0.0024	0.11678	20%	**0.01447**	0.25	10
Pb*	NA	NA	79%	0.00406	ND	0.007	20%	**0.00263**	0.1	340
Zn*	NA	NA	60%	0.04879	0.0099	0.26385	20%	**0.03514**	0.25	400
Al	NA	NA	99%	0.05	ND	0.75	20%	**0.05**	NA	NA
Mo	NA	NA	18%	0.0055	ND	NA	20%	**0.00084**	NA	NA
Se	NA	NA	50%	0.001	0.02	0.005	20%	**0.00101**	NA	NA

*HARDNESS DEPENDENT

- Sludge Values More Conservative

- No Data Available, Half of Detection Limit Assumed

	DW Design Daily avg lbs/day	DW Design Peak lbs/day	Domestic Sources lbs/day	Expansion Factor	Avg. Infl. Cncntrn
BOD	**3753**	**5629**	2966	10%	**91.7**
TSS	**6004**	**9007**	3489	10%	**128.04**
TKN	**650**	**975**	576	10%	**26**

Domestic Sources Estimator

Pop: 17446 persons

	lbs/cap/day	lbs/day
BOD	0.17	**2,966**
TSS	0.2	**3,489**
TKN	0.033	**576**

NOTE: all values mg/l unless noted

CONVERSIONS

CFS TO MGD

1 CFS = 0.646 mgd

SLUDGE, DT/Y to MGD

dt/y	avg %sld		mgd
1187.2	7.8%	=	0.01

BOD/TKN Design Values

1. Calculate O2 supply from O&M manual specs for rotors
2. Use NBOD ratio calculated from FP data to determine TKN loading
3. Adjust BOD level to match design O2 supply - based on CSR-20-8 O2 requirements for extended aeration BOD an

SUMMARY OF AVERAGE MASS LOADINGS

	Domestic/commcl Sources		Maximum Allowable Industrial Load (MAIL)			Maximum Allowable Headwrks Load	Headworks ACTUAL Avg.Load	Current Loading
	lbs.	% of limit	lbs.	% of MAHL	lbs. Reserve	(MAHL) lbs	lbs	as % of MAHL
Ag	0.077	5%	1.257	79%	0.251	1.585	0.059	3.7%
As	0.040	28%	0.083	60%	0.017	0.139	0.061	44%
Cd	0.046	44%	0.050	47%	0.010	0.106	0.004	3%
CN	0.633	27%	1.454	61%	0.291	2.377	0.712	30%
Cr	0.031	3%	0.993	81%	0.199	1.222	2.116	173%
Cu	1.497	44%	1.620	47%	0.324	3.440	1.554	45%
Hg	0.005	6%	0.062	78%	0.012	0.079	0.0055	7.0%
Ni	0.324	39%	0.426	51%	0.085	0.835	0.344	41%
Pb	0.063	8%	0.608	77%	0.122	0.792	0.063	8%
Zn	0.753	13%	4.325	73%	0.865	5.942	0.835	14%
Al	0.771	1%	91.268	83%	18.254	110.293	1.188	1%
Mo	0.085	24%	0.223	63%	0.045	0.352	0.020	6%
Se	0.015	9%	0.126	76%	0.025	0.167	0.024	14%

TOXIC POLLUTANTS SUMMARY

UNIFORM CONCENTRATION LIMIT If APPLIED mg/l

Ag	0.2
As	0.0
Cd	0.0
CN	0.2
Cr	0.1
Cu	0.2
Hg	0.0
Ni	0.1
Pb	0.1
Zn	0.5

Mo	0.0
Se	0.0

LIMITING CRITERIA

Ag	Water Quality
As	SLDG Dispsl:
Cd	SLDG Dispsl:
CN	Secndry Inhib.:
Cr	SLDG Dispsl:
Cu	Water Quality
Hg	SLDG Dispsl:
Ni	SLDG Dispsl:
Pb	Water Quality
Zn	Secndry Inhib.:

Mo	SLDG Dispsl:
Se	SLDG Dispsl:

Conventional Pollutants - Long Term Average Limits

Based on Design Daily Average Criteria

	Domestic/commcl Sources		Maximum Allowable Industrial Load (MAIL)			Maximum Allowable Headwrks Load	Headworks ACTUAL Avg.Load	Current Loading
	lbs.	% of limit	lbs.	% of MAHL	lbs. Reserve	(MAHL) Avg,lbs	lbs	as % of MAHL
BOD	2966	79%	412	11%	375	3753	2180	58%
TSS	3489	58%	1914	32%	600	6004	3043	51%
TKN	576	89%	9	1%	65	650	618	95%

Conventional Pollutants - Daily Maximum Limits

Based on Peak Design Criteria

	Domestic/commcl Sources		Maximum Allowable Industrial Load (MAIL)			Maximum Allowable Headwrks Load	Headworks ACTUAL Avg.Load	Current Loading
	lbs.	% of limit	lbs.	% of MAHL	lbs. Reserve	(MAHL) Peak,lbs	lbs	as % of MAHL
BOD	2966	53%	2100	37%	563	5629	2180	39%
TSS	3489	39%	4617	51%	901	9007	3043	34%
TKN	576	59%	302	31%	98	975	618	63%

Conventional Pollutants Uniform Concentration Limits

Flow for SIUs Receiving Limits, mgd: 1

	Daily Max mg/l	Mo. Avg. mg/l
BOD	NA	144
TSS	554	633
TKN	NA	-4

CITY: **Festus-Crystal City, MO** 04/21/22

LOCAL LIMITS CALCULATOR - AVERAGE DATA

Plant Data:

Non SIU Flow, MGD:	**1.85**	SLDG To Disposal,MGD:	**0.0048**
TOTAL Flow, MGD:	**2.85**	SLDG Disposal %Solids:	**2.10**
7Q10, MGD:	**0.0001**	SITE Use, Years:	**10**
Flow To Digsr: MGD:	**0.1**	SITE Size, Acres:	**100**

	NPDES Limit	Removal Efficiencies Primary	Removal Efficiencies Plant	Domestic Level	Red Bird Conc.	WQS	Safety Factor	Avg. Infl. Cncntrn	AS Inhibition	Digestion Inhibition
Ag*	NA	NA	75%	0.005	ND	0.01667	20%	**0.0025**	0.25	13
As	NA	NA	45%	0.00257	ND	0.15	20%	**0.00257**	0.1	1.6
Cd*	NA	NA	67%	0.003	ND	0.00147	20%	**0.00015**	1	20
CN	NA	NA	69%	0.041	0.0095	0.0052	20%	**0.02995**	0.1	4
Cr	NA	NA	82%	0.002	0.143	0.16212	20%	**0.05147**	1	100
Cu*	NA	NA	86%	0.097	0.0069	0.02026	20%	**0.06539**	1	40
Hg	NA	NA	60%	0.0003	0.00011	0.00077	20%	**0.00023**	0.1	NA
Ni*	NA	NA	42%	0.021	0.0024	0.11678	20%	**0.01447**	0.25	10
Pb*	NA	NA	79%	0.00406	ND	0.007	20%	**0.00263**	0.1	340
Zn*	NA	NA	60%	0.04879	0.0099	0.26385	20%	**0.03514**	0.25	400
Al	NA	NA	99%	0.05	ND	0.75	20%	**0.05**	NA	NA
Mo	NA	NA	18%	0.0055	ND	NA	20%	**0.00084**	NA	NA
Se	NA	NA	50%	0.001	0.02	0.005	20%	**0.00101**	NA	NA

*HARDNESS DEPENDENT

- Sludge Values More Conservative

- No Data Available, Half of Detection Limit Assumed

	DW Design Daily avg lbs/day	DW Design Peak lbs/day	Domestic Sources lbs/day	Expansion Factor	Avg. Infl. Cncntrn
BOD	**3753**	**5629**	2966	10%	**91.7**
TSS	**6004**	**9007**	3489	10%	**128.04**
TKN	**650**	**975**	576	10%	**26**

Domestic Sources Estimator

Pop: 17446 persons

	lbs/cap/day	lbs/day
BOD	0.17	**2,966**
TSS	0.2	**3,489**
TKN	0.033	**576**

NOTE: all values mg/l unless noted

CONVERSIONS

CFS TO MGD

1 CFS = 0.646 mgd

SLUDGE, DT/Y to MGD

dt/y	avg %sld		mgd
1187.2	7.8%	=	0.01

BOD/TKN Design Values

1. Calculate O2 supply from O&M manual specs for rotors
2. Use NBOD ratio calculated from FP data to determine TKN loading
3. Adjust BOD level to match design O2 supply - based on CSR-20-8 O2 requirements for extended aeration BOD an

SUMMARY OF AVERAGE MASS LOADINGS

	Domestic/commcl Sources		Maximum Allowable Industrial Load (MAIL)			Maximum Allowable Headwrks Load (MAHL)	Headworks ACTUAL Avg.Load	Current Loading as % of
	lbs.	% of limit	lbs.	% of MAHL	lbs. Reserve	lbs	lbs	MAHL
Ag	0.077	5%	1.257	79%	0.251	1.585	0.059	3.7%
As	0.040	28%	0.083	60%	0.017	0.139	0.061	44%
Cd	0.046	44%	0.050	47%	0.010	0.106	0.004	3%
CN	0.633	27%	1.454	61%	0.291	2.377	0.712	30%
Cr	0.031	3%	0.993	81%	0.199	1.222	1.223	100%
Cu	1.497	44%	1.620	47%	0.324	3.440	1.554	45%
Hg	0.005	6%	0.062	78%	0.012	0.079	0.0055	7.0%
Ni	0.324	39%	0.426	51%	0.085	0.835	0.344	41%
Pb	0.063	8%	0.608	77%	0.122	0.792	0.063	8%
Zn	0.753	13%	4.325	73%	0.865	5.942	0.835	14%
Al	0.771	1%	91.268	83%	18.254	110.293	1.188	1%
Mo	0.085	24%	0.223	63%	0.045	0.352	0.020	6%
Se	0.015	9%	0.126	76%	0.025	0.167	0.024	14%

TOXIC POLLUTANTS SUMMARY

UNIFORM CONCENTRATION LIMIT If APPLIED mg/l

Ag	0.2
As	0.0
Cd	0.0
CN	0.2
Cr	0.1
Cu	0.2
Hg	0.0
Ni	0.1
Pb	0.1
Zn	0.5
Mo	0.0
Se	0.0

LIMITING CRITERIA

Ag	Water Quality
As	SLDG Dispsl:
Cd	SLDG Dispsl:
CN	Secndry Inhib.:
Cr	SLDG Dispsl:
Cu	Water Quality
Hg	SLDG Dispsl:
Ni	SLDG Dispsl:
Pb	Water Quality
Zn	Secndry Inhib.:
Mo	SLDG Dispsl:
Se	SLDG Dispsl:

Conventional Pollutants - Long Term Average Limits

Based on Design Daily Average Criteria

	Domestic/commcl Sources		Maximum Allowable Industrial Load (MAIL)			Maximum Allowable Headwrks Load (MAHL)	Headworks ACTUAL Avg.Load	Current Loading as % of
	lbs.	% of limit	lbs.	% of MAHL	lbs. Reserve	Avg,lbs	lbs	MAHL
BOD	2966	79%	412	11%	375	3753	2180	58%
TSS	3489	58%	1914	32%	600	6004	3043	51%
TKN	576	89%	9	1%	65	650	618	95%

Conventional Pollutants - Daily Maximum Limits

Based on Peak Design Criteria

	Domestic/commcl Sources		Maximum Allowable Industrial Load (MAIL)			Maximum Allowable Headwrks Load (MAHL)	Headworks ACTUAL Avg.Load	Current Loading as % of
	lbs.	% of limit	lbs.	% of MAHL	lbs. Reserve	Peak,lbs	lbs	MAHL
BOD	2966	53%	2100	37%	563	5629	2180	39%
TSS	3489	39%	4617	51%	901	9007	3043	34%
TKN	576	59%	302	31%	98	975	618	63%

Conventional Pollutants Uniform Concentration Limits

Flow for SIUs Receiving Limits, mgd: 1

	Daily Max mg/l	Mo. Avg. mg/l
BOD	NA	144
TSS	554	633
TKN	NA	-4

APPENDIX B – FESTUS/CRYSTAL CITY WWTP NPDES PERMIT

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No.	MO-0080632	
Owner:	Festus/Crystal City Sewage Commission	
Address:	355 County Road, Crystal City, MO 63019	
Co-Permittees:	City of Crystal City	City of Festus
Address:	130 Mississippi Avenue	711 West Main Street
	Crystal City, MO 63019	Festus, MO 63028

The co-permittees are only responsible for Special Conditions No. 2 and 3 listed on Pages 5 and 6 of the permit:

Continuing Authority:	Festus/ Crystal City Sewage Commission
Address:	355 County Road, Crystal City, MO 63019
Facility Name:	Festus-Crystal City WWTP
Facility Address:	355 County Road, Crystal City, MO 63019
Legal Description:	Landgrant 1906, Jefferson County
UTM Coordinates:	X= 729151, Y= 4232487
Receiving Stream:	Tributary to Plattin Creek (C)
First Classified Stream and ID:	8-20-13 MUDD V1.0 (C) (3960)
USGS Basin & Sub-watershed No.:	(07140101-0806)

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

See Page 2

This permit authorizes wastewater and stormwater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 621.250 RSMo, Section 640.013 RSMo and Section 644.051.6 of the Law.

April 1, 2018
Effective Date

Edward B. Galbraith, Director, Division of Environmental Quality

September 30, 2021
Expiration Date

Chris Wieberg, Director, Water Protection Program

Outfall #001 – POTW – SIC #4952
The use or operation of this facility shall be by or under the supervision of a Certified "B" Operator.
Influent lift station / comminutor / fine mechanical screen / aerated grit chamber / 4 parallel sequential batch reactors / UV disinfection / 3 aerobic sludge digesters / sludge filter press / sludge is land applied/ facility does not have materials stored or conduct operations in a manner that would cause the discharge of pollutants via stormwater
Design population equivalent is 30,000.
Design flow is 3.0 million gallons per day.
Actual flow is 2.0 million gallons per day.
Design sludge production is 500 dry tons/year.

Permitted Feature SM1 – Instream Monitoring
Instream monitoring location – Upstream, away from influence of effluent in the receiving stream

OUTFALL #001	TABLE A-1. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS					
The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The interim effluent limitations shall become effective on **April 1, 2018** and remain in effect through **Permit Expiration**. Such discharges shall be controlled, limited and monitored by the permittee as specified below:						
EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	MGD	*		*	once/weekday***	24 hr. total
Carbonaceous Biochemical Oxygen Demand$_5$ (May 1 – October 31)	mg/L	15		10	once/week	composite**
Carbonaceous Biochemical Oxygen Demand$_5$ (November 1 – April 30)	mg/L	25		15	once/week	composite**
Total Suspended Solids	mg/L		45	30	once/week	composite**
E. coli (Note 1, Page 3)	#/100mL		630	126	once/week	grab
Ammonia as N (Apr 1 – Sep 30) (Oct 1 – Mar 31)	mg/L	 5.2 10.4		 1.3 2.7	once/week	grab
MONITORING REPORTS SHALL BE SUBMITTED MONTHLY; THE FIRST REPORT IS DUE MAY 28, 2018. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.						
Total Phosphorus	mg/L	*		*	once/quarter*****	grab
Total Nitrogen	mg/L	*		*	once/quarter*****	grab
Oil & Grease	mg/L	15		10	once/quarter*****	grab
Lead, Total Recoverable	µg/L	*		*	once/quarter*****	grab
Zinc, Total Recoverable	µg/L	*		*	once/quarter*****	grab
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE JULY 28, 2018.						

* Monitoring requirement only.
** A 24-hour composite sample is composed of 48 aliquots (subsamples) collected at 30 minute intervals by an automatic sampling device.
*** Once each weekday means: Monday, Tuesday, Wednesday, Thursday, and Friday.
**** pH is measured in pH units and is not to be averaged.
***** See table on Page 3 for quarterly sampling requirements.

OUTFALL #001	TABLE A-1. (CONTINUED) FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The interim effluent limitations shall become effective on **April 1, 2018** and remain in effect through **Permit Expiration**. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	MINIMUM		MAXIMUM	MEASUREMENT FREQUENCY	SAMPLE TYPE
pH – Units ****	SU	6.5		9.0	once/week	grab

MONITORING REPORTS SHALL BE SUBMITTED MONTHLY; THE FIRST REPORT IS DUE MAY 28, 2018.

EFFLUENT PARAMETER(S)	UNITS	DAILY MINIMUM		MONTHLY AVERAGE MINIMUM	MEASUREMENT FREQUENCY	SAMPLE TYPE
Carbonaceous Biochemical Oxygen Demand$_5$ – Percent Removal (Note 2)	%			85	once/month	calculated
Total Suspended Solids – Percent Removal (Note 2)	%			85	once/month	calculated

MONITORING REPORTS SHALL BE SUBMITTED MONTHLY; THE FIRST REPORT IS DUE MAY 28, 2018.

**** pH is measured in pH units and is not to be averaged.

Quarterly Minimum Sampling Requirements			
Quarter	**Months**	**Table A-1 Effluent Parameters**	**Report is Due**
First	January, February, March	Sample at least once during any month of the quarter	April 28th
Second	April, May, June	Sample at least once during any month of the quarter	July 28th
Third	July, August, September	Sample at least once during any month of the quarter	October 28th
Fourth	October, November, December	Sample at least once during any month of the quarter	January 28th

Note 1 - Effluent limitations and monitoring requirements for *E. coli* are applicable only during the recreational season from April 1 through October 31. The Monthly Average Limit for *E. coli* is expressed as a geometric mean. The Weekly Average for *E. coli* will be expressed as a geometric mean if more than one (1) sample is collected during a calendar week (Sunday through Saturday).

Note 2 – Influent sampling is not required when the facility does not discharge effluent during the reporting period. Samples are to be collected prior to any treatment process. Percent Removal is calculated by the following formula: [(Average Influent –Average Effluent) / Average Influent] x 100% = Percent Removal. Influent and effluent samples are to be taken during the same month. The Average Influent and Average Effluent values are to be calculated by adding the respective values together and dividing by the number of samples taken during the month. Influent samples are to be collected as a 24-hour composite sample, composed of 48 aliquots (subsamples) collected at 30 minute intervals by an automatic sampling device.

OUTFALL #001	TABLE A-2. WHOLE EFFLUENT TOXICITY FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective on **April 1, 2018** and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Acute Whole Effluent Toxicity (Note 3)	TU_a	*			once/year	composite**
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE MARCH 28, 2019.						
Chronic Whole Effluent Toxicity (Note 4)	TU_c	*			once/permit cycle	composite**
WET TEST REPORTS SHALL BE SUBMITTED ONCE PER PERMIT CYCLE; THE FIRST REPORT IS DUE MARCH 28, 2021.						

* Monitoring requirement only.
** A 24-hour composite sample is composed of 48 aliquots (subsamples) collected at 30 minute intervals by an automatic sampling device.

Note 3 – The Acute WET test shall be conducted once per year during the 1st, 2nd, 3rd, and 5th year of the permit cycle. See Special Condition #19 for additional requirements.

Note 4 –The Chronic WET test shall be conducted during the 4th year of the permit cycle. See Special Condition #20 for additional requirements.

PERMITTED FEATURE SM1	TABLE B. INSTREAM MONITORING REQUIREMENTS

The monitoring requirements shall become effective on **April 1, 2018** and remain in effect until expiration of the permit. The stream shall be monitored by the permittee as specified below:

PARAMETER(S)	UNITS	MONITORING REQUIREMENTS				
		DAILY MAXIMUM		MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Total Phosphorus	mg/L	*		*	once/quarter*****	grab
Total Nitrogen	mg/L	*		*	once/quarter*****	grab
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE JULY 28, 2018.						

* Monitoring requirement only.
***** See table below for quarterly sampling

Quarterly Minimum Sampling Requirements			
Quarter	**Months**	**Total Nitrogen & Total Phosphorus**	**Report is Due**
First	January, February, March	Sample at least once during any month of the quarter	April 28th
Second	April, May, June	Sample at least once during any month of the quarter	July 28th
Third	July, August, September	Sample at least once during any month of the quarter	October 28th
Fourth	October, November, December	Sample at least once during any month of the quarter	January 28th

C. STANDARD CONDITIONS

In addition to specified conditions stated herein, this permit is subject to the attached Parts I, II, & III standard conditions dated August 1, 2014, May 1, 2013, and March 1, 2015, and hereby incorporated as though fully set forth herein.

D. SPECIAL CONDITIONS

1. Electronic Discharge Monitoring Report (eDMR) Submission System.
   (a) Discharge Monitoring Reporting Requirements. The permittee must electronically submit compliance monitoring data via the eDMR system. In regards to Standard Conditions Part I, Section B, #7, the eDMR system is currently the only Department approved reporting method for this permit.
   (b) Programmatic Reporting Requirements. The following reports (if required by this permit) must be electronically submitted as an attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:
      (1) Collection System Maintenance Annual Reports;
      (2) Wastewater Irrigation Annual Reports;
      (3) Sludge/Biosolids Annual Reports;
         i. In addition to the annual Sludge/Biosolids report submitted to the Department, the permittee must submit Sludge/Biosolids Annual Reports electronically using EPA's NPDES Electronic Reporting Tool ("NeT") (https://cdx.epa.gov/).
      (4) Any additional report required by the permit excluding bypass reporting.
      After such a system has been made available by the Department, required data shall be directly input into the system by the next report due date.
   (c) Other actions. The following shall be submitted electronically after such a system has been made available by the Department:
      (1) Notices of Termination (NOTs); and
      (2) Bypass reporting, See Special Condition #3 for 24-hr. bypass reporting requirements.
   (d) Electronic Submissions. To access the eDMR system, use the following link in your web browser: https://edmr.dnr.mo.gov/edmr/E2/Shared/Pages/Main/Login.aspx.
   (e) Waivers from Electronic Reporting. The permittee must electronically submit compliance monitoring data and reports unless a waiver is granted by the Department in compliance with 40 CFR Part 127. The permittee may obtain an electronic reporting waiver by first submitting an eDMR Waiver Request Form: http://dnr.mo.gov/forms/780-2692-f.pdf. The Department will either approve or deny this electronic reporting waiver request within 120 calendar days. Only permittees with an approved waiver request may submit monitoring data and reports on paper to the Department for the period that the approved electronic reporting waiver is effective.

2. The co-permittees shall develop and implement programs for maintenance and repair of the collection systems. The recommended guidance is the US EPA's Guide for Evaluating Capacity, Management, Operation, And Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems (Document number EPA 305-B-05-002) or the Departments' CMOM Model located at http://dnr.mo.gov/env/wpp/permits/docs/cmom-template.doc. For additional information regarding the Departments' CMOM Model, see the CMOM Plan Model Guidance document at http://dnr.mo.gov/pubs/pub2574.htm.

   The Festus Crystal City Sewage Commission shall also submit a report via the Electronic Discharge Monitoring Report (eDMR) Submission System annually, by January 28th, for the previous calendar year. The report shall contain the following information for Festus and Crystal City:
   (a) A summary of the efforts to locate and eliminate sources of excessive infiltration and inflow into the collection system serving the facility for the previous year.
   (b) A summary of the general maintenance and repairs to the collection system serving the facility for the previous year.
   (c) A summary of any planned maintenance and repairs to the collection system serving the facility for the upcoming calendar year. This list shall include locations (GPS, 911 address, manhole number, etc.) and actions to be taken.

D. SPECIAL CONDITIONS (continued)

3. Bypasses are not authorized at this facility unless they meet the criteria in 40 CFR 122.41(m). If a bypass occurs, the permittee shall report in accordance to 40 CFR 122.41(m)(3), and with Standard Condition Part I, Section B, subsection 2. Bypasses are to be reported to the St. Louis Regional Office during normal business hours or by using the online Sanitary Sewer Overflow/Facility Bypass Application located at: http://dnr.mo.gov/modnrcag/ or the Environmental Emergency Response spill-line at 573-634-2436 outside of normal business hours. Once an electronic reporting system compliant with 40 CFR Part 127, the National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, is available all bypasses must be reported electronically via the new system. Blending, which is the practice of combining a partially-treated wastewater process stream with a fully-treated wastewater process stream prior to discharge, is not considered a form of bypass. If the permittee wishes to utilize blending, the permittee shall file an application to modify this permit to facilitate the inclusion of appropriate monitoring conditions.

4. Expanded Effluent Testing:
   Permittee must sample and analyze for the pollutants listed in 40 CFR 122.21 Appendix J, Table 2 in addition to Aluminum and Iron. Pursuant to 40 CFR 122.21(j)(4) the permittee shall provide this data with the permit renewal application from a minimum of three samples taken within four and one-half years prior to the date of the permit application. Samples must be representative of the seasonal variation in the discharge.

5. The full implementation of this operating permit, which includes implementation of any applicable schedules of compliance, shall constitute compliance with all applicable federal and state statutes and regulations in accordance with §644.051.16, RSMo, and the Clean Water Act (CWA) section 402(k); however, this permit may be reopened and modified, or alternatively revoked and reissued:
   (a) To comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the CWA, if the effluent standard or limitation so issued or approved:
      (1) contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
      (2) controls any pollutant not limited in the permit.
   (b) To incorporate an approved pretreatment program pursuant to 40 CFR 403.8(a).

6. All outfalls must be clearly marked in the field. This does not include instream monitoring locations.

7. Permittee will cease discharge by connection to a facility with an area-wide management plan per 10 CSR 20-6.010(3)(B) within 90 days of notice of its availability.

8. Report as no-discharge when a discharge does not occur during the report period. For instream samples, report as "no flow" if no stream flow occurs during the report period.

9. Changes in existing pollutants or the addition of new pollutants to the treatment facility

   The permittee must provide adequate notice to the Director of the following:
   (a) Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; and
   (b) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   (c) For purposes of this paragraph, adequate notice shall include information on;
      (1) the quality and quantity of effluent introduced into the POTW, and
      (2) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

D. SPECIAL CONDITIONS (continued)

10. Reporting of Non-Detects:
    (a) An analysis conducted by the permittee or their contracted laboratory shall be conducted in such a way that the precision and accuracy of the analyzed result can be enumerated.
    (b) The permittee shall not report a sample result as "Non-Detect" without also reporting the detection limit of the test. Reporting as "Non Detect" without also including the detection limit will be considered failure to report, which is a violation of this permit.
    (c) The permittee shall provide the "Non-Detect" sample result using the less than sign and the minimum detection limit (e.g. <10).
    (d) Where the permit contains a Minimum Level (ML) and the permittee is granted authority in the permit to report zero in lieu of the < ML for a specified parameter (conventional, priority pollutants, metals, etc.), then zero (0) is to be reported for that parameter.
    (e) See Standard Conditions Part I, Section A, #4 regarding proper detection limits used for sample analysis.
    (f) When calculating monthly averages, one-half of the method detection limit (MDL) should be used instead of a zero. Where all data are below the MDL, the "<MDL" shall be reported as indicated in item (c).

11. It is a violation of the Missouri Clean Water Law to fail to pay fees associated with this permit (644.055 RSMo).

12. The permittee shall comply with any applicable requirements listed in 10 CSR 20-9, unless the facility has received written notification that the Department has approved a modification to the requirements. The monitoring frequencies contained in this permit shall not be construed by the permittee as a modification of the monitoring frequencies listed in 10 CSR 20-9. If a modification of the monitoring frequencies listed in 10 CSR 20-9 is needed, the permittee shall submit a written request to the Department for review and, if deemed necessary, approval.

13. The facility must be sufficiently secured to restrict entry by children, livestock and unauthorized persons as well as to protect the facility from vandalism.

14. At least one gate must be provided to access the wastewater treatment facility and provide for maintenance and mowing. The gate shall remain closed except when temporarily opened by the permittee to access the facility to perform operational monitoring, sampling, maintenance, or mowing. The gates shall also be temporarily opened for inspections by the Department. The gate shall be closed and locked when the facility is not staffed.

15. At least one (1) warning sign shall be placed on each side of the facility enclosure in such positions as to be clearly visible from all directions of approach. There shall also be one (1) sign placed for every five hundred feet (500') (150 m) of the perimeter fence. A sign shall also be placed on each gate. Minimum wording shall be SEWAGE TREATMENT FACILITY—KEEP OUT. Signs shall be made of durable materials with characters at least two inches (2") high and shall be securely fastened to the fence, equipment or other suitable locations.

16. An Operation and Maintenance (O & M) manual shall be maintained by the permittee and made available to the operator. The O & M manual shall include key operating procedures and a brief summary of the operation of the facility.

17. An all-weather access road shall be provided to the treatment facility.

18. The discharge from the wastewater treatment facility shall be conveyed to the receiving stream via a closed pipe or a paved or rip-rapped open channel. Sheet or meandering drainage is not acceptable. The outfall sewer shall be protected against the effects of floodwater, ice or other hazards as to reasonably insure its structural stability and freedom from stoppage. The outfall shall be maintained so that a sample of the effluent can be obtained at a point after the final treatment process and before the discharge mixes with the receiving waters.

D. SPECIAL CONDITIONS (continued)

19. Acute Whole Effluent Toxicity (WET) tests shall be conducted as follows:
    (a) Freshwater Species and Test Methods: Species and short-term test methods for estimating the acute toxicity of NPDES effluents are found in the most recent edition of *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (EPA/821/R-02/012; Table IA, 40 CFR Part 136). The permittee shall concurrently conduct 48-hour, static, non-renewal toxicity tests with the following species:
        - The fathead minnow, *Pimephales promelas* (Acute Toxicity EPA Test Method 2000.0).
        - The daphnid, *Ceriodaphnia dubia* (Acute Toxicity EPA Test Method 2002.0).
    (b) Chemical and physical analysis of the upstream control sample and effluent sample shall occur immediately upon being received by the laboratory, prior to any manipulation of the effluent sample beyond preservation methods consistent with federal guidelines for WET testing that are required to stabilize the sample during shipping. Where upstream receiving water is not available or known to be toxic, other approved control water may be used.
    (c) Test conditions must meet all test acceptability criteria required by the EPA Method used in the analysis.
    (d) The Allowable Effluent Concentration (AEC) for this facility is 100% with the dilution series being: 100%, 50%, 25%, 12.5%, and 6.25%.
    (e) All chemical and physical analysis of the effluent sample performed in conjunction with the WET test shall be performed at the 100% effluent concentration.
    (f) The facility must submit a full laboratory report for all toxicity testing. The report must include a quantification of acute toxic units ($TU_a = 100/LC_{50}$) reported according to the test methods manual chapter on report preparation and test review. The Lethal Concentration 50 Percent (LC_{50}) is the effluent concentration that would cause death in 50 percent of the test organisms at a specific time.

20. Chronic Whole Effluent Toxicity (WET) tests shall be conducted as follows:
    (a) Freshwater Species and Test Methods: Species and short-term test methods for estimating the chronic toxicity of NPDES effluents are found in the most recent edition of *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms (EPA/821/R-02/013; Table IA, 40 CFR Part 136).* The permittee shall concurrently conduct 7-day, static, renewal toxicity tests with the following species:
        a. The fathead minnow, *Pimephales promelas* (Survival and Growth Test Method 1000.0).
        b. The daphnid, *Ceriodaphnia dubia* (Survival and Reproduction Test Method 1002.0).
    (b) Chemical and physical analysis of the upstream control sample and effluent sample shall occur immediately upon being received by the laboratory, prior to any manipulation of the effluent sample beyond preservation methods consistent with federal guidelines for WET testing that are required to stabilize the sample during shipping. Where upstream receiving water is not available or known to be toxic, other approved control water may be used.
    (c) Test conditions must meet all test acceptability criteria required by the EPA Method used in the analysis.
    (d) The Allowable Effluent Concentration (AEC) is 100%, the dilution series is: 100%, 50%, 25%, 12.5%, and 6.25%.
    (e) All chemical and physical analysis of the effluent sample performed in conjunction with the WET test shall be performed at the 100% effluent concentration.
    (f) The facility must submit a full laboratory report for all toxicity testing. The report must include a quantification of chronic toxic units ($TU_c = 100/IC_{25}$) reported according to the *Methods for Measuring the Chronic Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* chapter on report preparation and test review. The 25 percent Inhibition Effect Concentration (IC_{25}) is the toxic or effluent concentration that would cause 25 percent reduction in mean young per female or in growth for the test populations.

