WASTEWATER COLLECTION SYSTEM STUDY

FOR

CITY OF OWATONNA

Study Report

November 2023

Presented to:

City of Owatonna
Owatonna, MN

Prepared By:

Advanced Engineering and Environmental Services, LLC, and Nero Engineering, LLC

AE2S Project Number
P14367-2021-002

OWATONNA WASTEWATER COLLECTION SYSTEM STUDY

FOR

CITY OF OWATONNA

PROFESSIONAL CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota

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GLOSSARY OF TERMS AND ABBREVIATIONS

A

AACE	American Association of Cost Engineers
AAF	Average Annual Flow
ACP	Asbestos Cement Pipe
AC-FT	Acre-Feet
ADD	Average Daily Demand
AE2S	Advanced Engineering and Environmental Services, Inc.

BC

C-Factor	Hazen-Williams Roughness Coefficient
CCTV	Closed-Circuit Television Inspection
CFS	Cubic Feet per Second
CIP	Capital Improvements Plan
CI	Cast Iron

D

DI	Ductile Iron
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association

EF

EPA	Environmental Protection Agency
FBO	Full Buildout
FPS	Feet per Second
FT	Feet
FT/1,000 FT	Feet per 1,000 Feet

G

GIS	Geographical Information System
GPCD	Gallons Per Capita Per Day
GPD	Gallons Per Day
GPM	Gallons Per Minute

H

HDPE	High Density Polyethylene
HGL	Hydraulic Grade Line
HP	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning

I

IITRI	Illinois Institute of Technology Research Institute
I&C	Instrumentation and Controls

JKLMN

kPa	Kilopascal
LiDAR	Light Detection and Ranging
MDD	Maximum Daily Demand
MG	Million Gallon
MGD	Million Gallons per Day
MMD	Maximum Month Demand
NAVD 88	North American Vertical Datum 1988
NFPA	National Fire Protection Association

OPQ

O&M	Operation and Maintenance
OPPC	Opinion of Probable Project Costs
OWCSS	Owatonna Wastewater Collection System Study
PACP	Pipeline Assessment Certification Program
PE	Polyethylene
PHF	Peak Hour Flow
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride

RSTUV

RCP	Reinforced Concrete Pipe
RDII	Rainfall-Derived Inflow and Infiltration
SCADA	Supervisory Control and Data Acquisition
STL	Steel
SWMM	Stormwater Management Model
TDH	Total Dynamic Head
US	United States
USGS	United States Geological Survey
VFD	Variable Frequency Drive

WXYZ

WWF	Wet Weather Flow
WWDF	Wastewater Duty Factor

CHAPTER 1 INTRODUCTION

1.1 Adopting the Facility Planning Process

Municipal wastewater utilities must continuously plan to identify system challenges. Wastewater collection system challenges come in many forms, such as population growth, increasing wastewater flows, aging infrastructure, increased regulatory standards and requirements, emerging technological trends and technological advancements, and effective capital improvements planning.

Facility planning provides policymakers and the public with a detailed report on infrastructure needs and the recommended actions to accommodate those needs. Facility planning helps establish priorities for the construction and implementation of necessary improvements. Lastly, a facility plan can be used as a tool to pursue and support requests for capital improvement funding. For these reasons and many others, the City has endeavored to study its wastewater collection system. The City recognizes that prudent management of annual operation and maintenance budgets, optimizing short-term capital improvement expenditures, and maximizing the benefits of long-term capital improvements requires a consistent direction for the utility, which can be attained through a robust planning process.

As the City adopts and cycles through the planning process, some uncertainties and changes can be expected. The impact of these changes can be best managed through a continued proactive planning approach. Responding to future challenges will be most appropriately accomplished through a fluid planning process that enables the City to maintain a clear vision and consistent direction for the Owatonna wastewater collection system.

The Owatonna Wastewater Collection System Study (OWCSS) will provide a guide for short-term and long-term capital improvements to Owatonna's wastewater collection system. The recommended improvements included in the Capital Improvements Plan (CIP) will be the basis for planning, financing, designing, constructing, and implementation of solutions to meet Owatonna's wastewater collection system needs for years to come.

1.2 Project Objectives and Deliverables

Key objectives of the OWCSS are as follows:

1) Provide an updated planning and service area map for the City's future wastewater collection system.
2) Characterize current wastewater flow patterns.
3) Project future wastewater flow.
4) Provide a comprehensive, calibrated, up-to-date wastewater collection system hydraulic model utilizing InfoSewer by Innovyze® that is integrated with the City's Geographic Information System (GIS), and facilitates continuous updates as the collection system is replaced, improved, and expanded.
5) Evaluate the City's existing wastewater collection system in terms of overall capacity and identify areas requiring improvements.
6) Provide a review of existing sewershed basins and delineate sewershed basins within the growth area.
7) Identify and describe wastewater collection system infrastructure improvements required to meet new service and population growth over identified planning horizons: A 30-year period was identified as the primary capital improvements planning horizon as well as assessment of building out in identified growth areas.
8) Provide a recommended CIP packet that includes detailed descriptions of recommended CIP projects, maps of the project, a proposed schedule, and engineer's opinion of probable project cost (OPPC).

1.3 Previous Studies

The following reports were utilized in preparation of the OWCSS:

- Owatonna WWTF Facility Plan- 2019 (Nero)
- Owatonna Inflow/Infiltration (I/I) Study- 2011 (Foth)
- Sanitary Sewer System Study, 2004 (Bonestroo)

CHAPTER 2 EXISTING SYSTEM

The existing wastewater collection and treatment system for the City's sewer service area includes the following components:

- Approximately 148 miles of sewer gravity main.
- Approximately 5.6 miles of sewer force main.
- Approximately 3,000 sewer manholes.
- 18 sewer lift stations.
- One municipal wastewater treatment facility (WWTF).

A map showing the existing wastewater collection system service area is shown in **Figure 2.1**. The components identified above provide sewer service to the City's existing population of approximately 26,400 people, which includes a combination of residential, commercial, and industrial service connections. The following sections provide an overview of the existing major components of the City's sewer collection, conveyance, and treatment system.

2.1 Overview of Existing Sewer Collection and Conveyance Facilities

The City sewer collection and conveyance facilities include manholes, gravity mains, force mains, and lift stations. These facilities collect sewer flows from residential, commercial, and industrial users and convey them to the City's WWTF. The collection system facilities are described in the following sections. **Figure 2.2** and **Figure 2.3** provide overviews of the existing sewer collection system by sewer main sizes and materials, respectively.

2.1.1 Municipal Sewer Gravity Collection

The wastewater collection system consists of approximately 148 miles of sewer gravity main varying in size from four inches up to 30 inches in diameter, with around 75 percent of the system consisting of 8-inch pipe. The sewer gravity main in the collection system consists primarily of vitrified clay (VCP) pipe (69 miles) and polyvinyl chloride (PVC) pipe (66 miles). The remaining pipe within the collection system consists of approximately 13 miles total of transite (TRS), reinforced concrete pipe (RCP), cast iron pipe (CIP), ductile iron pipe (DIP), high-density polyethylene (HDPE), and some small sections of undefined pipe material. Sewer gravity main information, including size and material, is included in **Table 2-1**, which is based on the City's GIS database.

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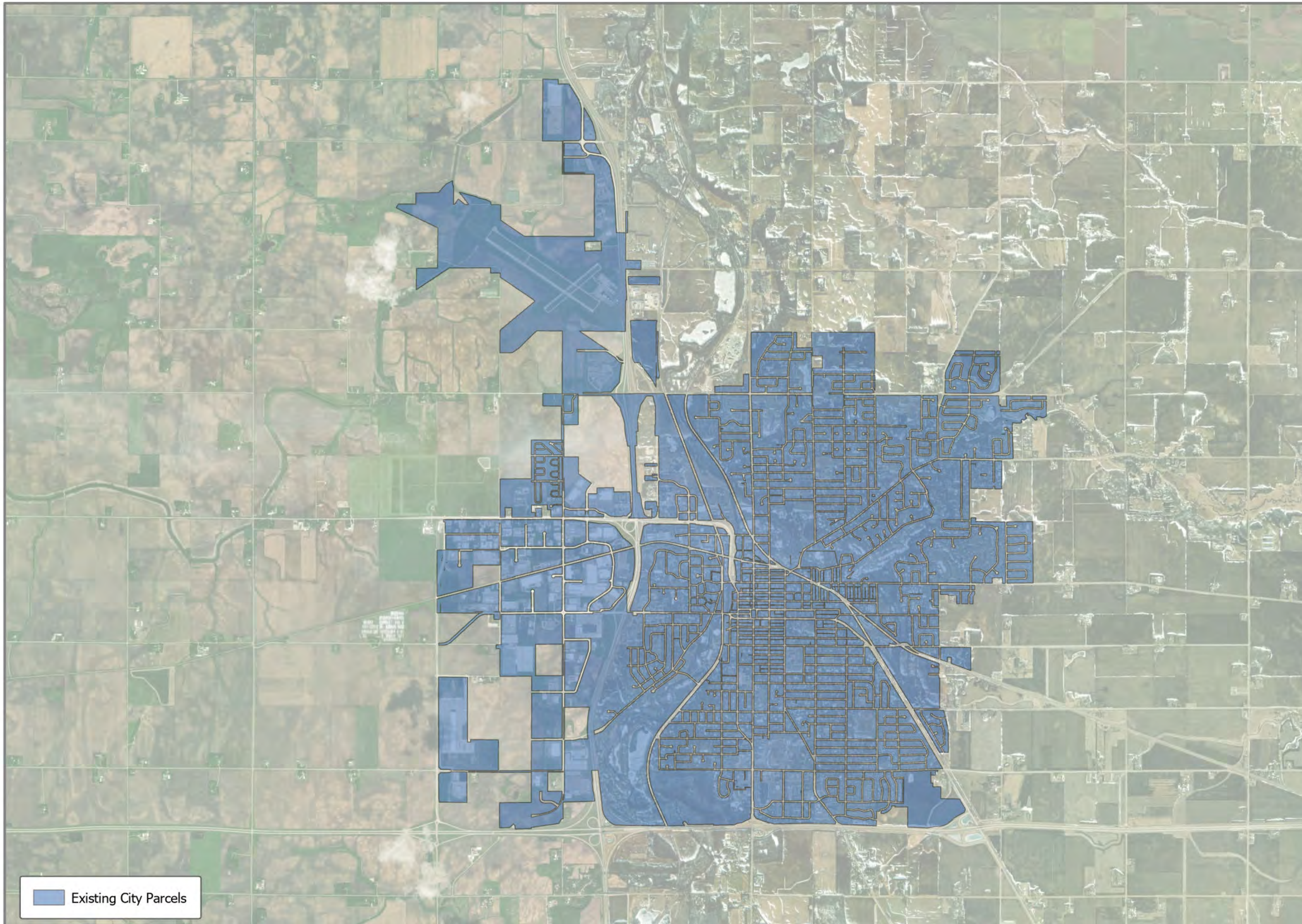

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1 inch equals 4,000 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 2.1

EXISTING WASTEWATER COLLECTION SYSTEM SERVICE AREA

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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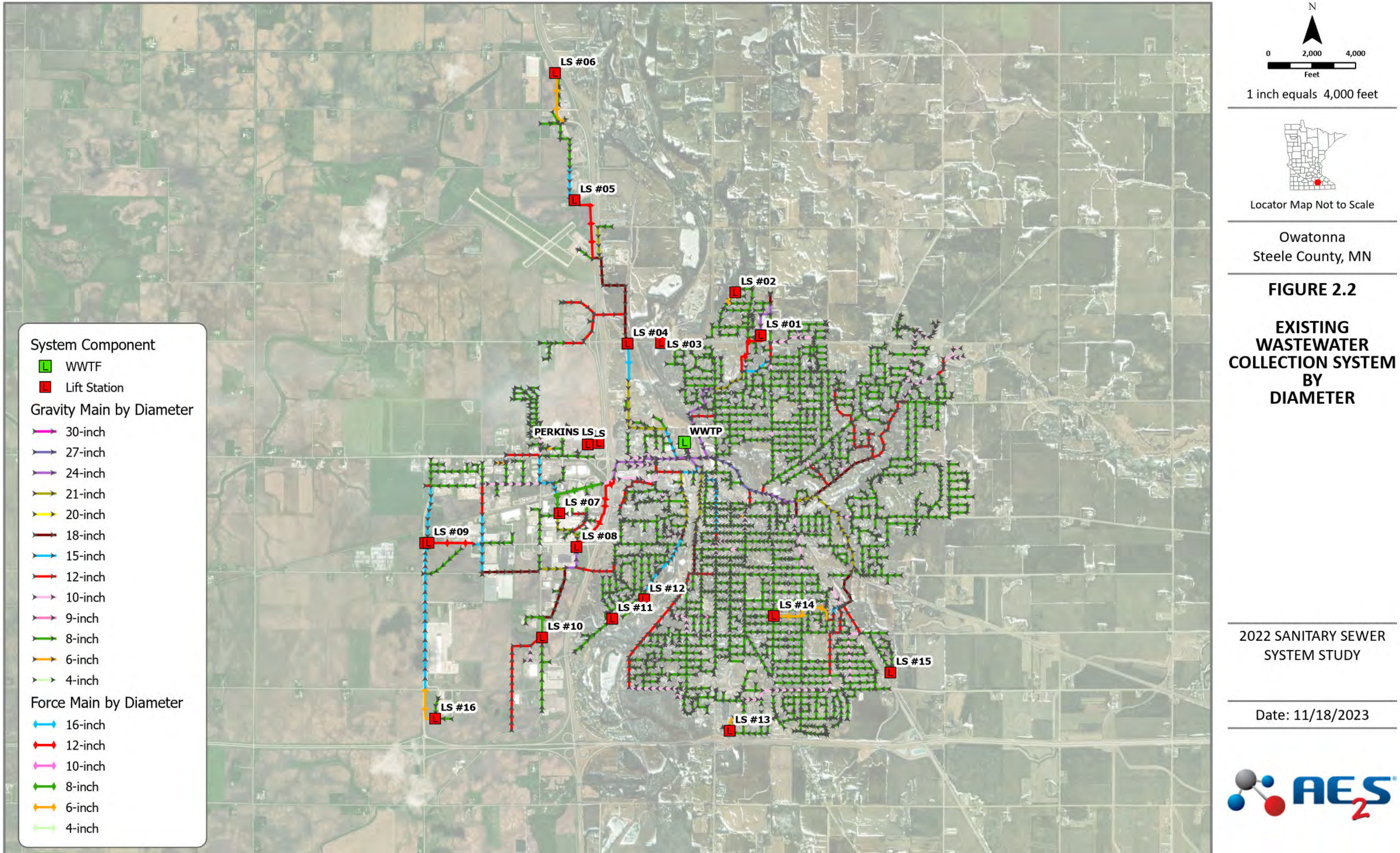