D. SPECIAL CONDITIONS (continued)

21. Receiving Water Monitoring Conditions

(a) In-stream receiving water samples should be taken at the location(s) specified on Page 2 of this permit. In the event that a safe, accessible location is not present at the location(s) listed, a suitable location can be negotiated with the Department. Samples should be taken at least four feet from the bank or from the middle of the stream (whichever is less) and 6-inches below the surface if possible. The upstream receiving water sample should be collected at a point upstream from any influence of the effluent, where the water is visibly flowing down stream.

(b) When conducting in-stream monitoring, the permittee shall record observations that include: the time of day, weather conditions, unusual stream characteristics (e.g., septic conditions, algae growth, etc.), the stream segment (e.g., riffle, pool or run) from where the sample was collected. These observations shall be submitted with the sample results.

(c) Samples shall not be collected from areas with especially turbulent flow, still water or from the stream bank, unless these conditions are representative of the stream reach or no other areas are available for sample collection. Sampling should not be made when significant precipitation has occurred recently. The sampling event should be terminated and rescheduled if any of the following conditions occur:

- If turbidity in the stream increases notably; or
- If rainfall over the past two weeks exceeds 2.5 inches or exceeds 1 inch in the last 24 hours

(d) Always use the correct sampling technique and handling procedure specified for the parameter of interest. Please refer to the latest edition of Standard Methods for the Examination of Water and Wastewater for further discussion of proper sampling techniques. All analyses must be conducted in accordance with an approved EPA method. Meters shall be calibrated immediately (within 1 hour) prior to the sampling event.

(e) Please contact the Department if you need additional instructions or assistance.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
FACT SHEET
FOR THE PURPOSE OF RENEWAL
OF
MO-0080632
FESTUS CRYSTAL CITY WWTP

The Federal Water Pollution Control Act ("Clean Water Act" Section 402 Public Law 92-500 as amended) established the National Pollutant Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the "Clean Water Act"). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Director of the Missouri Department of Natural Resources (Department) under an approved program, operating in accordance with federal and state laws (Federal "Clean Water Act" and "Missouri Clean Water Law" Section 644 as amended). MSOPs are issued for a period of five (5) years unless otherwise specified.

As per [40 CFR Part 124.8(a)] and [10 CSR 20-6.020(1)(A)2.] a Factsheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the Missouri State Operating Permit (operating permit) listed below.

A Factsheet is not an enforceable part of an operating permit.

This Factsheet is for a Major facility.

Part I – Facility Information

The Festus-Crystal City Sewage Treatment Commission was created under the provision of and in accordance with the powers granted to the Cities of Festus and Crystal City under Section 70.210 though and including 70.320 of the Missouri Statutes. A contract for the Festus- Crystal City Joint Sewage Commission was signed by both cities on December 14, 1964. This contract purposed the commission to "operate and maintain a sewage treatment facility, to treat the sewage contributed to the facility by the Cities of Festus and Crystal City, Missouri." The contract also states the facility (the Festus- Crystal City Sewage Treatment Plant) will be "operated and maintained by The Commission shall consist of a sewage treatment plant, pumping station, force main, the equipment and machinery required for the operation of the plant and the outfall sewer from the plant as required for the operation of the plant, and as required by the Missouri Water Pollution Board. The sewage treatment facility shall be used for the treatment of sewage contributed to the facility by the Cities of Festus and Crystal City, Missouri, and from such other areas as may be suggested by The Commission and approved by the City Councils of Festus and Crystal City, Missouri.

The current Owner and Continuing Authority for Missouri State Operating Permit (MSOP) #MO-0080632 is the Festus-Crystal City Sewage Treatment Commission. The permit lists the Cities of Festus and Crystal City as co-permittees for the Festus-Crystal City Sewage Treatment Plant. To reaffirm the collection system ownership and maintenance requirements already agreed upon between the Cities in the agreement referenced above, the Department has added the Cities as co-permittees to this operating permit. Listing the cities as co-permittees will minimize human health and water quality impacts resulting from excessive inflow and infiltration and sanitary sewer overflow associated with blockages in the sewer systems.

Facility Type: POTW - SIC #4952

Facility Description: Influent lift station / comminutor / fine mechanical screen / aerated grit chamber / 4 parallel sequential batch reactors / UV disinfection / 3 aerobic sludge digesters / sludge filter press / sludge is land applied

Have any changes occurred at this facility or in the receiving water body that effects effluent limit derivation?
☐ - Yes.
☒ - No.

Application Date: 5/10/16
Expiration Date: 9/30/16

OUTFALL TABLE:

OUTFALL	DESIGN FLOW (CFS)	TREATMENT LEVEL	EFFLUENT TYPE
#001	6.2	Secondary	Domestic

Facility Performance History:
A compliance inspection of the facility was performed by the St. Louis Regional Office on September 20, 2016. At the time of the inspection the facility was issued a referral notice of violation for chronic noncompliance issues.

Comments:
Changes in this permit include the addition of a chronic WET test, and quarterly Lead and Zinc monitoring. See Part VI of the Fact Sheet for further information regarding the addition and removal of effluent parameters. The following special conditions were added or updated: inflow and infiltration reporting requirements, reporting of Non-detects, bypass reporting requirements, and Chronic WET testing requirements.

Part II – Operator Certification Requirements

☒ - This facility is required to have a certified operator.

As per [10 CSR 20-6.010(8) Terms and Conditions of a Permit], the permittee shall operate and maintain facilities to comply with the Missouri Clean Water Law and applicable permit conditions and regulations. Operators or supervisors of operations at regulated wastewater treatment facilities shall be certified in accordance with [10 CSR 20-9.020(2)] and any other applicable state law or regulation. As per [10 CSR 20-9.020(2)(A)], requirements for operation by certified personnel shall apply to all wastewater treatment systems, if applicable, as listed below:

Owned or operated by the Festus Crystal City Sewage Commission for

☒ - Municipalities
☐ - Federal agency
☐ - County
☐ - Public Sewer District
☐ - State agency
☐ - Private Sewer Company regulated by the Public Service Commission
☐ - Public Water Supply Districts

Each of the above entities are only applicable if they have a Population Equivalent greater than two hundred (200) or fifty (50) or more service connections.

This facility currently requires an operator with a (B) Certification Level. Please see **Appendix - Classification Worksheet.** Modifications made to the wastewater treatment facility may cause the classification to be modified.

Operator's Name: Chad Shelby
Certification Number: 5273
Certification Level: A

The listing of the operator above only signifies that staff drafting this operating permit have reviewed appropriate Department records and determined that the name listed on the operating permit application has the correct and applicable Certification Level.

☐ - This facility is not required to have a certified operator.

Part III– Operational Monitoring

☐ - As per [10 CSR 20-9.010(4))], the facility is not required to conduct operational monitoring.

☒ - As per [10 CSR 20-9.010(4))], the facility is required to conduct operational monitoring.

Part IV – Receiving Stream Information

RECEIVING STREAM(S) TABLE: OUTFALL #001

WATER-BODY NAME	CLASS	WBID	DESIGNATED USES*	12-DIGIT HUC	DISTANCE TO CLASSIFIED SEGMENT (MI)
Tributary to Plattin Creek	C	3960	AQL, IRR, LWW, SCR, WBC(B), HHP	07140101-0806	0.0, 0.37
Plattin Creek	P	1728	AQL, IND, IRR, LWW, SCR, WBC(A), HHP		

*As per 10 CSR 20-7.031 Missouri Water Quality Standards, the Department defines the Clean Water Commission's water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and 1st classified receiving stream's beneficial water uses to be maintained are in the receiving stream table in accordance with [10 CSR 20-7.031(1)(C)].

Uses which may be found in the receiving streams table, above:

10 CSR 20-7.031(1)(C)1.:

AQL = Protection of aquatic life (Current narrative use(s) are defined to ensure the protection and propagation of fish shellfish and wildlife, which is further subcategorized as: WWH = Warm Water Habitat; **CDF** = Cold-water fishery (Current narrative use is cold-water habitat.); **CLF** = Cool-water fishery (Current narrative use is cool-water habitat); EAH = Ephemeral Aquatic Habitat; MAH = Modified Aquatic Habitat; LAH = Limited Aquatic Habitat. This permit uses AQL effluent limitations in 10 CSR 20-7.031 Table A for all habitat designations unless otherwise specified.)

10 CSR 20-7.031(1)(C)2.: Recreation in and on the water

WBC = Whole Body Contact recreation where the entire body is capable of being submerged;
WBC-A = Whole body contact recreation that supports swimming uses and has public access;
WBC-B = Whole body contact recreation that supports swimming;
SCR = Secondary Contact Recreation (like fishing, wading, and boating).

10 CSR 20-7.031(1)(C)3. to 7.:

HHP (formerly HHF) = Human Health Protection as it relates to the consumption of fish;
IRR = Irrigation for use on crops utilized for human or livestock consumption;
LWW = Livestock and wildlife watering (Current narrative use is defined as LWP = Livestock and Wildlife Protection);
DWS = Drinking Water Supply;
IND = Industrial water supply

10 CSR 20-7.031(1)(C)8-11.: Wetlands (10 CSR 20-7.031 Table A currently does not have corresponding habitat use criteria for these defined uses)

WSA = Storm- and flood-water storage and attenuation; WHP = Habitat for resident and migratory wildlife species; WRC = Recreational, cultural, educational, scientific, and natural aesthetic values and uses; WHC = Hydrologic cycle maintenance.

10 CSR 20-7.031(6): **GRW** = Groundwater

RECEIVING STREAM(S) LOW-FLOW VALUES:

RECEIVING STREAM (C, E, P, PI)	LOW-FLOW VALUES (CFS)		
	1Q10	7Q10	30Q10
Tributary to Plattin Creek	0.0	0.0	0.0

MIXING CONSIDERATIONS

Mixing Zone: Not Allowed [10 CSR 20-7.031(5)(A)4.B.(I)(a)].
Zone of Initial Dilution: Not Allowed [10 CSR 20-7.031(5)(A)4.B.(I)(b)].

MIXING CONSIDERATIONS TABLE:

MIXING ZONE (CFS) [10 CSR 20-7.031(5)(A)4.B.(I)(a)]			ZONE OF INITIAL DILUTION (CFS) [10 CSR 20-7.031(5)(A)4.B(I)(b)]		
1Q10	7Q10	30Q10	1Q10	7Q10	30Q10
0	0	0	0	0	N/A

RECEIVING STREAM MONITORING REQUIREMENTS:

Facilities with a design flow greater than 100,000 gallons per day are required to sample their effluent quarterly for Total Phosphorus and Total Nitrogen per 10 CSR 20-7.015(9)(D)7. Upstream monitoring for these parameters is necessary to determine background concentrations in order to complete calculations related to future effluent limit derivation where necessary or appropriate.

Receiving Water Body's Water Quality
No stream surveys have been performed by the department at this facility.

Part V – Rationale and Derivation of Effluent Limitations & Permit Conditions

ALTERNATIVE EVALUATIONS FOR NEW FACILITIES:
As per [10 CSR 20-7.015(4)(A)], discharges to losing streams shall be permitted only after other alternatives including land application, discharges to a gaining stream and connection to a regional wastewater treatment facility have been evaluated and determined to be unacceptable for environmental and/or economic reasons.

☐ - The facility discharges to a Losing Stream as defined by [10 CSR 20-2.010(36)] & [10 CSR 20-7.031(1)(N)], or is an existing facility, and has submitted an alternative evaluation.

☒ - The facility does not discharge to a Losing Stream as defined by [10 CSR 20-2.010(36)] & [10 CSR 20-7.031(1)(N)], or is an existing facility.

ANTI-BACKSLIDING:
A provision in the Federal Regulations [CWA §303(d)(4); CWA §402(o); 40 CFR Part 122.44(l)] that requires a reissued permit to be as stringent as the previous permit with some exceptions.

☒ - Limitations in this operating permit for the reissuance of this permit conform to the anti-backsliding provisions of Section 402(o) of the Clean Water Act, and 40 CFR Part 122.44.

☒ - The sampling and reporting frequencies for some parameters in Table A-1 have been reduced. The department believes these frequencies are appropriate and protective of aquatic life.

☒ - Information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance.

- Effluent limitations were re-calculated for Ammonia based on new information derived from discharge monitoring reports and on the current Missouri Water Quality Standards for Ammonia. The newly established limitations are still protective of water quality.
- WET testing requirements were changed from pass/fail to monitoring only for toxic units. This change reflects modifications to Missouri's Effluent Regulation found at 10 CSR 20-7.015. 40 CFR 122.44(d)(1)(ii) requiring the Department to establish effluent limitations to control all parameters which have the reasonable potential to cause or contribute to an excursion above any state water quality standard, including state narrative criteria. The previous permit imposed a pass/fail limitation without collecting sufficient numerical data to conduct an analytical reasonable potential analysis. The permit writer has made a reasonable potential determination which concluded the facility does not have reasonable potential at this time but monitoring is required. Implementation of the toxic unit monitoring requirement will allow the Department to effect numeric criteria in accordance with water quality standards established under §303 of the CWA.

☒ - The Department determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under section 402(a)(1)(b).

- **General Criteria**. The previous permit contained a special condition which described a specific set of prohibitions related to general criteria found in 10 CSR 20-7.031(4). In order to comply with 40 CFR 122.44(d)(1), the permit writer has conducted reasonable potential determinations for each general criterion and established numeric effluent limitations where reasonable potential exists. While the removal of the previous permit special condition creates the appearance of backsliding, since this permit establishes numeric limitations where reasonable potential to cause or contribute to an excursion of the general criteria exists the permit maintains sufficient effluent limitations and monitoring requirements in order to protect water quality, this permit is equally protective as compared to the previous permit. Therefore, given this new information, and the fact that the previous permit special condition was not consistent with 40 CFR 122.44(d)(1), an error occurred in the establishment of the general criteria as a special condition of the previous permit. Please see Part VI – Effluent Limits Determination for more information regarding the reasonable potential determinations for each general criterion related to this facility.

ANTIDEGRADATION:
In accordance with Missouri's Water Quality Standard [10 CSR 20-7.031(3)], for domestic wastewater discharge with new, altered, or expanding discharges, the Department is to document by means of Antidegradation Review that the use of a water body's available assimilative capacity is justified. In accordance with Missouri's water quality regulations for antidegradation [10 CSR 20-7.031(3)], degradation may be justified by documenting the socio-economic importance of a discharge after determining the necessity of the discharge. Facilities must submit the antidegradation review request to the Department prior to establishing, altering, or expanding discharges. See http://dnr.mo.gov/env/wpp/permits/antideg-implementation.htm

☒ - No degradation proposed and no further review necessary. Facility did not apply for authorization to increase pollutant loading or to add additional pollutants to their discharge.

☐ - This permit contains new and/or expanded discharge; please see **APPENDIX FOR ANTIDEGRADATION ANALYSIS.**

For stormwater discharges, the stormwater BMP chosen for the facility, through the antidegradation analysis performed by the facility, must be implemented and maintained at the facility. Failure to implement and maintain the chosen BMP alternative is a permit violation; see SWPPP.

☒ - The facility must review and maintain stormwater BMPs as appropriate.

☐ - The facility does not have stormwater discharges or the stormwater outfalls onsite have no industrial exposure.

AREA-WIDE WASTE TREATMENT MANAGEMENT & CONTINUING AUTHORITY:
As per [10 CSR 20-6.010(3)(B)], …An applicant may utilize a lower preference continuing authority by submitting, as part of the application, a statement waiving preferential status from each existing higher preference authority, providing the waiver does not conflict with any area-wide management plan approved under section 208 of the Federal Clean Water Act or any other regional sewage service and treatment plan approved for higher preference authority by the Department.

BIOSOLIDS & SEWAGE SLUDGE:
Biosolids are solid materials resulting from domestic wastewater treatment that meet federal and state criteria for beneficial uses (i.e. fertilizer). Sewage sludge is solids, semi-solids, or liquid residue generated during the treatment of domestic sewage in a treatment works; including but not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in a treatment works. Additional information regarding biosolids and sludge is located at the following web address: http://extension.missouri.edu/main/DisplayCategory.aspx?C=74, items WQ422 through WQ449.

☒ - Permittee has a Department approved biosolids management plan, and is authorized to land apply biosolids in accordance with Standard Conditions III.

☐ - Permittee is not authorized to land apply biosolids. Sludge/biosolids are removed by contract hauler, incinerated, stored in the lagoon, etc.

☐ - This condition is not applicable to the permittee for this facility.

COMPLIANCE AND ENFORCEMENT:
Enforcement is the action taken by the Water Protection Program (WPP) to bring an entity into compliance with the Missouri Clean Water Law, its implementing regulations, and/or any terms and conditions of an operating permit. The primary purpose of the enforcement activity in the WPP is to resolve violations and return the entity to compliance.

☐ - The facility is currently under enforcement action.

☒ - The facility is not currently under Water Protection Program enforcement action.

ELECTRONIC DISCHARGE MONITORING REPORT (EDMR) SUBMISSION SYSTEM:
The U.S. Environmental Protection Agency (EPA) promulgated a final rule on October 22, 2015, to modernize Clean Water Act reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system. This final rule requires regulated entities and state and federal regulators to use information technology to electronically report data required by the National Pollutant Discharge Elimination System (NPDES) permit program instead of filing paper reports. To comply with the federal rule, the Department is requiring all permittees to begin submitting discharge monitoring data and reports online. In an effort to aid facilities in the reporting of applicable information electronically, the Department has created several new forms including operational control monitoring forms and an I&I location and reduction form. These forms are for optional use and can be found on the Department's website at the following locations:

Operational Monitoring Lagoon: http://dnr.mo.gov/forms/780-2801-f.pdf
Operational Monitoring Mechanical: http://dnr.mo.gov/forms/780-2800-f.pdf
I&I Report: http://dnr.mo.gov/forms/780-2690-f.pdf

Per 40 CFR 127.15 and 127.24, permitted facilities may request a temporary waiver for up to 5 years or a permanent waiver from electronic reporting from the Department. To obtain an electronic reporting waiver, a permittee must first submit an eDMR Waiver Request Form: http://dnr.mo.gov/forms/780-2692-f.pdf. A request must be made for each facility. If more than one facility is owned or operated by a single entity, then the entity must submit a separate request for each facility based on its specific circumstances. An approved waiver is non-transferable.

The Department must review and notify the facility within 120 calendar days of receipt if the waiver request has been approved or rejected [40 CFR 124.27(a)]. During the Department review period as well as after a waiver is granted, the facility must continue submitting a hard-copy of any reports required by their permit. The Department will enter data submitted in hard-copy from those facilities allowed to do so and electronically submit the data to the EPA on behalf of the facility.

☒ - The permittee/facility is currently using the eDMR data reporting system.

PRETREATMENT PROGRAM:
The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a Publicly Owned Treatment Works [40 CFR Part 403.3(q)].

Pretreatment programs are required at any POTW (or combination of POTW operated by the same authority) and/or municipality with a total design flow greater than 5.0 MGD and receiving industrial wastes that interfere with or pass through the treatment works or are otherwise subject to the pretreatment standards. Pretreatment programs can also be required at POTWs/municipals with a design flow less than 5.0 MGD if needed to prevent interference with operations or pass through.

Several special conditions pertaining to the permittee's pretreatment program may be included in the permit, and are as follows:

- Implementation and enforcement of the program,
- Annual pretreatment report submittal,
- Submittal of list of industrial users,
- Technical evaluation of need to establish local limitations, and
- Submittal of the results of the evaluation

☐ - This permittee has an approved pretreatment program in accordance with the requirements of [40 CFR Part 403] and [10 CSR 20-6.100] and is expected to implement and enforce its approved program.

☒ - The permittee, at this time, is not required to have a Pretreatment Program or does not have an approved pretreatment program.

REASONABLE POTENTIAL ANALYSIS (RPA):
Federal regulation [40 CFR Part 122.44(d)(1)(i)] requires effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause or contribute to an in-stream excursion above narrative or numeric water quality standard.

In accordance with [40 CFR Part 122.44(d)(1)(iii)] if the permit writer determines that any given pollutant has the reasonable potential to cause, or contribute to an in-stream excursion above the WQS, the permit must contain effluent limits for that pollutant.

☒ - A RPA was conducted on appropriate parameters. Please see **APPENDIX – RPA RESULTS.**

☐ - A RPA was not conducted for this facility.

- **Conservative assumption**:
  The following conservative assumptions have been made regarding the facility:
  - Ammonia is a constituent of domestic wastewater. A reasonable potential to violate water quality standards is assumed.
  - Default multipliers from EPA guidance were utilized to calculate effluent limits.

REMOVAL EFFICIENCY:
Removal efficiency is a method by which the Federal Regulations define Secondary Treatment and Equivalent to Secondary Treatment, which applies to Biochemical Oxygen Demand 5-day (BOD_5) and Total Suspended Solids (TSS) for Publicly Owned Treatment Works (POTWs)/municipals.

☒ - Secondary Treatment is 85% removal [40 CFR Part 133.102(a)(3) & (b)(3)].

☐ - Equivalent to Secondary Treatment is 65% removal [40 CFR Part 133.105(a)(3) & (b)(3)].

SANITARY SEWER OVERFLOWS (SSO) AND INFLOW AND INFILTRATION (I&I):
Sanitary Sewer Overflows (SSOs) are defined as untreated sewage releases and are considered bypassing under state regulation [10 CSR 20-2.010(11)] and should not be confused with the federal definition of bypass. SSOs result from a variety of causes including blockages, line breaks, and sewer defects that can either allow wastewater to backup within the collection system during dry weather conditions or allow excess stormwater and groundwater to enter and overload the collection system during wet weather conditions. SSOs can also result from lapses in sewer system operation and maintenance, inadequate sewer design and construction, power failures, and vandalism. SSOs include overflows out of manholes, cleanouts, broken pipes, and other into waters of the state and onto city streets, sidewalks, and other terrestrial locations.

Inflow and Infiltration (I&I) is defined as unwanted intrusion of stormwater or groundwater into a collection system. This can occur from points of direct connection such as sump pumps, roof drain downspouts, foundation drains, and storm drain cross-connections or through cracks, holes, joint failures, faulty line connections, damaged manholes, and other openings in the collection system itself. I&I results from a variety of causes including line breaks, improperly sealed connections, cracks caused by soil erosion/settling, penetration of vegetative roots, and other sewer defects. In addition, excess stormwater and groundwater entering the collection system from line breaks and sewer defects have the potential to negatively impact the treatment facility.

Missouri RSMo §644.026.1.(13) mandates that the Department issue permits for discharges of water contaminants into the waters of this state, and also for the operation of sewer systems. Such permit conditions shall ensure compliance with all requirements as established by sections 644.006 to 644.141. Standard Conditions Part I, referenced in the permit, contains provisions requiring proper operation and maintenance of all facilities and systems of treatment and control. Missouri RSMo §644.026.1.(15) instructs the Department to require proper maintenance and operation of treatment facilities and sewer systems and proper disposal of residual waste from all such facilities. To ensure that public health and the environment are protected, any noncompliance which may endanger public health or the environment must be reported to the Department within 24 hours of the time the permittee becomes aware of the noncompliance. Standard Conditions Part I, referenced in the permit, contains the reporting requirements for the permittee when bypasses and upsets occur. The permit also contains requirements for the co-permittees to develop and implement a program for maintenance and repair of the collection system. The permit requires the co-permittees to submit an annual report to the Department for the previous calendar year that contains a summary of efforts taken by the permittee to locate and eliminate sources of excess I & I, a summary of general maintenance and repairs to the collection system, and a summary of any planned maintenance and repairs to the collection system for the upcoming calendar year.

☒ - At this time, the Department recommends the US EPA's Guide for Evaluating Capacity, Management, Operation and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems (Document # EPA 305-B-05-002) or the Departments' CMOM Model located at http://dnr.mo.gov/env/wpp/permits/docs/cmom-template.doc. For additional information regarding the Departments' CMOM Model, see the CMOM Plan Model Guidance document at http://dnr.mo.gov/pubs/pub2574.htm. The CMOM identifies some of the criteria used to evaluate a collection system's management, operation, and maintenance and was intended for use by the EPA, state, regulated community, and/or third party entities. The CMOM is applicable to small, medium, and large systems; both public and privately owned; and both regional and satellite collection systems. The CMOM does not substitute for the Clean Water Act, the Missouri Clean Water Law, and both federal and state regulations, as it is not a regulation.

☐ - This facility is not required to develop or implement a program for maintenance and repair of the collection system; however, it is a violation of Missouri State Environmental Laws and Regulations to allow untreated wastewater to discharge to waters of the state.

SCHEDULE OF COMPLIANCE (SOC):
Per 644.051.4 RSMo, a permit may be issued with a Schedule of Compliance (SOC) to provide time for a facility to come into compliance with new state or federal effluent regulations, water quality standards, or other requirements. Such a schedule is not allowed if the facility is already in compliance with the new requirement, or if prohibited by other statute or regulation. A SOC includes an enforceable sequence of interim requirements (actions, operations, or milestone events) leading to compliance with the Missouri Clean Water Law, its implementing regulations, and/or the terms and conditions of an operating permit. *See also* Section 502(17) of the Clean Water Act, and 40 CFR §122.2. For new effluent limitations, the permit includes interim monitoring for the specific parameter to demonstrate the facility is not already in compliance with the new requirement. Per 40 CFR § 122.47(a)(1) and 10 CSR 20-7.031(11), compliance must occur as soon as possible. If the permit provides a schedule for meeting new water quality based effluent limits, a SOC must include an enforceable, final effluent limitation in the permit even if the SOC extends beyond the life of the permit.

A SOC is not allowed:

- For effluent limitations based on technology-based standards established in accordance with federal requirements, if the deadline for compliance established in federal regulations has passed. 40 CFR § 125.3.
- For a newly constructed facility in most cases. Newly constructed facilities must meet applicable effluent limitations when discharge begins, because the facility has installed the appropriate control technology as specified in a permit or antidegradation review. A SOC is allowed for a new water quality based effluent limit that was not included in a previously public noticed permit or antidegradation review, which may occur if a regulation changes during construction.
- To develop a TMDL, UAA, or other study associated with development of a site specific criterion. A facility is not prohibited from conducting these activities, but a SOC may not be granted for conducting these activities.

In order to provide guidance to Permit Writers in developing SOCs, and attain a greater level of consistency, on April 9, 2015 the Department issued an updated policy on development of SOCs. This policy provides guidance to Permit Writers on the standard time frames for schedules for common activities, and guidance on factors that may modify the length of the schedule such as a Cost Analysis for Compliance.

☐ - The time given for effluent limitations of this permit listed under Interim Effluent Limitation and Final Effluent Limitations were established in accordance with [10 CSR 20-7.031(11)]. The facility has been given a schedule of compliance to meet final effluent limits for parameter.

☒ - This permit does not contain a SOC.

SEWER EXTENSION AUTHORITY SUPERVISED PROGRAM:
In accordance with [10 CSR 20-6.010(6)(A)], the Department may grant approval of a permittee's Sewer Extension Authority Supervised Program. These approved permittees regulate and approve construction of sanitary sewers and pump stations, which are tributary to this wastewater treatment facility. The permittee shall act as the continuing authority for the operation, maintenance, and modernization of the constructed collection system. See http://dnr.mo.gov/env/wpp/permits/sewer-extension.htm.

☐ - The permittee's Sewer Extension Authority Supervised Program has been reauthorized. Please see **Appendix – Sewer Extension Authority Supervised Program Reauthorization Letter** for applicable conditions.

☐ - The permittee's Sewer Extension Authority Supervised Program is currently under review. The Department is reevaluating the permittee's Sewer Extension Authority Supervised Program to determine if it is current, complete, and meets the requirements of 10 CSR 20-8 Design Guides. Once the Sewer Extension Authority Supervised Program is reauthorized or denied by the Department, the operating permit will be updated accordingly.

☒ - The permittee does not have a Department approved Sewer Extension Authority Supervised Program.

STORMWATER POLLUTION PREVENTION PLAN (SWPPP):
In accordance with 40 CFR 122.44(k) *Best Management Practices (BMPs)* to control or abate the discharge of pollutants when: (1) Authorized under section 304(e) of the Clean Water Act (CWA) for the control of toxic pollutants and hazardous substances from ancillary industrial activities: (2) Authorized under section 402(p) of the CWA for the control of stormwater discharges; (3) Numeric effluent limitations are infeasible; or (4) the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA.

In accordance with the EPA's *Developing Your Stormwater Pollution Prevention Plan, A Guide for Industrial Operators*, (Document number EPA 833-B-09-002) [published by the United States Environmental Protection Agency (USEPA) in February 2009], BMPs are measures or practices used to reduce the amount of pollution entering (regarding this operating permit) waters of the state. BMPs may take the form of a process, activity, or physical structure.

Additionally in accordance with the Stormwater Management, a SWPPP is a series of steps and activities to (1) identify sources of pollution or contamination, and (2) select and carry out actions which prevent or control the pollution of stormwater discharges. The purpose of a SWPPP is to comply with all applicable stormwater regulations by creating an adaptive management plan to control and mitigate stream pollution from stormwater runoff. Developing a SWPPP provides opportunities to employ appropriate BMPs to minimize the risk of pollutants being discharged during storm events. The following paragraph outlines the general steps the permittee should take to determine which BMPs will work to achieve the benchmark values or limits in the permit. This section is not intended to be all encompassing or restrict the use of any physical BMP or operational and maintenance procedure assisting in pollution control. Additional steps or revisions to the SWPPP may be required to meet the requirements of the permit.

Areas which should be included in the SWPPP are identified in 40 CFR 122.26(b)(14). Once the potential sources of stormwater pollution have been identified, a plan should be formulated to best control the amount of pollutant being released and discharged by each activity or source. This should include, but is not limited to, minimizing exposure to stormwater, good housekeeping measures, proper facility and equipment maintenance, spill prevention and response, vehicle traffic control, and proper materials handling. Once a plan has been developed the facility will employ the control measures determined to be adequate to achieve the benchmark values discussed above. The facility will conduct monitoring and inspections of the BMPs to ensure they are working properly and re-evaluate any BMP not achieving compliance with permitting requirements. For example, if sample results from an outfall show values of TSS above the benchmark value, the BMP being employed is deficient in controlling stormwater pollution. Corrective action should be taken to repair, improve, or replace the failing BMP. This internal evaluation is required at least once per month but should be continued more frequently if BMPs continue to fail. If failures do occur, continue this trial and error process until appropriate BMPs have been established.

For new, altered, or expanded stormwater discharges, the SWPPP shall identify reasonable and effective BMPs while accounting for environmental impacts of varying control methods. The antidegradation analysis must document why no discharge or no exposure options are not feasible. The selection and documentation of appropriate control measures shall serve as an alternative analysis of technology and fulfill the requirements of antidegradation [10 CSR 20-7.031(3)]. For further guidance, consult the antidegradation implementation procedure (http://dnr.mo.gov/env/wpp/docs/AIP050212.pdf).

Alternative Analysis (AA) evaluation of the BMPs is a structured evaluation of BMPs that are reasonable and cost effective. The AA evaluation should include practices that are designed to be: 1) non-degrading; 2) less degrading; or 3) degrading water quality. The glossary of AIP defines these three terms. The chosen BMP will be the most reasonable and effective management strategy while ensuring the highest statutory and regulatory requirements are achieved and the highest quality water attainable for the facility is discharged. The AA evaluation must demonstrate why "no discharge" or "no exposure" is not a feasible alternative at the facility. This structured analysis of BMPs serves as the antidegradation review, fulfilling the requirements of 10 CSR 20-7.031(3) Water Quality Standards and *Antidegradation Implementation Procedure* (AIP), Section II.B.

If parameter-specific numeric exceedances continue to occur and the permittee feels there are no practicable or cost-effective BMPs which will sufficiently reduce a pollutant concentration in the discharge to the benchmark values established in the permit, the permittee can submit a request to re-evaluate the benchmark values. This request needs to include 1) a detailed explanation of why the facility is unable to comply with the permit conditions and unable to establish BMPs to achieve the benchmark values; 2) financial data of the company and documentation of cost associated with BMPs for review and 3) the SWPPP, which should contain adequate documentation of BMPs employed, failed BMPs, corrective actions, and all other required information. This will allow the Department to conduct a cost analysis on control measures and actions taken by the facility to determine cost-effectiveness of BMPs. The request shall be submitted in the form of an operating permit modification; the application is found at: http://dnr.mo.gov/forms/index.html.

☐ - 10 CSR 20-6.200 and 40 CFR 122.26 includes treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge that is located within the confines of the facility, with a design flow of 1.0 mgd or more, or are required to have an approved pretreatment program under 40 CFR part 403, as an industrial activity in which permit coverage is required.

In lieu of requiring sampling in the site-specific permit, the facility is required to develop and implement a Stormwater Pollution Prevention Plan (SWPPP). A facility can apply for conditional exclusion for "no exposure" of industrial activities and materials to stormwater by submitting a permit modification via Form B2 (http://dnr.mo.gov/forms/780-1805-f.pdf) appropriate application filing fees and a completed NPDES Form 3510-11 – No Exposure Certification for Exclusion from NPDES Stormwater Permitting (https://www3.epa.gov/npdes/pubs/msgp2008_appendixk.pdf) to the Department's Water Protection Program, Operating Permits Section. Upon approval of the No Exposure Certification, the permit will be modified and the Special Condition to develop and implement a SWPPP will be removed. This information will be reevaluated at the time of renewal.

☒ - At this time, the permittee is not required to develop and implement a SWPPP. A No Exposure Certification for Exclusion from NPDES Stormwater Permitting was submitted to the Department in January 2018. The Festus Crystal City Sewage Commission certifies that there are no discharges of stormwater contaminated by exposure to industrial activities or material from the facility or site identified in the No Exposure Certification; therefore stormwater permit coverage and the requirement to develop a SWPPP is not applicable to the facility during this permit cycle.

VARIANCE:
As per the Missouri Clean Water Law § 644.061.4, variances shall be granted for such period of time and under such terms and conditions as shall be specified by the commission in its order. The variance may be extended by affirmative action of the commission. In no event shall the variance be granted for a period of time greater than is reasonably necessary for complying with the Missouri Clean Water Law §§644.006 to 644.141 or any standard, rule or regulation promulgated pursuant to Missouri Clean Water Law §§644.006 to 644.141.

☐ - This operating permit is drafted under premises of a petition for variance.

☒ - This operating permit is not drafted under premises of a petition for variance.

WASTELOAD ALLOCATIONS (WLA) FOR LIMITS:
As per [10 CSR 20-2.010(78)], the amount of pollutant each discharger is allowed by the Department to release into a given stream after the Department has determined total amount of pollutant that may be discharged into that stream without endangering its water quality.

☒ - Wasteload allocations were calculated where applicable using water quality criteria or water quality model results and the dilution equation below:

$$Ce = \frac{(Qe + Qs)C - (Qs \times Cs)}{(Qe)}$$ (EPA/505/2-90-001, Section 4.5.5)

Where C = downstream concentration Ce = effluent concentration
Cs = upstream concentration Qe = effluent flow
Qs = upstream flow

Chronic wasteload allocations were determined using applicable chronic water quality criteria (CCC: criteria continuous concentration) and stream volume of flow at the edge of the mixing zone (MZ). Acute wasteload allocations were determined using applicable water quality criteria (CMC: criteria maximum concentration) and stream volume of flow at the edge of the zone of initial dilution (ZID).

Water quality based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's "Technical Support Document For Water Quality-based Toxics Control" (EPA/505/2-90-001).

Number of Samples "n":
Additionally, in accordance with the TSD for water quality-based permitting, effluent quality is determined by the underlying distribution of daily values, which is determined by the Long Term Average (LTA) associated with a particular Wasteload Allocation (WLA) and by the Coefficient of Variation (CV) of the effluent concentrations. Increasing or decreasing the monitoring frequency does not affect this underlying distribution or treatment performance, which should be, at a minimum, be targeted to comply with the values dictated by the WLA. Therefore, it is recommended that the actual planned frequency of monitoring normally be used to determine the value of "n" for calculating the AML. However, in situations where monitoring frequency is once per month or less, a higher value for "n" must be assumed for AML derivation purposes. Thus, the statistical procedure being employed using an assumed number of samples is "n = 4" at a minimum. For Total Ammonia as Nitrogen, "n = 30" is used.

☐ - Wasteload allocations were not calculated.

WLA MODELING:
There are two general types of effluent limitations, technology-based effluent limits (TBELs) and water quality based effluent limits (WQBELs). If TBELs do not provide adequate protection for the receiving waters, then WQBEL must be used.

☐ - A WLA study including model was submitted to the Department.

☒ - A WLA study was either not submitted or determined not applicable by Department staff.

WATER QUALITY STANDARDS:

Per [10 CSR 20-7.031(4)], General Criteria shall be applicable to all waters of the state at all times including mixing zones. Additionally, [40 CFR 122.44(d)(1)] directs the Department to establish in each NPDES permit to include conditions to achieve water quality established under Section 303 of the Clean Water Act, including State narrative criteria for water quality.

WHOLE EFFLUENT TOXICITY (WET) TEST:

☒ - The permittee is required to conduct WET test for this facility.

A WET test is a quantifiable method of determining if a discharge from a facility may be causing toxicity to aquatic life by itself, in combination with or through synergistic responses when mixed with receiving stream water.

Under the federal Clean Water Act (CWA) §101(a)(3), requiring WET testing is reasonably appropriate for site-specific Missouri State Operating Permits for discharges to waters of the state issued under the National Pollutant Discharge Elimination System (NPDES). WET testing is also required by 40 CFR 122.44(d)(1). WET testing ensures that the provisions in the 10 CSR 20-6.010(8)(A)7. and the Water Quality Standards 10 CSR 20-7.031(4)(D),(F),(G),(I)2.A & B are being met. Under [10 CSR 20-6.010(8)(A)4], the Department may require other terms and conditions that it deems necessary to assure compliance with the Clean Water Act and related regulations of the Missouri Clean Water Commission. In addition the following MCWL apply: §§§644.051.3 requires the Department to set permit conditions that comply with the MCWL and CWA; 644.051.4 specifically references toxicity as an item we must consider in writing permits (along with water quality-based effluent limits, pretreatment, etc…); and 644.051.5 is the basic authority to require testing conditions. WET test will be required by facilities meeting the following criteria:

- ☒ Facility is a designated Major.
- ☐ Facility continuously or routinely exceeds its design flow.
- ☐ Facility that exceeds its design population equivalent (PE) for BOD_5 whether or not its design flow is being exceeded.
- ☐ Facility (whether primarily domestic or industrial) that alters its production process throughout the year.
- ☐ Facility handles large quantities of toxic substances, or substances that are toxic in large amounts.
- ☐ Facility has Water Quality-based Effluent Limitations for toxic substances (other than NH_3)
- ☐ Facility is a municipality with a Design Flow ≥ 22,500 gpd.
- ☐ Other – please justify.

☐ - At this time, the permittee is not required to conduct WET test for this facility.

40 CFR 122.41(M) - BYPASSES:
The federal Clean Water Act (CWA), Section 402 prohibits wastewater dischargers from "bypassing" untreated or partially treated sewage (wastewater) beyond the headworks. A bypass is defined as an intentional diversion of waste streams from any portion of a treatment facility, [40 CFR 122.41(m)(1)(i)]. Additionally, Missouri regulation 10 CSR 20-7.015(9)(G) states a bypass means the intentional diversion of waste streams from any portion of a treatment facility, except in the case of blending, to waters of the state. Only under exceptional and specified limitations do the federal regulations allow for a facility to bypass some or all of the flow from its treatment process. Bypasses are prohibited by the CWA unless a permittee can meet all of the criteria listed in 40 CFR 122.41(m)(4)(i)(A), (B), & (C). Any bypasses from this facility are subject to the reporting required in 40 CFR 122.41(l)(6) and per Missouri's Standard Conditions I, Section B, part 2.b. Additionally, Anticipated Bypasses include bypasses from peak flow basins or similar devices designed for peak wet weather flows.

☐ - Bypasses occur or have occurred at this facility.

☒ - This facility does not anticipate bypassing.

303(d) LIST & TOTAL MAXIMUM DAILY LOAD (TMDL):
Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses of water as whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

A TMDL is a calculation of the maximum amount of a given pollutant that a body of water can absorb before its water quality is affected. If a water body is determined to be impaired as listed on the 303(d) list, then a watershed management plan will be developed that shall include the TMDL calculation

☐ - This facility discharges to a 303(d) listed stream.

☒ - This facility does not discharge to a 303(d) listed stream.

☐ - This facility discharges to a stream with an EPA approved TMDL.

Part VI – Effluent Limits Determination

APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:
As per Missouri's Effluent Regulations [10 CSR 20-7.015], the waters of the state are divided into the below listed seven (7) categories. Each category lists effluent limitations for specific parameters, which are presented in each outfall's Effluent Limitation Table and further discussed in the Derivation & Discussion of Limits section.

- ☐ Missouri or Mississippi River [10 CSR 20-7.015(2)]
- ☐ Lakes or Reservoirs [10 CSR 20-7.015(3)]
- ☐ Losing Streams [10 CSR 20-7.015(4)]
- ☐ Metropolitan No-Discharge Streams [10 CSR 20-7.015(5)]
- ☐ Special Streams [10 CSR 20-7.015(6)]
- ☐ Subsurface Waters [10 CSR 20-7.015(7)]
- ☒ All Other Waters [10 CSR 20-7.015(8)]

OUTFALL #001 – MAIN FACILITY OUTFALL

Effluent limitations derived and established in the below Effluent Limitations Table are based on current operations of the facility. Future permit action due to facility modification may contain new operating permit terms and conditions that supersede the terms and conditions, including effluent limitations, of this operating permit.

EFFLUENT LIMITATIONS TABLE:

PARAMETER	Unit	Basis for Limits	Daily Maximum	Weekly Average	Monthly Average	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type ****
Flow	MGD	1	*		*	*/*	1/week-days	monthly	T
Carbonaceous BOD_5 (May 1 – October 31)	mg/L	1	15		10	15/15	1/week	monthly	C
Carbonaceous BOD_5 (November 1 – April 30)		1	25		15	25/15	1/week	monthly	C
TSS	mg/L	1		45	30	45/30	1/week	monthly	C
Escherichia coli **	#/100mL	1, 3		630	126	630/126	1/week	monthly	G
Ammonia as N (Apr 1 –Sep 30)	mg/L	2, 3	5.2		1.3	4.9/1.3	1/week	monthly	G
Ammonia as N (Oct 1 – Mar 31)	mg/L	2, 3	10.4		2.7	12.0/2.4	1/week	monthly	G
Oil & Grease	mg/L	1, 3	15		10	15/10	1/quarter	quarterly	G
Total Nitrogen	mg/L	1	*		*	*/*	1/quarter	quarterly	G
Total Phosphorus	mg/L	1	*		*	*/*	1/quarter	quarterly	G
Lead, Total Recoverable	µg/L	1	*		*	***	1/quarter	quarterly	G
Zinc, Total Recoverable	µg/L	1	*		*	***	1/quarter	quarterly	G
Acute Whole Effluent Toxicity	TUa	1, 9	*			Pass/ Fail	1/year	annually	C
Chronic Whole Effluent Toxicity	TUc	1, 9	*			***	1/permit cycle	1/permit cycle	C
PARAMETER	Unit	Basis for Limits	Minimum		Maximum	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type
pH	SU	1	6.5		9.0	6.5-9.0	1/week	monthly	G
PARAMETER	Unit	Basis for Limits	Daily Minimum		Monthly Avg Min	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type
Carbonaceous BOD_5 Percent Removal	%	1			85	85	1/month	monthly	M
TSS Percent Removal	%	1			85	85	1/month	monthly	M

* - Monitoring requirement only.
** - #/100mL; the Monthly Average for *E. coli* is a geometric mean.
*** - Parameter not previously established in previous state operating permit.

**** - C = 24-hour composite
G = Grab
T = 24-hr. total
E = 24-hr. estimate
M = Measured/calculated

Basis for Limitations Codes:
1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Antidegradation Review
5. Antidegradation Policy
6. Water Quality Model
7. Best Professional Judgment
8. TMDL or Permit in lieu of TMDL
9. WET Test Policy
10. Multiple Discharger Variance

OUTFALL #001 – DERIVATION AND DISCUSSION OF LIMITS:

- **Flow**. In accordance with [40 CFR Part 122.44(i)(1)(ii)] the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the Department, which may require the submittal of an operating permit modification.

- **Carbonaceous Biochemical Oxygen Demand (BOD_5)**.

  ☒ - Effluent limitations have been retained from previous state operating permit.

  Limits derived from Wasteload Allocation Study (WLA) completed in 1991. WLA study: May - October = 15 mg/l, November – April = 25 mg/l. Used EPA guidance document EPA/505/2-90-001 PB91-127415

  May - October
  Long-Term Average (LTA) = WLA * multiplier = 15 * 0.321 = 5.0 mg/l
  (CV = 0.6, 99th percentile probability occurrence).

  Maximum Daily Limit (MDL) = LTA * multiplier = 5.0 * 3.11 = ***15 mg/l***
  Average Monthly Limit (AML) = 5.0 * 1.9 = ***10 mg/l***

  November – April
  Long-Term Average (LTA) = WLA * multiplier = 25 * 0.321 = 8.0 mg/l
  (CV = 0.6, 99th percentile probability occurrence).

  Maximum Daily Limit (MDL) = LTA * multiplier = 8.0 * 3.11 = ***25 mg/l***
  Average Monthly Limit (AML) = 8.0 * 1.9 = ***15 mg/l***

- **Total Suspended Solids (TSS)**.

  ☒ - Effluent limitations have been retained from previous state operating permit, please see the APPLICABLE DESIGNATION OF WATERS OF THE STATE sub-section of the **Effluent Limits Determination.**

- ***Escherichia coli (E. coli)***. Monthly average of 126 per 100 mL as a geometric mean and Weekly Average of 630 per 100 mL as a geometric mean during the recreational season (April 1 – October 31), to protect Whole Body Contact Recreation (A) designated use of the receiving stream, as per 10 CSR 20-7.031(5)(C). An effluent limit for both monthly average and weekly average is required by 40 CFR 122.45(d). The Geometric Mean is calculated by multiplying all of the data points and then taking the nth root of this product, where n = # of samples collected. For example: Five *E. coli* samples were collected with results of 1, 4, 6, 10, and 5 (#/100mL). Geometric Mean = 5th root of (1)(4)(6)(10)(5) = 5th root of 1,200 = 4.1 #/100mL.

- **Total Ammonia Nitrogen**. Early Life Stages Present Total Ammonia Nitrogen criteria apply [10 CSR 20-7.031(5)(B)7.C. & Table B3]. Background total ammonia nitrogen = 0.01 mg/L. No mixing considerations allowed; therefore, WLA = appropriate criterion.

Season	Temp (°C)	pH (SU)	Total Ammonia Nitrogen CCC (mg/L)	Total Ammonia Nitrogen CMC (mg/L)
Summer	26	7.8	1.5	12.1
Winter	6	7.8	3.1	12.1

Summer: April 1 – September 30
Chronic WLA: $C_e = ((4.62 + 0.0)1.5 – (0.0 * 0.01))/4.62$
$C_e = 1.5$ mg/L

Acute WLA: $C_e = ((4.62 + 0.0)12.1 – (0.0 * 0.01))/4.62$
$C_e = 12.1$ mg/L

$LTA_c = 1.5$ mg/L (0.6414) = 0.96 mg/L [CV = 1.10, 99th Percentile, 30 day avg.]
$LTA_a = 12.1$ mg/L (0.187) = 2.26 mg/L [CV = 1.10, 99th Percentile]

Use most protective number of LTA_c or LTA_a.

MDL = 0.96 mg/L (5.3527) = 5.2 mg/L [CV = 1.10, 99th Percentile]
AML = 2.26 mg/L (1.36) = 1.3 mg/L [CV = 1.10, 95th Percentile, n =30]

Winter: October 1 – March 31
Chronic WLA: $C_e = ((4.62 + 0.0)3.1 – (0.0 * 0.01))/4.62$
$C_e = 3.1$ mg/L

Acute WLA: $C_e = ((4.62 + 0.0)12.1 – (0.0 * 0.01))/4.62$
$C_e = 12.1$ mg/L

$LTA_c = 3.1$ mg/L (0.655) = 2.03 mg/L [CV = 1.05, 99th Percentile, 30 day avg.]
$LTA_a = 12.1$ mg/L (0.1959) = 2.37 mg/L [CV = 1.05, 99th Percentile]

Use most protective number of LTA_c or LTA_a.

MDL = 2.03 mg/L (5.11) = 10.4 mg/L [CV = 1.05, 99th Percentile]
AML = 2.03 mg/L (1.34) = 2.7 mg/L [CV = 1.05, 95th Percentile, n =30]

- **Oil & Grease**. Conventional pollutant, effluent limitation for protection of aquatic life; 10 mg/L monthly average, 15 mg/L daily maximum.

- **Total Phosphorus and Total Nitrogen**. Monitoring required for facilities greater than 100,000 gpd design flow per 10 CSR 20-7.015(9)(D)7. Total Nitrogen shall be determined by testing for Total Kjeldahl Nitrogen (TKN) and Nitrate + Nitrite and reporting the sum of the results (reported as N). Nitrate + Nitrite can be analyzed together or separately.

- **pH**. – 6.5-9.0 SU. pH limitations of 6.0-9.0 SU [10 CSR 20-7.015] are not protective of the in-stream Water Quality Standard, which states that water contaminants shall not cause pH to be outside the range of 6.5-9.0 SU. No mixing zone is allowed due to the classification of the receiving stream, therefore the water quality standard must be met at the outfall.

- **Lead, Total Recoverable and Zinc, Total Recoverable.** The permit includes quarterly monitoring for lead and zinc. The expanded effluent test submitted with the permit renewal showed detectable levels of these parameters in the effluent.

- **Biochemical Oxygen Demand (BOD_5) Percent Removal**. In accordance with 40 CFR Part 133, removal efficiency is a method by which the Federal Regulations define Secondary Treatment and Equivalent to Secondary Treatment, which applies to Biochemical Oxygen Demand 5-day (BOD_5) and Total Suspended Solids (TSS) for Publicly Owned Treatment Works (POTWs)/municipals. This facility is required to meet 85% removal efficiency for BOD_5.

- **Total Suspended Solids (TSS) Percent Removal**. In accordance with 40 CFR Part 133, removal efficiency is a method by which the Federal Regulations define Secondary Treatment and Equivalent to Secondary Treatment, which applies to Biochemical Oxygen Demand 5-day (BOD_5) and Total Suspended Solids (TSS) for Publicly Owned Treatment Works (POTWs)/municipals. This facility is required to meet 85% removal efficiency for TSS.

Whole Effluent Toxicity

- **Acute Whole Effluent Toxicity**. Monitoring requirement only. Monitoring is required to determine if reasonable potential exists for this facility's discharge to exceed water quality standards. Where no mixing is allowed, the acute criterion must be met at the end of the pipe. However, when using an LC50 as the test endpoint, the acute toxicity test has an upper sensitivity level of 100% effluent, or 1.0 TUa. If less than 50% of the test organisms die at 100% effluent, the true LC50 value for the effluent cannot be measured, effectively acting as a detection limit. Therefore, when the allowable effluent concentration is 100% a limit of 1.0 TUa will apply. If more than 50% of the organisms survive at 100% effluent, the permittee should report TUa <1.

  Acute and/or Chronic Allowable Effluent Concentrations (AECs) for facilities that discharge to Waters of the State lacking designated uses, Class C, Class P (with default Mixing Considerations), or Lakes [10 CSR 20-7.031(5)(A)4.B.(IV)(b)] are 100%, 50%, 25%, 12.5%, & 6.25%.

- **Chronic Whole Effluent Toxicity**. Monitoring requirement only. Monitoring is required to determine if reasonable potential exists for this facility's discharge to exceed water quality standards.

  Acute and/or Chronic Allowable Effluent Concentrations (AECs) for facilities that discharge to Waters of the State lacking designated uses, Class C, Class P (with default Mixing Considerations), or Lakes [10 CSR 20-7.031(5)(A)4.B.(IV)(b)] are 100%, 50%, 25%, 12.5%, & 6.25%.

Sampling Frequency Justification:

Sampling and Reporting Frequency was retained from previous permit. Some sampling and reporting frequencies have been reduced due to the facilities good compliance history. Weekly sampling is required for *E. coli*, per 10 CSR 20-7.015(9)(D)6.A.

WET Test Sampling Frequency Justification. WET Testing schedules and intervals are established in accordance with the Department's Permit Manual; Section 5.2 *Effluent Limits / WET Testing for Compliance Bio-monitoring*. It is recommended that WET testing be conducted during the period of lowest stream flow.

Acute Whole Effluent Toxicity

☒ - No less than ONCE/YEAR:
- ☒ -Facility is designated as a Major facility or has a design flow ≥ 1.0 MGD.
- ☐ - Facility incorporates a pretreatment program.
- ☐ - Facility continuously or routinely exceeds their design flow.
- ☐ -Facility exceeds its design population equivalent (PE) for BOD_5 whether or not its design flow is being exceeded.
- ☐ -Facility has Water Quality-based effluent limitations for toxic substances (other than NH_3).

Chronic Whole Effluent Toxicity

☒ -No less than ONCE/PERMIT CYCLE:
- ☒ -POTW facilities with a design flow of greater than 1.0 million gallons per day, but less than 10 million gallons per day, shall conduct and submit to the Department a chronic WET test no less than once per five years.

Sampling Type Justification:

As per 10 CSR 20-7.015, BOD_5, TSS, and WET test samples collected for mechanical plants shall be a 24 hour composite sample. Grab samples, however, must be collected for pH, Ammonia as N, *E. coli*, Oil & Grease, Total Phosphorus, Total Nitrogen and metals. This is due to the holding time restriction for *E. coli*, the volatility of Ammonia, and the fact that pH cannot be preserved and must be sampled in the field. Other samples must be immediately preserved, these samples are to be collected as a grab.

PERMITTED FEATURE SM1 – INSTREAM MONITORING (UPSTREAM)

The monitoring requirements established in the below Monitoring Requirements Table are based on current operations of the facility. Future permit action due to facility modification may contain new operating permit terms and conditions that supersede the terms and conditions, including the monitoring requirements listed in this table..

MONITORING REQUIREMENTS TABLE:

PARAMETER	Unit	Basis for Limits	Daily Maximum	Weekly Average	Monthly Average	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type
Total Nitrogen	mg/L	7	*		*	***	quarterly	quarterly	G
Total Phosphorus	mg/L	7	*		*	***	quarterly	quarterly	G

* - Monitoring requirement only.
*** - Parameter not previously established in previous state operating permit.

G = Grab
M = Measured /calculated

Basis for Limitations Codes:

1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Antidegradation Review
5. Antidegradation Policy
6. Water Quality Model
7. Best Professional Judgment
8. TMDL or Permit in lieu of TMDL
9. WET Test Policy

PERMITTED FEATURE SM1 – DERIVATION AND DISCUSSION OF MONITORING REQUIREMENTS:

- **Total Phosphorus and Total Nitrogen**. Facilities with a design flow greater than 100,000 gallons per day are required to sample their effluent quarterly for Total Phosphorus and Total Nitrogen per 10 CSR 20-7.015(9)(D)7. Upstream monitoring for these parameters is necessary to determine background stream concentrations in order to complete calculations that determine instream nutrient loading.

Sampling Frequency Justification:
The sampling and reporting frequency for Total Phosphorus and Total Nitrogen has been established to match the required sampling frequency of these parameters in the effluent.

Sampling Type Justification
As Total Phosphorus and Total Nitrogen samples must be immediately preserved; these samples are to be collected as a grab.

OUTFALL #001 – GENERAL CRITERIA CONSIDERATIONS:
In accordance with 40 CFR 122.44(d)(1), effluent limitations shall be placed into the permit for those pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. The rule further states that pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above a narrative criterion within an applicable State water quality standard, the permit shall contain a numeric effluent limitation to protect that narrative criterion. In order to comply with this regulation, the permit writer will complete reasonable potential determinations on whether the discharge will violate any of the general criteria listed in 10 CSR 20-7.031(4). These specific requirements are listed below followed by derivation and discussion (the lettering matches that of the rule itself, under 10 CSR 20-7.031(4)). It should also be noted that Section 644.076.1, RSMo as well as Section D – Administrative Requirements of Standard Conditions Part I of this permit states that it shall be unlawful for any person to cause or permit any discharge of water contaminants from any water contaminant or point source located in Missouri that is in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law or any standard, rule or regulation promulgated by the commission.

(A) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses. The discharge from this facility is made up of treated domestic wastewater. Based upon review of the Report of Compliance Inspection dated December 23, 2016, no evidence of an excursion of this criterion has been observed by the Department in the past and the facility has not disclosed any other information related to the characteristics of the discharge on their permit application which has the potential to cause or contribute to an excursion of this narrative criterion. Additionally, this facility utilizes equivalent to secondary treatment technology and is currently in compliance with the equivalent to secondary treatment technology based effluent limits established in this permit and there has been no indication to the Department that the stream has had issues maintaining beneficial uses as a result of this discharge. Based on the information reviewed during the drafting of this permit, these final effluent limitations appear to have protected against the excursion of this criterion in the past. Therefore, the discharge does not have the reasonable potential to cause or contribute to an excursion of this criterion.

(B) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses. Please see (A) above as justification is the same.

(C) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses. Please see (A) above as justification is the same.

(D) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life. This permit contains final effluent limitations which are protective of both acute and chronic toxicity for various pollutants that are either expected to be discharged by domestic wastewater facilities or that were disclosed by this facility on the application for permit coverage. Based on the information reviewed during the drafting of this permit, it has been determined if the facility meets final effluent limitations established in this permit, there is no reasonable potential for the discharge to cause an excursion of this criterion.

(E) There shall be no significant human health hazard from incidental contact with the water. Please see (D) above as justification is the same.

(F) There shall be no acute toxicity to livestock or wildlife watering. Please see (D) above as justification is the same.

(G) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community. Please see (A) above as justification is the same.

(H) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247. The discharge from this facility is made up of treated domestic wastewater. No evidence of an excursion of this criterion has been observed by the Department in the past and the facility has not disclosed any other information related to the characteristics of the discharge on their permit application which has the potential to cause or contribute to an excursion of this narrative criterion. Additionally, any solid wastes received or produced at this facility are wholly contained in appropriate storage facilities, are not discharged, and are disposed of offsite. This discharge is subject to Standard Conditions Part III, which contains requirements for the management and disposal of sludge to prevent its discharge. Therefore, this discharge does not have reasonable potential to cause or contribute to an excursion of this criterion.

Part VII – Cost Analysis for Compliance

Pursuant to Section 644.145, RSMo, when issuing permits under this chapter that incorporate a new requirement for discharges from publicly owned combined or separate sanitary or storm sewer systems or publicly owned treatment works, or when enforcing provisions of this chapter or the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq., pertaining to any portion of a publicly owned combined or separate sanitary or storm sewer system or [publicly owned] treatment works, the Department of Natural Resources shall make a "finding of affordability" on the costs to be incurred and the impact of any rate changes on ratepayers upon which to base such permits and decisions, to the extent allowable under this chapter and the Federal Water Pollution Control Act. This process is completed through a cost analysis for compliance. Permits that do not include new requirements may be deemed affordable.

☒ - The Department is required to determine "findings of affordability" because the permit applies to a combined or separate sanitary sewer system for a publically-owned treatment works.

☐ - The Department is required to make a "finding of affordability" on the new environmental requirement(s) within the permit. However, due to no costs associated with the new requirement(s) the Department has determined the permit to be affordable based on the eight requirements listed in Section 644.145.4, RSMo.

Cost Analysis for Compliance - The Department has made a reasonable search for empirical data indicating the permit is affordable. The search consisted of a review of Department records that might contain economic data on the community, a review of information provided by the applicant as part of the application, and public comments received in response to public notices of this draft permit. If the empirical cost data was used by the permit writer, this data may consist of median household income, any other ongoing projects that the Department has knowledge, and other demographic financial information that the community provided as contemplated by Section 644. 145.3. See **Appendix – Cost Analysis for Compliance**

☐ - The Department is not required to determine Cost Analysis for Compliance because the permit contains no new conditions or requirements that convey a new cost to the facility.

Part VIII – Administrative Requirements

On the basis of preliminary staff review and the application of applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the operating permit. The proposed determinations are tentative pending public comment.

PERMIT SYNCHRONIZATION:
The Department of Natural Resources is currently undergoing a synchronization process for operating permits. Permits are normally issued on a five-year term, but to achieve synchronization many permits will need to be issued for less than the full five years allowed by regulation. The intent is that all permits within a watershed will move through the Watershed Based Management (WBM) cycle together will all expire in the same fiscal year. This will allow further streamlining by placing multiple permits within a smaller geographic area on public notice simultaneously, thereby reducing repeated administrative efforts. This will also allow the Department to explore a watershed based permitting effort at some point in the future. Renewal applications must continue to be submitted within 180 days of expiration, however, in instances where effluent data from the previous renewal is less than 4 years old, that data may be re-submitted to meet the requirements of the renewal application. If the permit provides a schedule of compliance for meeting new water quality based effluent limits beyond the expiration date of the permit, the time remaining in the schedule of compliance will be allotted in the renewed permit. With permit synchronization, this permit will expire in the 3rd Quarter of calendar year 2021.

PUBLIC NOTICE:
The Department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest in and water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and permittee must be notified of the denial in writing. The Department must issue public notice of a pending operating permit or of a new or reissued statewide general permit. The public comment period is the length of time not less than 30 days following the date of the public notice which interested persons may submit written comments about the proposed permit. For persons wanting to submit comments regarding this proposed operating permit, then please refer to the Public Notice page located at the front of this draft operating permit. The Public Notice page gives direction on how and where to submit appropriate comments.

☒ - The Public Notice period for this operating permit was February 23, 2018 – March 26, 2018, no comments were received.