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FIGURE 2.2

EXISTING WASTEWATER COLLECTION SYSTEM BY DIAMETER

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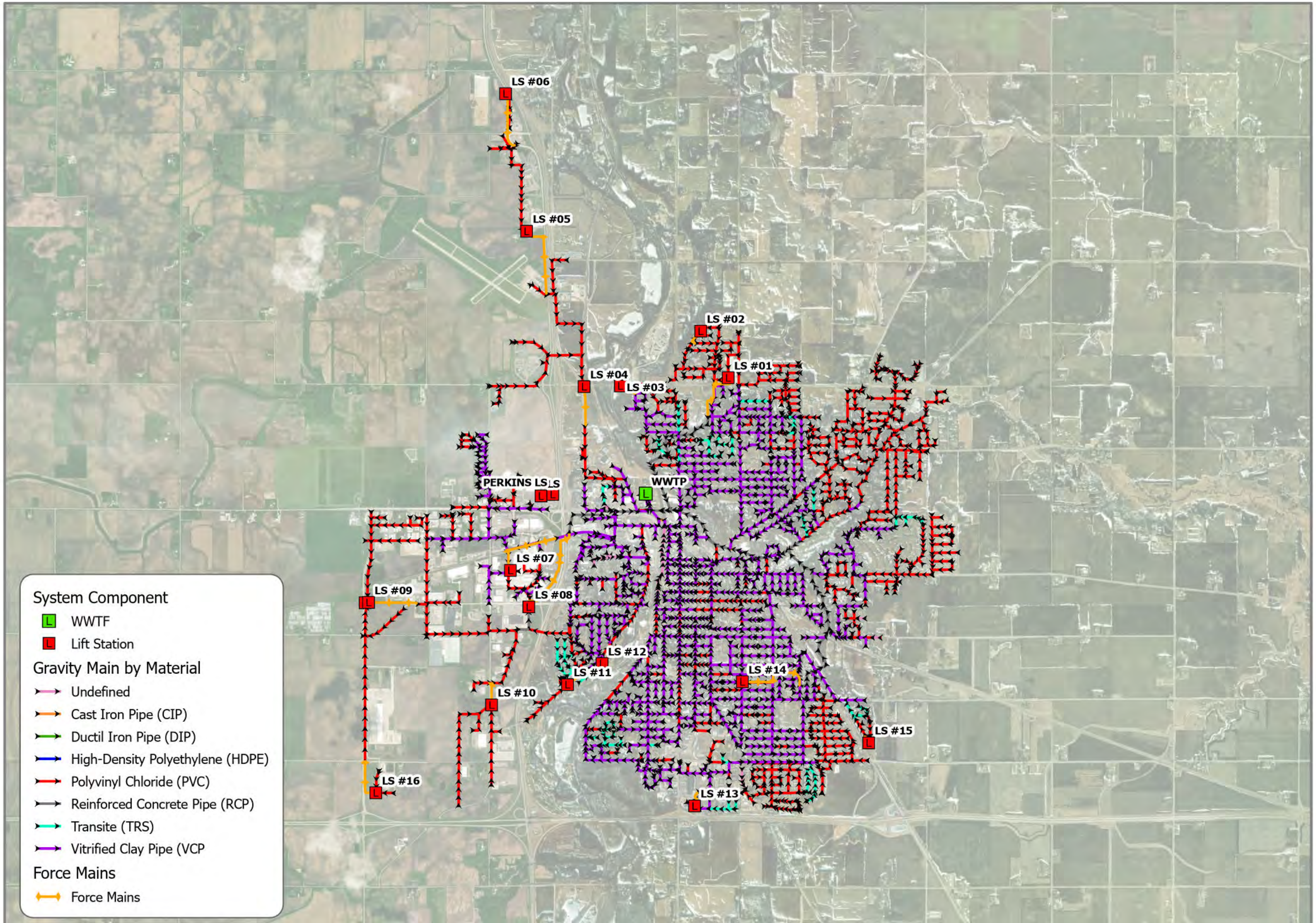

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FIGURE 2.3

EXISTING WASTEWATER COLLECTION SYSTEM BY MATERIAL

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Table 2-1: Existing System Sewer Gravity Main Information

Pipe Diameter (inches)	Length of Pipe by Material (feet)								Total Length (ft)	Total Length (mi)
	VCP	PVC	TRS	RCP	Undefined	CIP	DIP	HDPE		
4		208							208	0.04
6	426	1,052							1,478	0.28
8	298,802	251,171	36,315	51	4,257	467	92		591,155	111.96
9	230								230	0.04
10	30,049	15,774	52		350			205	46,430	8.79
12	19,890	31,462		542			94		51,988	9.85
15	10,552	16,740		676			27		27,995	5.30
18	2,713	16,213		2,662					21,589	4.09
20							51		51	0.01
21	1,965	11,346		7,316					20,627	3.91
24	629	2,602		12,095		624			15,950	3.02
27				2,798					2,798	0.53
30	685								685	0.13
Total (feet)	**365,941**	**346,569**	**36,368**	**26,139**	**4,607**	**1,091**	**263**	**205**	**781,183**	
Total (miles)	**69.31**	**65.64**	**6.89**	**4.95**	**0.87**	**0.21**	**0.05**	**0.04**		**147.95**

The large diameter gravity sewer main that serves large areas is classified as trunk sewer. There are several trunk sewers within the collection system and can range in size from 15-inches to 30-inches. Generally, the major trunk sewers (greater than 18-inches) were separated into nine segments and given a general identifier as "A-I". These major trunk lines are summarized in **Table 2-2** and are shown in **Figure 2.4**.

Table 2-2: Wastewater Trunk Line Summary

Trunk Line	Location
A	Gravity main ranging in size from 18-inch to 30-inch mainly along the east side of the Straight River from School Street to the WWTF.
B	Gravity main ranging in size from 21-inch to 30-inch along Maple Creek from Industrial Road approximately to Maple Drive.
C	18-inch and 21-inch gravity main along Izaak Walton Creek between Cherry Street and Bixby Road.
D	18-inch gravity main along Cherry Street from approximately Maple Drive to east of Spring Place.
E	Gravity main ranging in size from 18-inch to 24-inch along Hoffman Drive between Industrial Road and I-35.
F	21-inch and 24-inch gravity main along the east side of the railroad east of the Straight River between approximately Maple Creek and 3rd Avenue NE
G	Gravity main ranging in size from 15-inch to 21-inch along the east side of County Road 45 approximately to Hoffman Drive.
H	Gravity main ranging in size from 15-inch to 21-inch along Riverside Avenue between W Bridge Street and North Street.
I	18-inch and 21-inch gravity mains along Alexander Street from 24th Avenue to Lift Station 8, and from 32nd Avenue to Lift Station 8.

2.1.2 Force Main Conveyance System

The sewer force main conveyance system network consists of approximately 5.6 miles of pipe varying in size from four inches up to 16 inches in diameter. The sewer force main in the conveyance system consists primarily of PVC pipe (4.0 miles). CIP is the second most common force main material in the system (1.4 miles). The remaining force main consists of approximately 0.3 miles total of VCP and undefined pipe material. Sewer force main information, including size and material, is included in **Table 2-3**, which is based on the City's GIS database.

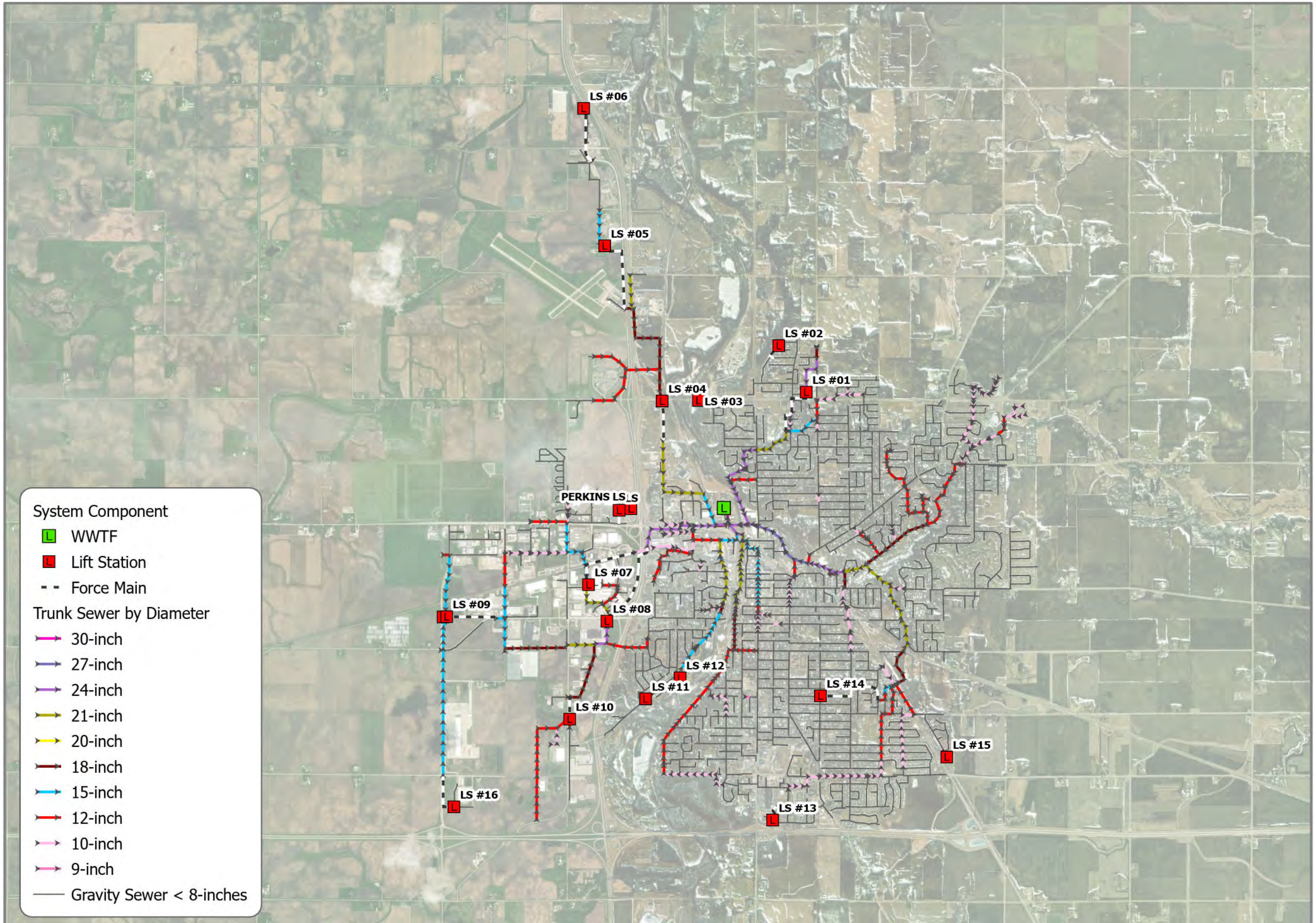

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FIGURE 2.4

EXISTING WASTEWATER COLLECTION TRUNK SYSTEM

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Table 2-3: Force Main Information

Pipe Diameter (inches)	Length of Pipe by Material (feet)				Total Length (ft)	Total Length (mi)
	PVC	CIP	Undefined	VCP		
4	803	231	914		1,948	0.37
6	4,935	3,949			8,884	1.68
8	1,280	2,961		570	4,811	0.91
12	11,939				11,939	2.26
16	2,090				2,090	0.4
Total (feet)	**21,047**	**7,141**	**28,188**	**570**	**29,672**	
Total (miles)	**3.99**	**1.35**	**5.34**	**0.11**		**5.62**

2.1.3 Municipal Lift Stations

The 18 municipal sewer lift stations transfer wastewater from one location to another within the sewer collection and conveyance system. **Table 2-4** summarizes each lift station's number, location, number of pumps, and general facility age. **Figure 2.4** shows the locations of each lift station within the sewer system.