DATE OF FACT SHEET: JANUARY 19, 2018

COMPLETED BY:

EMILIE TWINING GERDES, ENVIRONMENTAL SPECIALIST III
MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
OPERATING PERMITS SECTION - DOMESTIC WASTEWATER UNIT
573-526-0827
Emilie.Twining-Gerdes@dnr.mo.gov

Appendices

APPENDIX - CLASSIFICATION WORKSHEET:

ITEM	POINTS POSSIBLE	POINTS ASSIGNED
Maximum Population Equivalent (P.E.) served (Max 10 pts.)	1 pt./10,000 PE or major fraction thereof.	3
Maximum: 10 pt Design Flow (avg. day) or peak month; use greater (Max 10 pts.)	1 pt. / MGD or major fraction thereof.	3
EFFLUENT DISCHARGE RECEIVING WATER SENSITIVITY:		
Missouri or Mississippi River	0	
All other stream discharges except to losing streams and stream reaches supporting whole body contact	1	
Discharge to lake or reservoir outside of designated whole body contact recreational area	2	
Discharge to losing stream, or stream, lake or reservoir area supporting whole body contact recreation	3	3
PRELIMINARY TREATMENT - Headworks		
Screening and/or comminution	3	3
Grit removal	3	3
Plant pumping of main flow (lift station at the headworks)	3	3
PRIMARY TREATMENT		
Primary clarifiers	5	
Combined sedimentation/digestion	5	
Chemical addition (except chlorine, enzymes)	4	
REQUIRED LABORATORY CONTROL – performed by plant personnel (highest level only)		
Push – button or visual methods for simple test such as pH, Settleable solids	3	
Additional procedures such as DO, COD, BOD, titrations, solids, volatile content	5	
More advanced determinations such as BOD seeding procedures, fecal coliform, nutrients, total oils, phenols, etc.	7	7
Highly sophisticated instrumentation, such as atomic absorption and gas chromatograph	10	
ALTERNATIVE FATE OF EFFLUENT		
Direct reuse or recycle of effluent	6	
Land Disposal – low rate	3	
High rate	5	
Overland flow	4	
Total from page ONE (1)	----	25

APPENDIX - CLASSIFICATION WORKSHEET (CONTINUED):

ITEM	POINTS POSSIBLE	POINTS ASSIGNED
VARIATION IN RAW WASTE (highest level only) (DMR exceedances and Design Flow exceedances)		
Variation do not exceed those normally or typically expected	0	
Recurring deviations or excessive variations of 100 to 200 % in strength and/or flow	2	
Recurring deviations or excessive variations of more than 200 % in strength and/or flow	4	
Raw wastes subject to toxic waste discharge	6	
SECONDARY TREATMENT		
Trickling filter and other fixed film media with secondary clarifiers	10	
Activated sludge with secondary clarifiers (including extended aeration and oxidation ditches)	15	15
Stabilization ponds without aeration	5	
Aerated lagoon	8	
Advanced Waste Treatment Polishing Pond	2	
Chemical/physical – without secondary	15	
Chemical/physical – following secondary	10	
Biological or chemical/biological	12	
Carbon regeneration	4	
DISINFECTION		
Chlorination or comparable	5	
Dechlorination	2	
On-site generation of disinfectant (except UV light)	5	
UV light	4	4
SOLIDS HANDLING - SLUDGE		
Solids Handling Thickening	5	5
Anaerobic digestion	10	
Aerobic digestion	6	6
Evaporative sludge drying	2	
Mechanical dewatering	8	8
Solids reduction (incineration, wet oxidation)	12	
Land application	6	6
Total from page TWO (2)	----	44
Total from page ONE (1)	---	25
Grand Total	---	69

☐ - A: 71 points and greater
☒ - B: 51 points – 70 points
☐ - C: 26 points – 50 points
☐ - D: 0 points – 25 points

APPENDIX – RPA RESULTS:

Parameter	CMC*	RWC Acute*	CCC*	RWC Chronic*	n**	Range max/min	CV***	MF	RP Yes/No
Total Ammonia as Nitrogen (Summer) mg/L	12.1	59.92	1.5	59.92	16.00	13.72/0.3	1.10	4.37	YES
Total Ammonia as Nitrogen (Winter) mg/L	12.1	44.80	3.1	44.80	14.00	10/0.36	1.05	4.48	YES

N/A – Not Applicable
* - Units are (µg/L) unless otherwise noted.
** - If the number of samples is 10 or greater, then the CV value must be used in the WQBEL for the applicable constituent. If the number of samples is < 10, then the default CV value must be used in the WQBEL for the applicable constituent.
*** - Coefficient of Variation (CV) is calculated by dividing the Standard Deviation of the sample set by the Mean of the same sample set.
RWC – Receiving Water Concentration. It is the concentration of a toxicant or the parameter toxicity in the receiving water after mixing (if applicable).
n – Is the number of samples.
MF – Multiplying Factor. 99% Confidence Level and 99% Probability Basis.
RP – Reasonable Potential. It is where an effluent is projected or calculated to cause an excursion above a water quality standard based on a number of factors including, as a minimum, the four factors listed in 40 CFR 122.44(d)(1)(ii).

Reasonable Potential Analysis is conducted as per (TSD, EPA/505/2-90-001, Section 3.3.2). A more detailed version including calculations of this RPA is available upon request.

APPENDIX – COST ANALYSIS FOR COMPLIANCE:

Missouri Department of Natural Resources
Water Protection Program
Cost Analysis for Compliance
(In accordance with RSMo 644.145)

Festus Crystal City STP, Permit Renewal
Festus Crystal City Sewage Commission
Missouri State Operating Permit #MO-0080632

Section 644.145 RSMo requires the Department of Natural Resources (DNR) to make a "finding of affordability" when "issuing permits under" or "enforcing provisions of" state or federal clean water laws "pertaining to any portion of a combined or separate sanitary sewer system for publicly-owned treatment works."

This cost analysis is based on data available to the Department obtained from readily available sources. For the most accurate analysis, it is essential that the permittee provides the Department with current information about the commission's financial and socioeconomic situation. The financial questionnaire available to permittees on the DNR website (http://dnr.mo.gov/forms/780-2511-f.pdf) should have been submitted with the permit renewal application. If it was not received with the renewal application, the Department sent a request to complete it with the welcome letter.

The Department is required to issue a permit with final effluent limits in accordance with 644.051.1.(1) RSMo, 644.051.1.(2) RSMo, and the Clean Water Act. The practical result of this analysis is to incorporate a compliance schedule into the permit in order to mitigate adverse impact to distressed populations resulting from new costs for the wastewater treatment facility.

Residential Connections:	6,649
Commercial Connections:	643
Industrial Connections:	647
Total Connections for this facility:	7,939

New Permit Requirements:

The permit requires compliance with new monitoring requirements for Lead and Zinc, and a chronic WET test.

Anticipated Costs Associated with Complying with the New Requirements:

The following table outlines the estimated costs of the new permit requirements listed above:

New Requirement	Frequency	Estimated Cost	Estimated Annual Costs
Lead monitoring	Quarterly	$30	$120
Zinc monitoring	Quarterly	$30	$120
Chronic WET test	Once every 5 years	$310	$310
		TOTAL	**$550**

This estimated, annual cost, if financed through user fees, might cost each connection an extra $0.01[1] per month. A community sets their user rates based on several factors. The percentage of the current user rate that is available to cover new debt is unknown to the Department.

(1) A community's financial capability and ability to raise or secure necessary funding;

Due to the minimal cost associated with this new permit requirement, the Department anticipates the Commission has the means to raise $550 annually.

(2) Affordability of pollution control options for the individuals or households at or below the median household income level of the community;

Estimated Costs for New Permit Requirements:

Median Household Income (MHI) for Festus:	$46,074
Median Household Income (MHI) for Crystal City	$42,955
Estimated total annual cost:	$550
Estimated monthly cost per household:	$0.01
Estimated monthly cost per household as a percent of MHI[2] (Festus):	0.0002%
Estimated monthly cost per household as a percent of MHI[3] (Crystal City):	0.0002%
Estimated resulting user rate per household per month (Festus):	$24.34
Estimated resulting user rate as a percent of MHI[4] (Festus):	0.63%
Estimated resulting user rate per household per month (Crystal City):	$21.71
Estimated resulting user rate as a percent of MHI[5] (Crystal City):	0.61%

Due to the minimal cost associated with this new requirement, the Department anticipates an extremely low to no rate increase will be necessary that could impact individuals or households of the community.

(3) An evaluation of the overall costs and environmental benefits of the control technologies;

Whole Effluent Toxicity (WET) test

The WET Test is a quantifiable method of determining if discharge from a facility may be causing toxicity to aquatic life by itself or in combination with receiving stream water. WET tests are required under 10 CSR 20-6.010(8)(A)4 to be performed by specialists properly trained in conducting the test according to 40 CFR 136. This test will help ensure that the existing permit limits are providing adequate protection for aquatic life.

(4) Inclusion of ongoing costs of operating and maintaining the existing wastewater collection and treatment system, including payments on outstanding debts for wastewater collection and treatment systems when calculating projected rates:

The commission did not provide the Department with information, nor could it be found through readily available data.

(5) An inclusion of ways to reduce economic impacts on distressed populations in the community, including but not limited to low and fixed income populations. This requirement includes but is not limited to:

(a) Allowing adequate time in implementation schedules to mitigate potential adverse impacts on distressed populations resulting from the costs of the improvements and taking into consideration local community economic considerations.
(b) Allowing for reasonable accommodations for regulated entities when inflexible standards and fines would impose a disproportionate financial hardship in light of the environmental benefits to be gained.

Socioeconomic Data[6-14]: The following table characterizes the current overall socioeconomic condition of the community as compared to the overall socioeconomic condition of the State of Missouri. The following information was compiled using the latest U.S. Census data.

Select a Community from the Dropdown List →	Festus City	Missouri State
Population (2015)	11,839	6,045,448
Percent Change in Population (2000-2015)	22.6%	8.0%
2015 Median Household Income (in 2016 Dollar)	$46,074	$48,582
Percent Change in Median Household Income (2000-2015)	-9.6%	-7.8%
Median Age (2015)	37.5	38.2
Change in Median Age in Years (2000-2015)	1.6	2.1
Unemployment Rate (2015)	9.6%	7.5%
Percent of Population Below Poverty Level (2015)	12.5%	15.6%
Percent of Household Received Food Stamps (2015)	16.1%	13.5%

Select a Community from the Dropdown List →	Crystal City	Missouri State
Population (2015)	4,829	6,045,448
Percent Change in Population (2000-2015)	13.7%	8.0%
2015 Median Household Income (in 2016 Dollar)	$42,955	$48,582
Percent Change in Median Household Income (2000-2015)	-14.4%	-7.8%
Median Age (2015)	35	38.2
Change in Median Age in Years (2000-2015)	-4.5	2.1
Unemployment Rate (2015)	6.6%	7.5%
Percent of Population Below Poverty Level (2015)	17.6%	15.6%
Percent of Household Received Food Stamps (2015)	14.1%	13.5%

(6) An assessment of other community investments and operating costs relating to environmental improvements and public health protection;

The commission did not report any other investments relating to environmental improvements.

(7) An assessment of factors set forth in the United States Environmental Protection Agency's guidance, including but not limited to the "Combined Sewer Overflow Guidance for Financial Capability Assessment and Schedule Development" that may ease the cost burdens of implementing wet weather control plans, including but not limited to small system considerations, the attainability of water quality standards, and the development of wet weather standards;

The new sampling requirements associated with this permit will not impose a financial burden on the community, nor will the new requirements require the Commission to seek funding from an outside source.

(8) An assessment of any other relevant local community economic condition.

The commission did not report any other relevant local economic conditions.

Conclusion and Finding

As a result of new regulations, the Department is proposing modifications to the current operating permit that may require the permittee to perform new testing. The Department identified the actions for which cost analysis for compliance is required under Section 644.145 RSMo.

The Department estimates the cost for the new testing is $550 per year. Should these additional costs be financed through user fees, it may require an increase in user fees 0.001% of the community's MHI.

The Department considered the eight (8) criteria presented in subsection 644.145, RSMo when evaluating the cost associated with the relevant actions. Taking into consideration these criteria, this analysis examined whether the above referenced permit modifications affects the ability of an individual customer or household to pay a utility bill without undue hardship or unreasonable sacrifice in the essential lifestyle or spending patterns of the individual or household. As a result of reviewing the above criteria, the Department hereby finds that the action described above may result in a low burden with regard to the community's overall financial capability and a low financial impact for most individual customers/households; therefore, the new permit requirements are affordable.

References:

1. (($550/7939 connections)/12 months)) = $0.01
2. (($0.01/($46,074/12))*100% = 0.0002%
3. (($0.01/($42,955/12))*100% = 0.0002%
4. (($24.34/($46,074/12))*100% = 0.63%
5. (($21.71/($42,955/12))*100% = 0.61%
6. U.S. Census Bureau. 2011-2015 American Community Survey 5-Year Estimates, Table B01003: Total Population - Universe: Total Population. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_B01003&prodType=table.
7. U.S. Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC. https://www.census.gov/prod/cen2000/phc-1-1-pt1.pdf. U.S. Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC. http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf.
8. U.S. Census Bureau. 2011-2015 American Community Survey 5-Year Estimates, Table B19013: Median Household Income in the Past 12 Months (in 2015 Inflation-Adjusted Dollars). http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_B19013&prodType=table.
9. U.S. Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-1 Part 1. United States Summary, Table 5. Work Status and Income in 1999: 2000, Washington, DC. https://www.census.gov/prod/cen2000/phc-2-1-pt1.pdf. U.S. Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-27, Missouri, Table 10. Work Status and Income in 1999: 2000, Washington, DC. https://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf.
10. U.S. Department of Labor Bureau of Labor Statistics (2016) Consumer Price Index - All Urban Consumers, U.S. City Average, All items, 1982-84=100. http://data.bls.gov/timeseries/CUUR0000SA0?data_tool=Xgtable. U.S. Department of Labor Bureau of Labor Statistics (2016) Consumer Price Index - All Urban Consumers, All items, 1982-84=100, Midwest Urban Areas. http://data.bls.gov/timeseries/CUUR0300SA0?data_tool=Xgtable.
11. U.S. Census Bureau. 2011-2015 American Community Survey 5-Year Estimates, Table B01002: Median Age by Sex - Universe: Total population. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_B01002&prodType=table.
12. U.S. Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC. https://www.census.gov/prod/cen2000/phc-1-1-pt1.pdf. U.S. Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC. http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf.
13. U.S. Census Bureau. 2011-2015 American Community Survey 5-Year Estimates, B23025: Employment Status for the Population 16 Years and Over - Universe: Population 16 years and Over. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_B23025&prodType=table.
14. U.S. Census Bureau. 2011-2015 American Community Survey 5-Year Estimates, Table B22003: Receipt of Food Stamps/SNAP in the Past 12 Months by Poverty Status in the Past 12 Months for Households - Universe: Households. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_B22003&prodType=table.

NPDES FORM 3510-11

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

Form Approved
OMB No. 2040-0211

NO EXPOSURE CERTIFICATION FOR EXCLUSION FROM NPDES STORMWATER PERMITTING

Submission of this No Exposure Certification constitutes notice that the entity identified in Section A does not require permit authorization for its stormwater discharges associated with industrial activity in the State identified in Section B under EPA's Stormwater Multi Sector General Permit due to the existence of a condition of no exposure.

A condition of no exposure exists at an industrial facility when all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products. Material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product or waste product. A storm resistant shelter is not required for the following industrial materials and activities:

- drums, barrels, tanks, and similar containers that are tightly sealed, provided those containers are not deteriorated and do not leak. "Sealed" means banded or otherwise secured and without operational taps or valves;
- adequately maintained vehicles used in material handling; and
- final products, other than products that would be mobilized in stormwater discharges (e.g., rock salt).

A No Exposure Certification must be provided for each facility qualifying for the no exposure exclusion. In addition, the exclusion from NPDES permitting is available on a facility-wide basis only, not for individual outfalls. If any industrial activities or materials are or will be exposed to precipitation, the facility is not eligible for the no exposure exclusion.

By signing and submitting this No Exposure Certification form, the entity in Section A is certifying that a condition of no exposure exists at its facility or site, and is obligated to comply with the terms and conditions of 40 CFR 122.26(g).

ALL INFORMATION MUST BE PROVIDED ON THIS FORM.

Detailed instructions for completing this form and obtaining the no exposure exclusion are provided on pages 3 and 4.

A. Facility Operator Information

1. Name: CHAD A SHELBY
2. Phone: 636-575-7318
3. Email: CSHELBY@ALLIANCEWATER.COM
4. Mailing Address: a. Street 355 COUNTY ROAD
   b. City: CRYSTAL CITY c. State MO d. Zip Code: 63019-

B. Facility/Site Location Information

1. Facility Name: FESTUS/CRYSTAL CITY SEWER DIST
2. a. Street Address: 355 COUNTY ROAD
   b. City: CRYSTAL CITY c. County: JEFFERSON
   d. State: MO e. Zip Code: 63019-
3. Is the facility located on Indian Lands? ☐ YES ☑ NO
4. Is this a Federal facility? ☐ YES ☑ NO
5. a. Latitude: 72° 91' 51" b. Longitude: 423° 24' 87"
6. a. Was the facility or site previously covered under an NPDES stormwater permit? ☐ YES ☑ NO
   b. If yes, enter NPDES permit number or tracking number: MO-0080632
7. SIC/Activity Codes: Primary: Secondary (if applicable):
8. Total size of site associated with industrial activity: 9.0 acres
9. a. Have you paved or roofed over a formerly exposed, pervious area in order to qualify for the no exposure exclusion? ☐ YES ☑ NO
   b. If yes, please indicate approximately how much area was paved or roofed over. Completing this question does not disqualify you for the no exposure exclusion. However, your permitting authority may use this information in considering whether stormwater discharges from your site are likely to have an adverse impact on water quality, in which case you could be required to obtain permit coverage.

   Less than one acre ☐ One to five acres ☐ More than five acres ☐

C. Exposure Checklist

Are any of the following materials or activities exposed to precipitation, now or in the foreseeable future? (Please check either "Yes" or "No" in the appropriate box.) **If you answer "Yes" to any of these questions (1) through (11), you are <u>not</u> eligible for the no exposure exclusion.**

	Yes	No
1. Using, storing or cleaning industrial machinery or equipment, and areas where residuals from using, storing or cleaning industrial machinery or equipment remain and are exposed to stormwater	☐	☑
2. Materials or residuals on the ground or in stormwater inlets from spills/leaks	☐	☑
3. Materials or products from past industrial activity	☐	☑
4. Material handling equipment (except adequately maintained vehicles)	☐	☑
5. Materials or products during loading/unloading or transporting activities	☐	☑
6. Materials or products stored outdoors (except final products intended for outside use [e.g., new cars] where exposure to stormwater does not result in the discharge of pollutants)	☐	☑
7. Materials contained in open, deteriorated or leaking storage drums, barrels, tanks, and similar containers	☐	☑
8. Materials or products handled/stored on roads or railways owned or maintained by the discharger	☐	☑
9. Waste material (except waste in covered, non leaking containers (e.g., dumpsters))	☐	☑
10. Application or disposal of process wastewater (unless otherwise permitted)	☐	☑
11. Particulate matter or visible deposits of residuals from roof stacks and/or vents not otherwise regulated (i.e., under an air quality control permit) and evident in the stormwater outflow	☐	☑

D. Certification Statement

I certify under penalty of law that I have read and understand the eligibility requirements for claiming a condition of "no exposure" and obtaining an exclusion from NPDES stormwater permitting.

I certify under penalty of law that there are no discharges of stormwater contaminated by exposure to industrial activities or materials from the industrial facility or site identified in this document (except as allowed under 40 CFR 122.26(g)(2)).

I understand that I am obligated to submit a no exposure certification form once every five years to the NPDES permitting authority and, if requested, to the operator of the local municipal separate storm sewer system (MS4) into which the facility discharges (where applicable). I understand that I must allow the NPDES permitting authority, or MS4 operator where the discharge is into the local MS4, to perform inspections to confirm the condition of no exposure and to make such inspection reports publicly available upon request. I understand that I must obtain coverage under an NPDES permit prior to any point source discharge of stormwater from the facility.

Additionally, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name: CHAD A SHELBY

Print Title: LOCAL MANAGER (ALLIANCE WATER)

Signature: 

Date: 01/16/2018
Mo Day Year

Email: CSHELBY@ALLIANCEWATER.COM

STANDARD CONDITIONS FOR NPDES PERMITS
ISSUED BY
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION
REVISED
AUGUST 1, 2014

These Standard Conditions incorporate permit conditions as required by 40 CFR 122.41 or other applicable state statutes or regulations. These minimum conditions apply unless superseded by requirements specified in the permit.

Part I – General Conditions

Section A – Sampling, Monitoring, and Recording

1. **Sampling Requirements.**
   a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
   b. All samples shall be taken at the outfall(s) or Missouri Department of Natural Resources (Department) approved sampling location(s), and unless specified, before the effluent joins or is diluted by any other body of water or substance.

2. **Monitoring Requirements.**
   a. Records of monitoring information shall include:
      i. The date, exact place, and time of sampling or measurements;
      ii. The individual(s) who performed the sampling or measurements;
      iii. The date(s) analyses were performed;
      iv. The individual(s) who performed the analyses;
      v. The analytical techniques or methods used; and
      vi. The results of such analyses.
   b. If the permittee monitors any pollutant more frequently than required by the permit at the location specified in the permit using test procedures approved under 40 CFR Part 136, or another method required for an industry-specific waste stream under 40 CFR subchapters N or O, the results of such monitoring shall be included in the calculation and reported to the Department with the discharge monitoring report data (DMR) submitted to the Department pursuant to Section B, paragraph 7.

3. **Sample and Monitoring Calculations.** Calculations for all sample and monitoring results which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in the permit.

4. **Test Procedures.** The analytical and sampling methods used shall conform to the reference methods listed in 10 CSR 20-7.015 unless alternates are approved by the Department. The facility shall use sufficiently sensitive analytical methods for detecting, identifying, and measuring the concentrations of pollutants. The facility shall ensure that the selected methods are able to quantify the presence of pollutants in a given discharge at concentrations that are low enough to determine compliance with Water Quality Standards in 10 CSR 20-7.031 or effluent limitations unless provisions in the permit allow for other alternatives. A method is "sufficiently sensitive" when; 1) the method minimum level is at or below the level of the applicable water quality criterion for the pollutant or, 2) the method minimum level is above the applicable water quality criterion, but the amount of pollutant in a facility's discharge is high enough that the method detects and quantifies the level of pollutant in the discharge, or 3) the method has the lowest minimum level of the analytical methods approved under 10 CSR 20-7.015. These methods are also required for parameters that are listed as monitoring only, as the data collected may be used to determine if limitations need to be established. A permittee is responsible for working with their contractors to ensure that the analysis performed is sufficiently sensitive.

5. **Record Retention.** Except for records of monitoring information required by the permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five (5) years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

6. **Illegal Activities.**
   a. The Federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under the permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than two (2) years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or both.
   b. The Missouri Clean Water Law provides that any person or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than six (6) months, or by both. Second and successive convictions for violation under this paragraph by any person shall be punished by a fine of not more than $50,000 per day of violation, or by imprisonment for not more than two (2) years, or both.

Section B – Reporting Requirements

1. **Planned Changes.**
   a. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility when:
      i. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or
      ii. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42;
      iii. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan;
      iv. Any facility expansions, production increases, or process modifications which will result in a new or substantially different discharge or sludge characteristics must be reported to the Department 60 days before the facility or process modification begins. Notification may be accomplished by application for a new permit. If the discharge does not violate effluent limitations specified in the permit, the facility is to submit a notice to the Department of the changed discharge at least 30 days before such changes. The Department may require a construction permit and/or permit modification as a result of the proposed changes at the facility.

2. **Non-compliance Reporting.**
   a. The permittee shall report any noncompliance which may endanger health or the environment. Relevant information shall be provided orally or via the current electronic method approved by the Department, within 24 hours from the time the permittee becomes aware of the circumstances, and shall be reported to the appropriate Regional Office during normal business hours or the Environmental Emergency Response hotline at 573-634-2436 outside of normal business hours. A written submission shall also be provided within five (5) business days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

b. The following shall be included as information which must be reported within 24 hours under this paragraph.
   i. Any unanticipated bypass which exceeds any effluent limitation in the permit.
   ii. Any upset which exceeds any effluent limitation in the permit.
   iii. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Department in the permit required to be reported within 24 hours.

c. The Department may waive the written report on a case-by-case basis for reports under paragraph 2. b. of this section if the oral report has been received within 24 hours.

3. **Anticipated Noncompliance.** The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The notice shall be submitted to the Department 60 days prior to such changes or activity.

4. **Compliance Schedules.** Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date. The report shall provide an explanation for the instance of noncompliance and a proposed schedule or anticipated date, for achieving compliance with the compliance schedule requirement.

5. **Other Noncompliance.** The permittee shall report all instances of noncompliance not reported under paragraphs 2, 3, and 6 of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph 2. a. of this section.

6. **Other Information.** Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

7. **Discharge Monitoring Reports.**
   a. Monitoring results shall be reported at the intervals specified in the permit.
   b. Monitoring results must be reported to the Department via the current method approved by the Department, unless the permittee has been granted a waiver from using the method. If the permittee has been granted a waiver, the permittee must use forms provided by the Department.
   c. Monitoring results shall be reported to the Department no later than the 28th day of the month following the end of the reporting period.

Section C – Bypass/Upset Requirements

1. **Definitions.**
   a. *Bypass*: the intentional diversion of waste streams from any portion of a treatment facility, except in the case of blending.
   b. *Severe Property Damage*: substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
   c. *Upset*: an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

2. **Bypass Requirements.**
   a. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2. b. and 2. c. of this section.
   b. Notice.
      i. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.
      ii. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Section B – Reporting Requirements, paragraph 5 (24-hour notice).
   c. Prohibition of bypass.
      i. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless:
         1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
         2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
         3. The permittee submitted notices as required under paragraph 2. b. of this section.
      ii. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three (3) conditions listed above in paragraph 2. c. i. of this section.

3. **Upset Requirements.**
   a. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph 3. b. of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
   b. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
      i. An upset occurred and that the permittee can identify the cause(s) of the upset;
      ii. The permitted facility was at the time being properly operated; and
      iii. The permittee submitted notice of the upset as required in Section B – Reporting Requirements, paragraph 2. b. ii. (24-hour notice).
      iv. The permittee complied with any remedial measures required under Section D – Administrative Requirements, paragraph 4.
   c. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

Section D – Administrative Requirements

1. **Duty to Comply.** The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Missouri Clean Water Law and Federal Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.
   a. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Federal Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.
   b. The Federal Clean Water Act provides that any person who violates section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under section 402, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed $25,000 per day for each violation. The Federal Clean Water Act provides that any person who negligently violates sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, or any requirement

imposed in a pretreatment program approved under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than one (1) year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than two (2) years, or both. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than three (3) years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than six (6) years, or both. Any person who knowingly violates section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the CWA, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.

c. Any person may be assessed an administrative penalty by the EPA Director for violating section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

d. It is unlawful for any person to cause or permit any discharge of water contaminants from any water contaminant or point source located in Missouri in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law, or any standard, rule or regulation promulgated by the commission. In the event the commission or the director determines that any provision of sections 644.006 to 644.141 of the Missouri Clean Water Law or standard, rules, limitations or regulations promulgated pursuant thereto, or permits issued by, or any final abatement order, other order, or determination made by the commission or the director, or any filing requirement pursuant to sections 644.006 to 644.141 of the Missouri Clean Water Law or any other provision which this state is required to enforce pursuant to any federal water pollution control act, is being, was, or is in imminent danger of being violated, the commission or director may cause to have instituted a civil action in any court of competent jurisdiction for the injunctive relief to prevent any such violation or further violation or for the assessment of a penalty not to exceed $10,000 per day for each day, or part thereof, the violation occurred and continues to occur, or both, as the court deems proper. Any person who willfully or negligently commits any violation in this paragraph shall, upon conviction, be punished by a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than one year, or both. Second and successive convictions for violation of the same provision of this paragraph by any person shall be punished by a fine of not more than $50,000 per day of violation, or by imprisonment for not more than two (2) years, or both.

2. **Duty to Reapply.**
   a. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.
   b. A permittee with a currently effective site-specific permit shall submit an application for renewal at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Department. (The Department shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)
   c. A permittees with currently effective general permit shall submit an application for renewal at least 30 days before the existing permit expires, unless the permittee has been notified by the Department that an earlier application must be made. The Department may grant permission for a later submission date. (The Department shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

3. **Need to Halt or Reduce Activity Not a Defense.** It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. **Duty to Mitigate.** The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

5. **Proper Operation and Maintenance.** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

6. **Permit Actions.**
   a. Subject to compliance with statutory requirements of the Law and Regulations and applicable Court Order, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:
      i. Violations of any terms or conditions of this permit or the law;
      ii. Having obtained this permit by misrepresentation or failure to disclose fully any relevant facts;
      iii. A change in any circumstances or conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
      iv. Any reason set forth in the Law or Regulations.
   b. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

7. **Permit Transfer.**
   a. Subject to 10 CSR 20-6.010, an operating permit may be transferred upon submission to the Department of an application to transfer signed by the existing owner and the new owner, unless prohibited by the terms of the permit. Until such time the permit is officially transferred, the original permittee remains responsible for complying with the terms and conditions of the existing permit.
   b. The Department may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Missouri Clean Water Law or the Federal Clean Water Act.
   c. The Department, within 30 days of receipt of the application, shall notify the new permittee of its intent to revoke or reissue or transfer the permit.

8. **Toxic Pollutants.** The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Federal Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the Federal Clean Water Act within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.

9. **Property Rights.** This permit does not convey any property rights of any sort, or any exclusive privilege.

10. **Duty to Provide Information.** The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.

11. **Inspection and Entry.** The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), upon presentation of credentials and other documents as may be required by law, to:
    a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;
    b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
    c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
    d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Federal Clean Water Act or Missouri Clean Water Law, any substances or parameters at any location.

12. **Closure of Treatment Facilities.**
    a. Persons who cease operation or plan to cease operation of waste, wastewater, and sludge handling and treatment facilities shall close the facilities in accordance with a closure plan approved by the Department.
    b. Operating Permits under 10 CSR 20-6.010 or under 10 CSR 20-6.015 are required until all waste, wastewater, and sludges have been disposed of in accordance with the closure plan approved by the Department and any disturbed areas have been properly stabilized. Disturbed areas will be considered stabilized when perennial vegetation, pavement, or structures using permanent materials cover all areas that have been disturbed. Vegetative cover, if used, shall be at least 70% plant density over 100% of the disturbed area.

13. **Signatory Requirement.**
    a. All permit applications, reports required by the permit, or information requested by the Department shall be signed and certified. (See 40 CFR 122.22 and 10 CSR 20-6.010)
    b. The Federal Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six (6) months per violation, or by both.
    c. The Missouri Clean Water Law provides that any person who knowingly makes any false statement, representation or certification in any application, record, report, plan, or other document filed or required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than ten thousand dollars, or by imprisonment for not more than six months, or by both.

14. **Severability.** The provisions of the permit are severable, and if any provision of the permit, or the application of any provision of the permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of the permit, shall not be affected thereby.

STANDARD CONDITIONS FOR NPDES PERMITS
ISSUED BY
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION
REVISED
MAY 1, 2013

PART II - SPECIAL CONDITIONS – PUBLICLY OWNED TREATMENT WORKS
SECTION A – INDUSTRIAL USERS

1. Definitions

Definitions as set forth in the Missouri Clean Water Laws and approved by the Missouri Clean Water Commission shall apply to terms used herein.

Significant Industrial User (SIU). Except as provided in the *General Pretreatment Regulation* 10 CSR 20-6.100, the term Significant Industrial User means:

1. All Industrial Users subject to Categorical Pretreatment Standards; and
2. Any other Industrial User that: discharges an average of 25,000 gallons per day or more of process wastewater to the Publicly-Owned Treatment Works (POTW) (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority on the basis that the Industrial User has a reasonable potential for adversely affecting the POTW's or for violating any Pretreatment Standard or requirement.

Clean Water Act (CWA) is the the federal Clean Water Act of 1972, 33 U.S.C. § 1251 et seq. (2002).

2. Identification of Industrial Discharges

Pursuant to 40 CFR 122.44(j)(1), all POTWs shall identify, in terms of character and volume of pollutants, any Significant Industrial Users discharging to the POTW subject to Pretreatment Standards under section 307(b) of the CWA and 40 CFR 403.

3. Application Information

Applications for renewal or modification of this permit must contain the information about industrial discharges to the POTW pursuant to 40 CFR 122.21(j)(6)

4. Notice to the Department

Pursuant to 40 CFR 122.42(b), all POTWs must provide adequate notice of the following:

1. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging these pollutants; and
2. Any substantial change into the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
3. For purposes of this paragraph, adequate notice shall include information on:
   i. the quality and quantity of effluent introduced into the POTW, and
   ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

For POTWs without an approved pretreatment program, the notice of industrial discharges which was not included in the permit application shall be made as soon as practicable. For POTWs with an approved pretreatment program, notice is to be included in the annual pretreatment report required in the special conditions of this permit. Notice may be sent to:

Missouri Department of Natural Resources
Water Protection Program
Attn: Pretreatment Coordinator
P.O. Box 176
Jefferson City, MO 65102

STANDARD CONDITIONS FOR NPDES PERMITS
ISSUED BY
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION
March 1, 2015

PART III – SLUDGE AND BIOSOLIDS FROM DOMESTIC AND INDUSTRIAL WASTEWATER TREATMENT FACILITIES

SECTION A – GENERAL REQUIREMENTS

1. This permit pertains to sludge requirements under the Missouri Clean Water Law and regulation for domestic wastewater and industrial process wastewater. This permit also incorporates applicable federal sludge disposal requirements under 40 CFR 503 for domestic wastewater. The Environmental Protection Agency (EPA) has principal authority for permitting and enforcement of the federal sludge regulations under 40 CFR 503 for domestic wastewater. EPA has reviewed and accepted these standard sludge conditions. EPA may choose to issue a separate sludge addendum to this permit or a separate federal sludge permit at their discretion to further address the federal requirements.
2. These PART III Standard Conditions apply only to sludge and biosolids generated at domestic wastewater treatment facilities, including public owned treatment works (POTW), privately owned facilities and sludge or biosolids generated at industrial facilities.
3. Sludge and Biosolids Use and Disposal Practices:
    a. The permittee is authorized to operate the sludge and biosolids treatment, storage, use, and disposal facilities listed in the facility description of this permit.
    b. The permittee shall not exceed the design sludge volume listed in the facility description and shall not use sludge disposal methods that are not listed in the facility description, without prior approval of the permitting authority.
    c. The permittee is authorized to operate the storage, treatment or generating sites listed in the Facility Description section of this permit.
4. Sludge Received from other Facilities:
    a. Permittees may accept domestic wastewater sludge from other facilities including septic tank pumpings from residential sources as long as the design sludge volume is not exceeded and the treatment facility performance is not impaired.
    b. The permittee shall obtain a signed statement from the sludge generator or hauler that certifies the type and source of the sludge
5. These permit requirements do not supersede nor remove liability for compliance with county and other local ordinances.
6. These permit requirements do not supersede nor remove liability for compliance with other environmental regulations such as odor emissions under the Missouri Air Pollution Control Law and regulations.
7. This permit may (after due process) be modified, or alternatively revoked and reissued, to comply with any applicable sludge disposal standard or limitation issued or approved under Section 405(d) of the Clean Water Actor under Chapter 644 RSMo.
8. In addition to STANDARD CONDITIONS, the Department may include sludge limitations in the special conditions portion or other sections of a site specific permit.
9. Alternate Limits in the Site Specific Permit.
   Where deemed appropriate, the Department may require an individual site specific permit in order to authorize alternate limitations:
    a. A site specific permit must be obtained for each operating location, including application sites.
    b. To request a site specific permit, an individual permit application, permit fee, and supporting documents shall be submitted for each operating location. This shall include a detailed sludge/biosolids management plan or engineering report.
10. Exceptions to these Standard Conditions may be authorized on a case-by-case basis by the Department, as follows:
    a. The Department will prepare a permit modification and follow permit notice provisions as applicable under 10 CSR 20-6.020, 40 CFR 124.10, and 40 CFR 501.15(a)(2)(ix)(E). This includes notification of the owner of the property located adjacent to each land application site, where appropriate.
    b. Exceptions cannot be granted where prohibited by the federal sludge regulations under 40 CFR 503.

SECTION B – DEFINITIONS

1. Best Management Practices include agronomic loading rates, soil conservation practices and other site restrictions.
2. Biosolids means organic fertilizer or soil amendment produced by the treatment of domestic wastewater sludge.
3. Biosolids land application facility is a facility where biosolids are spread onto the land at agronomic rates for production of food or fiber. The facility includes any structures necessary to store the biosolids until soil, weather, and crop conditions are favorable for land application.
4. Class A biosolids means a material that has met the Class A pathogen reduction requirements or equivalent treatment by a Process to Further Reduce Pathogens (PFRP) in accordance with 40 CFR 503.
5. Class B biosolids means a material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PFRP) in accordance with 40 CFR 503.
6. Domestic wastewater means wastewater originating from the sanitary conveniences of residences, commercial buildings, factories and institutions; or co-mingled sanitary and industrial wastewater processed by a (POTW) or a privately owned facility.
7. Industrial wastewater means any wastewater, also known as process water, not defined as domestic wastewater. Per 40 CFR Part 122, process water means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.
8. Mechanical treatment plants are wastewater treatment facilities that use mechanical devices to treat wastewater, including septic tanks, sand filters, extended aeration, activated sludge, contact stabilization, trickling filters, rotating biological discs, and other similar facilities. It does not include wastewater treatment lagoons and constructed wetlands for wastewater treatment.
9. Operating location as defined in 10 CSR 20-2.010 is all contiguous lands owned, operated or controlled by one (1) person or by two (2) or more persons jointly or as tenants in common.
10. Plant Available Nitrogen (PAN) is the nitrogen that will be available to plants during the growing seasons after biosolids application.
11. Public contact site is land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.
12. Sludge is the solid, semisolid, or liquid residue removed during the treatment of wastewater. Sludge includes septage removed from septic tanks or equivalent facilities. Sludge does not include carbon coal byproducts (CCBs)
13. Sludge lagoon is part of a mechanical wastewater treatment facility. A sludge lagoon is an earthen basin that receives sludge that has been removed from a wastewater treatment facility. It does not include a wastewater treatment lagoon or sludge treatment units that are not a part of a mechanical wastewater treatment facility.
14. Septage is the material pumped from residential septic tanks and similar treatment works (with a design population of less than 150 people). The standard for biosolids from septage is different from other sludges.

SECTION C – MECHANICAL WASTEWATER TREATMENT FACILITIES

1. Sludge shall be routinely removed from wastewater treatment facilities and handled according to the permit facility description and sludge conditions of this permit.
2. The permittee shall operate the facility so that there is no sludge discharged to waters of the state.
3. Mechanical treatment plants shall have separate sludge storage compartments in accordance with 10 CSR 20, Chapter 8. Failure to remove sludge from these storage compartments on the required design schedule is a violation of this permit.

SECTION D – SLUDGE DISPOSED AT OTHER TREATMENT FACILITY OR CONTRACT HAULER

1. This section applies to permittees that haul sludge to another treatment facility for disposal or use contract haulers to remove and dispose of sludge.
2. Permittees that use contract haulers are responsible for compliance with all the terms of this permit including final disposal, unless the hauler has a separate permit for sludge or biosolids disposal issued by the Department; or the hauler transports the sludge to another permitted treatment facility.
3. Haulers who land apply septage must obtain a state permit.
4. Testing of sludge, other than total solids content, is not required if sludge is hauled to a municipal wastewater treatment facility or other permitted wastewater treatment facility, unless it is required by the accepting facility.

SECTION E – INCINERATION OF SLUDGE

1. Sludge incineration facilities shall comply with the requirements of 40 CFR 503 Subpart E; air pollution control regulations under 10 CSR 10; and solid waste management regulations under 10 CSR 80.
2. Permittee may be authorized under the facility description of this permit to store incineration ash in lagoons or ash ponds. This permit does not authorize the disposal of incineration ash. Incineration ash shall be disposed in accordance with 10 CSR 80; or if the ash is determined to be hazardous with 10 CSR 25.
3. In addition to normal sludge monitoring, incineration facilities shall report the following as part of the annual report, quantity of sludge incinerated, quantity of ash generated, quantity of ash stored, and ash used or disposal method, quantity, and location. Permittee shall also provide the name of the disposal facility and the applicable permit number.

SECTION F – SURFACE DISPOSAL SITES AND SLUDGE LAGOONS

1. Surface disposal sites of domestic facilities shall comply with the requirements in 40 CFR 503 Subpart C; air pollution control regulations under 10 CSR 10; and solid waste management regulations under 10 CSR 80.
2. Sludge storage lagoons are temporary facilities and are not required to obtain a permit as a solid waste management facility under 10 CSR 80. In order to maintain sludge storage lagoons as storage facilities, accumulated sludge must be removed routinely, but not less than once every two years unless an alternate schedule is approved in the permit. The amount of sludge removed will be dependent on sludge generation and accumulation in the facility. Enough sludge must be removed to maintain adequate storage capacity in the facility.
    a. In order to avoid damage to the lagoon seal during cleaning, the permittee may leave a layer of sludge on the bottom of the lagoon, upon prior approval of the Department; or
    b. Permittee shall close the lagoon in accordance with Section H.

SECTION G – LAND APPLICATION

1. The permittee shall not land apply sludge or biosolids unless land application is authorized in the facility description or the special conditions of the issued NPDES permit.
2. Land application sites within a 20 miles radius of the wastewater treatment facility are authorized under this permit when biosolids are applied for beneficial use in accordance with these standard conditions unless otherwise specified in a site specific permit. If the permittee's land application site is greater than a 20 mile radius of the wastewater treatment facility, approval must be granted from the Department.
3. Land application shall not adversely affect a threatened or endangered species or its designated critical habitat.
4. Biosolids shall not be applied unless authorized in this permit or exempted under 10 CSR 20, Chapter 6.
    a. This permit does not authorize the land application of domestic sludge except for when sludge meets the definition of biosolids.
    b. This permit authorizes "Class A or B" biosolids derived from domestic wastewater and/or process water sludge to be land applied onto grass land, crop land, timber or other similar agricultural or silviculture lands at rates suitable for beneficial use as organic fertilizer and soil conditioner.
5. Public Contact Sites:

    Permittees who wish to apply Class A biosolids to public contact sites must obtain approval from the Department after two years of proper operation with acceptable testing documentation that shows the biosolids meet Class A criteria. A shorter length of testing will be allowed with prior approval from the Department. Authorization for land applications must be provided in the special conditions section of this permit or in a separate site specific permit.
    a. After Class B biosolids have been land applied, public access must be restricted for 12 months.
    b. Class B biosolids are only land applied to root crops, home gardens or vegetable crops whose edible parts will not be for human consumption.
6. Agricultural and Silvicultural Sites:

    Septage – Based on Water Quality guide 422 (WQ422) published by the University of Missouri
    a. Haulers that land apply septage must obtain a state permit
    b. Do not apply more than 30,000 gallons of septage per acre per year.
    c. Septage tanks are designed to retain sludge for one to three years which will allow for a larger reduction in pathogens and vectors, as compared to other mechanical type treatment facilities.
    d. To meet Class B sludge requirements, maintain septage at 12 pH for at least thirty (30) minutes before land application. 50 pounds of hydrated lime shall be added to each 1,000 gallons of septage in order to meet pathogen and vector stabilization for septage biosolids applied to crops, pastures or timberland.
    e. Lime is to be added to the pump truck and not directly to the septic tanks, as lime would harm the beneficial bacteria of the septic tank.

Biosolids - Based on Water Quality guide 423, 424, and 425 (WQ423, WQ424, WQ425) published by the University of Missouri;

a. Biosolids shall be monitored to determine the quality for regulated pollutants

b. The number of samples taken is directly related to the amount of sludge produced by the facility (See Section I of these Standard Conditions). Report as dry weight unless otherwise specified in the site specific permit. Samples should be taken only during land application periods. When necessary, it is permissible to mix biosolids with lower concentrations of biosolids as well as other suitable Department approved material to reach the maximum concentration of pollutants allowed.

c. Table 1 gives the maximum concentration allowable to protect water quality standards

TABLE 1

Biosolids ceiling concentration [1]	
Pollutant	Milligrams per kilogram dry weight
Arsenic	75
Cadmium	85
Copper	4,300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7,500

[1] Land application is not allowed if the sludge concentration exceeds the maximum limits for any of these pollutants

d. The low metal concentration biosolids has reduced requirements because of its higher quality and can safely be applied for 100 years or longer at typical agronomic loading rates. (See Table 2)

TABLE 2

Biosolids Low Metal Concentration [1]	
Pollutant	Milligrams per kilogram dry weight
Arsenic	41
Cadmium	39
Copper	1,500
Lead	300
Mercury	17
Nickel	420
Selenium	36
Zinc	2,800

[1] You may apply low metal biosolids without tracking cumulative metal limits, provided the cumulative application of biosolids does not exceed 500 dry tons per acre.

e. Each pollutant in Table 3 has an annual and a total cumulative loading limit, based on the allowable pounds per acre for various soil categories.

TABLE 3

Pollutant	CEC 15+		CEC 5 to 15		CEC 0 to 5	
	Annual	Total [1]	Annual	Total [1]	Annual	Total [1]
Arsenic	1.8	36.0	1.8	36.0	1.8	36.0
Cadmium	1.7	35.0	0.9	9.0	0.4	4.5
Copper	66.0	1,335.0	25.0	250.0	12.0	125.0
Lead	13.0	267.0	13.0	267.0	13.0	133.0
Mercury	0.7	15.0	0.7	15.0	0.7	15.0
Nickel	19.0	347.0	19.0	250.0	12.0	125.0
Selenium	4.5	89.0	4.5	44.0	1.6	16.0
Zinc	124.0	2,492.0	50.0	500.0	25.0	250.0

[1] Total cumulative loading limits for soils with equal or greater than 6.0 pH (salt based test) or 6.5 pH (water based test)

TABLE 4 - Guidelines for land application of other trace substances [1]

Cumulative Loading	
Pollutant	Pounds per acre
Aluminum	4,000[2]
Beryllium	100
Cobalt	50
Fluoride	800
Manganese	500
Silver	200
Tin	1,000
Dioxin	(10 ppt in soil)[3]
Other	[4]

[1] Design of land treatment systems for Industrial Waste, 1979. Michael Ray Overcash, North Carolina State University and Land Treatment of Municipal Wastewater, EPA 1981.)

[2] This applies for a soil with a pH between 6.0 and 7.0 (salt based test) or a pH between 6.5 to 7.5 (water based test). Case-by-case review is required for higher pH soils.

[3] Total Dioxin Toxicity Equivalents (TEQ) in soils, based on a risk assessment under 40 CFR 744, May 1998.

[4] Case by case review. Concentrations in sludge should not exceed the 95th percentile of the National Sewage Sludge Survey, EPA, January 2009.

Best Management Practices – Based on Water Quality guide 426 (WQ426) published by the University of Missouri

a. Use best management practices when applying biosolids.
b. Biosolids cannot discharge from the land application site
c. Biosolid application is subject to the Missouri Department of Agriculture State Milk Board concerning grazing restrictions of lactating dairy cattle.
d. Biosolid application must be in accordance with section 4 of the Endangered Species Act.
e. Do not apply more than the agronomic rate of nitrogen needed.
f. The applicator must document the Plant Available Nitrogen (PAN) loadings, available nitrogen in the soil, and crop removal when either of the following occurs: 1) When biosolids are greater than 50,000 mg/kg TN; or 2) When biosolids are land applied at an application rate greater than two dry tons per acre per year.
    i. PAN can be determined as follows and is in accordance with WQ426
    (Nitrate + nitrite nitrogen) + (organic nitrogen x 0.2) + (ammonia nitrogen x volatilization factor[1]).
    [1] Volatilization factor is 0.7 for surface application and 1 for subsurface application.
g. Buffer zones are as follows:
    i. 300 feet of a water supply well, sinkhole, lake, pond, water supply reservoir or water supply intake in a stream;
    ii. 300 feet of a losing stream, no discharge stream, stream stretches designated for whole body contact recreation, wild and scenic rivers, Ozark National Scenic Riverways or outstanding state resource waters as listed in the Water Quality Standards, 10 CSR 20-7.031;
    iii. 150 feet if dwellings;
    iv. 100 feet of wetlands or permanent flowing streams;
    v. 50 feet of a property line or other waters of the state, including intermittent flowing streams.
h. Slope limitation for application sites are as follows;
    i. A slope 0 to 6 percent has no rate limitation
    ii. Applied to a slope 7 to 12 percent, the applicator may apply biosolids when soil conservation practices are used to meet the minimum erosion levels
    iii. Slopes > 12 percent, apply biosolids only when grass is vegetated and maintained with at least 80 percent ground cover at a rate of two dry tons per acre per year or less.
i. No biosolids may be land applied in an area that it is reasonably certain that pollutants will be transported into waters of the state.
j. Do not apply biosolids to sites with soil that is snow covered, frozen or saturated with liquid without prior approval by the Department.
k. Biosolids / sludge applicators must keep detailed records up to five years.

SECTION H – CLOSURE REQUIREMENTS

1. This section applies to all wastewater facilities (mechanical, industrial, and lagoons) and sludge or biosolids storage and treatment facilities and incineration ash ponds. It does not apply to land application sites.
2. Permittees of a domestic wastewater facility who plan to cease operation must obtain Department approval of a closure plan which addresses proper removal and disposal of all residues, including sludge, biosolids. Mechanical plants, sludge lagoons, ash ponds and other storage structures must obtain approval of a closure plan from the Department. Permittee must maintain this permit until the facility is closed in accordance with the approved closure plan per 10 CSR 20 – 6. 010 and 10 CSR 20 – 6.015.
3. Residuals that are left in place during closure of a lagoon or earthen structure or ash pond shall not exceed the agricultural loading rates as follows:
    a. Residuals shall meet the monitoring and land application limits for agricultural rates as referenced in Section H of these standard conditions.
    b. If a wastewater treatment lagoon has been in operation for 15 years or more without sludge removal, the sludge in the lagoon qualifies as a Class B biosolids with respect to pathogens due to anaerobic digestion, and testing for fecal coliform is not required. For other lagoons, testing for fecal coliform is required to show compliance with Class B biosolids limitations. In order to reach Class B biosolids requirements, fecal coliform must be less than 2,000,000 colony forming units or 2,000,000 most probable number. All fecal samples must be presented as geometric mean per gram.
    c. The allowable nitrogen loading that may be left in the lagoon shall be based on the plant available nitrogen (PAN) loading. For a grass cover crop, the allowable PAN is 300 pounds/acre.
        i. PAN can be determined as follows:

        (Nitrate + nitrite nitrogen) + (organic nitrogen x 0.2) + (ammonia nitrogen x volatilization factor[1]).

        [1] Volatilization factor is 0.7 for surface application and 1 for subsurface application.
4. When closing a domestic wastewater treatment lagoon with a design treatment capacity equal or less than 150 persons, the residuals are considered "septage" under the similar treatment works definition. See Section B of these standard conditions. Under the septage category, residuals may be left in place as follows:
    a. Testing for metals or fecal coliform is not required
    b. If the wastewater treatment lagoon has been in use for less than 15 years, mix lime with the sludge at a rate of 50 pounds of hydrated lime per 1000 gallons (134 cubic feet) of sludge.
    c. The amount of sludge that may be left in the lagoon shall be based on the plant available nitrogen (PAN) loading. 100 dry tons/acre of sludge may be left in the basin without testing for nitrogen. If 100 dry tons/acre or more will be left in the lagoon, test for nitrogen and determine the PAN using the calculation above. Allowable PAN loading is 300 pounds/acre.
5. Residuals left within the domestic lagoon shall be mixed with soil on at least a 1 to 1 ratio, the lagoon berm shall be demolished, and the site shall be graded and contain ≥70% vegetative density over 100% of the site so as to avoid ponding of storm water and provide adequate surface water drainage without creating erosion.
6. Lagoons and/or earthen structure and/or ash pond closure activities shall obtain a storm water permit for land disturbance activities that equal or exceed one acre in accordance with 10 CSR 20-6.200
7. When closing a mechanical wastewater and/or industrial process wastewater plant; all sludge must be cleaned out and disposed of in accordance with the Department approved closure plan before the permit for the facility can be terminated.
    a. Land must be stabilized which includes any grading, alternate use or fate upon approval by the Department, remediation, or other work that exposes sediment to stormwater per 10 CSR 20-6.200. The site shall be graded and contain ≥70% vegetative density over 100% of the site, so as to avoid ponding of storm water and provide adequate surface water drainage without creating erosion.
    b. Per 10 CSR 20-6.015(4)(B)6, Hazardous Waste shall not be land applied or disposed during industrial and mechanical plant closures unless in accordance with Missouri Hazardous Waste Management Law and Regulations under 10 CSR 25.
    c. After demolition of the mechanical plant / industrial plant, the site must only contain clean fill defined in RSMo 260.200 (5) as uncontaminated soil, rock, sand, gravel, concrete, asphaltic concrete, cinderblocks, brick, minimal amounts of wood and metal, and inert solids as approved by rule or policy of the Department for fill or other beneficial use. Other solid wastes must be removed.
8. If sludge from the domestic lagoon or mechanical treatment plant exceeds agricultural rates under Section G and/or H, a landfill permit or solid waste disposal permit must be obtained if the permittee chooses to seek authorization for on-site sludge disposal under the Missouri Solid Waste Management Law and regulations per 10 CSR 80, and the permittee must comply with the surface disposal requirements under 40 CFR 503, Subpart C.

SECTION I – MONITORING FREQUENCY

1. At a minimum, sludge or biosolids shall be tested for volume and percent total solids on a frequency that will accurately represent sludge quantities produced and disposed. Please see the table below.

TABLE 5

Design Sludge Production (dry tons per year)	Monitoring Frequency (See Notes 1, 2, and 3)			
	Metals, Pathogens and Vectors	Nitrogen TKN [1]	Nitrogen PAN [2]	Priority Pollutants and TCLP [3]
0 to 100	1 per year	1 per year	1 per month	1 per year
101 to 200	biannual	biannual	1 per month	1 per year
201 to 1,000	quarterly	quarterly	1 per month	1 per year
1,001 to 10,000	1 per month	1 per month	1 per week	--[4]
10,001 +	1 per week	1 per week	1 per day	--[4]

[1] Test total Kjeldahl nitrogen, if biosolids application is 2 dry tons per acre per year or less.
[2] Calculate plant available nitrogen (PAN) when either of the following occurs: 1) when biosolids are greater than 50,000 mg/kg TN; or 2) when biosolids are land applied at an application rate greater than two dry tons per acre per year.
[3] Priority pollutants (40 CFR 122.21, Appendix D, Tables II and III) and toxicity characteristic leaching procedure (40 CFR 261.24) is required only for permit holders that must have a pre-treatment program.
[4] One sample for each 1,000 dry tons of sludge.

Note 1: Total solids: A grab sample of sludge shall be tested one per day during land application periods for percent total solids. This data shall be used to calculate the dry tons of sludge applied per acre.
Note 2: Total Phosphorus: Total phosphorus and total potassium shall be tested at the same monitoring frequency as metals.
Note 3: Table 5 is not applicable for incineration and permit holders that landfill their sludge.

2. If you own a wastewater treatment lagoon or sludge lagoon that is cleaned out once a year or less, you may choose to sample only when the sludge is removed or the lagoon is closed. Test one composite sample for each 100 dry tons of sludge or biosolids removed from the lagoon during the year within the lagoon at closing. Composite sample must represent various areas at one-foot depth.
3. Additional testing may be required in the special conditions or other sections of the permit. Permittees receiving industrial wastewater may be required to conduct additional testing upon request from the Department.
4. At this time, the Department recommends monitoring requirements shall be performed in accordance with, "POTW Sludge Sampling and Analysis Guidance Document," United States Environmental Protection Agency, August 1989, and the subsequent revisions.

SECTION J – RECORD KEEPING AND REPORTING REQUIREMENTS

1. The permittee shall maintain records on file at the facility for at least five years for the items listed in these standard conditions and any additional items in the Special Conditions section of this permit. This shall include dates when the sludge facility is checked for proper operation, records of maintenance and repairs and other relevant information.
2. Reporting period
   a. By January 28th of each year, an annual report shall be submitted for the previous calendar year period for all mechanical wastewater treatment facilities, sludge lagoons, and sludge or biosolids disposal facilities.
   b. Permittees with wastewater treatment lagoons shall submit the above annual report only when sludge or biosolids are removed from the lagoon during the report period or when the lagoon is closed.
3. Report Forms. The annual report shall be submitted on report forms provided by the Department or equivalent forms approved by the Department.
4. Reports shall be submitted as follows:

Major facilities (those serving 10,000 persons or 1 million gallons per day) shall report to both the Department and EPA. Other facilities need to report only to the Department. Reports shall be submitted to the addresses listed as follows:

DNR regional office listed in your permit
(see cover letter of permit)
ATTN: Sludge Coordinator

EPA Region VII
Water Compliance Branch (WACM)
Sludge Coordinator
11201 Renner Blvd.
Lenexa, KS 66219

5. Annual report contents. The annual report shall include the following:
    a. Sludge and biosolids testing performed. Include a copy or summary of all test results, even if not required by the permit.
    b. Sludge or biosolids quantity shall be reported as dry tons for quantity generated by the wastewater treatment facility, the quantity stored on site at the end of the year, and the quantity used or disposed.
    c. Gallons and % solids data used to calculate the dry ton amounts.
    d. Description of any unusual operating conditions.
    e. Final disposal method, dates, and location, and person responsible for hauling and disposal.
        i. This must include the name, address for the hauler and sludge facility. If hauled to a municipal wastewater treatment facility, sanitary landfill, or other approved treatment facility, give the name of that facility.
        ii. Include a description of the type of hauling equipment used and the capacity in tons, gallons, or cubic feet.
    f. Contract Hauler Activities:
    If contract hauler, provide a copy of a signed contract from the contractor. Permittee shall require the contractor to supply information required under this permit for which the contractor is responsible. The permittee shall submit a signed statement from the contractor that he has complied with the standards contained in this permit, unless the contract hauler has a separate sludge or biosolids use permit.
    g. Land Application Sites:
        i. Report the location of each application site, the annual and cumulative dry tons/acre for each site, and the landowners name and address. The location for each spreading site shall be given as a legal description for nearest ¼, ¼, Section, Township, Range, and county, or UTM coordinates. The facility shall report PAN when either of the following occurs: 1) When biosolids are greater than 50,000 mg/kg TN; or 2) when biosolids are land applied at an application rate greater than two dry tons per acre per year.
        ii. If the "Low Metals" criteria are exceeded, report the annual and cumulative pollutant loading rates in pounds per acre for each applicable pollutant, and report the percent of cumulative pollutant loading which has been reached at each site.
        iii. Report the method used for compliance with pathogen and vector attraction requirements.
        iv. Report soil test results for pH, CEC, and phosphorus. If none was tested during the year, report the last date when tested and results.

Festus-Crystal City
Sewage Commission
355 County Rd.
Crystal City; MO. 63019

Dept. of Natural Resources
Water Protection Program
Attn: NPDES Permit and Engineering Section
P.O. Box 176
Jefferson City, MO. 65102

5/6/16

To: NPDES Permit and Engineering Section personal

You will find our new permit application with supporting data, although you will find only one day sample of Expanded Effluent Analysis Data for the month of March 2016. That was the first time we have ever had this analysis done at our facility that I am aware of. We will be collecting two more samples, one at the end of May and the other at the end July for more Expanded Effluent Data to be submitted and added to this new NPDES permit application found on Part D, Section 16. Pages 9 through 12.

When each of these samples will analyzed, I will be submitting an updated Expanded Effluent Testing Data section. If you have any questions, please contact me at 636-937-7444, or at fccsc@sbcglobal.net

Thank you,

David W. Smith

David W. Smith F-CCSC WWTP Supt.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH

MAY 10 2016

WATER PROTECTION PROGRAM

FORM B2 – APPLICATION FOR OPERATING PERMIT FOR FACILITIES THAT RECEIVE PRIMARILY DOMESTIC WASTE AND HAVE A DESIGN FLOW MORE THAN 100,000 GALLONS PER DAY

FACILITY NAME: FESTUS - CRYSTAL CITY STP

PERMIT NO.: MO-0080632

COUNTY: JEFFERSON

APPLICATION OVERVIEW

Form B2 has been developed in a modular format and consists of Parts A, B and C and a Supplemental Application Information (Parts D, E, F and G) packet. All applicants must complete Parts A, B and C. Some applicants must also complete parts of the Supplemental Application Information packet. The following items explain which parts of Form B2 you must complete. Submittal of an incomplete application may result in the application being returned.

BASIC APPLICATION INFORMATION

A. Basic Application Information for all Applicants. All applicants must complete Part A.

B. Additional Application Information for all Applicants. All applicants must complete Part B.

C. Certification. All applicants must complete Part C.

SUPPLEMENTAL APPLICATION INFORMATION

D. Expanded Effluent Testing Data. A treatment works that discharges effluent to surface water of the United States and meets one or more of the following criteria must complete *Part D - Expanded Effluent Testing Data*:

1. Has a design flow rate greater than or equal to 1 million gallons per day.
2. Is required to have or currently has a pretreatment program.
3. Is otherwise required by the permitting authority to provide the information.

E. Toxicity Testing Data. A treatment works that meets one or more of the following criteria must complete *Part E - Toxicity Testing Data*:

1. Has a design flow rate greater than or equal to 1 million gallons per day.
2. Is required to have or currently has a pretreatment program.
3. Is otherwise required by the permitting authority to provide the information.

F. Industrial User Discharges and Resource Conservation and Recovery Act / Comprehensive Environmental Response, Compensation and Liability Act Wastes. A treatment works that accepts process wastewater from any significant industrial users, also known as SIUs, or receives a Resource Conservation and Recovery Act or CERCLA wastes must complete *Part F - Industrial User Discharges and Resource Conservation and Recovery Act /CERCLA Wastes.*

SIUs are defined as:

1. All Categorical Industrial Users, or CIUs, subject to Categorical Pretreatment Standards under 40 Code of Federal Regulations 403.6 and 40 Code of Federal Regulations 403.6 and 40 CFR Chapter 1, Subchapter N.
2. Any other industrial user that meets one or more of the following:
   - i. Discharges an average of 25,000 gallons per day or more of process wastewater to the treatment works (with certain exclusions).
   - ii. Contributes a process waste stream that makes up five percent or more of the average dry weather hydraulic or organic capacity of the treatment plant.
   - iii. Is designated as an SIU by the control authority.
   - iv. Is otherwise required by the permitting authority to provide the information.

G. Combined Sewer Systems. A treatment works that has a combined sewer system must complete *Part G - Combined Sewer Systems.*

ALL APPLICANTS MUST COMPLETE PARTS A, B and C

RECEIVED

MAY 10 2016

WATER PROTECTION PROGRAM

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH

FORM B2 – APPLICATION FOR AN OPERATING PERMIT FOR FACILITIES THAT RECEIVE PRIMARILY DOMESTIC WASTE AND HAVE A DESIGN FLOW MORE THAN 100,000 GALLONS PER DAY

FOR AGENCY USE ONLY	
CHECK NUMBER	
DATE RECEIVED	FEE SUBMITTED
5/10/16	0807

PART A – BASIC APPLICATION INFORMATION

1. THIS APPLICATION IS FOR:

- ☐ An operating permit for a new or unpermitted facility. Construction Permit # _____
  (Include completed Antidegradation Review or request to conduct an Antidegradation Review, see instructions)
- ☑ An operating permit renewal: Permit #MO- 0080632 Expiration Date 9/30/16
- ☐ An operating permit modification: Permit #MO-_____ Reason: _____

1.1 Is the appropriate fee included with the application (see instructions for appropriate fee)? ☑ YES ☐ NO

2. FACILITY

NAME	TELEPHONE NUMBER WITH AREA CODE
FESTUS - CRYSTAL CITY STP	636-937-7444

ADDRESS (PHYSICAL)	CITY	STATE	ZIP CODE
355 COUNTY RD	CRYSTAL CITY	MO	63019

2.1 LEGAL DESCRIPTION (Facility Site): SE ¼, SE ¼, NW ¼, Sec. 8, T 40N, R 6E COUNTY: JEFFERSON

2.2 UTM Coordinates Easting (X): +3812346 Northing (Y): -09022574
For Universal Transverse Mercator (UTM), Zone 15 North referenced to North American Datum 1983 (NAD83)

2.3 Name of receiving stream: UNNAMED TRIBUTARY to PLATTIN CREEK

2.4 Number of Outfalls: 1 wastewater outfalls, stormwater outfalls, instream monitoring sites

3. OWNER

NAME	EMAIL ADDRESS	TELEPHONE NUMBER WITH AREA CODE
FESTUS-CRYSTAL CITY SEWAGE COMMISSION	fccsc@sbcglobal.net	636-937-7444

ADDRESS	CITY	STATE	ZIP CODE
355 COUNTY RD	CRYSTAL CITY	MO	63019

- **3.1** Request review of draft permit prior to Public Notice? ☑ YES ☐ NO
- **3.2** Are you a Publically Owned Treatment Works (POTW)? ☐ YES ☐ NO
  If yes, is the Financial Questionnaire attached? ☐ YES ☐ NO
- **3.3** Are you a Privately Owned Treatment Facility? ☐ YES ☑ NO
- **3.4** Are you a Privately Owned Treatment Facility regulated by the Public Service Commission (PSC)? ☑ YES ☐ NO

4. CONTINUING AUTHORITY: Permanent organization which will serve as the continuing authority for the operation, maintenance and modernization of the facility.