Table 2-4: Municipal Sewer Lift Station Summary (Location and Arrangement)

Lift Station	Location	Number of Pumps	Lift Station Age
1	380 Autumn Hills Place NE	2	2006
2	3036 Northridge Lane NE	2	2003
3	475 26th Street NW	2	2005
4	657 26th Street NW	3	1997
5	2331 Heritage Place NW	2	1997
6	4900 Frontage Road W	2	1997
7	2310 4th Street NW	2	1967
8	2015 Bridge Street W	3	1989
9	3950 Bridge Street W	2	2008
10	1155 24th Street SW	2	1996
11	1002 Lemond Road SW	2	1990
12	600 Riverwood Drive SW	2	1979
13	222 Cedardale Drive SE	2	1976
14	925 Lincoln Avenue S	1	1965
15	1550 Greenleaf Road SE	2	2001
16	3705 18th Street SW	2	
LS	475 26th Street NW		1975
Perkins	Perkins Lift Station		

2.2 Overview of Existing Wastewater Treatment Facility

The existing Owatonna WWTF was commissioned in 1989. It was designed to treat 5 million gallons per day (MGD), as average wet weather flow (AWWF) and implemented the following liquid train treatment processes:

1. Raw wastewater screening
2. Raw wastewater pumping
3. Influent flow monitoring (flume)
4. Grit removal
5. Primary clarification with scum removal
6. Activated sludge (aeration basins)
7. Final Clarification with scum removal
8. Tertiary sand filtration
9. Chlorine disinfection

Biosolids are processed through anaerobic digestion, dissolved air floatation (DAF) thickening, sludge storage, dewatering, biosolids cake storage and land application equipment.

The WWTF is currently undergoing a plant expansion and upgrade. The 5 MGD facility will be expanded to treat 9.1 MGD AWWF. The process will also change slightly to incorporate membrane bioreactors (MBR), which replaced expanding the final clarifiers and tertiary filters. Additionally, DAF thickening of the waste activated sludge (WAS) will be replaced with drum thickeners. Most of the original 1989 equipment in the retained treatment processes will be upgraded.

The hydraulic capacity of the WWTF expansion is limited to the capacity of the raw wastewater pumping and the MBR permeate pumping. The peak hourly flow (also peak instantaneous) of the WWTF is 18.2 MGD (12,610 gpm).

CHAPTER 3 BASIS OF PLANNING

To plan for future growth of the existing sewer collection system, an evaluation needs to occur to quantify how much growth can be expected during planning periods. This is accomplished by evaluating future growth in specific planning periods, which helps guide the timing of capital improvement projects required to meet future growth conditions.

3.1 Planning Periods

The establishment of planning periods is an important component in the development of the collection system plan. Two planning periods were established, including a 30-year period and a buildout scenario. The 30-year planning period was established to coincide with the planning period of the wastewater treatment facility and comprehensive planning horizons. The buildout scenario was established to define the wastewater collection needs for complete infill of the growth area discussed in the following paragraphs.

Capital improvement projects determined in this planning effort were placed into the two planning periods based on infrastructure capacity, assumed growth rates, and discussions with City staff. This process is further discussed in **Chapter 9**.

3.2 Study Service Area

For systems experiencing growth, such as Owatonna, defining the study service area is necessary to provide a framework to: 1) define system capacity milestones, 2) develop appropriate phasing of capital improvements, and 3) strategically integrate improvements with existing infrastructure. The ultimate goal of this approach is to maximize the economic benefit of the improvements.

The City's study service area was evaluated for future growth trends. The study service area was developed by reviewing current planning documentation, considering previously completed planning documents, evaluating geographical boundaries, and discussions with City staff. These boundaries establish the future growth areas. The study service area boundary used for the collection system evaluation is shown in **Figure 3.1**.

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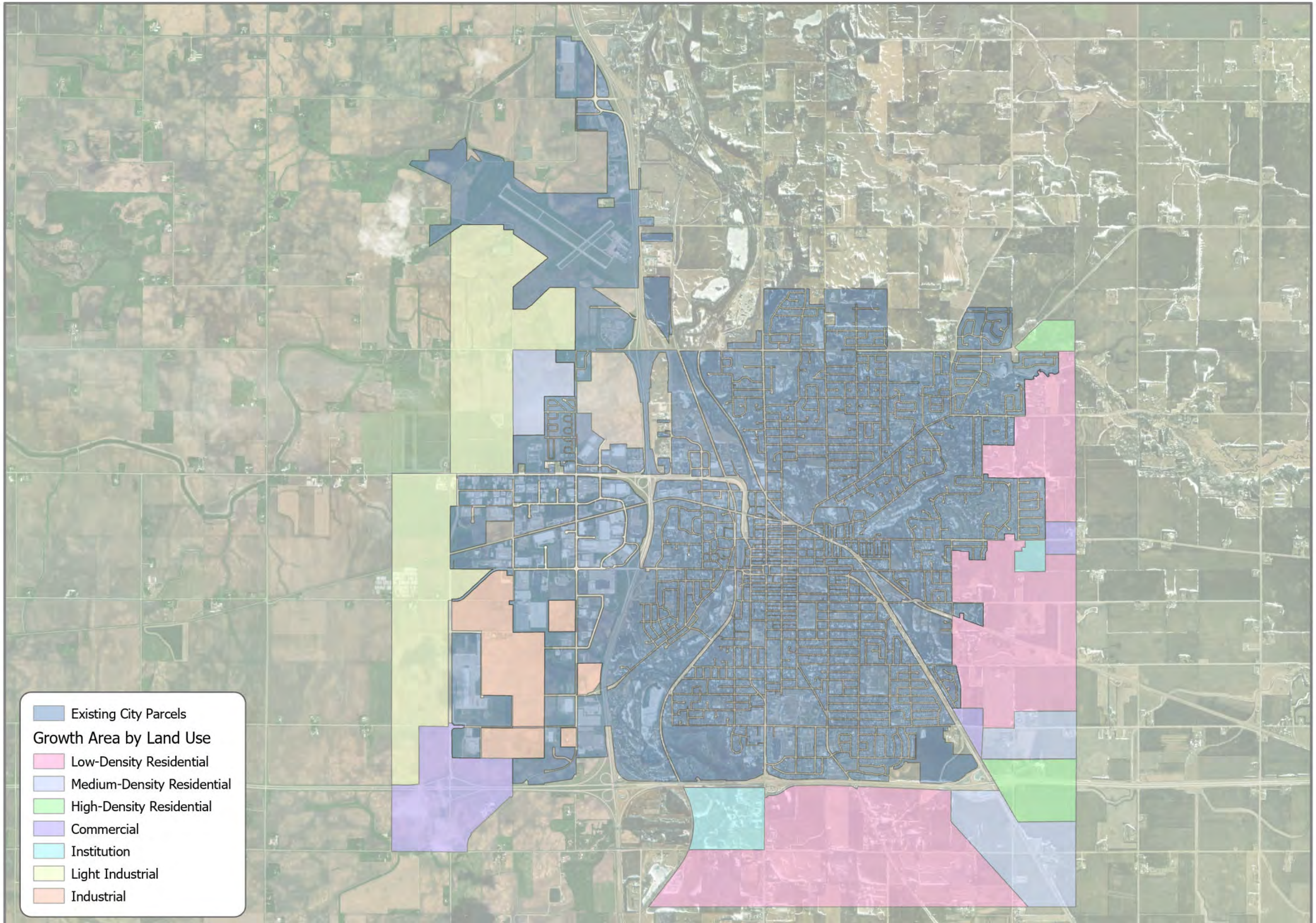

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FIGURE 3.1

WASTEWATER COLLECTION SYSTEM FUTURE SERVICE AREA

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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3.2.1 Population and Growth Rates

For predicting growth trends of Owatonna's study service area, an estimated annual population growth rate was evaluated based on historic U.S. Census Bureau population trends, recent growth patterns and trends, and Owatonna planning estimates. The past trend of population growth in Owatonna is presented in the table below and is based on U.S. Census Bureau data since 1990. Over the years, the growth rate has experienced some variations from a very slow 0.3 percent per year to a relatively fast growth rate of 1.4 percent per year. The average annual growth rate for the past 30 years is 1.1 percent per year, as shown in **Table 3-1**. Historically (since 1960), the population growth has been fairly consistent with an average increase of about 230 people per year.

Table 3-1: Owatonna Population Trends

Year	Population	Percent Population Growth for the Period	Average Population Growth per Year
1960	13,409		
1970	15,341	1.4%	193
1980	18,632	2.0%	329
1990	19,766	0.6%	113
2000	22,608	1.4%	284
2010	25,560	1.2%	295
2020	26,402	0.3%	84
30-Year Historical Average Growth Rate = 1.1%			

The 30-year population established for the WWTF was estimated to be 34,700 people. The future population for this study was estimated to follow a similar planning population. A 30-year population of 34,700 people approximates to 0.9 percent annual growth rate which nearly matches the historic annual growth rate of 1.1 percent. The growth estimated for this study is shown **Table 3-2**.

Table 3-2: Owatonna Projected Population

Year	Population	Average Population Growth per Year
2020 (current)	26,402	
2030	28,920	252
2040	31,679	276
2050 (30-year)	34,700	302
30-Year Projected Average Growth Rate = ~0.9%		

Per U.S. Census Bureau's 2020 population data for Owatonna, the average household size of owner-occupied housing units is 2.4 persons. The City of Owatonna has historically used 2.50 persons per dwelling unit as an average, and this number will continue to be used for this evaluation as it is a conservative estimate for residential housing units. Multi-family units will be estimated at the same rate.

3.2.2 Land Use Plan and Growth Projections

The information associated with each planning horizon is based on data provided by the City of Owatonna. For each planning horizon, the City identified areas of Owatonna expected to experience growth within current City limits or expected to be annexed into the City based on development trends. The seven (7) land use designations were identified by the City for future growth areas are as follows:

- Residential – Low Density
- Residential – Medium Density
- Residential – High Density
- Commercial
- Institution
- Light Industrial
- Industrial

Land use designations serve as a guide for development in the future. Wastewater originating from a parcel of land will depend on the development type. For the purposes of this study the land use categories are summarized as follows:

- Low-density residential development can occur at a density of up to 5 dwelling units per acre. For wastewater loading this was reduced by 30 percent to account for right of way. The effective dwelling units are calculated at 3.5 units per acre.
- Medium-density residential development can have densities of up to 12 dwelling units per acre calculated. For wastewater loading this was reduced by 30 percent to account for right of way. The effective dwelling units are calculated at 8.4 units per acre.
- High-density residential development can have densities up to 20 dwelling units per acre calculated. For wastewater loading this was reduced by 30 percent to account for right of way. The effective dwelling units are calculated at 14 units per acre.
- Commercial development can have a range of properties from office, food services, and general service businesses.

- Institutional land use was identified for two areas that may develop into future education facilities. Each institutional area was assumed to have approximately 500 students and 75 teachers. The south institutional area was identified as having potential for more wastewater generation due to being a high school with showering facilities.
- Light Industrial development was generally categorized as warehouse type facilities.
- Industrial development was generally categorized as having the potential for higher wastewater generation when compared to light industrial land use.

The City provided GIS shapefiles for each land area planned for development. A map summarizing the growth areas was previously provided as **Figure 3.1**. For each growth area, the future total buildout acreage was calculated and presented in **Table 3-3**. **Table 3-3** also calculates the effective buildout acreage assuming a 30 percent reduction for right of way.

As discussed in the previous section, the 30-year planning horizon is included for the study. Approximately 13 percent of the buildout acreage is required to be filled in to meet the planning population of 34,700 people. **Table 3-4** shows the approximate acreage (gross and effective acreage) required to meet the 30-year growth period.

Table 3-3: Future Buildout Area

Future Land Use	Buildout Gross[1] Acreage	Buildout Effective[2] Acreage
Residential – Low Density	2,405	1,683
Residential – Medium Density	737	516
Residential – High Density	257	180
Commercial	489	342
Institutional	244	156
Light Industrial	1,517	1,062
Industrial	479	335
Total	**6,106**	**4,274**

[1]Gross acreage including right of way.
[2]Effective acreage assumes 30% for right of way

Table 3-4: Anticipated Service Area Growth for the 30-year Planning Period

Future Land Use	30-yr Growth Gross[1] Acreage	30-yr Growth Effective[2] Acreage*
Residential – Low Density	2,405	309
Residential – Medium Density	737	95
Residential – High Density	257	33
Commercial	489	63
Institutional	244	29
Light Industrial	1,517	195
Industrial	479	62
Total	**6,106**	**785**

[1]Gross acreage including right of way.
[2]Effective acreage assumes 30% for right of way

CHAPTER 4 WASTEWATER CHARACTERIZATION

Wastewater characterization involves the analysis of measured wastewater flows to better understand the City's wastewater generation trends. Wastewater characterization is necessary to assess the capabilities of the City's existing facilities to adequately address current wastewater needs and ensure the design and functionality of proposed wastewater system components can sufficiently accommodate future wastewater needs.

This chapter provides an overview of the City's historical wastewater generation trends and defines recent wastewater generation and wastewater forecasting trends. Additionally, this chapter presents the City's projected future wastewater needs for the different planning periods identified in **Chapter 3**. The City's average total wastewater flow trends are shown in **Figure 4.1** and precipitation events which represents the City's daily wastewater treatment facility (WWTF) influent flow from November 2018 through August 2022.