NAME	EMAIL ADDRESS	TELEPHONE NUMBER WITH AREA CODE
FESTUS - CRYSTAL CITY SEWAGE COMMISSION	fccsc@sbcglobal.net	636-937-7444

ADDRESS	CITY	STATE	ZIP CODE
355 COUNTY RD	CRYSTAL CITY	MO.	63019

If the Continuing Authority is different than the Owner, include a copy of the contract agreement between the two parties and a description of the responsibilities of both parties within the agreement.

5. OPERATOR

NAME	TITLE	CERTIFICATE NUMBER (IF APPLICABLE)
David Smith	WASTEWATER SUPT.	A-8208

EMAIL ADDRESS	TELEPHONE NUMBER WITH AREA CODE
fccsc@sbcglobal.net	636-937-7444

6. FACILITY CONTACT

NAME	TITLE
David Smith	WASTEWATER SUPT.

EMAIL ADDRESS	TELEPHONE NUMBER WITH AREA CODE
fccsc@sbcglobal.net	636-937-7444

ADDRESS	CITY	STATE	ZIP CODE
355 COUNTY RD	CRYSTAL CITY	MO	63019

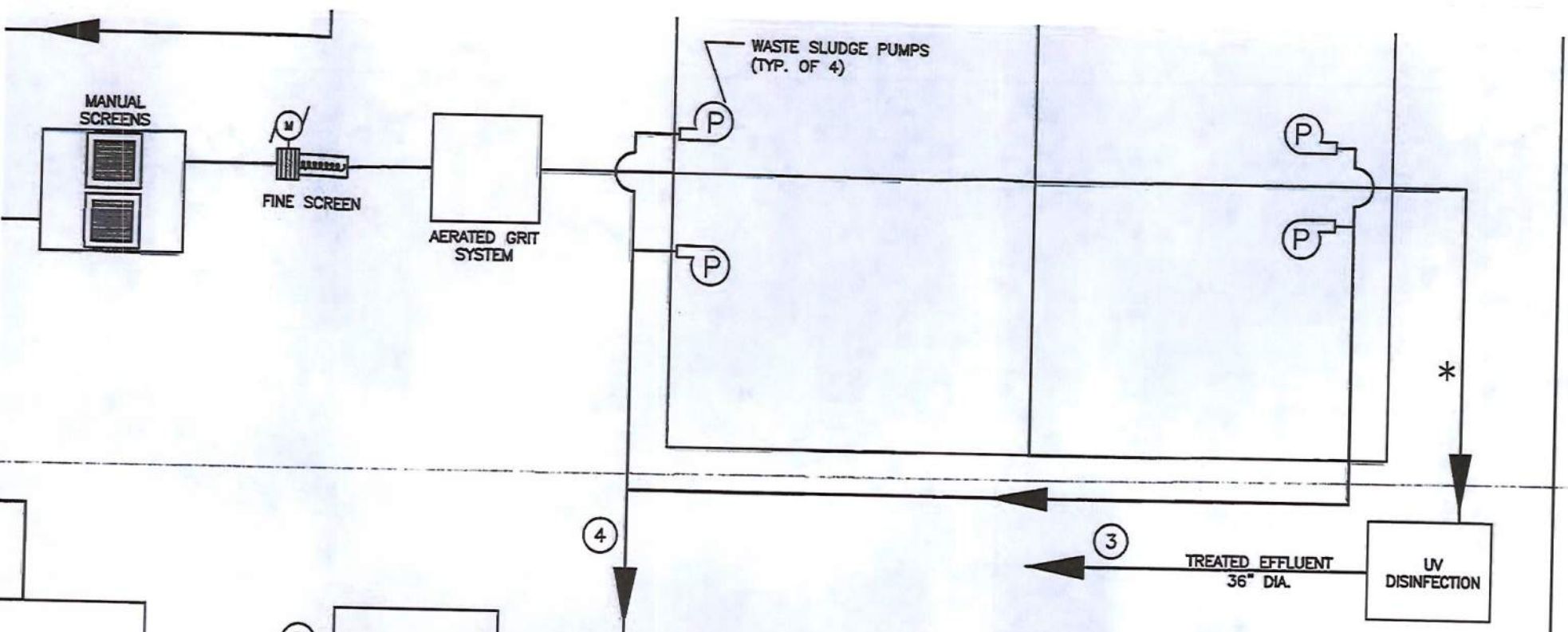
FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS - CRYSTAL CITY SDP	MO- 0080632	001

PART A – BASIC APPLICATION INFORMATION

7. FACILITY INFORMATION

7.1 Process Flow Diagram or Schematic. Provide a diagram showing the processes of the treatment plant. Show all of the treatment units, including disinfection (e.g. – Chlorination and Dechlorination), influents, and outfalls. Specify where samples are taken. Indicate any treatment process changes in the routing of wastewater during dry weather and peak wet weather. Include a brief narrative description of the diagram.
Attach sheets as necessary.

SEE ATTACHMENTS



Festus / Crystal City, Missouri
Process Diagram

	1	2	3	4	5	6	7	8	9
	Influent	Influent & Recycle	Average Effluent	WAS to Digester	Digested to Thickener	Thickened to Sludge Holding	Sludge Holding to BFP's	Dewatered to Land App.	Return Flow
Flow (mgd)	3.00	3.05	3.00	0.048	0.024	0.006	0.006	0.0014	0.048
BOD5 (mg/l)	150	150	15	-	-	-	-	-	300
TSS (mg/l)	240	250	15	8,500	12,500	-	-	-	600
BOD5 (lb/d)	3,800	3,900	400	-	-	-	-	-	100
TSS (lb/d)	6000	6,328	400	8,500	12,500	-	-	-	228
Total Solids (lb/d)	7,900	8,300	-	3,378	2,528	2,401	2,401	2,300	-
F/M	0.05								
Solids %	-	-	-	0.85%	1.25%	5.00%	5.00%	20.00%	-
Wet Tons	-	-	-	-		-	24	6	-
Operating Schedule									
Hours/day	-	-	-	3.4	3.4	1.4	1.4	1.4	-
Days/week	-	-	-	5	5	5	5	5	-
Pumping Rate (gpm)	-	-	-	330	330	101	101	23	-
Operating Rate (lb/hr)	-	-	-	-		2,400	2,400	-	-
Operating Rate (ton/hr)	-	-	-	-		-	-	-	-
Total Neat Polymer Addition (lb/ton D.S.) -	-	-	-	-		8	8	-	-
Total Polymer Addition (gal/hr) -1	-	-	-	-		2.2	2.2	-	-
Dilution Water Required (gpm) -2	-	-	-	-		7.4	7.4	-	-
Lime Addition (lbs)	-	-	-	-		-	-	-	-
Calculated Belt Width (m)	-	-	-	-		2	2	-	-
Belt Width Selected (m)	-	-	-	-		2	2	-	-
Wastewater Load (gpm)	-	-	-	-		90	180	-	-
Wastewater Total (gpd)						7,565	15,129		
Filtrate (gpm)	-	-	-			319	255		
Filtrate (gpd)						27,000	22,000		

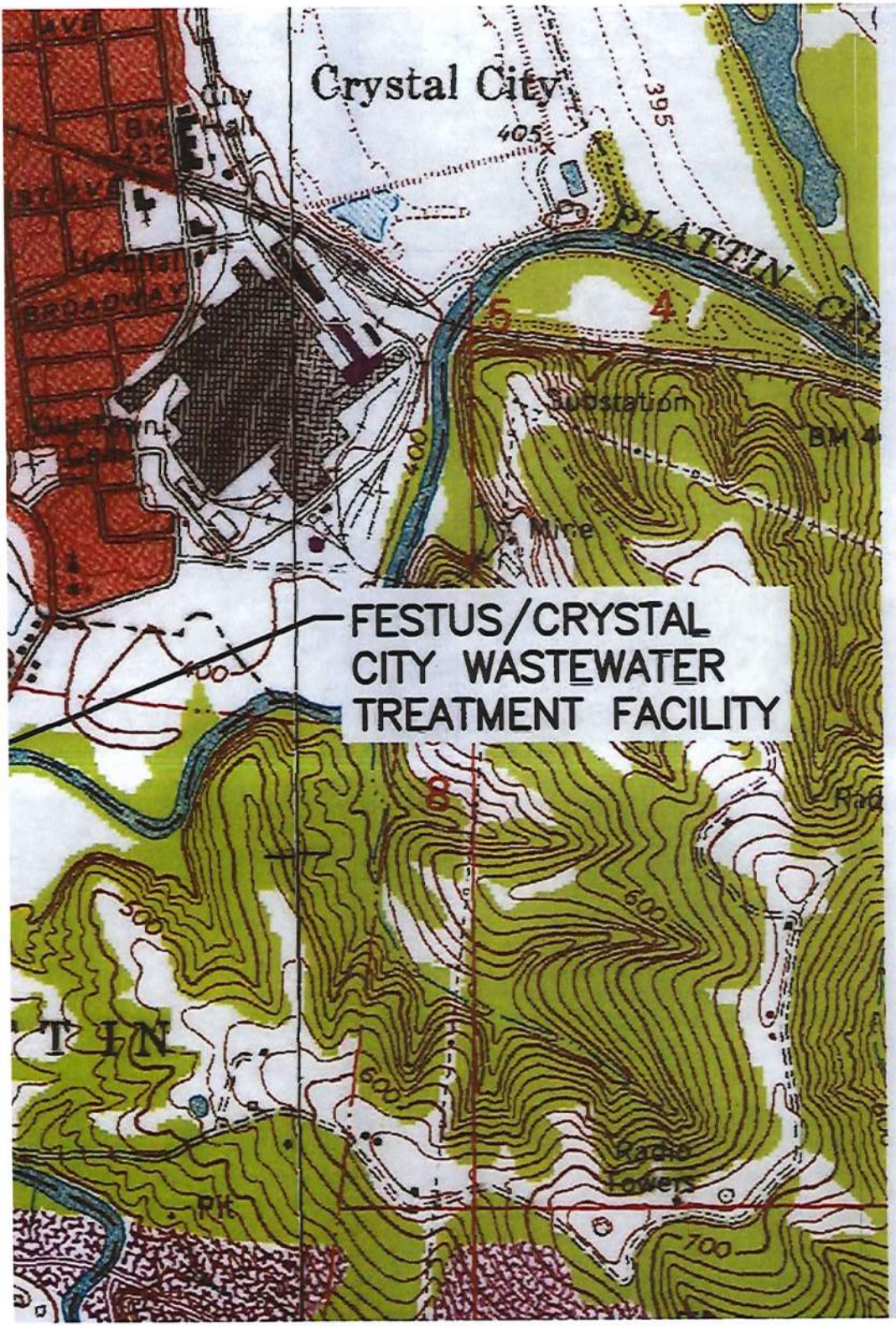
* THE UV SYSTEM IS DESIGNED TO DISINFECT WASTEWATER FROM THE SBR'S AT A DECANT RATE OF 7.35 mgd AVERAGE

1. Assumes active "pure" polymer at 50%.
2. Assumes solution concentration of 0.5%.
3. The return/recycle flow is based on a 5 day per week schedule. Therefore, for 2 days per week, there will be no recycle flow.
4. GBT mode is operated at 165 gpm/m (equals 330 gpm for 2 meter machine).
5. BFP mode is operated at 1,200 lb/hr/m (equals 2,400 lb/hr for 2 meter machine).
6. Assumes 60% volatile solids concentration and 30% V.S. destruction through aerobic digestion.

HORNER &

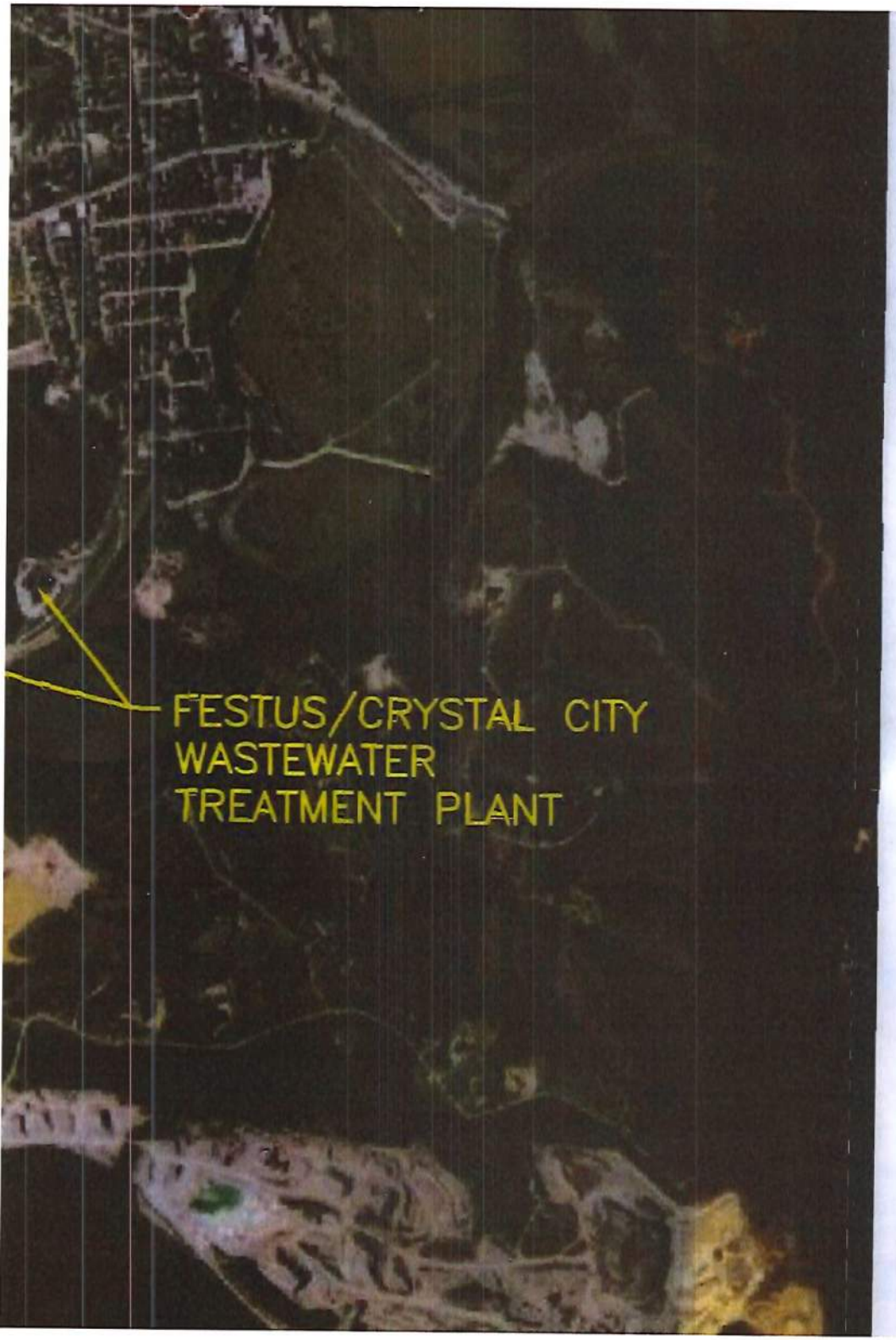
FESTUS / CRYSTAL CITY
WASTEWATER TREATMENT FACILITY

TOPOGRAPHIC MAP FOR CONSTRUCTION PERMIT APPLICATION FORM B2 PART A, ITEM 7.2a.

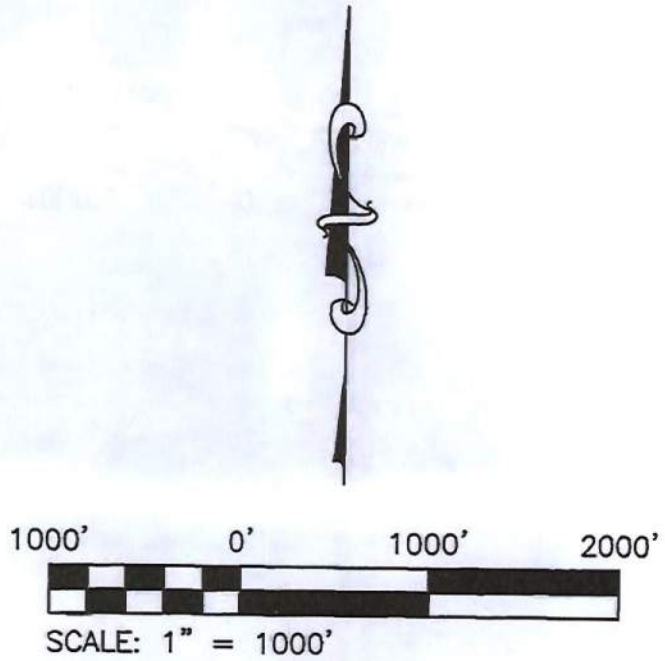


1000' 0' 1000' 2000'

SCALE: 1" = 1000'

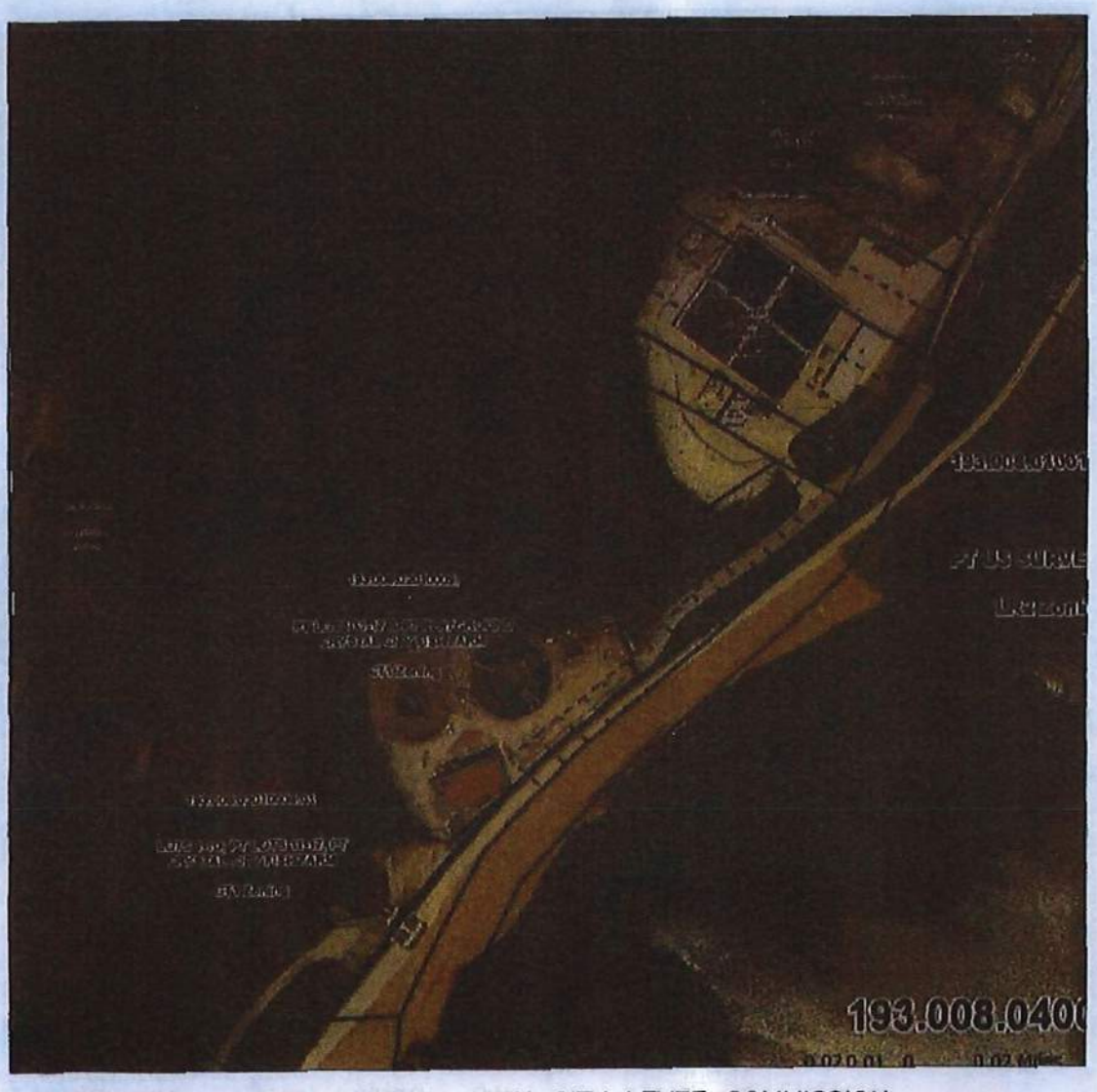


AERIAL MAP FOR CONSTRUCTION PERMIT APPLICATION FORM B2 PART A, ITEM 7.2a.



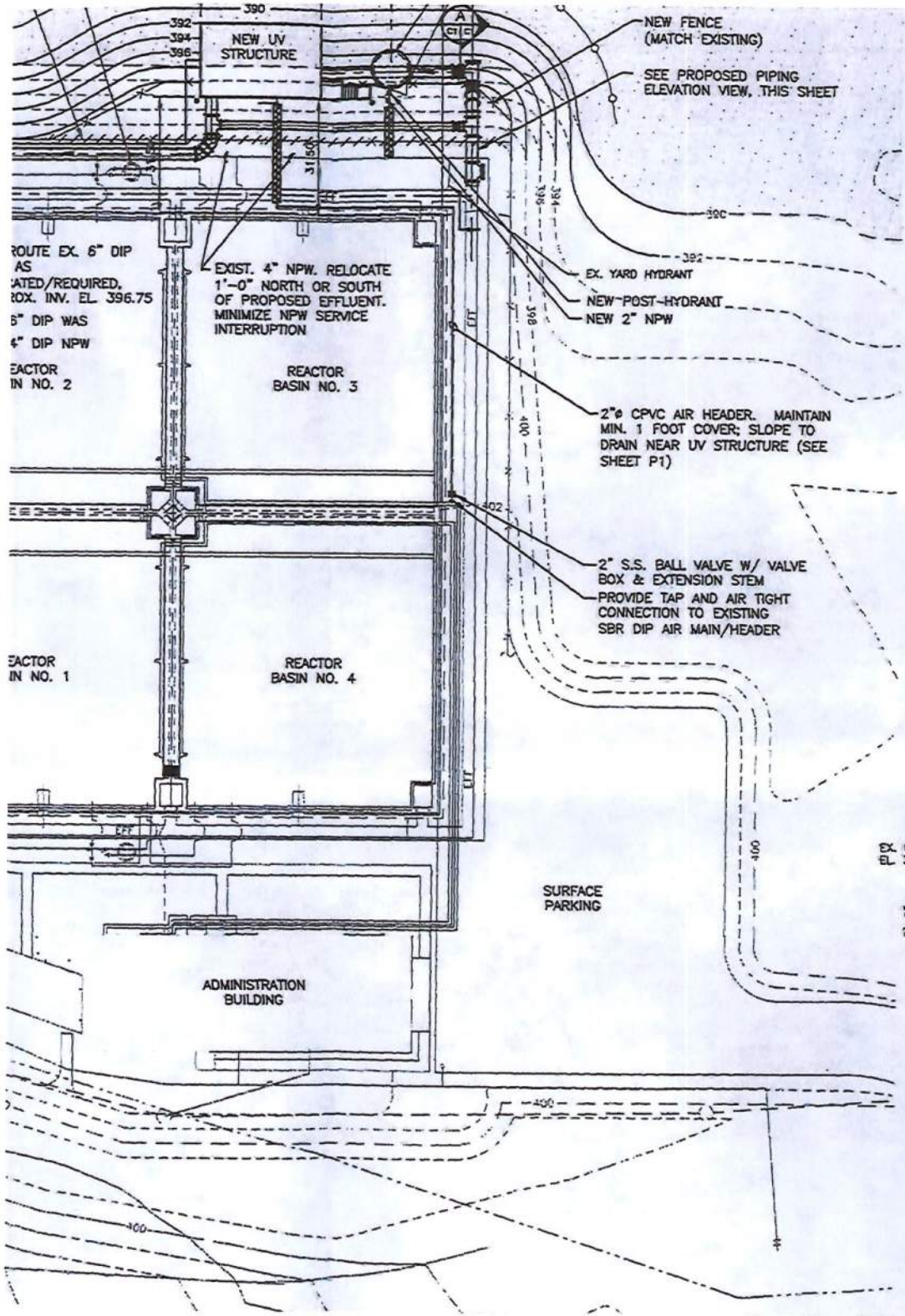
FESTUS/CRYSTAL CITY
WASTEWATER TREATMENT FACILITY

PARCEL MAP
APPLICATION FOR
PERMIT MODIFICATION
FORM B.2
PART A, ITEM 7.2b.



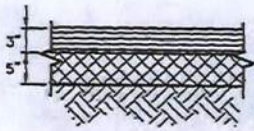
DOWNSTREAM PARCEL OWNER: TWIN CITY LEVEE COMMISSION

HORNER & SHIFRIN, INC.
ENGINEERS



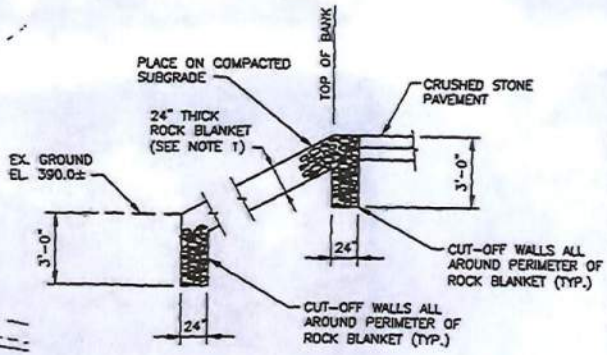
WILL BE PROVIDED TO CONTRACTOR UPON REQUEST, IF AVAILABLE.

NOTE:
1. THE CONTRACTOR SHALL HAVE THE OPTION TO UTILIZE HDPE PIPING, AS SPECIFIED, IN LIEU OF DUCTILE IRON PIPING, FOR SOME OR ALL OF THE NEW DUCTILE IRON PIPING SHOWN.



CRUSHED STONE PAVEMENT DETAIL

N.T.S.



TYPICAL ROCK BLANKET DETAIL

NTS

NOTE:
1. HEAVY LIMESTONE REVETMENT ROCK SHALL BE AT LEAST 12" INCHES IN SIZE AND ALL STONES SHALL WEIGH NOT LESS THAN 50 POUNDS, AND AT LEAST 60 PERCENT SHALL NOT WEIGH LESS THAN 100 POUNDS.

LEGEND

WETLAND AREA

NO.	DATE
1	1/25/
0	11/05/

11/05/07

HORNER & SHIFRIN, INC. ENGINEERS

FESTUS/CHRYSTAL CITY SEWAGE TREATMENT COMMISSION
WWTF UV DISINFECTION SYSTEM ADDITION

SITE GRADING AND YARD PIPING PLAN
FORM B2, PART A, 7.2c., d., e. AND f.

DATE: 11/05/07

DESIGNED: JTL

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS - CRYSTAL CITY STP	MO- 0080632	001

PART A – BASIC APPLICATION INFORMATION

7. FACILITY INFORMATION (continued)

7.2 Topographic Map. Attach to this application a topographic map of the area extending at least one mile beyond facility property boundaries. This map must show the outline of the facility and the following information.

a. The area surrounding the treatment plant, including all unit processes.
b. The location of the downstream landowner(s). (See Item 10.)
c. The major pipes or other structures through which wastewater enters the treatment works and the pipes or other structures through which treated wastewater is discharged from the treatment plant. Include outfalls from bypass piping, if applicable.
d. The actual point of discharge.
e. Wells, springs, other surface water bodies and drinking water wells that are: 1) within ¼ mile of the property boundaries of the treatment works, and 2) listed in public record or otherwise known to the applicant.
f. Any areas where the sewage sludge produced by the treatment works is stored, treated, or disposed.
g. If the treatment works receives waste that is classified as hazardous under the Resource Conservation and Recovery Act (RCRA) by truck, rail, or special pipe, show on the map where that hazardous waste enters the treatment works and where it is treated, stored, or disposed.

7.3 Facility SIC Code: 4952 | Discharge SIC Code: ____

7.4 Number of people presently connected or population equivalent (P.E.): 16,475 Design P.E. 20,000

7.5 Connections to the facility:

Number of units presently connected:

	Festus	C.C.
Homes	4850	1719
Trailers	80	N/A
Apartments	643	N/A
Other (including industrial)		
Number of Commercial Establishments:	417	230

7.6 Design Flow 3.0 MGD | Actual Flow 1.56 MGD

7.7 Will discharge be continuous through the year? Yes ☑ No ☐
Discharge will occur during the following months: 12 How many days of the week will discharge occur? 7

7.8 Is industrial wastewater discharged to the facility? Yes ☐ No ☑
If yes, describe the number and types of industries that discharge to your facility. Attach sheets as necessary

Refer to the APPLICATION OVERVIEW to determine whether additional information is needed for Part F.

7.9 Does the facility accept or process leachate from landfills?: Yes ☐ No ☑

7.10 Is wastewater land applied? Yes ☐ No ☑
If yes, is Form I attached? Yes ☐ No ☑

7.11 Does the facility discharge to a losing stream or sinkhole? Yes ☐ No ☑

7.12 Has a wasteload allocation study been completed for this facility? Yes ☐ No ☐

8. LABORATORY CONTROL INFORMATION

LABORATORY WORK CONDUCTED BY PLANT PERSONNEL

Lab work conducted outside of plant.	Yes ☑ &	No ☑
Push–button or visual methods for simple test such as pH, settleable solids.	Yes ☑	No ☐
Additional procedures such as Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand, titrations, solids, volatile content.	Yes ☑	No ☐
More advanced determinations such as BOD seeding procedures, fecal coliform, nutrients, total oils, phenols, etc.	Yes ☑	No ☐
Highly sophisticated instrumentation, such as atomic absorption and gas chromatograph.	Yes ☐	No ☑

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO- 0080632	001

PART A – BASIC APPLICATION INFORMATION

9. SLUDGE HANDLING, USE AND DISPOSAL

9.1 Is the sludge a hazardous waste as defined by 10 CSR 25? Yes ☐ No ☑

9.2 Sludge production (Including sludge received from others): Design Dry Tons/Year 500 Actual Dry Tons/Year < 200

9.3 Sludge storage provided: 123,240 Cubic feet; 1.3 Days of storage; 1.5 Average percent solids of sludge;

☐ No sludge storage is provided. ☐ Sludge is stored in lagoon.

9.4 Type of storage:

☐ Holding Tank ☐ Building
☑ Basin ☐ Lagoon
☐ Concrete Pad ☐ Other (Describe) ____

9.5 Sludge Treatment:

☐ Anaerobic Digester ☐ Storage Tank ☐ Lime Stabilization ☐ Lagoon
☑ Aerobic Digester ☐ Air or Heat Drying ☐ Composting ☐ Other (Attach Description)

9.6 Sludge use or disposal:

☑ Land Application ☐ Contract Hauler ☐ Hauled to Another Treatment Facility ☐ Solid Waste Landfill
☐ Surface Disposal (Sludge Disposal Lagoon, Sludge Held For More Than Two Years) ☐ Incineration
☐ Other (Attach Explanation Sheet) ____

9.7 Person responsible for hauling sludge to disposal facility:
☑ By Applicant ☐ By Others (complete below)

NAME	EMAIL ADDRESS
FESTUS-CRYSTAL CITY STP	fccsc@sbcglobal.net

ADDRESS	CITY	STATE	ZIP CODE
355 County RD	CRYSTAL CITY	MO	63019

CONTACT PERSON	TELEPHONE NUMBER WITH AREA CODE	PERMIT NO.
David Smith	636-937-7444	MO- 0080632

9.8 Sludge use or disposal facility:
☑ By Applicant ☐ By Others (Complete below)

NAME	EMAIL ADDRESS

ADDRESS	CITY	STATE	ZIP CODE

CONTACT PERSON	TELEPHONE NUMBER WITH AREA CODE	PERMIT NO.
		MO-

9.9 Does the sludge or biosolids disposal comply with Federal Sludge Regulation 40 CFR 503?
☑ Yes ☐ No (Explain)

END OF PART A

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS - CRYSTAL CITY STP	MO- 0080632	001

PART B - ADDITIONAL APPLICATION INFORMATION

10. COLLECTION SYSTEM

10.1 Length of sanitary sewer collection system in miles

—

10.2 Does significant infiltration occur in the collection system? ☑ Yes ☐ No

If yes, briefly explain any steps underway or planned to minimize inflow and infiltration:

Both CITIES OF FESTUS and CRYSTAL CITY ARE IN A WORKING EFFORT TO reduce the I & I PROBLEMS. I SUBMITT AN Bi-ANNUAL REPORT TO DNR ON the PROGRESS.

11. BYPASSING

Does any bypassing occur anywhere in the collection system or at the treatment facility? Yes ☑ No ☐

If yes, explain: EACH CITY IS Responsible for the OWN COLLECTION SYSTEM MAINTENANCE & BYPASS REPORTING.

12. OPERATION AND MAINTENANCE PERFORMED BY CONTRACTOR(S)

Are any operational or maintenance aspects (related to wastewater treatment and effluent quality) of the treatment works the responsibility of the contractor?

Yes ☑ No ☐

If Yes, list the name, address, telephone number and status of each contractor and describe the contractor's responsibilities. (Attach additional pages if necessary.)

NAME	
FABIC POWER SYSTEMS	
MAILING ADDRESS	
101 FABIC DR. FENTON, MO. 63025	
TELEPHONE NUMBER WITH AREA CODE	EMAIL ADDRESS
636-349-5500	

RESPONSIBILITIES OF CONTRACTOR

MAINTAIN BACK UP POWER GENERATOR FOR WWTP.

13. SCHEDULED IMPROVEMENTS AND SCHEDULES OF IMPLEMENTATION

Provide information about any uncompleted implementation schedule or uncompleted plans for improvements that will affect the wastewater treatment, effluent quality, or design capacity of the treatment works. If the treatment works has several different implementation schedules or is planning several improvements, submit separate responses for each.

NONE AT THIS MOMENT

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO- 0080632	001

PART B – ADDITIONAL APPLICATION INFORMATION

14. EFFLUENT TESTING DATA

Applicants must provide effluent testing data for the following parameters. Provide the indicated effluent data **for each outfall through which effluent is discharged.** Do not include information of combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least **three samples** and must be no more than four and one-half years apart.

Outfall Number

PARAMETER	MAXIMUM DAILY VALUE		AVERAGE DAILY VALUE		
	Value	Units	Value	Units	Number of Samples
pH (Minimum)	6.83	S.U.	7.09	S.U.	522
pH (Maximum)	7.46	S.U.	7.27	S.U.	522
Flow Rate	11.62	MGD	2.12	MGD	1862

*For pH report a minimum and a maximum daily value

POLLUTANT		MAXIMUM DAILY DISCHARGE		AVERAGE DAILY DISCHARGE			ANALYTICAL METHOD	ML/MDL
		Conc.	Units	Conc.	Units	Number of Samples		
Conventional and Nonconventional Compounds								
BIOCHEMICAL OXYGEN DEMAND (Report One)	BOD_5	N/A	mg/L	N/A	mg/L	N/A	N/A	N/A
	$CBOD_5$	10.65	mg/L	2.19	mg/L	522	SM 5210 B	0.32
E. COLI		2420	#/100 mL	402	#/100 mL	43	SM 9223 B	0
TOTAL SUSPENDED SOLIDS (TSS)		28	mg/L	11	mg/L	522	SM 2540 D	0
AMMONIA (as N)		14.50	mg/L	0.90	mg/L	522	350.3	0.02
CHLORINE* (TOTAL RESIDUAL, TRC)		N/A	mg/L	N/A	mg/L	N/A	N/A	N/A
DISSOLVED OXYGEN		N/A	mg/L	N/A	mg/L	N/A	N/A	N/A
OIL and GREASE		0	mg/L	0	mg/L	60	16664	0
OTHER		N/A	mg/L	N/A	mg/L	N/A	N/A	N/A

*Report only if facility chlorinates

END OF PART B

Started E. Coli in June 2015

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS - CRYSTAL CITY STP	MO- 0080632	001

PART C – CERTIFICATION

15. CERTIFICATION

All applicants must complete the Certification Section. This certification must be signed by an officer of the company or city official. All applicants must complete all applicable sections as explained in the Application Overview. By signing this certification statement, applicants confirm that they have reviewed the entire form and have completed all sections that apply to the facility for which this application is submitted.

ALL APPLICANTS MUST COMPLETE THE FOLLOWING CERTIFICATION.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

PRINTED NAME	OFFICIAL TITLE (MUST BE AN OFFICER OF THE COMPANY OR CITY OFFICIAL)
David W. Smith	WASTEWATER SUPT.

SIGNATURE: David W. Smith

TELEPHONE NUMBER WITH AREA CODE: 636-937-7444

DATE SIGNED: 5/6/16

Upon request of the permitting authority, you must submit any other information necessary to assess wastewater treatment practices at the treatment works or identify appropriate permitting requirements.

Send Completed Form to:

Department of Natural Resources
Water Protection Program
ATTN: NPDES Permits and Engineering Section
P.O. Box 176
Jefferson City, MO 65102

END OF PART C
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH PARTS OF FORM B2 YOU MUST COMPLETE.

Do not complete the remainder of this application, unless at least one of the following statements applies to your facility:

1. Your facility design flow is equal to or greater than 1,000,000 gallons per day.
2. Your facility is a pretreatment treatment works.
3. Your facility is a combined sewer system.

Submittal of an incomplete application may result in the application being returned. Permit fees for returned applications shall be forfeited. Permit fees for applications being processed by the department that are withdrawn by the applicant shall be forfeited.

MAKE ADDITIONAL COPIES OF THIS FORM FOR EACH OUTFALL

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS - CRYSTAL CITY STP	MO- 0080632	001

PART D – EXPANDED EFFLUENT TESTING DATA

16. EXPANDED EFFLUENT TESTING DATA

Refer to the APPLICATION OVERVIEW to determine whether Part D applies to the treatment works.

If the treatment works has a design flow greater than or equal to 1 million gallons per day or it has (or is required to have) a pretreatment program, or is otherwise required by the permitting authority to provide the data, then provide effluent testing data for the following pollutants. Provide the indicated effluent testing information **for each outfall through which effluent is discharged.** Do not include information of combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. The facility shall use sufficiently sensitive analytical methods for detecting, identifying, and measuring the concentrations of pollutants. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. Indicate in the blank rows provided below any data you may have on pollutants not specifically listed in this form. At a minimum, effluent testing data must be based on at least **three pollutant scans** and must be no more than four and one-half years apart.

Outfall Number (Complete Once for Each Outfall Discharging Effluent to Waters of the State.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	No. of Samples		
METALS (TOTAL RECOVERABLE), CYANIDE, PHENOLS AND HARDNESS											
ALUMINUM	0.10	mg/l							1	200.7	0.05
ANTIMONY	<0.03	mg/l							1	200.7	0.03
ARSENIC	<0.03	mg/l							1	200.7	0.03
BERYLLIUM	<0.05	mg/l							1	2007	0.05
CADMIUM	<0.03	mg/l							1	2007	0.03
CHROMIUM III	<0.03	mg/l							1	DIFFERENCE	—
CHROMIUM VI	<0.02	mg/l							1	HACH 8023	0.02
COPPER	<0.03	mg/l							1	2007	0.03
IRON	<0.05	mg/l							1	2007	0.05
LEAD	<0.03	mg/l							1	2007	0.03
MERCURY	<0.001	mg/l							1	200.8	0.001
NICKEL	<0.03	mg/l							1	200.7	0.03
SELENIUM	<0.03	mg/l							1	200.7	0.03
SILVER	<0.03	mg/l							1	200.7	0.03
THALLIUM	<0.03	mg/l							1	200.7	0.03
ZINC	<0.05	mg/l							1	200.7	0.05
CYANIDE	<0.01	mg/l							1	335.4	0.01
TOTAL PHENOLIC COMPOUNDS	<0.01	mg/l							1	420.1	0.01
HARDNESS (as $CaCO_3$)	262	mg/l							1	2340 B/200.7	1.0
VOLATILE ORGANIC COMPOUNDS											
ACROLEIN	<0.10	mg/l							1	600/624	0.10
ACRYLONITRILE	<0.005	mg/l							1	600/624	0.005
BENZENE	<0.002	mg/l							1	600/624	0.002
BROMOFORM	<0.005	mg/l							1	600/624	0.005
CARBON TETRACHLORIDE	<0.005	mg/l							1	600/624	0.005

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO- 0080632	001

PART D – EXPANDED EFFLUENT TESTING DATA

16. EXPANDED EFFLUENT TESTING DATA

Complete Once for Each Outfall Discharging Effluent to Waters of the State

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	No. of Samples		
CHLOROBENZENE	<0.005	mg/l							1	600/624	0.10
CHLORODIBROMO-METHANE	<0.005	mg/l							1	600/624	0.005
CHLOROETHANE	<0.010	mg/l							1	600/624	0.002
2-CHLORO-ETHYLVINYL ETHER	<0.020	mg/l							1	600/624	0.005
CHLOROFORM	<0.005	mg/l							1	600/624	0.005
DICHLOROBROMO-METHANE	<0.005	mg/l							1	600/624	0.005
1,1-DICHLORO-ETHANE	<0.005	mg/l							1	600/624	0.005
1,2-DICHLORO-ETHANE	<0.005	mg/l							1	600/624	0.010
TRANS-1,2-DICHLOROETHYLENE	<0.005	mg/l							1	600/624	0.020
1,1-DICHLORO-ETHYLENE	<0.005	mg/l							1	600/624	0.005
1,2-DICHLORO-PROPANE	<0.005	mg/l							1	600/624	0.005
1,3-DICHLORO-PROPYLENE	<0.005	mg/l							1	600/624	0.005
ETHYLBENZENE	<0.005	mg/l							1	600/624	0.005
METHYL BROMIDE	<0.010	mg/l							1	600/624	0.005
METHYL CHLORIDE	<0.010	mg/l							1	600/624	0.005
METHYLENE CHLORIDE	<0.005	mg/l							1	600/624	0.005
1,1,2,2-TETRA-CHLOROETHANE	<0.005	mg/l							1	600/624	0.005
TETRACHLORO-ETHANE	<0.005	mg/l							1	600/624	0.005
TOLUENE	<0.005	mg/l							1	600/624	0.005
1,1,1-TRICHLORO-ETHANE	<0.005	mg/l							1	600/624	0.005
1,1,2-TRICHLORO-ETHANE	<0.005	mg/l							1	600/624	0.005
TRICHLORETHYLENE	<0.005	mg/l							1	600/624	0.005
VINYL CHLORIDE	<0.002	mg/l							1	600/624	0.002
ACID-EXTRACTABLE COMPOUNDS											
P-CHLORO-M-CRESOL	<0.020	mg/l							1	600/625	0.020
2-CHLOROPHENOL	<0.010	mg/l							1	600/625	0.010
2,4-DICHLOROPHENOL	<0.010	mg/l							1	600/625	0.010
2,4-DIMETHYLPHENOL	<0.010	mg/l							1	600/625	0.010
4,6-DINITRO-O-CRESOL	<0.020	mg/l							1	600/625	0.020
2,4-DINITROPHENOL	<0.010	mg/l							1	600/625	0.010
2-NITROPHENOL	<0.020	mg/l							1	600/625	0.020
4-NITROPHENOL	<0.020	mg/l							1	600/625	0.020

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO- 0080632	001

PART D - EXPANDED EFFLUENT TESTING DATA

16. EXPANDED EFFLUENT TESTING DATA

Complete Once for Each Outfall Discharging Effluent to Waters of the State.

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	No. of Samples		
PENTACHLOROPHENOL	<0.020	mg/l							1	600/625	0.020
PHENOL	<0.005	mg/l							1	600/625	0.005
2,4,6-TRICHLOROPHENOL	<0.010	mg/l							1	600/625	0.010
BASE-NEUTRAL COMPOUNDS											
ACENAPHTHENE	<0.010	mg/l							1	600/625	0.010
ACENAPHTHYLENE	<0.010	mg/l							1	600/625	0.010
ANTHRACENE	<0.010	mg/l							1	600/625	0.010
BENZIDINE	<0.040	mg/l							1	600/625	0.010
BENZO(A)ANTHRACENE	<0.010	mg/l							1	600/625	0.010
BENZO(A)PYRENE	<0.010	mg/l							1	600/625	0.010
3,4-BENZO-FLUORANTHENE	<0.010	mg/l							1	600/625	0.010
BENZO(GH) PHERYLENE	<0.010	mg/l							1	600/625	0.010
BENZO(K) FLUORANTHENE	<0.010	mg/l							1	600/625	0.010
BIS (2-CHLOROTHOXY) METHANE	<0.010	mg/l							1	600/625	0.010
BIS (2-CHLOROETHYL) - ETHER	<0.010	mg/l							1	600/625	0.010
BIS (2-CHLOROISO-PROPYL) ETHER	<0.010	mg/l							1	600/625	0.010
BIS (2-ETHYLHEXYL) PHTHALATE	<0.006	mg/l							1	600/625	0.010
4-BROMOPHENYL PHENYL ETHER	<0.010	mg/l							1	600/625	0.010
BUTYL BENZYL PHTHALATE	<0.010	mg/l							1	600/625	0.010
2-CHLORONAPH-THALENE	<0.010	mg/l							1	600/625	0.010
4-CHLORPHENYL PHENYL ETHER	<0.010	mg/l							1	600/625	0.010
CHRYSENE	<0.010	mg/l							1	600/625	0.010
DI-N-BUTYL PHTHALATE	<0.010	mg/l							1	600/625	0.010
DI-N-OCTYL PHTHALATE	<0.010	mg/l							1	600/625	0.010
DIBENZO (A,H) ANTHRACENE	<0.010	mg/l							1	600/625	0.010
1,2-DICHLORO-BENZENE	<0.005	mg/l							1	600/624	0.010
1,3-DICHLORO-BENZENE	<0.005	mg/l							1	600/624	0.010
1,4-DICHLORO-BENZENE	<0.005	mg/l							1	600/624	0.010
3,3-DICHLORO-BENZIDINE	<0.010	mg/l							1	600/625	0.010
DIETHYL PHTHALATE	<0.010	mg/l							1	600/625	0.010
DIMETHYL PHTHALATE	<0.010	mg/l							1	600/625	0.010

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO- 0080632	001

PART D - EXPANDED EFFLUENT TESTING DATA

16. EXPANDED EFFLUENT TESTING DATA

Complete Once for Each Outfall Discharging Effluent to Waters of the State.

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	No. of Samples		
2,4-DINITRO-TOLUENE	<0.020								1	600/625	0.020
2,6-DINITRO-TOLUENE	<0.010								1	600/625	0.010
1,2-DIPHENYL-HYDRAZINE	<0.010								1	600/625	0.010
FLUORANTHENE	<0.010								1	600/625	0.010
FLUORENE	<0.010								1	600/625	0.010
HEXACHLOROBENZENE	<0.010								1	600/625	0.010
HEXACHLOROBUTADIENE	<0.010								1	600/625	0.010
HEXACHLOROCYCLO-PENTADIENE	<0.020								1	600/625	0.020
HEXACHLOROETHANE	<0.010								1	600/625	0.010
INDENO (1,2,3-CD) PYRENE	<0.010								1	600/625	0.010
ISOPHORONE	<0.010								1	600/625	0.010
NAPHTHALENE	<0.010								1	600/625	0.010
NITROBENZENE	<0.010								1	600/625	0.010
N-NITROSODI-PROPYLAMINE	<0.010								1	600/625	0.010
N-NITROSODI-METHYLAMINE	<0.020								1	600/625	0.020
N-NITROSODI-PHENYLAMINE	<0.010								1	600/625	0.010
PHENANTHRENE	<0.010								1	600/625	0.010
PYRENE	<0.010								1	600/625	0.010
1,2,4-TRICHLOROBENZENE	<0.010								1	600/625	0.010

Use this space (or a separate sheet) to provide information on other pollutants not specifically listed in this form.

END OF PART D

REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM B2 YOU MUST COMPLETE.

MAKE ADDITIONAL COPIES OF THIS FORM FOR EACH OUTFALL

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS - CRYSTAL CITY STP	MO- 0080632	001

PART E – TOXICITY TESTING DATA

17. TOXICITY TESTING DATA

Refer to the APPLICATION OVERVIEW to determine whether Part E applies to the treatment works.

Publicly owned treatment works, or POTWs, meeting one or more of the following criteria must provide the results of whole effluent toxicity tests for acute or chronic toxicity for each of the facility's discharge points.

A. POTWs with a design flow rate greater than or equal to 1 million gallons per day
B. POTWs with a pretreatment program (or those that are required to have one under 40 CFR Part 403)
C. POTWs required by the permitting authority to submit data for these parameters

- At a minimum, these results must include quarterly testing for a 12-month period within the past one year using multiple species (minimum of two species), or the results from four tests performed at least annually in the four and one-half years prior to the application, provided the results show no appreciable toxicity, and testing for acute or chronic toxicity, depending on the range of receiving water dilution. Do not include information about combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136.
- If EPA methods were not used, report the reason for using alternative methods. If test summaries are available that contain all of the information requested below, they may be submitted in place of Part E. If no biomonitoring data is required, do not complete Part E. Refer to the application overview for directions on which other sections of the form to complete.

Indicate the number of whole effluent toxicity tests conducted in the past four and one-half years: ____ chronic 4 acute

Complete the following chart **for the last three whole effluent toxicity tests.** Allow one column per test. Copy this page if more than three tests are being reported.

	Most Recent	2ND Most Recent	3RD Most Recent
A. Test Information			
Test Method Number	EPA-821-R-02-012	EPA-821-R-02-012	EPA-821-R-02-012
Final Report Number	MO 1905227	MO 1713903	MO-1608419
Outfall Number	001	001	001
Dates Sample Collected	9/22/15 & 9/23/15	8/20/14 & 8/21/14	8/13/13 & 8/14/13
Date Test Started	9/23/15	8/21/14	8/14/13
Duration	48 HRS	48 HRS	48 HRS
B. Toxicity Test Methods Followed			
Manual Title	STANDARD METHODS	STANDARD METHODS	STANDARD METHODS
Edition Number and Year of Publication	18TH 1992	18TH 1992	18TH 1992
Page Number(s)			
C. Sample collection method(s) used. For multiple grab samples, indicate the number of grab samples used			
24-Hour Composite	X	X	X
Grab			
D. Indicate where the sample was taken in relation to disinfection (Check all that apply for each)			
Before Disinfection	☐	☐	☐
After Disinfection	☒	☒	☒
After Dechlorination	☐	☐	☐
E. Describe the point in the treatment process at which the sample was collected			
Sample Was Collected:	EFFLUENT & UPSTREAM	EFFLUENT & UPSTREAM	EFFLUENT & UPSTREAM
F. Indicate whether the test was intended to assess chronic toxicity, acute toxicity, or both			
Chronic Toxicity	☐	☐	☐
Acute Toxicity	☒	☒	☒
G. Provide the type of test performed			
Static	☒	☒	☒
Static-renewal	☐	☐	☐
Flow-through	☐	☐	☐
H. Source of dilution water. If laboratory water, specify type; if receiving water, specify source			
Laboratory Water	☐	☐	☐
Receiving Water	☒	☒	☒

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO- 0080632	001

PART E – TOXICITY TESTING DATA

17. TOXICITY TESTING DATA (continued)

	Most Recent	Second Most Recent	Third Most Recent
I. Type of dilution water. If salt water, specify "natural" or type of artificial sea salts or brine used.			
Fresh Water	NATURAL UPSTREAM	NATURAL UPSTREAM	NATURAL UPSTREAM
Salt Water			
J. Percentage of effluent used for all concentrations in the test series			
	6.25%, 12.5%	6.25%, 12.5%	6.25%, 12.5%
	25%, 50%	25%, 50%	25%, 50%
	100%	100%	100%
K. Parameters measured during the test (State whether parameter meets test method specifications) EFFLUENT			
pH	8.41	7.59	7.07
Salinity	444	1010	919
Temperature	11	7	12
Ammonia	0.344	0.010	0.033
Dissolved Oxygen	9.4	7.9	4.6
L. Test Results			
Acute:			
Percent Survival in 100% Effluent	100%/100%	100%/100%	100%/100%
LC_{50}	1.071 g/L / 0.486 g/L	0.796 g/L / 0.451 g/L	0.886 g/L / 0.508 g/L
95% C.I.	0.676-1.466 g/L / 0.300 g/L-0.[illegible]	0.640-1.173 / 0.326-0.575	0.661-1.110 / 0.400-0.615
Control Percent Survival	100 / 100	100 / 100	100 / 100
Other (Describe)			
Chronic:			
NOEC	N/A	N/A	N/A
IC_{25}			
Control Percent Survival			
Other (Describe)			
M. Quality Control/ Quality Assurance			
Is reference toxicant data available?	yes	yes	yes
Was reference toxicant test within acceptable bounds?	yes	yes	yes
What date was reference toxicant test run (MM/DD/YYYY)?	9/9/15	8/6/14	8/7/13
Other (Describe)			

Is the treatment works involved in a toxicity reduction evaluation? ☐ Yes ☑ No

If yes, describe:

If you have submitted biomonitoring test information, or information regarding the cause of toxicity, within the past four and one-half years, provide the dates the information was submitted to the permitting authority and a summary of the results.

Date Submitted (MM/DD/YYYY) N/A

Summary of Results (See Instructions)

N/A

END OF PART E.

REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM B2 YOU MUST COMPLETE.

MAKE ADDITIONAL COPIES OF THIS FORM FOR EACH OUTFALL

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO- 0080632	001

PART F – INDUSTRIAL USER DISCHARGES AND RCRA/CERCLA WASTES

Refer to the APPLICATION OVERVIEW to determine whether Part F applies to the treatment works.

18. GENERAL INFORMATION

18.1 Does the treatment works have, or is it subject to, an approved pretreatment program?

☐ Yes ☑ No

18.2 Number of Significant Industrial Users (SIUs) and Categorical Industrial Users (CIUs). Provide the number of each of the following types of industrial users that discharge to the treatment works:

Number of non-categorical SIUs ____

Number of CIUs ____

19. INDUSTRIES CONTRIBUTING MORE THAN 5 PERCENT OF THE ACTUAL FLOW TO THE FACILITY OR OTHER SIGNIFICANT INDUSTRIAL USERS INFORMATION

Supply the following information for each SIU. If more than one SIU discharges to the treatment works, provide the information requested for each. Submit additional pages as necessary.

NAME			
MAILING ADDRESS	CITY	STATE	ZIP CODE

19.1 Describe all of the industrial processes that affect or contribute to the SIU's discharge

19.2 Describe all of the principle processes and raw materials that affect or contribute to the SIU's discharge.

Principal Product(s):

Raw Material(s):

19.3 Flow Rate

a. PROCESS WASTEWATER FLOW RATE. Indicate the average daily volume of process wastewater discharged into the collection system in gallons per day, or gpd, and whether the discharge is continuous or intermittent.

gpd ☐ Continuous ☐ Intermittent

b. NON-PROCESS WASTEWATER FLOW RATE. Indicate the average daily volume of non-process wastewater discharged into the collection system in gallons per day, or gpd, and whether the discharge is continuous or intermittent.

gpd ☐ Continuous ☐ Intermittent

19.4 Pretreatment Standards. Indicate whether the SIU is subject to the following:

a. Local Limits ☐ Yes ☐ No

b. Categorical Pretreatment Standards ☐ Yes ☐ No

If subject to categorical pretreatment standards, which category and subcategory?

19.5 Problems at the treatment works attributed to waste discharged by the SIU. Has the SIU caused or contributed to any problems (e.g., upsets, interference) at the treatment works in the past three years?

☐ Yes ☐ No

If Yes, describe each episode

MAKE ADDITIONAL COPIES OF THIS FORM FOR EACH OUTFALL

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-Crystal City STP	MO- 0080632	001

PART F – INDUSTRIAL USER DISCHARGES AND RCRA/CERCLA WASTES

20. RCRA HAZARDOUS WASTE RECEIVED BY TRUCK, RAIL, OR DEDICATED PIPELINE

20.1 Does the treatment works receive or has it in the past three years received RCRA hazardous waste by truck, rail or dedicated pipe? ☐ Yes ☐ No

20.2 Method by which RCRA waste is received. (Check all that apply)
☐ Truck ☐ Rail ☐ Dedicated Pipe

20.3 Waste Description

EPA Hazardous Waste Number	Amount (volume or mass)	Units

21. CERCLA (SUPERFUND) WASTEWATER, RCRA REMEDIATION/CORRECTIVE ACTION WASTEWATER, AND OTHER REMEDIAL ACTIVITY WASTEWATER

21.1 Does the treatment works currently (or has it been notified that it will) receive waste from remedial activities?
☐ Yes ☐ No
Provide a list of sites and the requested information for each current and future site.

21.2 Waste Origin. Describe the site and type of facility at which the CERCLA/RCRA/or other remedial waste originates (or is expected to originate in the next five years).

21.3 List the hazardous constituents that are received (or are expected to be received). Included data on volume and concentration, if known. (Attach additional sheets if necessary)

21.4 Waste Treatment

a. Is this waste treated (or will it be treated) prior to entering the treatment works?
☐ Yes ☐ No

If Yes, describe the treatment (provide information about the removal efficiency):

b. Is the discharge (or will the discharge be) continuous or intermittent?
☐ *Continuous* ☐ *Intermittent*

If intermittent, describe the discharge schedule:

END OF PART F
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM B2 YOU MUST COMPLETE.

MAKE ADDITIONAL COPIES OF THIS FORM FOR EACH OUTFALL

FACILITY NAME	PERMIT NO.	OUTFALL NO.
FESTUS-CRYSTAL CITY STP	MO-0080632	001

PART G – COMBINED SEWER SYSTEMS

Refer to the APPLICATION OVERVIEW to determine whether Part G applies to the treatment works.

22. GENERAL INFORMATION

22.1 System Map. Provide a map indicating the following: (May be included with basic application information.)

A. All CSO Discharges.
B. Sensitive Use Areas Potentially Affected by CSOs. (e.g., beaches, drinking water supplies, shellfish beds, sensitive aquatic ecosystems and Outstanding Natural Resource Waters.)
C. Waters that Support Threatened and Endangered Species Potentially Affected by CSOs.

22.2 System Diagram. Provide a diagram, either in the map provided above or on a separate drawing, of the Combined Sewer Collection System that includes the following information:

A. Locations of Major Sewer Trunk Lines, Both Combined and Separate Sanitary.
B. Locations of Points where Separate Sanitary Sewers Feed into the Combined Sewer System.
C. Locations of In-Line or Off-Line Storage Structures.
D. Locations of Flow-Regulating Devices.
E. Locations of Pump Stations.

22.3 Percent of collection system that is combined sewer

22.4 Population served by combined sewer collection system

22.5 Name of any satellite community with combined sewer collection system

23. CSO OUTFALLS. COMPLETE THE FOLLOWING ONCE FOR EACH CSO DISCHARGE POINT.

23.1 Description of Outfall

a. Outfall Number

b. Location

c. Distance from Shore (if applicable) _____ ft

d. Depth Below Surface (if applicable) _____ ft

e. Which of the following were monitored during the last year for this CSO?

☐ Rainfall ☐ CSO Pollutant Concentrations ☐ CSO
☐ CSO Flow Volume ☐ Receiving Water Quality

f. How many storm events were monitored last year?

23.2 CSO Events

a. Give the Number of CSO Events in the Last Year Events ☐ Actual ☐ Approximate

b. Hours
Give the Average Duration Per CSO Event
☐ Actual ☐ Approximate

c. Million Gallons
Give the Average Volume Per CSO Event
☐ Actual ☐ Approximate

d. Give the minimum rainfall that caused a CSO event in the last year _____ inches of rainfall

23.3 Description of Receiving Waters

a. Name of Receiving Water

b. Name of Watershed/River/Stream System

c. U.S. Soil Conservation Service 14-Digit Watershed Code (If Known)

d. Name of State Management/River Basin

e. U.S. Geological Survey 8- Digit Hydrologic Cataloging Unit Code (If Known)

23.4 CSO Operations

Describe any known water quality impacts on the receiving water caused by this CSO (e.g., permanent or intermittent beach closings, permanent or intermittent shellfish bed closings, fish kills, fish advisories, other recreational loss, or violation of any applicable state water quality standard.)

END OF PART G

REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM B2 YOU MUST COMPLETE.