Figure 4.1 Wastewater Treatment Facility Daily Inflow (MGD) and Precipitation (in)

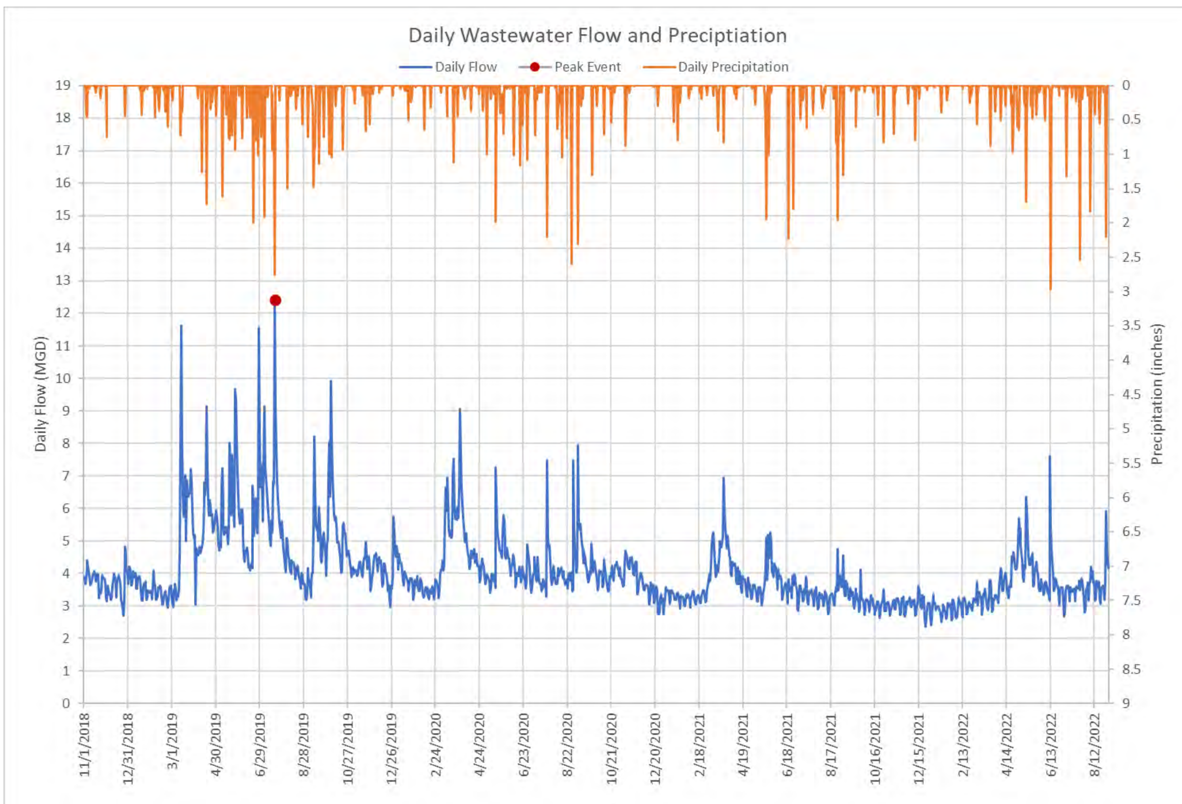

Figure 4.1 will be reviewed in detail in the following sections to determine the City's past wastewater trends as well as anticipated future wastewater flows. Results from the wastewater

analysis were incorporated into the hydraulic collection system model to evaluate both existing and future collection system performance. The model was also used to determine future recommended collection system capital improvements.

4.1 Existing Wastewater Flow Analysis

The following paragraphs outline various wastewater flow terms. Each of the flow terms are used for a specific purpose in wastewater system planning. Additionally, all flow terms presented hereafter in this chapter are represented in terms of million gallons per day (MGD) unless otherwise stated. Wastewater treatment facility daily inflow was provided for November 2018 through August 2022. The daily WWTF inflow data is summarized in **Table 4-1** and was the data used to calculate the flow parameters.

Table 4-1: Wastewater Treatment Facility Daily Inflow Summary (MGD)

	2018	2019	2020	2021	2022
January		3.68	3.93	3.25	2.89
February		3.41	3.63	3.26	2.98
March		5.43	5.73	4.65	3.24
April		5.57	4.62	3.88	3.87
May		6.23	4.49	3.85	4.41
June		5.54	4.13	3.70	3.80
July		6.52	4.08	3.34	3.41
August		4.12	3.98	3.36	3.75
September		4.73	4.61	3.40	
October		5.58	3.95	3.03	
November	3.85	4.17	4.09	3.02	
December	3.61	4.14	3.43	3.05	
Minimum Month	3.61*	3.41	3.43	3.02	2.89*
Average Month	3.73*	4.93	4.22	3.48	3.54*
Maximum Month	3.85*	**6.52**	5.73	4.65	4.41*
Wet Weather					
Average Annual	**4.21**	(2019-2021)			
Wet Weather	**2.31**	(Peak Month less Average Annual)			
Total Model Allocation	**6.52**	(Average Annual + Wet Weather)			
*Incomplete data set year.					

4.1.1 Average Annual Flow

Average Annual Flow (AAF) is calculated by taking the annual wastewater influent flow volume divided by the number of days in a given year. The AAF calculated for the years with complete data sets (2019-2021) is 4.21 MGD. The AAF ranged from 3.48 MGD in 2021 to 4.93 MGD in 2019, which was a wet year marked with high snowfall, large rain events, and high groundwater.

4.1.2 Maximum Monthly Flow

Maximum Monthly Flow (MMF) is defined by taking an average of the daily flows for each month and selecting the month when the maximum flows occurred during each calendar year. This is commonly referred to as Average Wet Weather Flow (AWWF) for regulatory purposes. The MMF for 2019 to 2021 is 6.52 MGD, which occurred in July 2019. The MMF ranged from 4.65 MGD in 2021 to 6.52 MGD in 2019.

4.1.3 Maximum Daily Flow

Maximum Daily Flow (MDF) is defined as the largest amount of wastewater generated in a given day over a one-year timespan. The largest MDF occurred in July 2019 at 12.42 MGD. The MDF is dependent on groundwater, snowmelt, and rainfall events as evident by the range of dates and flows. MDF ranges from 6.94 MGD in 2021 to 12.42 MGD in 2019. Historical MDFs is summarized in **Table 4-2**.

Table 4-2: Wastewater Treatment Peak Day Inflow Summary (MGD)

	2018	2019	2020	2021	2022
January		4.21	4.85	3.57	3.36
February		4.08	3.85	3.49	3.27
March		11.61	9.07	6.94	3.79
April		9.14	6.13	4.56	5.00
May		9.67	7.26	5.27	6.35
June		11.55	4.90	4.32	7.60
July		**12.42**	7.47	3.89	3.84
August		5.10	7.47	4.75	5.91
September		8.22	7.95	4.55	
October		9.92	4.44	3.51	
November	4.40	4.98	4.71	3.29	
December	4.83	5.76	4.00	3.62	
Maximum Day	4.83	**12.42**	9.07	6.94	7.60
Date	12/27/18	**7/20/19**	7/21/19	7/8/19	6/13/22

4.1.4 Peak Hourly Flow and Peaking Factor Evaluation

Peak Hourly Flow (PHF) is the largest volume of wastewater flow to be received during a one-hour period expressed as a volume per unit of time. The WWTF should be sized to accommodate the PHF. Three methods were explored for evaluating PHF for the City, which are provided below.

4.1.4.1 Ratio of Peak Hourly Flow to Design Average Flow

Great Lakes Upper Mississippi River Board (10-States Standards) design guidelines for public sewage systems which contains an equation to calculate peak hourly flow. The equation[1] is as follows, where the variable "P" is population in thousands.

$$Design\ Peak\ Hourly\ Flow = \left(\frac{18 + \sqrt{P}}{4 + \sqrt{P}}\right) * Design\ Average\ Flow$$

The equation allows a peaking factor to be calculated based on population. Once the peaking factor is calculated, it is multiplied by the design average flow, or in this case the AAF, to calculate a design PHF. In 2020, the US Census population estimate for the City was 26,402. Using the 2020 US Census Estimate, the peaking factor is calculated as 2.53. Note the peaking factor formula is stated to assume 100 gallons per capacity per day and includes normal inflow and infiltration for modern construction techniques.

4.1.4.2 Metropolitan Council Flow Variation Factors for Sewer Design

The Metropolitan Council is the regional policy-making body, planning agency, and provider of essential services for the Minneapolis-St. Paul metropolitan region in Minnesota. The Metropolitan Council Environmental Services (MCES) division provides water and wastewater services to the Minneapolis-St. Paul metropolitan area.[2]

The Council developed a 2040 Water Resources Policy Plan in partnership with local communities, watershed management organizations, and other stakeholders.[3] Included in this plan were PHF factors for sewer design with different degrees of expected I/I, which are provided as **Table 4-3**[4] and **Table 4-4**[5]. These tables were both considered for the OWCSS and compared to the other peaking factor methods.

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[1] Fair, G.M. and Geyer, J.C. "Water Supply and Waste-water Disposal" 1st Ed. John Wiley & Sons, Inc. New York, (1954), P. 136

[2] Metropolitan Council. *Who We Are*. https://metrocouncil.org/About-Us/The-Council-Who-We-Are.aspx.

[3] Metropolitan Council. *2040 Water Resources Policy Plan*. https://metrocouncil.org/Wastewater-Water/Planning/2040-Water-Resources-Policy-Plan.aspx.

[4] Metropolitan Council. *2040 Water Resources Policy Plan, Table A1*. Page 61. May 20, 2015.

[5] Metropolitan Council. *2040 Water Resources Policy Plan, Table A2*. Page 62. May 20, 2015.

Table 4-3: MCES Flow Variation Factors for Sewer Design (Smaller Peaking Factors)

AAF	PHF Factor	AAF	PHF Factor
0.00 – 0.11	4.0	1.90 – 2.29	2.8
0.12 – 0.18	3.9	2.30 – 2.89	2.7
0.19 – 0.23	3.8	2.90 – 3.49	2.6
0.24 – 0.29	3.7	3.50 – 4.19	2.5
0.30 – 0.39	3.6	4.20 – 5.09	**2.4**
0.40 – 0.49	3.5	5.10 – 6.39	2.3
0.50 – 0.64	3.4	6.40 – 7.99	2.2
0.65 – 0.79	3.3	8.00 – 10.39	2.1
0.80 – 0.99	3.2	10.40 – 13.49	2.0
1.00 – 1.19	3.1	13.50 – 17.99	1.9
1.20 – 1.49	3.0	18.00 – 29.99	1.8
1.50 – 1.89	2.9	Over 30.00	1.7

Table 4-4: MCES Flow Variation Factors for Sewer Design (Larger Peaking Factors)

AAF	PHF Factor	AAF	PHF Factor
<0.10	4.5	2.51 – 3.00	3.2
0.11 – 0.20	4.4	3.01 – 3.50	3.1
0.21 – 0.30	4.3	3.51 – 4.00	3.0
0.31 – 0.40	4.2	4.01 – 4.50	**2.9**
0.41 – 0.50	4.1	4.51 – 5.00	2.8
0.51 – 0.60	4.0	5.01 – 6.00	2.7
0.61 – 0.70	3.9	6.01 – 8.00	2.6
0.71 – 0.80	3.8	8.01 – 10.00	2.5
0.81 – 1.00	3.7	10.01 – 12.00	2.4
1.01 – 1.20	3.6	12.01 – 16.00	2.3
1.21 – 1.50	3.5	16.01 – 20.00	2.2
1.51 – 2.00	3.4	20.01 – 30.00	2.1
2.01 – 2.50	3.3	> 30.00	2.0

As previously mentioned, the AAF for Owatonna was calculated at 4.21 MGD. Using this value in **Table 4-3** and **Table 4-4**, peaking factors of 2.4 and 2.9 were determined. Ultimately, a peaking factor of 3.5 is required due to high inflow and infiltration experienced through past rain events and observed during field testing. A peaking factor of 3.5 provides a more conservative value for planning and provides considerations for I/I susceptibility. Peaking is discussed further in the flow monitoring and calibration sections of the report.

4.1.4.3 Observed Hourly Wastewater Flow Records

The WWTF does not track hourly wastewater flow records and therefore, could not be used as reference for this study.

4.1.4.4 Peak Hourly Flow Summary

A summary of the PHF evaluation is provided below in **Table 4-5**.

Table 4-5: PHF and Peaking Factor Evaluation Summary

Source	Parameter	Peaking Factor	Peak Hourly Flow
10-States	Population: 26,402	2.53	10.65 MGD
MCES	4.21 MGD	2.4-2.9	10.10 – 12.21 MGD
Recommended Peaking Factor		**3.5**	14.73 MGD

The City should use a peaking factor of 3.5 for planning purposes. This is considered a city-wide peaking factor for planning purposes. The 3.5 peaking factor will be used to plan for future PHF rates.

4.1.5 Rainfall and Seasonal Wastewater Variations

The daily WWTF inflow data was used to analyze the three main components that comprise wastewater flow at the WWTF. The three components to wastewater flow are generally described as follows and discussed in more detail in the following sections:

- **Domestic Flow:** The portion of wastewater flow originates from domestic water use including residential, commercial, and industrial activities. This flow is considered to be relatively steady throughout the year and can be estimated from indoor metered water use.
- **Base Infiltration (BI):** The portion of wastewater flow that originates from ground water and can vary by season and depth of the ground water table.
- **Rainfall Derived Inflow and Infiltration (RDII):** The portion of wastewater flow that originates from rainfall events as inflow and infiltration into the collection system.

4.1.5.1 Domestic Flow based on Metered Customer Water Usage

Water meter records are used to estimate the domestic flow portion of wastewater flow which originates from domestic, commercial, and industrial water use. The City measures water consumption through customer water meters.

- **Domestic Flow:** the Non-Irrigation Demand of **3.5 MGD** from March 2021 was used as the base domestic flow allocated within the hydraulic model. Flow metering identified areas that required additional flow so the total domestic flow was increased to 4.21 MGD as the AAF within the hydraulic model.

4.1.5.2 Ground Water Infiltration

Inflow and Infiltration (I&I) is a critical consideration when evaluating collection system capacity. With the presence of groundwater, infiltration can influence the system during dry weather. This is referred to as base groundwater infiltration (BI), which is included in DWF and AAF at the WWTF. During and after rain events, flows within the collection system increase in response to the rainfall. This increase in wastewater flow is known as rainfall derived inflow and infiltration (RDII). The BI and RDII flow components are combined with diurnal peak domestic flows to define the total wastewater flow conveyed by the wastewater collection system and treated at the WWTF. This peak wet weather flow condition is a worst-case scenario and used in evaluating a collection system.

The daily WWTF historic wastewater flow summary (**Figure 4.1**) shows the range of flows and trends that the WWTF experiences over the course of winter, spring runoff, and wet weather seasons. BI varies throughout the year and is influenced seasonally by spring runoff/snowmelt and by dry or winter conditions. The difference between the maximum monthly flow (6.52 MGD) and the average annual flow (4.21 MGD) is the representation of groundwater within the system. Therefore 2.31 MGD was added to the model as the BI as groundwater infiltration. The method used to allocate the groundwater was gallons per foot of pipe or 3.0 gal/day/ft. The following observations are made from the analysis:

- The peak months for WWTF I&I vary from March to July depending on the timing of snow melt, high ground water, and rain events. The maximum month flow of BI occurred during July of 2019.
- **2.31 MGD** of BI will be allocated into the model as non-peakable flow during the wet weather scenario.

4.1.6 Summary of Existing System Model Loading

Table 4-6 provides an overview of the loads allocated within the model to establish the existing system scenarios.

Table 4-6: Existing System Model Flow Summary

Flow Condition	Existing
Model Average Annual Flow	4.21
Model Base Infiltration	2.31
Model Wet Weather Average	6.52
Modeled Peak[1]	17.04

[1]AAF is peaked BI is not peaked

4.1.7 Comparison of WWTF and WWCS Planning

Ideally a comprehensive sewer plan would be completed ahead of facility planning for a WWTF since the flows coming from the system predicate the capacity needed at the WWTF. During the facility planning phase, finished in 2019, Nero did a higher-level evaluation of the collection system and growth planning to establish the design flows for the WWTF. The following table summarizes the flow comparisons developed by this sewer study and the facility plan (and ultimately final design).

Table 4-7: WWTF Planning vs Sewer Study Plan

Evaluation Component	2019 WWTF Facility Plan Value	2022 Sewer Study Value
30-year Population Growth (2050)	34,710	34,700
30-year Population Growth Flows (mgd)	0.686	0.540
Average Wet Weather Flow (mgd)	9.1	7.1
Peak Hourly Flow (mgd)	18.2	18.5

As shown, fortunately the two studies performed three years apart generally come to very similar conclusions and the flow projections between the two systems align very well. This indicates that the 30-year plan for both systems should be fairly representative of the 2050 projections.

4.2 Future Wastewater Flow Projections

Historical wastewater trends and data are frequently used to project future wastewater flows. Wastewater flow projections are crucial when sizing future infrastructure and developing capital improvement plans. For this facility plan, future wastewater flow projections were estimated using a land use projection method, where anticipated land use type and either associated number of dwelling units or area (acres) is multiplied by a wastewater duty factor (WWDF).

The first component of the land use projection method was to analyze water usage by land use class and land use area (in acres) to determine how much water the various land use classes use per acre. The planning areas provided by the City contained projections within the broad land use categories of residential, commercial, and industrial. **Table 4-8** provides a summary of the duty factors.

Table 4-8: Land Use Duty Factor Summary

Land Use	Dwellings per Acre	Effective Dwellings per Acre[1]	Duty Factor (gpad)[1,2]
Low Density Residential	5	3.5	570
Medium Density Residential	12	8.4	1,365
High Density Residential	20	14	2,275
Commercial			750
Institutional[3]			45-200
Light Industrial			250
Industrial			1000

[1]Accounts for 30% right of way.
[2]Based on 2.5 people per dwelling unit and 65 gpcd.

The following is summary of how the duty factors were estimated:

- Residential wastewater duty factors were calculated based on 2.5 people per dwelling unit and an wastewater generation of 65 gpcd.
- Commercial wastewater duty factor was estimated based on review of winter water usage of existing commercial accounts and acreage.
- Institutional wastewater duty factors were based on each parcel accomodating 500 students at 75 staff. The northeast (smaller parcel) was based on 12 gpcd and the southwest (larger parcel) was based on 15 gpcd to accommodate shower facilities.
- Light industrial wastewater duty factor was estimated based on storage type facilities with minimal office or personnel space.
- Industrial wastewater duty factors was estimated based on medium water usage duty factor.

Table 4-9 shows a summary of the system to meet the 30-year population. The table provides an overview of the land use, total acreage, developed acreage, wastewater duty factors and projected increase in average annual flow and population. The following provides a summary of the 30-year growth:

- Develop Acres: 785 acres are assumed to be developed (excluded right of way).
- Additional Dwellings: 2,339 dwelling units are assumed to contribute wastewater flow.
- Population: The population is estimated to increase by 8,300 people for a total population of 34,700.
- Average Annual Flow Increase: The AAF is expected to increase by 0.54 MGD due to the population growth.

Table 4-10 shows a summary of the system should the identified growth areas completely fill in as a buildout scenario. The table provides an overview of the land use, total acreage, developed acreage, wastewater duty factors and projected increase in average annual flow and population. The following provides a summary of the buildout growth:

- Develop Acres: 4,274 acres are assumed to be developed (excluded right of way).
- Additional Dwellings: 18,201 dwelling units are assumed to contribute wastewater flow.
- Population: The population is estimated to increase by 64,578 people for a total population of 90,980.
- Average Annual Flow Increase: The AAF is expected to increase by 4.2 MGD due to the population growth.

Table 4-9: 30-Year Growth Projected Loading

	Total Acreage	Effective Acreage*	30-Yr Developed Effective Acres	Effective Dwellings per Acre or GPAD	30-Yr Dwellings	30-Yr Population Growth	Average Annual Flow from Growth (gpd)
Residential - Low Density	2,405	1,683	309	3.5	1,082	2,705	175,797
Residential - Medium Density	737	516	95	8.4	795	1,988	129,246
Residential - High Density	257	180	33	14.0	462	1,155	75,088
Commercial	489	342	63	750 gpad		724	47,089
Institutional - NE	35	25	5	197 gpad		14	894
Institutional - SW	188	132	24	45 gpad		17	1,098
Light Industrial	1,517	1,062	195	250 gpad		750	48,737
Industrial	479	335	62	1,000 gpad		947	61,551
Total	**6,106**	**4,274**	**785**		**2,339**	**8,300**	**539,500**

Table 4-10: Buildout Growth Projected Loading

	Total Acreage	Buildout Developed Effective Acres	Effective Dwellings per Acre or GPAD	Buildout Dwellings	Population Growth	Average Annual Flow from Growth
Residential - Low Density	2,405	1,683	3.5	8,417	21,043	1,367,787
Residential - Medium Density	737	516	8.4	6,188	15,471	1,005,596
Residential - High Density	257	180	14.0	3,595	8,988	584,220
Commercial	489	342	750 gpad		5,637	366,375
Institutional - NE	35	25	197 gpad		107	6,959
Institutional - SW	188	132	45 gpad		131	8,543
Light Industrial	1,517	1,062	250 gpad		5,834	379,200
Industrial	479	335	1,000 gpad		7,368	478,900
Total	**6,106**	**4,274**		**18,201**	**64,578**	**4,197,580**

4.3 Summary of Existing System Model Loading

Table 4-11 provides an overview of the loads allocated within the model to establish the future system scenarios.

Table 4-11: Model Flow Summary

Flow Condition	Existing	30-Year	Buildout
Model Average Annual Flow	4.21	4.75	8.41
Model Base Infiltration	2.31	2.31	2.31
Model Wet Weather Average	6.52	7.06	10.72
Modeled Peak[1]	17.04	18.59	28.30

[1]AAF is peaked BI is not peaked

4.4 Wastewater Flow Monitoring

Wastewater flow was monitored at twelve (12) locations from April 9, 2022 to June 25, 2022. The purpose of this monitoring effort was to collect data to assist with calibration of the hydraulic model and determine areas of potential deficiencies. **Figure 4.2** shows the 12 monitoring locations. Detailed site location maps are provided in **Appendix A**.

4.4.1 2022 Flow Monitoring

As previously mentioned, flow monitors were in place between April 9, 2022 and June 25, 2022. The flow monitors assist both with calibration of the model during wet weather events and dry weather. Graphs of representative flow data for the first week of flow monitoring period at each flow meter location are provided in **Appendix B**.

Two large rain events were captured during the monitoring period: May 11 and June 13. The larger of these rain events (June 13) produced over 3 inches of precipitation with a noticeable response in the collection system. The June 13 event assisted in determining a proper peaking factor for the collection system. Graphs of the flow data during the May 11 and June 13 rain events at each flow meter location are provided in **Appendix C** and **Appendix D**, respectively.

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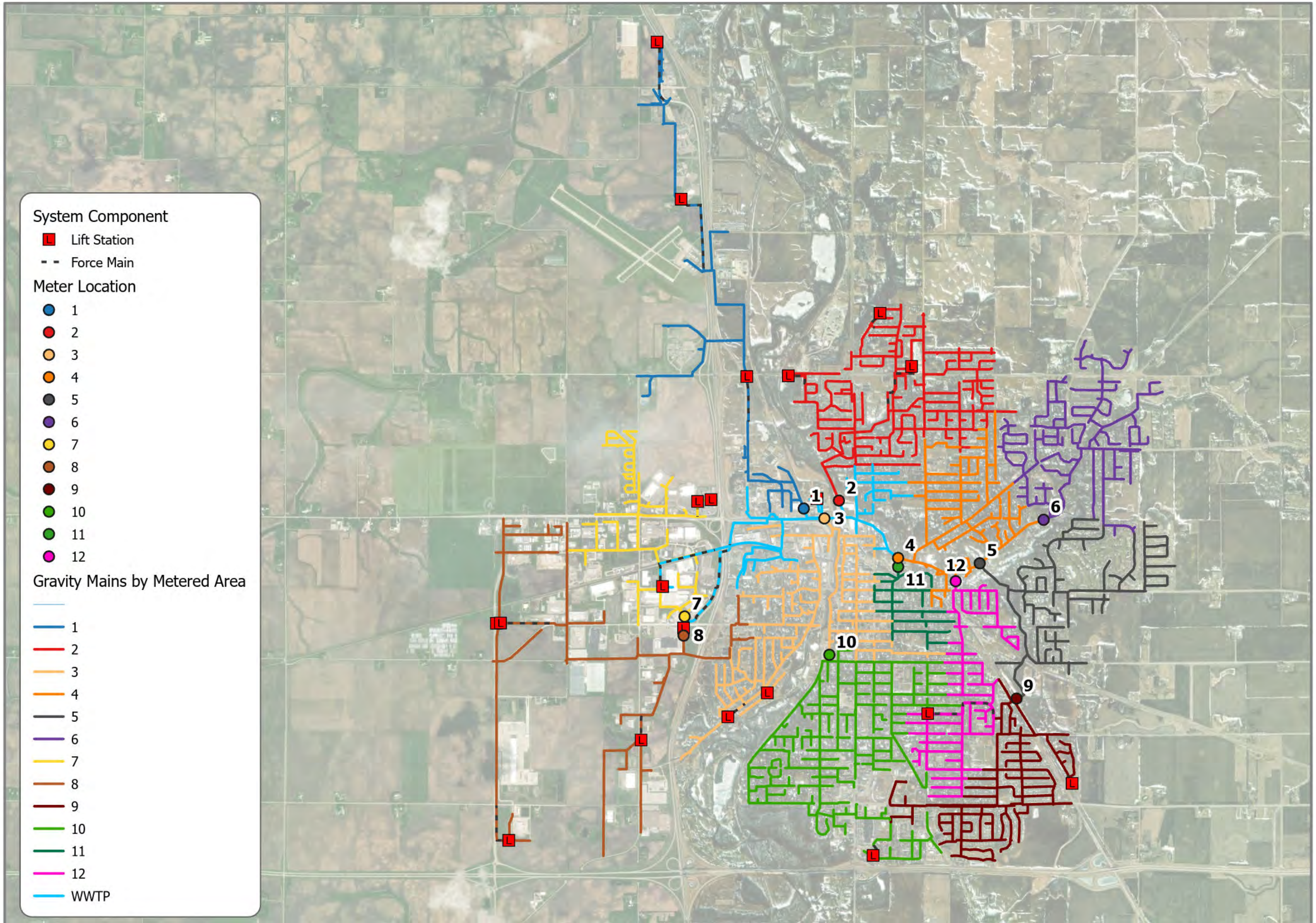


N

0 500 1,000

Feet

1 inch equals 3,500 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 4.2

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

AE2S

Information depicted may include data unverified by AE2S. Any reliance upon such data is at the user's own risk. AE2S does not warrant this map or its features are either spatially or temporally accurate.

Coordinate System: NAD 1983 HARN Adj MN Steele Feet | Edited by: DVoeller | E:\Data\Projects\O\Owatonna\Wastewater Collection System\Hydraulic Model\Owatonna Mapping\Owatonna Maps.aprx | 4.2 - Meter Locations

For estimation of domestic (dry weather) flow, base infiltration, and rainfall derived inflow and infiltration an analysis was completed on the flow data. The monitoring period of the second week of July 2022 was utilized to estimate the base dry weather flow. This period showed low ground water impact at the WWTF with inflow at the plant around 3.5 MGD. The dry weather flow was then compared to first week of flow monitoring in April and the difference is estimated to be the increase in I&I during the spring runoff experienced in 2022. Graphs of the flow data for this time period at each flow meter location are provided in **Appendix B**. A summary of the flow monitoring analysis is provided in **Table 4-12**. Notably, metered areas 3, 4, 8, and 10 showed the highest amounts of infiltration. Additionally, metered areas, 3,4,6, 8 and 10 showed the highest impact from the June 13th rain event as a result of high inflow from the rain event as well as increase infiltration following the event.

4.4.2 Wastewater Treatment Facility Influent Data

In addition to monitoring flows at the 12 locations showing in **Figure 4.2**, flow data into the WWTF during the same monitoring period was evaluated. The peak flow into the WWTF during the monitoring period occurred on June 13, 2022, with a peak flow of approximately 7.6 MGD, as shown in **Figure 4.3**.