APPENDIX C – SANITAIRE ICEAS DETAILED DESIGN CALCULATIONS

SANITAIRE ICEAS Detailed Design Calculations
BOD Removal, Nitrification, and De-Nitrification Process

SANITAIRE Project #00735822
Festus-Crystal City

Design Parameters

A. Flow

Max Month	3,050,000	GPD
Normal 3.6 hr Flow	5,600,000	GPD
Maximum 2.4 hr Flow	12,000,000	GPD

B. Treatment

	Influent Quality	Effluent Requirement
BOD_5 (20°C), mg/l	231.9	15
Suspended Solids, mg/l	221.3	15
TKN, mg/l	65.3	
NH_3-N, mg/l		1
TN, mg/l		
Phosphorus	14.2	

C. Environment

Sufficient Alkalinity must be provided to maintain basin pH of 6.8

Max Wastewater Temperature	23	°C
Min Wastewater Temperature	12	°C
Ambient Air Temperature	20 - 90	°F
Site Elevation	406	ft

D. ICEAS Process Design Criteria

F / M	0.056	BOD_5 / MLSS / day
SVI (after 30 minutes settling)	150	ml/g
Number of ICEAS Basins	5	
Top Water Level	18	ft

E. Cycle Timing

		Normal	Storm
Air-On	min	144	52
Air-Off	min	24	
Settle	min	48	60
Decant	min	72	60
Total	hrs	4.8	2.4

F. Detailed Calculations

Mass of BOD

$$BODL = \frac{Q \times BODin \times 8.34}{1{,}000{,}000} = \frac{875{,}000 \times 134 \times 8.34}{1{,}000{,}000} = 980 \text{ lb/day/basin}$$

where: BODL = BOD Load (lb/day/basin)
Q = Average Dry Weather Flow per basin (gal/day)
BODin = Influent BOD concentration (mg/l)
1,000,000 = Conversion (l/mg)
8.34 = Conversion (lb/gal)

Mass of Biomass

$$BMOB = \frac{BOD_L}{F/M} = \frac{980}{0.0395} = 24{,}836 \text{ lb/basin}$$

where: BMOB = Mass of Biochemicalmass (lb/day/basin)
F / M = Food to Microorganism ratio (day^{-1})

Volume of Biomass

$$Vbio = BMOB \times SVI = 24{,}836 \times 2.4 = 59{,}606 \text{ ft}^3\text{/basin}$$

where: Vbio = Volume of Biochemicalmass (ft^3/basin)
SVI = Sludge Volume Index (ft^3/lb)

Maximum Volume Above Bottom Water Level

Peak Dry Weather Flow:

$$Vbwld = \frac{PDWF \times (NCT - NDT)}{24 \times 7.48} = \frac{1{,}527{,}778 \times (4.0 - 1.00)}{24 \times 7.48} = 25{,}531\ ft^3/basin$$

where: Vbwld = Maximum Volume Above BWL at Peak Dry Weather Flow (ft^3/basin)
PDWF = Peak Dry Weather Flow (gal/day)
NCT = Normal Cycle Time (hr/cycle)
NDT = Decant Time (hr/cycle)
7.48 = Conversion (gal/ft^3)
24 = Conversion (hours/day)

Peak Wet Weather Flow:

$$Vbwls = \frac{PWWF \times (SCT - SDT)}{24 \times 7.48} = \frac{3{,}000{,}000 \times (2.4 - 0.93)}{24 \times 7.48} = 24{,}510\ ft^3/basin$$

where: Vbwls = Maximum Volume Above BWL at Peak Wet Weather (Storm) Flow (ft^3/basin)
PWWF = Peak Wet Weather Flow (gal/day)
SCT = Storm Cycle Time (hr/cycle)
SDT = Storm Decant Time (hr/cycle)

MVAB (Maximum Volume Above Bottom Water Level) is larger of Peak Dry Weather and Peak Wet Weather Calculation

$$MVAB = 25{,}531\ ft^3/basin$$

Decant Rates

Peak Dry Weather Flow:

$$PDR = \frac{MVAB \times 7.48}{NDT} + \frac{PDWF}{1{,}440} = \frac{25{,}531 \times 7.48}{60.0} + \frac{1{,}527{,}778}{1{,}440} = 4{,}244\ gal/min$$

where: PDR = Normal Decant Rate (gal/min)
NDT = Normal Decant Time (min/cycle)
1440 = Conversion (min/day)

Peak Wet Weather Flow:

$$PWR = \frac{MVAB \times 7.48}{SDT} + \frac{PWWF}{1{,}440} = \frac{25{,}531 \times 7.48}{56.0} + \frac{3{,}000{,}000}{1{,}440} = 5{,}787\ gal/min$$

where: PWR = Peak Decant Rate (gal/min)
SDT = Storm Decant Time (min/cycle)

Decanter Sizing

Peak Dry Weather Flow:

$$DLa = \frac{PDR}{\text{Weir Loading Rate} \times 7.48} = \frac{4{,}244}{20.00 \times 7.48} = 28.37 \text{ ft}$$

where: DLa = Decanter Length for Average Dry Weather Flow (ft)
20.00 = Weir Loading Rate (ft^3/min/ft of decanter weir)

Peak Wet Weather Flow:

$$DLp = \frac{PWR}{\text{Weir Loading Rate} \times 7.48} = \frac{5{,}787}{25.00 \times 7.48} = 29.38 \text{ ft}$$

where: DLp = Decanter Length for Peak Wet Weather (Storm) Flow (ft)
25.00 = Weir Loading Rate (ft^3/min/ft of decanter weir)

Design Decanter Length = 35.0 ft

Basin Working Volume

$$BWV = MVAB + Vbio = 25{,}531 + 59{,}606 = 85{,}137 \text{ ft}^3\text{/basin}$$

where: BWV = Basin Working Volume (ft^3/basin)

Basin Area

$$BA = \frac{BWV}{TWL - BZ} = \frac{85{,}137}{18.0 - 2.6} = 5{,}530 \text{ ft}^2\text{/basin}$$

where: BA = Basin Area (ft^2)
TWL = Top Water Level (ft)
BZ = Buffer Zone (ft) (Safety Factor)

Sludge Depth

$$SD = \frac{Vbio}{BA} = \frac{59{,}606}{5{,}530} = 10.78 \text{ ft}$$

where: SD = Sludge Depth (ft)

Decanter Draw Down

$$DD = \frac{MVAB}{BA} = \frac{25{,}531}{5{,}530} = 4.62 \text{ ft}$$

where: DD = Draw Down (ft)

Bottom Water Level

$$BWL = SD + BZ = 10.78 + 2.60 = 13.38 \text{ ft}$$

where: BWL = Bottom Water Level (ft)

Top Water Level

$$TWL = BWL + DD = 13.38 + 4.62 = 18.00 \text{ ft}$$

where: TWL = Top Water Level (ft)

Hydraulic Retention Time

$$HRT = \frac{BA \times MAFD \times 7.48}{QT}$$

where: HRT = Hydraulic Retention Time (days)
MAFD = Maximum Average Flow Depth (ft)
QT = Fill Rate at Average Dry Weather Flow (gal/day)

$$MAFD = \frac{Q \times [(NCT \times 60) - NDT]}{BA \times 1{,}440 \times 7.48} + BWL = \frac{875{,}000 \times [(4.0 \times 60) - 60.0]}{5{,}530 \times 1{,}440 \times 7.48} + 13.38 = 16.03 \text{ ft}$$

$$HRT = \frac{5{,}530 \times 16.03 \times 7.48}{875{,}000} = 0.76 \text{ days}$$

MLSS Concentration at Bottom Water Level

$$MLSS = \frac{Mbio \times 1{,}000{,}000}{BWL \times BA \times 62.42} = \frac{24{,}836 \times 1{,}000{,}000}{13.38 \times 5{,}530 \times 62.42} = 5{,}376 \text{ mg/l}$$

where: MLSS = Mixed Liquor Suspended Solids concentration at Bottom Water Level (mg/l)
62.42/1E+06 = Conversion (lb/mg x l/ft³)

Mass of Sludge Produced

$$\Delta M = \left(\frac{Y \times (BOD_{in} - BOD_{out})}{1 + (B \times \theta^{(T-20)} \times SRT)} + Zio + Zno \right) \times \frac{Q \times 8.34}{1{,}000{,}000} + Csludge$$

$$\Delta M = \left(\frac{0.6 \times (134 - 15.0)}{1 + (0.07 \times 1.02^{(12-20)} \times 27.3)} + 32.9 + 49.3 \right) \times \frac{8.8E{+}05 \times 8.34}{1{,}000{,}000} + 0 = 803 \text{ lb/day/basin}$$

(Lawrence-McCarty Equation as presented in WEF MOP/8 4th Edition, pg 11-11, Eqn. 11.7)

where:
- ΔM = Mass of Sludge Produced (lb/day/basin)
- Y = Volatile cell yield (VSS/BOD removed)
- q = Arrhenius Temperature Correction Factor
- B = Decay Rate (day^{-1})
- BOD_{out} = Anticipated Effluent BOD (mg/l)
- SRT = Solids Retention Time (days)
- Zio = Nonvolatile Influent suspended solids (mg/l)
- Zno = Volatile Non-Biodegradable solids (mg/l)
- T = Minimum Wastewater Temperature (°C)

Volume of Sludge Produced

$$V_{ws} = \frac{\Delta M}{SFws \times 8.34} = \frac{803}{0.0085 \times 8.34} = 11{,}320 \text{ gal/day/basin}$$

where: Vws = Volume of Waste Sludge (gal/day/basin)
SFws = Solids Fraction in Waste Sludge
8.34 = Density (lb/gal)

Observed Yield Factor

$$Yobs = \frac{\Delta M}{BOD_L} = \frac{803}{980} = 0.819 \frac{MLSS}{BOD}$$

Observed Yield Factor (lb/day MLSS/lb/day BODremoved)

Mean Cell Residence Time

$$MCRT = \frac{Mbio}{\Delta M + ((Q - Vws) \times TESS \times 8.34 / 1E{+}06)}$$

$$MCRT = \frac{24{,}836}{803 + ((875{,}000 - 11{,}320) \times 15.0 \times 8.34 / 1{,}000{,}000)} = 27.3 \text{ days}$$

where: MCRT = Mean Cell Residence Time (days)
TESS = Anticipated Effluent Total Suspended Solids (mg/l)
8.34E-06 = Conversion (lb/mg x l/gal)

Sludge Age for Nitrification

Refer to Metcalf and Eddy, Edition IV pages 614 and 705

Constants and Temperature Corrections:

Coefficient	Base Value	Theta	Temperature Corrected	Symbol
Maximum Specific Growth Rate of Nitrifying bacteria, g VSS/g VSS.day	0.75	1.07	0.437	$\mu_{nm}(T)$
Half-Velocity constant for nitrifiers	0.74	1.053	0.490	Kn(T)
Nitrifier decay rate	0.08	1.04	0.058	Kdn(T)
Dissolved Oxygen, mg/l	2		2	DO
Half-Velocity Constant for Dissolved Oxygen, mg/l	0.5		0.5	Ko
Minimum Water Temperature, °C	12		12	T
Safety Factor	2.0		2.0	SF

Calculations:

$$\mu_n = \left(\mu_{nm}(T) \times \frac{TENH_3}{TENH_3 + Kn(T)} \times \frac{DO}{DO + Ko} \right) - Kdn(T)$$

$$\mu_n = \left(0.437 \times \frac{1.0}{1.0 + 0.490} \times \frac{2.0}{2.0 + 0.5} \right) - 0.058 = 0.176 \text{ days}^{-1}$$

$$SRTmin = \frac{1}{\mu_n} = \frac{1}{0.176} = 5.7 \text{ days}$$

$$SRTaerobic = SRTmin \times SF = 5.7 \times 2 = 11.4 \text{ days}$$

$$SRToverall = \frac{SRTaerobic \times 24}{TA} = \frac{11.4 \times 24}{10.0} = 27.3 \text{ days}$$

Design sludge age adequate for nitrification.

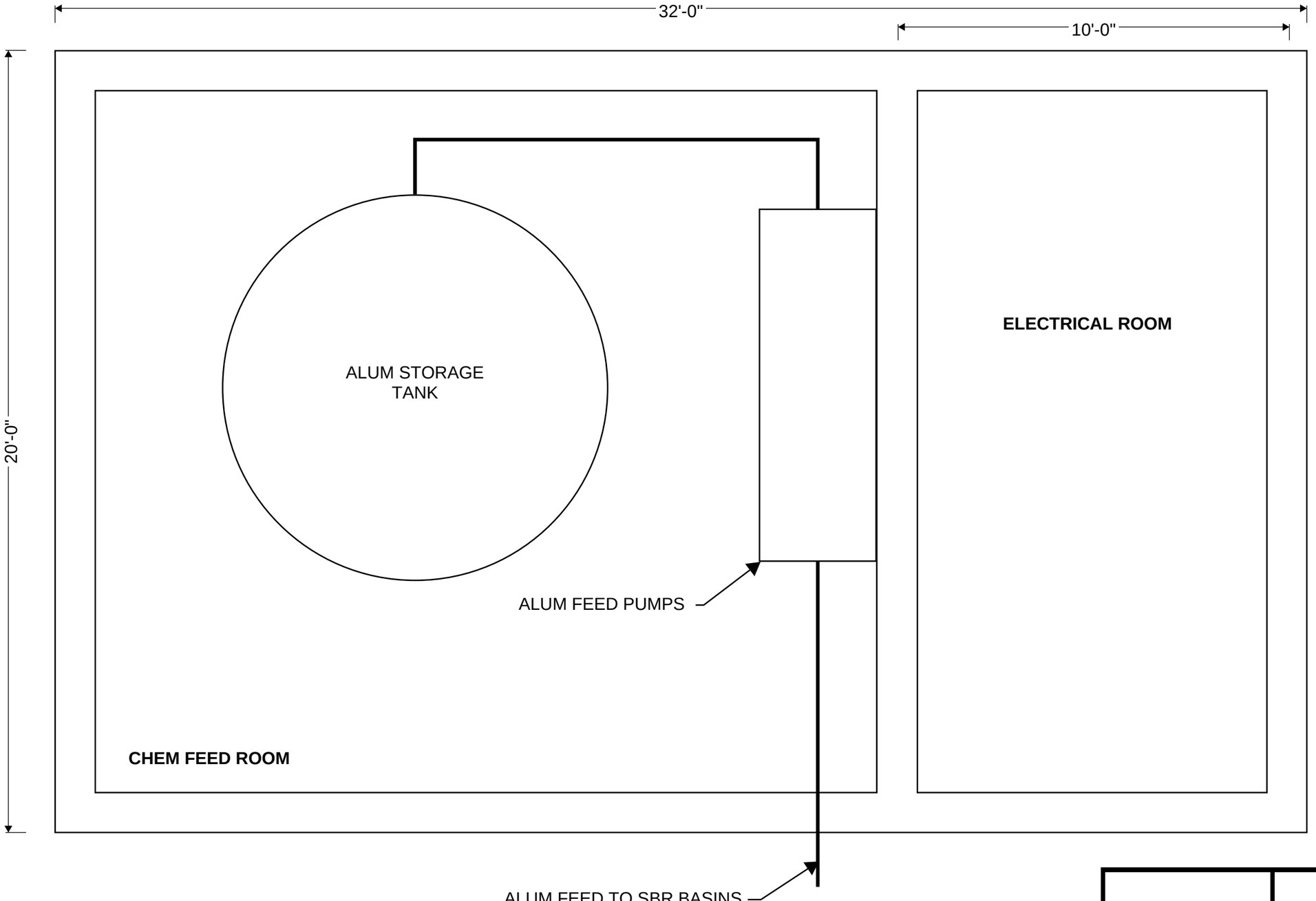
where: $\mu nm(T)$ = Maximum Temperature Corrected Nitrifier Growth Rate ($days^{-1}$)
μ_n = Specific Nitrifier Growth Rate at Temperature, DO, and Effluent NH_3 (g/g-days)
SRTmin = Minimum Sludge age required for Nitrification (days)
SRTaerobic = Design Aerobic Sludge Age (days)
SF = Safety Factor
SRToverall = Sludge Age accounting for entire ICEAS cycle (days)
TA = Aeration Time (hrs/day)
$TENH_3$ = Anticipated Effluent Ammonia (mg/l)

Waste Sludge Pump Capacity

$$WSP = \frac{Vws \times NCT}{24 \times SPT} = \frac{11{,}320 \times 4.0}{24 \times 17.15} = 110\ gal/min$$

where: WSP = Waste Sludge Pump Capacity(gal/min)
SPT = Sludge Pumping Time (min/cycle)

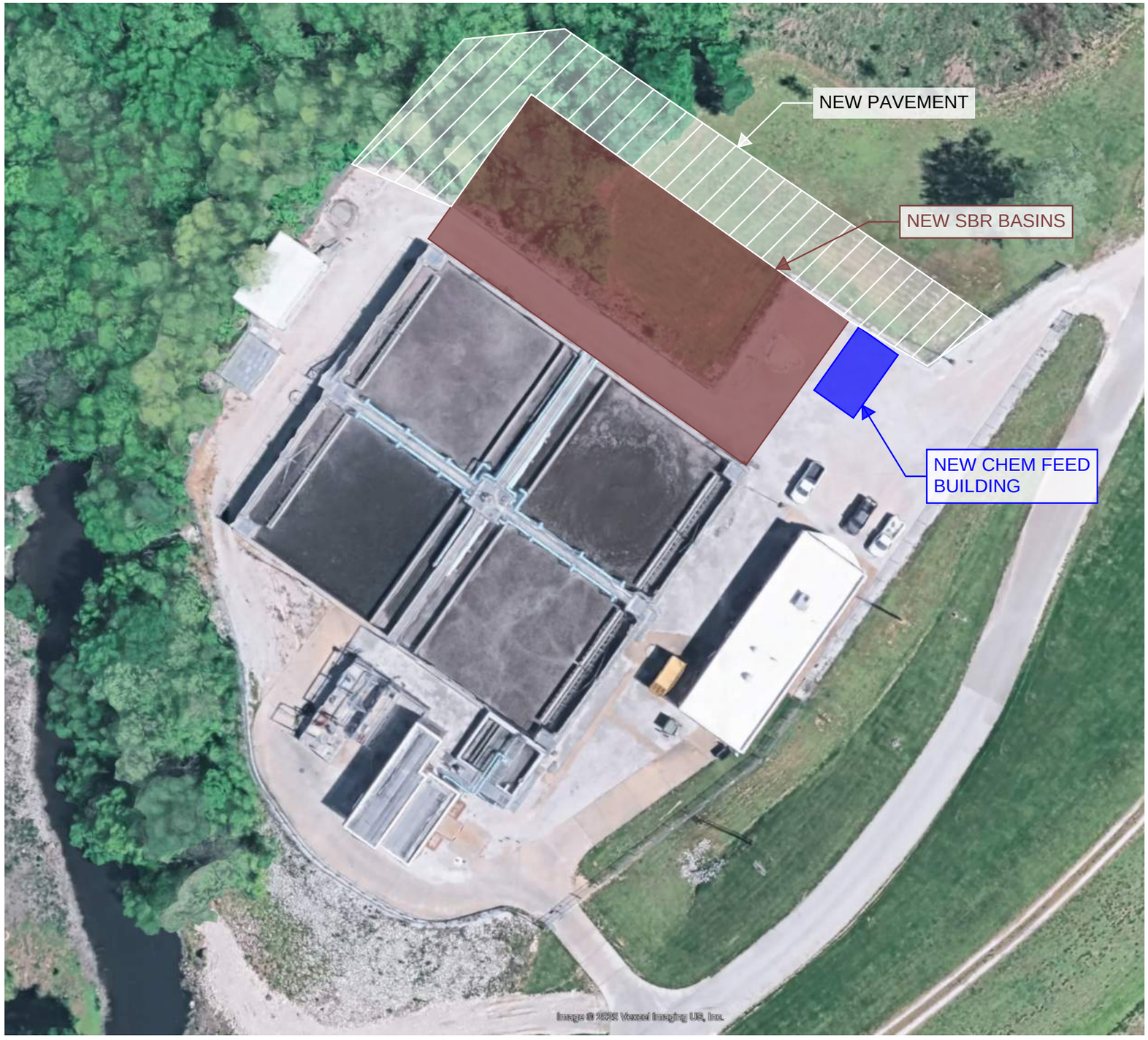
APPENDIX D – ALUM FEED CONCEPTUAL DESIGN



BURNS McDONNELL

APPENDIX D-1

ALUM FEED
FACILITY LAYOUT
CONCEPTUAL DESIGN

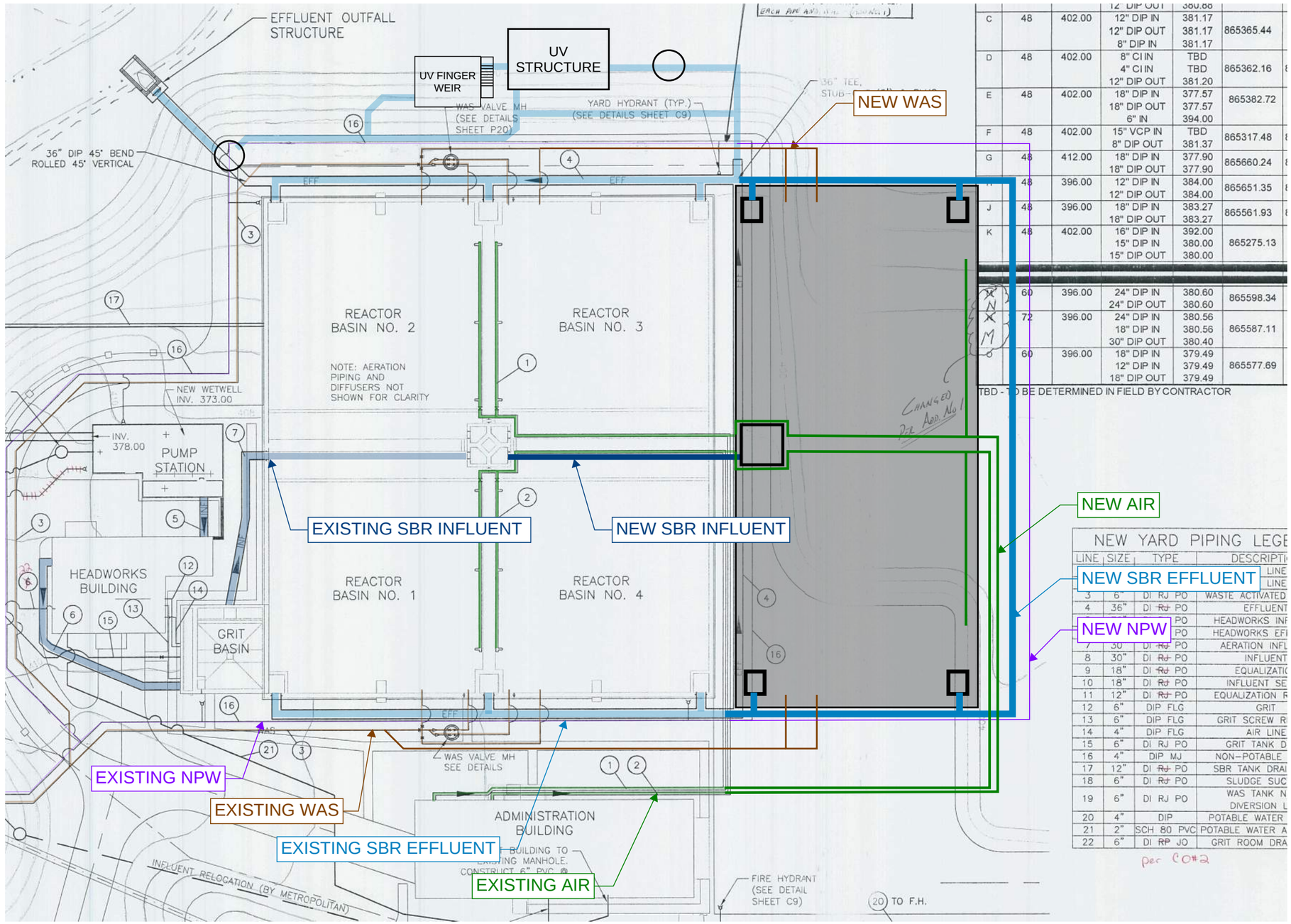


BURNS McDONNELL

APPENDIX D-2

ALUM FEED
SITE PLAN
CONCEPTUAL DESIGN

APPENDIX E – PROPOSED SBR EXPANSION PIPING CONCEPTUAL DESIGN



C	48	402.00	12" DIP IN 12" DIP OUT 8" DIP IN	381.17 381.17 381.17	865365.44
D	48	402.00	8" CI IN 4" CI IN 12" DIP OUT	TBD TBD 381.20	865362.16
E	48	402.00	18" DIP IN 18" DIP OUT 6" IN	377.57 377.57 394.00	865382.72
F	48	402.00	15" VCP IN 8" DIP OUT	TBD 381.37	865317.48
G	48	412.00	18" DIP IN 18" DIP OUT	377.90 377.90	865660.24
H	48	396.00	12" DIP IN 12" DIP OUT	384.00 384.00	865651.35
J	48	396.00	18" DIP IN 18" DIP OUT	383.27 383.27	865561.93
K	48	402.00	16" DIP IN 15" DIP IN 15" DIP OUT	392.00 380.00 380.00	865275.13
N	60	396.00	24" DIP IN 24" DIP OUT	380.60 380.60	865598.34
M	72	396.00	24" DIP IN 18" DIP IN 30" DIP OUT	380.56 380.56 380.40	865587.11
O	60	396.00	18" DIP IN 12" DIP IN 18" DIP OUT	379.49 379.49 379.49	865577.69

LINE	SIZE	TYPE	DESCRIPTION
3	6"	DI RJ PO	WASTE ACTIVATED
4	36"	DI ~~RJ~~ PO	EFFLUENT
7	30"	DI ~~RJ~~ PO	AERATION INFL
8	30"	DI ~~RJ~~ PO	INFLUENT
9	18"	DI ~~RJ~~ PO	EQUALIZATI
10	18"	DI ~~RJ~~ PO	INFLUENT SE
11	12"	DI ~~RJ~~ PO	EQUALIZATION R
12	6"	DIP FLG	GRIT
13	6"	DIP FLG	GRIT SCREW R
14	4"	DIP FLG	AIR LINE
15	6"	DI RJ PO	GRIT TANK D
16	4"	DIP MJ	NON-POTABLE
17	12"	DI ~~RJ~~ PO	SBR TANK DRAI
18	6"	DI ~~RJ~~ PO	SLUDGE SUC
19	6"	DI RJ PO	WAS TANK N DIVERSION L
20	4"	DIP	POTABLE WATER
21	2"	SCH 80 PVC	POTABLE WATER A
22	6"	DI ~~RP~~ JO	GRIT ROOM DRA

per CO#2

NOT TO SCALE

BURNS McDONNELL

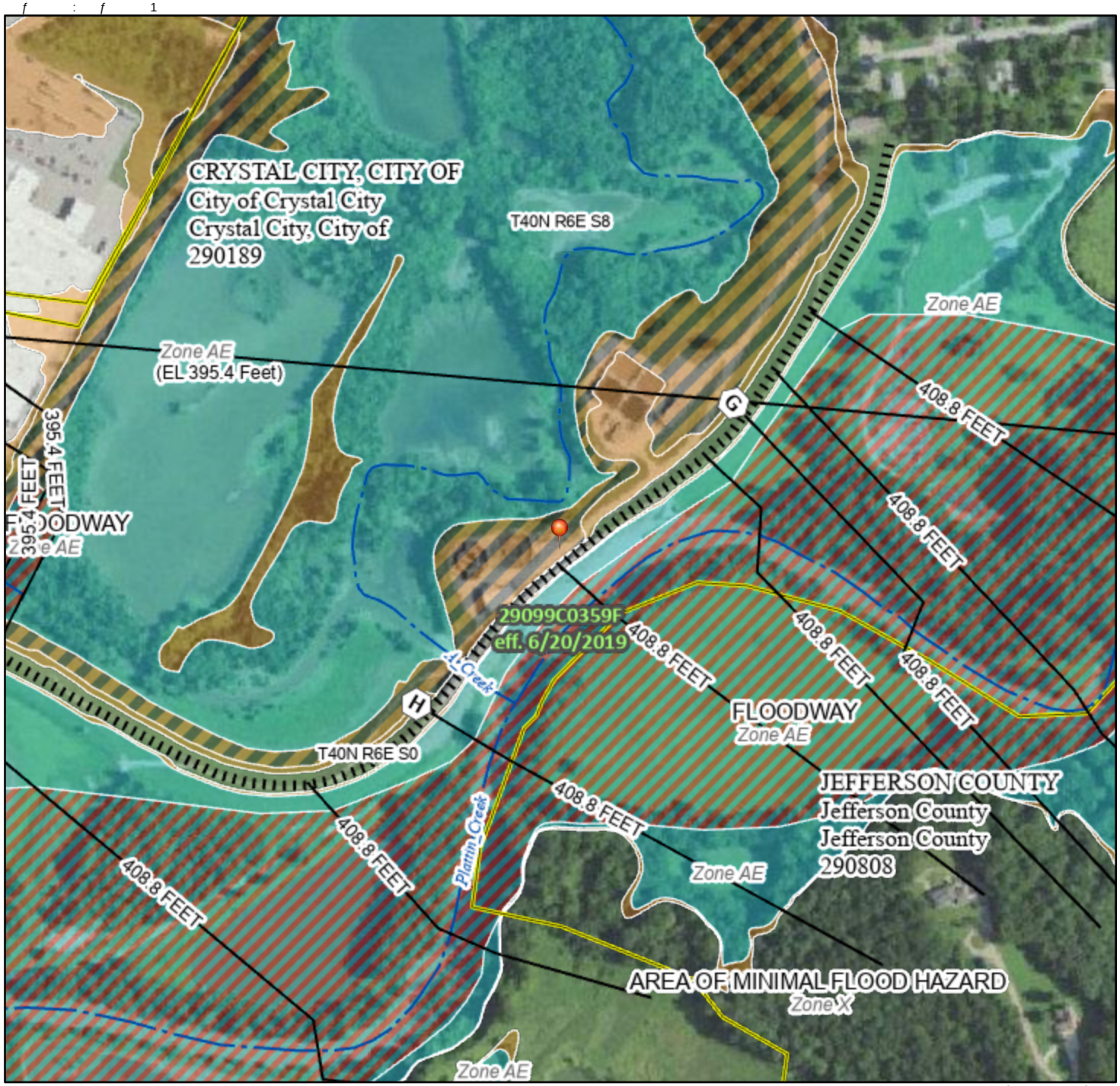
APPENDIX E

PROPOSED SBR EXPANSION PIPING CONCEPTUAL DESIGN

APPENDIX F – NATIONAL FLOOD HAZARD LAYER FIRMETTE

1DWLRQDO)ORRG +D]DUG / FEMA |) [illegible]

f : f 1



)HHW

f : f 1

/HJHQG

6(( ),6 5(3257)25 '(7$,/(' /(*(1' $1' ,1'(; 0$3)25),50

63(&,$/)/22 +$=$5' $5(:LWKRXW %DVH)ORRG (O =RQH $ 9 $:LWK %)(RU +HLJKW 5HJXODWRU\ )ORRGZD\

$QQXDO &KDQFH)ORR RI DQQXDO FKDQFH IO GHSWK OHVV WKDQ RQH DUHDV RI OHVV WKDQ RQ

27+(5 $5($6 2))/22' +$=$5')XWXUH &RQGLWLRQV &KDQFH)ORRG +D]DUG $UHD ZLWK 5HGXFHG)OR /HYHH 6HH 12WHV $UHD ZLWK)ORRG 5LVN

12 6&5((1 $UHD RI 0LQLPDO)ORRG (IIHFWLYH /205 27+(5 $5($6 $UHD RI 8QGHWHUPLQHG

*(1(5$/ 6758&785(6 &KDQQHO &XOYHUW RU /HYHH 'LNH RU)ORRGZD

&URVV 6HFWLRQV ZLW :DWHU 6XUIDFH (OHYDWL &RDVWDO 7UDQVHFW %DVH)ORRG (OHYDWLRQ /LPLW RI 6WXG\ -XULVGLFWLRQ %RXQGDU &RDVWDO 7UDQVHFW %DV 27+(5)($785(6 3URILOH %DVHOLQH +\GURJUDSKLF)HDWXUH

'LJLWDO 'DWD $YDLODEO 1R 'LJLWDO 'DWD $YDLOD 0$3 3$1(/6 8QPDSSHG

7KH SLQ GLVSOD\HG RQ WKH SRLQW VHOHFWHG E\ WKH XV DQ DXWKRULWDWLYH SURSHU

7KLV PDS FRPSOLHV ZLWK)(0$ V VWDQ GLJLWDO IORRG PDSV LI LW LV QRW YR 7KH EDVHPDS VKRZQ FRPSOLHV ZLWK) DFFXUDF\ VWDQGDUGV

7KH IORRG KD]DUG LQIRUPDWLRQ LV GH DXWKRULWDWLYH 1)+/ ZHE VHUYLFHV S ZDV H[SRUWHG RQ DW DQG GHV QRW UHIOHFW FKDQJHV RU DPHQGPHQWV VX WLPH 7KH 1)+/ DQG HIIHFWLYH LQIRUP EHFRPH VXSHUVHGHG E\ QHZ GDWD RYH

7KLV PDS LPDJH LV YRLG LI WKH RQH R HOHPHQWV GR QRW DSSHDU EDVHPDS OHJHQG VFDOH EDU PDS FUHDWLRQ G),50 SDQHO QXPEHU DQG),50 HIIHFWLY XQPDSSHG DQG XQPRGHUQL]HG DUHDV UHJXODWRU\ SXUSRVHV

%DVHPDS ,PDJHU\ 6RXUFH 86*6 1DWLRQDO 0DS

CREATE AMAZING.

CREATE AMAZING.