Figure 4.3 WWTF Daily Inflow During Flow Monitoring

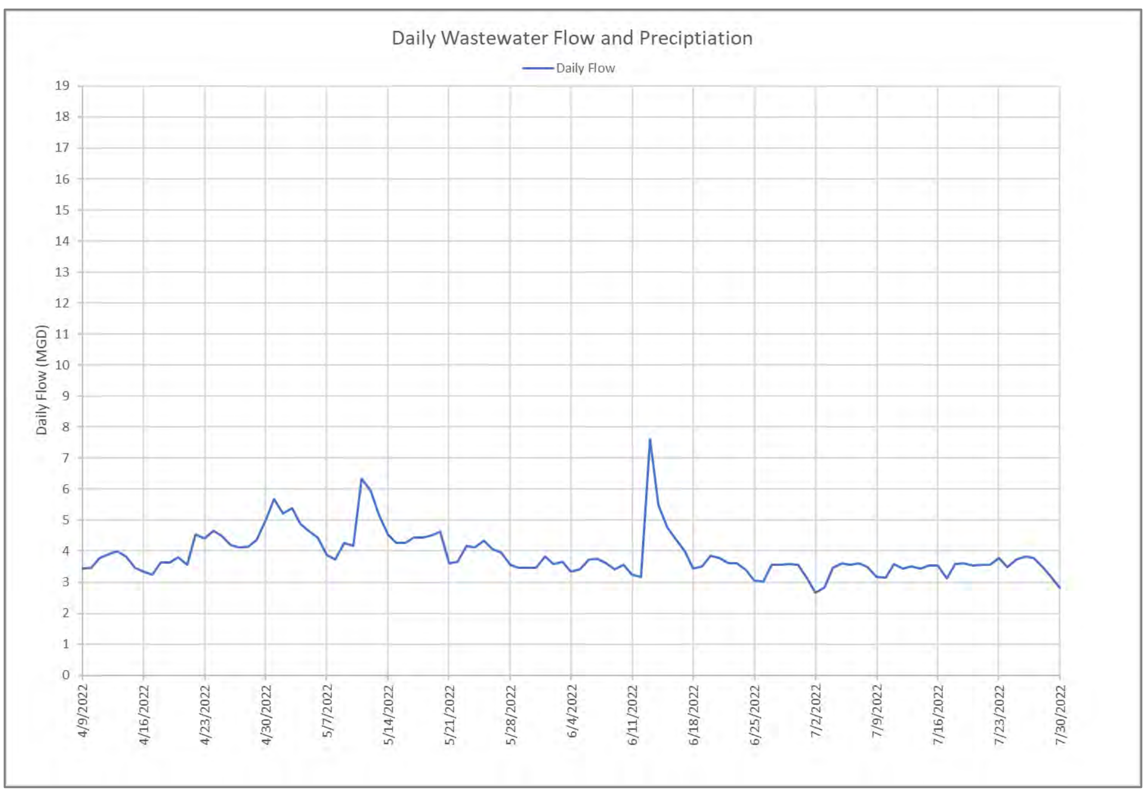


Table 4-12: Flow Monitoring Results

Meter Location	Upstream Meters	Avg Base Flow (gpm)	Avg Dry Weather Flow (gpm)	Avg I&I (gpm)	Peak Dry Weather Flow (gpm)	5-11-22 Rain Event - Peak Flow (gpm)	6-13-22 Rain Event - Peak Flow (gpm)
1		50.0	50.7	-0.7	110	103	330
2		231.5	229.7	1.8	375	810	1,600
3	10	771.0	606.8	**164.2**	1,167	2,348	3,648
4	5, 6, 11, 12	426.1	322.5	**103.6**	668	1,802	2,139
5	9	382.2	348.8	**33.3**	578	905	983
6		26.1	26.1	0.0	70	577	394
7		272.3	266.3	6.0	396	499	830
8		264.1	210.4	**53.7**	385	458	1,187
9		356.2	341.7	**14.5**	545	659	873
10		486.7	351.6	**135.1**	645	1,294	1,924
11		35.6	35.6	0.0	57	69	*
12		196.7	196.7	0.0	250	575	*

*No flow meter results during this event at this location.

CHAPTER 5 WASTEWATER COLLECTION SYSTEM MODEL UPDATE

Hydraulic capacity is a key performance metric for collection systems. The pipes and various other structures in the collection system should be engineered for design flows without causing surcharging, incurring damage through scour, requiring unintended flushing, creating excessive operation and maintenance activities, or otherwise negatively impacting the level of service.

Hydraulic modeling is an efficient tool for evaluating the capacity of a collection system under a broad range of conditions. The following chapter provides an overview of the data sources used to develop the hydraulic model of the City's wastewater collection system.

5.1 Model Development

InfoSewer® hydraulic modeling software was used for analysis of the collection system. InfoSewer is a fully GIS integrated collection system modeling and management software application. InfoSewer, which runs a hydraulic engine and integrates wastewater network modeling with ArcGIS.

The following information was provided by the City and incorporated into the hydraulic model:

- City GIS data was used to develop the collection system pipe network. GIS information included gravity sewers, force mains, manholes, and lift stations.
- There were a number of sources used to determine elevations within the hydraulic model:
    1. Invert elevation from the City's GIS.
    2. Invert elevation obtained from invert surveys.
    3. Invert elevation interpolated between known invert elevations.
    4. Invert elevation based on a known invert elevation and extrapolated using Ten State Standards recommended minimum slope.

A comprehensive "all-pipes" hydraulic model was developed for the City. The model excludes service connections.

5.2 Hydraulic Model Calibration

Wastewater flow consists of dry and wet weather flow components. The dry weather flow (DWF) component is classified into groundwater base infiltration (BI) and base domestic sanitary wastewater flow (BSWF). BI represents the groundwater that infiltrates into the collection system through defective pipes, pipe joints, and leaking manhole walls regardless of rainfall. BSWF represents sewage from residential, commercial, and industrial areas conveyed to the sanitary sewer system. The wet weather flow (WWF) consists of rainfall derived inflow and infiltration (RDII), which is flow that makes its way into the collection system as a result of rainfall. Isolating each of these components of wastewater flow can be used to understand the sources of flow and the relative quantities of each flow component within the sewer system. Additionally, it determines if RDII and groundwater flow components are excessive enough to cause capacity issues and other operational problems.

Model calibration is a process used to adjust the modeled physical system or the flow representations to closely match observed measurements and ultimately enables the model to predict the wastewater flow components and system performance. Examples of adjusting the flow representation include changing the base flow volume or the peaking factor.

5.2.1 Dry Weather Flow Calibration

DWF is the average flow that occurs on a day not influenced by rainfall. Selection of the dry days to develop the DWF is important since this typical day becomes the basis of wet weather flow (WWF) calculations. Wet weather responses are the deviations from the DWFs. DWF is determined by selecting days on which several conditions are met including the following:

- No rainfall occurred on that day.
- No rainfall occurred on the preceding days.
- Flow volumes were within a specified range (not less than 85 percent of the average or more than 115 percent of the average).

For determining DWF flow for the City, observed flows during dry weather days in April and July were utilized.

The DWF is composed of BSWF and BI, and their relationship is represented by the following formula:

$$DWF = BSWF + BI$$

BSWF represents sewage from residential, commercial, and industrial areas conveyed to the sanitary sewer system. The volume of BSWF produced is generally a function of the population and land use category in the area. It is also strongly related to the actual water consumption in the area. To determine the BSWF, customer water meter data was geo-referenced and allocated throughout the system. Water consumption data was obtained during winter months when no outside irrigation typically occurs, however, it is still not a direct relationship between water usage and wastewater flows. As a result, the DWF was scaled to match average day flows more closely into the WWTP and at twelve (12) flow meter sites throughout the City.

5.2.2 Wet Weather Flow Calibration

Following dry weather calibration, the hydraulic model was calibrated for wet weather conditions. The Ten States Standards peaking factor formula was the starting point to estimate peak hour flows. As discussed in **Section 4.1**, the peak hour factor was determined to be approximate 50 percent higher than the Ten States Standards peaking formula. This peaking factor was adjusted until the peak flows in the model more accurately represented those experienced by the WWTP and at the 12 flow meter sites. A comparison of metered and modeled flows at each of the flow monitoring sites is provided in **Table 5-1**. It should be noted that the rain events that occurred during the monitoring period do not represent design peak flows.

Table 5-1: Metered vs Modeled Flows

Meter Location	Avg Base Flow (gpm)	Peak Dry Weather Flow (gpm)	5-11-22 Rain Event - Peak Flow (gpm)	6-13-22 Rain Event - Peak Flow (gpm)	Model Base Flow (gpm)	Model Peak Flow (gpm)
1	50	110	103	330	49	361
2	232	375	810	1,600	229	1,369
3	771	1,167	2,348	3,648	861	4,096
4	426	668	1,802	2,139	735	3,886
5	382	578	905	983	427	2,311
6	26	70	577	394	76	567
7	272	396	499	830	323	1,635
8	264	385	458	1,187	535	2,569
9	356	545	659	873	355	1,900
10	487	645	1,294	1,924	485	2,462
11	36	57	69	*	37	250
12	197	250	575	*	83	546

*No flow meter results during this event at this location.

5.3 Future System Model Development

5.3.1 Future System Flows

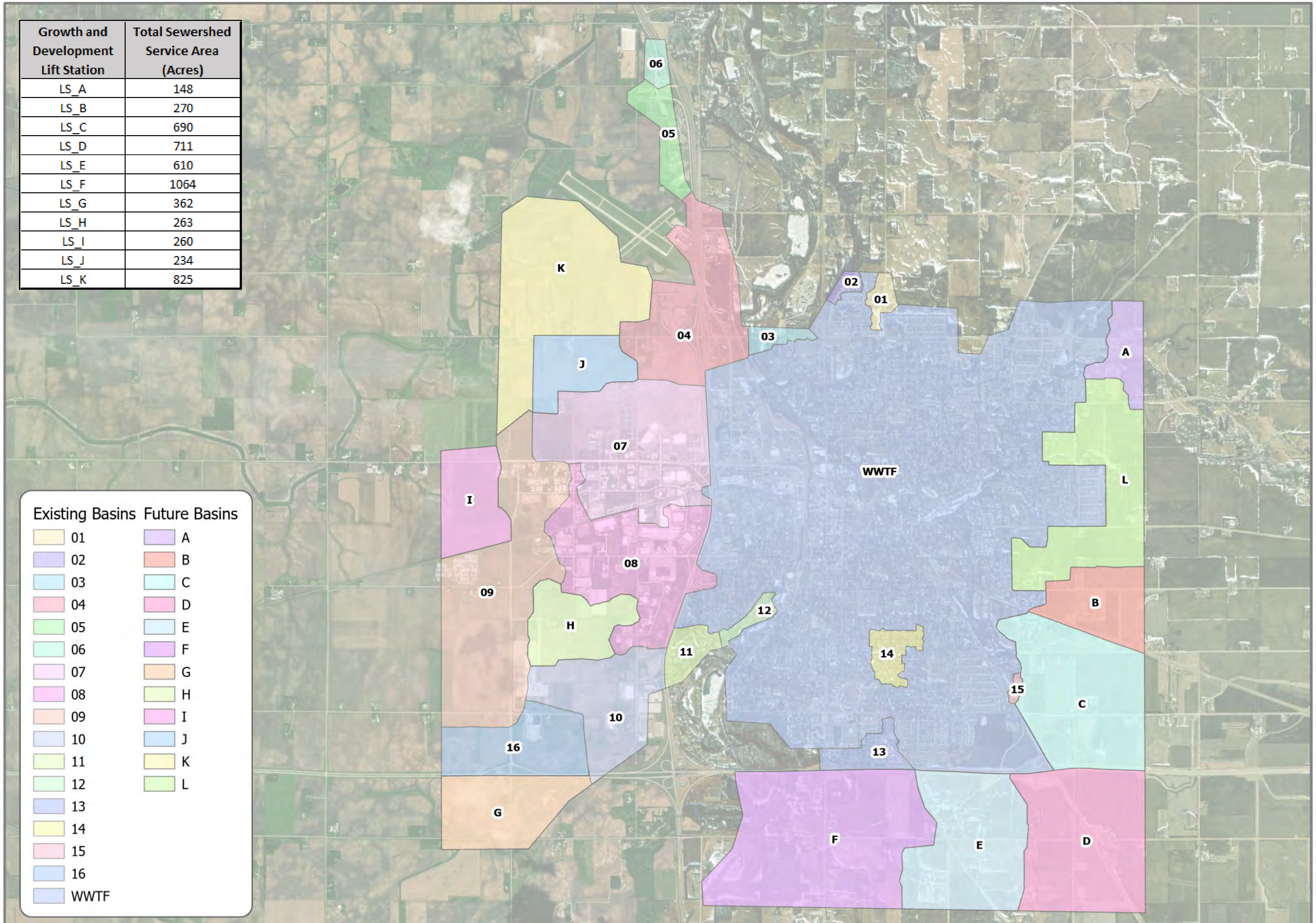
Boundaries for future growth were established and provided by the City. These boundaries, along with elevation data, were used as the basis for laying out future pipelines to service new developments. After the general layout of the future pipelines was established, future flows were allocated to the system.

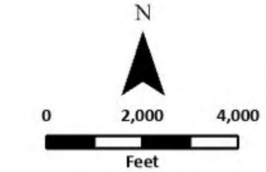
Future system wastewater flows were estimated for two planning periods: 1) 30-year growth, and 2) Buildout. Wastewater loading data sets were developed within the hydraulic model for each of these timelines. The buildout flows were established first by utilizing the City's future growth boundary and assigning flows based on land use. The average daily loadings for buildout were spatially distributed using InfoSewer Load Allocator®. The InfoSewer Load Allocator® module uses GIS technology to assign land use flow data (gpd/ac) to a designated junction within the wastewater collection system network. For each junction in the buildout area, algorithms in the software determine the area of influence, or area served by each node and adjacent pipe segments. The allocation tool then superimposes projected flow data over the area of influence to determine the total demand at each node.

Once the buildout flows were established, it was determined that the 30-year growth flows would be estimated by assuming 13% of the future growth areas would be developed. A summary of the future system flows was presented in **Table 4-11**.

While determining the future collection system layout and preliminary lift station locations, the sewershed for each lift station (future and existing) was established by reviewing topography and preliminary layout of sewer main at minimum grade. The basin boundaries are shown in **Figure 5.1**.

Growth and Development Lift Station	Total Sewershed Service Area (Acres)
LS_A	148
LS_B	270
LS_C	690
LS_D	711
LS_E	610
LS_F	1064
LS_G	362
LS_H	263
LS_I	260
LS_J	234
LS_K	825





1 inch equals 4,000 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 5.1

WASTEWATER COLLECTION SYSTEM FUTURE SEWER BASINS

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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CHAPTER 6 DESIGN PARAMETERS AND EVALUATION CRITERIA

Design parameters identify the features and performance requirements of wastewater collection system infrastructure and provide the standard against which system performance is assessed. The design parameters and criteria presented within this chapter were used to evaluate the performance of the existing Owatonna wastewater collection system, and to conceptualize system improvements (gravity mains, force mains, and pumping facilities) necessary to maintain system reliability and accommodate future growth and development of the system.

Design parameters and evaluation criteria are established herein for sizing gravity mains, force mains, and pumping facilities. The criteria were established based on industry standards, existing City codes, and engineering judgment. Generally, the design parameters that govern system capacity and should be defined by each utility, include:

1. Force Main Design Parameters: velocity, diameter, and friction factor;
2. Gravity Main Design Parameters: velocity, depth of flow, diameter, minimum slope, friction factor;
3. Lift Station Design Parameters: firm capacity and peak hour flow;
4. Peak Hour Design Factors;
5. Dry Weather Parameters; and
6. Wet Weather Storm Event Parameters.

6.1 Force Main Design Parameters

Force mains are sized to meet maximum flow conditions, which for the purposes of this report is defined as:

- **Design Peak Hourly Flow**: The largest volume of flow to be received during a one-hour period expressed as a volume per unit time (i.e. gallons per minute).

Force mains are designed to carry wastewater from lift stations to the wastewater treatment facility or to other gravity mains or sewer interceptors without excessive pressure loss. The following subsections establish the parameters used for evaluating and estimating the size and capacity of force mains.

6.1.1 Force Main Velocity and Diameter

Minimum and Maximum velocity guidelines for the analysis of the force mains will be discussed in the following section. Existing force mains that exceed these criteria will not necessarily be identified for replacement unless there are known existing problems within the collection system. However, if new pipelines are planned to replace old, deteriorated pipelines, then the new pipelines should be sized appropriately to meet these guidelines.

The force main cleaning velocity refers to the minimum velocity (or flowrate) required to keep solids suspended within a pipe. Operations below this velocity will allow for solids to build up within the force main and potentially lead to excess formation of hydrogen sulfide (H_2S) gas. Velocity is also recommended to remain below a maximum to reduce overall system headloss, reduce system pressures, and reduce the occurrence of pressure transients within the force main. This reduces the frequency of force main breaks and the amount of leakage from the pressure system.

Ten States Standards and other publications recommend a cleaning velocity of 2 ft/s to keep solids suspended while pumping. When no wastewater is flowing through the force main solids may settle. A minimum velocity of 3 ft/s is recommended based on the desire to resuspend settled solids.

Ten States Standards states that the maximum velocity shall not exceed 8 ft/s. Based on this design parameter, it is recommended that existing force mains be considered for replacement with larger diameter pipes if the velocity exceeds 8 ft/s. Note, higher velocities will be accepted to avoid upsizing pipe diameters for a minor violation of this velocity criterion.

Ten States Standards states that the minimum diameter for raw wastewater force mains is 4 inches. Larger diameter force mains shall be assessed or designed based on the minimum and maximum velocity criteria. **Table 6-1** summarizes the recommended force main evaluation criteria.

Table 6-1: Force Main Hydraulic Criteria Recommendations

Force Main Parameter	Criteria
Minimum Velocity	2 ft/s
Maximum Velocity	8 ft/s
Minimum Diameter	4 inches

6.2 Gravity Main Design Parameters

Gravity mains are designed to carry wastewater from service connections to lift stations or the treatment facility. The following subsections establish the parameters used for evaluating and estimating the size and capacity of gravity mains and provide support for the development of improvement concepts.

1. Velocity and Flow Depth;
2. Diameter and Minimum Slope;
3. Gravity Main Friction Losses.

6.2.1 Gravity Main Velocity and Depth of Flow

Gravity mains must be designed to prevent deposition of solids within the main. Ten States Standards suggests a minimum velocity of 3.0 ft/s when flowing full based on Manning's formula "n" value of 0.013 and a maximum sewer velocity of 15 ft/s.

The capacity of a gravity main is measured ratio of depth of flow to diameter of the pipe. For the purposes of this analysis, the maximum design flow depth is 75%. A summary of the maximum design flow depths and gravity main velocity requirements are as follows:

- Minimum Velocity = 3 ft/s
- Maximum Velocity = 15 ft/s
- Maximum Design Depth (depth / diameter) = 75%

6.2.2 Gravity Main Diameter and Minimum Slope

Ten States Standards require gravity mains to have a minimum diameter of 8 inches. In order to maintain the minimum velocity of 3.0 ft/s, minimum sewer slopes are defined by Ten States Standards and presented in **Table 6-4**.

Table 6-4: Gravity Main Diameter and Minimum Slope

Diameter of Gravity Main	Minimum Slope in Feet per 100 Feet
8-inch	0.40
10-inch	0.28
12-inch	0.22
15-inch	0.15
18-inch	0.12
21-inch	0.10
24-inch	0.08
27-inch	0.067
30-inch	0.058
33-inch	0.052
36-inch	0.046
39-inch	0.041
42-inch	0.037
Minimum Diameter	8 inches

6.2.3 Gravity Main Friction Loss

Friction loss is an important design parameter for determining gravity main sizing requirements. As stated in **Section 6.2.2**, Ten States Standards suggests designing for minimum velocity of 3.0 ft/s when flowing full based on a Manning's formula "n" value of 0.013. Manning's "n" is known as the friction factor for calculating flow in open channel conduits such as gravity main. Lower Manning's "n" values are applied to smooth-walled conduits and correlate to higher flow. Larger Manning's "n" values are applied to rough-walled conduits and correlate to lower flow due to higher friction losses. The value of 0.013 is recommended by numerous publications and agencies and is generally applied to all pipe materials as the design-life friction factor. This application is widely practiced within the industry for evaluation of existing system capacity and design of future gravity mains. Following this, a Manning's "n" value of 0.013 was applied to all gravity mains in the model (**Table 6-5**).

Table 6-5: Gravity Main Friction Loss

Gravity Main Parameter	Criteria
Design Manning's-n friction factor	0.013

6.3 Lift Station Design Parameters

Appropriate lift station capacity should be provided to meet the following conditions within the wastewater collection system:

- **Design Peak Hourly Flow**: the largest volume of flow to be received during a one-hour period expressed as a volume per unit time (i.e. gallons per minute).

Pump station capacity guidelines are based on firm capacity, which is defined as the capacity of the system with the largest pump out of service. Ten States Standards states that when only two pumps are provided for a lift station, they must be the same size with firm capacity to handle peak hour flow. They should be sized to maintain the established minimum force main velocity and to deliver uniform flow to minimize hydraulic surges. The effective volume of the wet well should be sized based on design peak hourly flow with a filling time not to exceed 30 minutes unless the facility is designed to provide flow equalization.

6.4 Peak Hour Design Factors

Ten States Standards has design standards for public sewage systems which contains an equation to calculate peak hourly flow. The equation is as follows, where the variable "P" is population in thousands.

$$Design\ Peak\ Hourly\ Flow = \left(\frac{18 + \sqrt{P}}{4 + \sqrt{P}}\right) * Design\ Average\ Flow$$

The equation allows a peaking factor to be calculated based on population. This results in a declining peaking factor as the flows move downstream through the system within the hydraulic model. The peaking factor is applied to the allocated average daily flow at each model node. However, based on flow monitoring data, the City of Owatonna has seen higher peak flows than the Ten States Standards peaking formula would calculate. As a result, this formula within the model was increased by 50 percent to match existing peak flows experienced at the WWTF. The InfoSewer model was used for evaluation of the existing system and future development under future flow conditions and is discussed in further detail in **Chapter 7** and **Chapter 8**. The overall peaking factor for the system is calculated as 3.5.

6.5 Design Parameter and Evaluation Criteria Summary

Table 6-7 summarizes the wastewater collection system design parameters and evaluation criteria presented in the previous subsections. This includes recommendations for sizing gravity mains, force mains, and pumping facilities.

Table 6-7: Summary of Design Parameter and Evaluation Criteria

System Component	Criteria
Force Main Parameter	**Recommendation**
Minimum Velocity	2 ft/s
Maximum Velocity	8 ft/s
Minimum Diameter	4 inches
Design C-factor for smooth pipe (PVC, HDPE, lined ductile iron pipe, etc.)	120
Design C-factor for other pipe (unlined iron or steel pipe, etc.)	100
Gravity Main Parameter	**Recommendation**
Minimum Velocity	3 ft/s
Maximum Velocity	15 ft/s
Minimum Diameter	8 inches
Minimum Slope	Per Ten States Standards recommendations
Design Capacity (depth of flow / diameter as % Capacity)	75%
Design Manning's-n friction factor	0.013
Peaking Factor	3.5
Lift Station Parameter	**Recommendation**
Minimum Number of Pumps	2
Firm Capacity	Peak Hour Flow (at buildout) (each pump in a 2-pump system)

CHAPTER 7 EXISTING SYSTEM EVALUATION

This chapter presents the evaluation of the City's existing wastewater collection system and its ability to accommodate peak flows and meet performance criteria under various flow conditions. Evaluations, findings, and recommendations for addressing any deficiencies identified in the City's existing wastewater collection system are summarized in this chapter. These recommendations are used, in part, for the development of the CIP.

7.1 Model Analysis

The InfoSewer model was utilized to simulate average annual flow and peak wet weather flows. Dry weather flows used in model calibration were scaled up to reflect an annual average flow of 4.21 MGD based on the analysis discussed in **Chapter 4**. Additionally, 2.3 MGD of BI was added to the model to represent high ground water conditions as experienced in 2019. The model then peaked the average annual flow according to the modified Ten States Peaking factor (50 percent higher) as discussed in in **Chapter 4.**

7.1.1 Gravity Main Analysis

Depths of flow in the gravity mains were evaluated with the modified peaking factor. Within the hydraulic model, a depth/Diameter (d/D) was calculated for each pipe segment. As discussed in **Chapter 6**, a pipeline segment is considered to be over capacity if its d/D is greater than 75%. Excessive d/D can be caused by excessive flows or flatter than recommended pipe slopes. As shown in **Figure 7.1**, there are several areas with d/Ds greater than 75%. The main areas of concern are the following:

- The trunk sewer along Straight River from Plainview Street to the Wastewater Treatment Plant.
- 18th Street SE from Truman Avenue to Smith Avenue.
- Smith Avenue from 18th Street SE to Havana Road.

There are other areas that are shown as being at or near capacity; however, these are mainly isolated areas of insufficient pipe slopes. These are also generally in areas not anticipated to see development in the near term and areas that have not been reported as experiencing significant surcharging.

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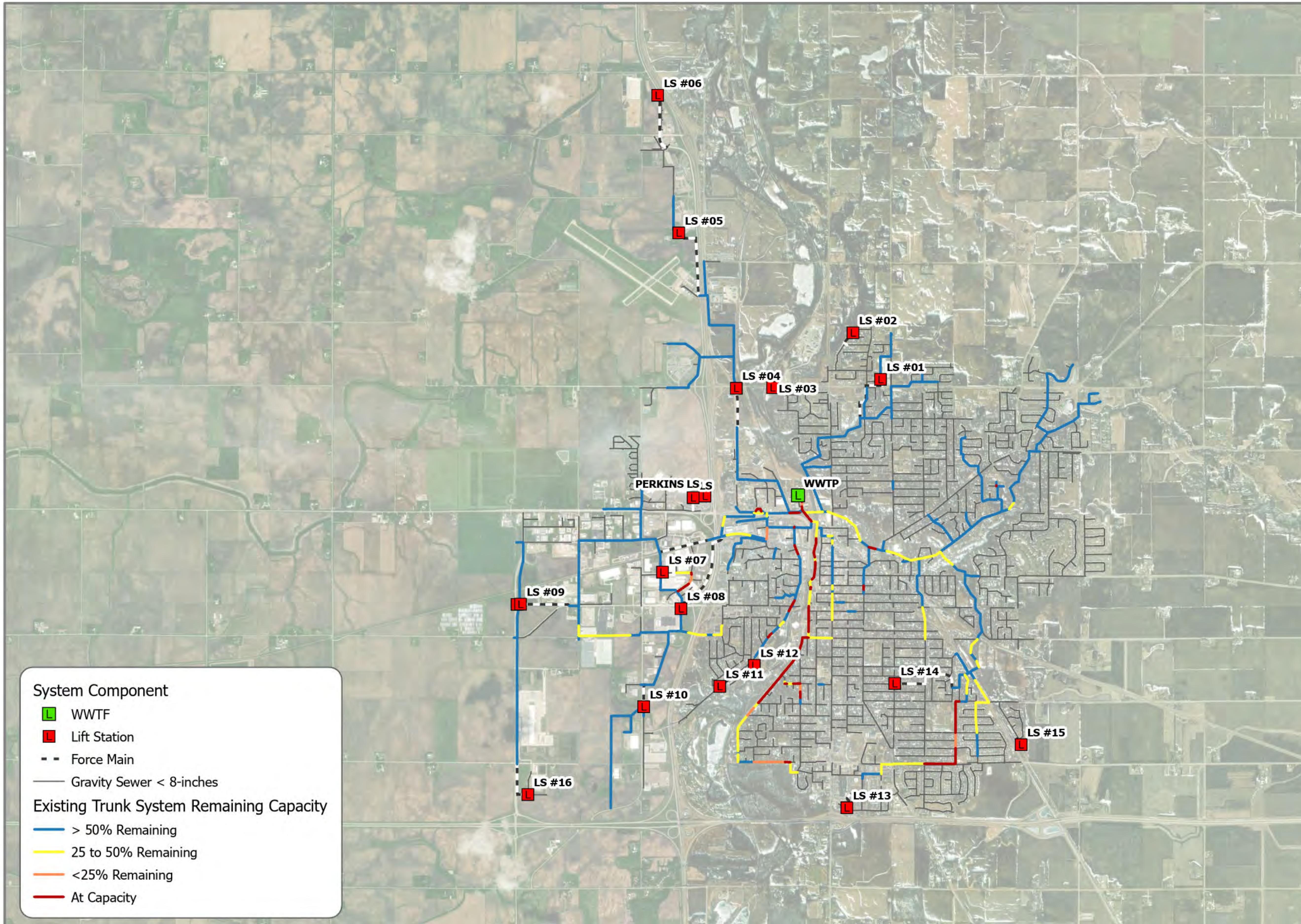

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Feet

1 inch equals 4,000 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 7.1

EXISTING WASTEWATER COLLECTION TRUNK SYSTEM

REMAINING CAPACITY

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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7.1.2 Lift Station and Force Main Analysis

Lift stations and force mains were also evaluated under a peak hourly flow based on the criteria discussed in **Chapter 6**. For the purposes of this report and based on the information available, all pumps were assumed to operate at the capacity provided by the City.

A summary of the lift station force main velocities is provided in **Table 7-1**. A summary of lift station capacities and the stations firm pump capacity as presented in **Table 7-2**. Location of lift stations can be found in **Figure 2.4**.

Table 7-1: Force Main Evaluation Summary

Lift Station	Location	Force Main Diameter (in)	Velocity (ft/s)
LS1	380 Autumn Hills Pl. NE	12	5.2
LS2	3036 Northridge Lane NE	6	9.1
LS3	475 26th St NW	4	4.1
LS4	657 26th St. NW	16	3.8
LS5	2331 Heritage Pl. NW	12	3.9
LS6	4900 West Frontage Rd	6	4.7
LS7	2310 4th Street NW	8	5.1
LS8	2015 W. Bridge St.	12	7.9
LS9	3950 W. Bridge St.	12	4.9
LS10	1155 24th Ave. SW	8	6.0
LS11	1002 Lemond Rd	4	11.5
LS12	600 Riverwood Dr.	4	6.4
LS13	222 Cedardale Dr	6	5.1
LS14	925 Lincoln Ave	6	9.6
LS15	1550 Greenleaf Rd SE	8	1.9
LS16	3705 18TH St. SW	6	5.7
Perkins	1200 Interstate Hwy 35	*	*
LS	475 26TH ST NW	*	*

*Excluded from analysis due to small size and limited service area.

Pump curves were not included for this analysis, so design and calculated pumping rates provided by the City were used. Actual pumping rates may differ from the estimated values, which would affect the velocities shown above.

A majority of the lift station force mains operate within the recommended velocity of 2 to 8 ft/s. Lift stations 2, 11, and 14 show velocities in excess of 8 ft/s. While these force mains exceed the recommended range of velocity, force main up-sizing is not recommended at this time. The force main segments are relatively short so additional headloss due to higher velocities is not excessive. It is recommended that the City review force main size when lift station upgrades are complete or the useful life of the force mains is reached.

Table 7-2: Lift Station Summary

Lift Station	Firm Capacity (gpm)	Modeled Avg Flow (gpm)	Modeled Peak Hour Flow (gpm)
LS1	1,850[a]	14	40
LS2	800[a]	11	40
LS3	160[a]	5	5
LS4	2,400[b]	98	330
LS5	1,360[b]	40	155
LS6	410[b]	8	30
LS7	800[a]	89	360
LS8	2,800[c]	1,024	3,850
LS9	1,740[b]	52	105
LS10	940[b]	30	80
LS11	450[d]	13	45
LS12	250[d]	8	25
LS13	450[d]	69	330
LS14	850[d]	43	145
LS15	300[a]	7	40
LS16	500[a]	4	10

[a] Pump rated capacity. Not calculated or estimated.
[b] Capacity calculated from lift station hydraulics.
[c] Estimated firm pumping capacity. Two pumps running with second pump contributing 40% more than one pump.
[d] Capacity based on best efficiency of pump curve.

Note that most lift stations are modeled to have a peak flow less than the firm capacity of the pumps with the exception of lift station 8. The modeled peak flow indicates that the lift station may need to rely on all three pumps within the station to convey peak hour and I/I flows during wet weather conditions. The city should consider long-term monitoring of flows into this station to determine if upsizing is required.

7.1.3 I/I Analysis and Considerations

One of the primary reasons for hydraulic modeling and flow monitoring was to identify areas of the collection system that contributed significant I/I, as well as provide the City with a working tool that could be further refined as additional data is collected.

Results from the wet weather hydraulic analysis and flow monitoring showed significant I/I enters the system which eventually impacts the WWTP, confirming the results and recommendations presented in **Chapter 4**.

CHAPTER 8 FUTURE SYSTEM EVALUATION

This chapter presents the recommended improvements and expansions necessary to meet the City's future wastewater collection system needs as well as satisfy the performance requirements outlined in **Chapter 6**.

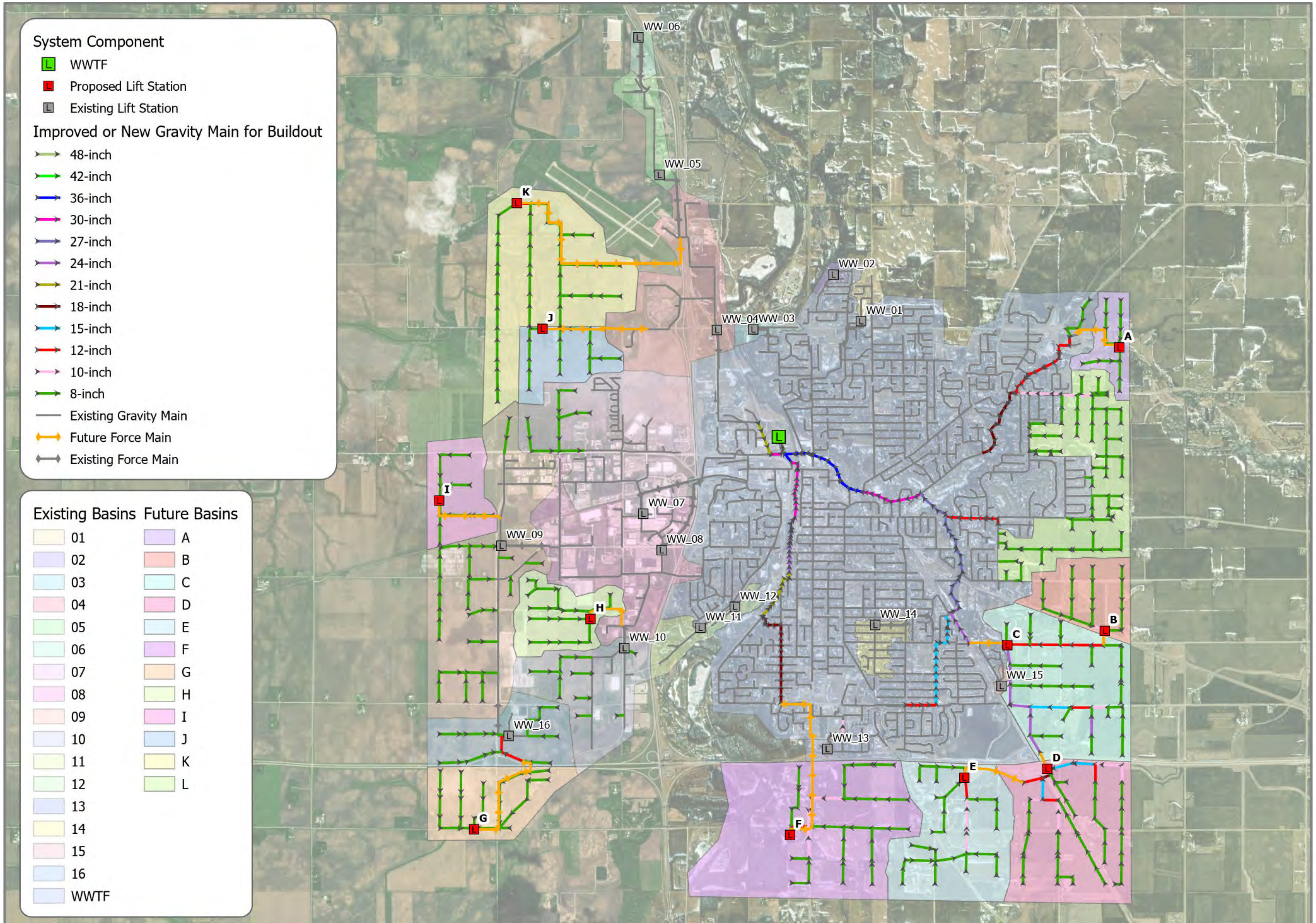
The following process was used to expand the wastewater collection system network:

- Extend existing gravity main into the growth areas were sewer depth and topography allowed.
- Review topography and delineate new sewersheds within the growth areas.
- Identify new lift station locations near the low point of the new sewer basins.
- Develop a sewer network within the new sewer basins using 8-inch main at minimum grade as a starting point.
- Identify routes for force main to tie into the existing collection system.
- Run Buildout allocation through the system to size the future system network and increase existing sewer main with larger sewer as required.
- Run the 30-year allocation through the system to identify sewer(s) that require improvements to meet the planning period.

8.1 Future Sewer Basin Descriptions

The growth area sewer basins are presented in **Figure 5.1** as well as **Figure 8.1**. Each growth area is summarized below in terms of the general location and relative size of sewer required within.

Growth Area A is located at the northeast corner of the City's growth limits, roughly including the area north of Dane Road and east of Hill Drive. In order to provide sewer service to this area, 8-inch gravity mains and a lift station will be required. The lift station is proposed to be located near the center of the eastern edge with the force main pumping to an existing gravity main located between Majestic Lane NE and NE 26th Street.



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Feet
1 inch equals 4,000 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 8.1

WASTEWATER COLLECTION SYSTEM

BUILDOUT SYSTEM IMPROVEMENTS

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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Growth Area B is located at the east edge of the City's growth limits, starting roughly ¼ mile north of School Street and moving south to the railroad, and approximately ¼ mile east of Partridge Avenue. The gravity portion of this service area can be served by mainly 8-inch gravity mains with the exception of a small portion of 10-inch gravity main. However, a lift station will be required, with the proposed location being near the southeast corner on the north side of the railroad. The proposed location for the force main will pump across the railroad and into a new 12-inch gravity main on the south side of Havana Road in Growth Area C. The following are two alternate force main routing options:

1. Directly to Growth Area C lift station.
    a. This may allow the trunk sewer along Havana Road in Growth Area C to be reduced in size to an 8-inch pipeline.
2. To the existing gravity main along Bixby Road.
    a. This will allow the lift station in Growth Area C to be downsized.

Growth Area C is located in the east edge of the City's growth limits, with the northern and southern limits being the railroad and Highway 14, respectively. The current layout is proposed to receive wastewater flows from Growth Areas D and E. As a result of these combined flows, the sizes of the gravity mains will range from 8-inch to 24-inch diameter. A lift station located in the northwest corner along Havana Road is proposed, with the force main conveying wastewater to the west across the railroad and into an existing gravity main along Bixby Road. The City may want to consider moving the proposed location of this lift station further south. This may allow the Lift Station 15 service area to be redirected into the proposed new lift station.

Growth Area D is located at the southeast corner of the City's growth limits. The current layout is proposed to receive wastewater flows from Growth Area E. As a result of these combined flows, the sizes of the gravity mains will range from 8-inch to 18-inch diameter. A lift station located near the corner of Highways 14 and 218 is proposed, with the force main conveying wastewater to the north across Highway 14 and into a proposed gravity main in Growth Area C. The following are two alternate force main routing options:

1. Directly to the lift station in Growth Area C.
    a. This may allow the trunk sewers in Growth Area C to be downsized.
2. Directly to the gravity main near the intersection of Bixby Road and Havana Road.
    a. This will allow the lift station in Growth Area C to be downsized and may allow the trunk sewers in Growth Area C to be downsized as well.

Growth Area E is located at the south edge of the City's growth limits. The gravity portion of this service area can be served by mainly 8-inch gravity mains with the exception of small portions of 10-inch and 12-inch gravity mains. A lift station will also be required, with the proposed location being near the north end of the service area. The proposed routing for the force main will be to pump to the east and into a new 12-inch gravity main in Growth Area D. The following are two alternate force main routing options:

1. Directly to the lift station in Growth Area C.
    a. This will allow the lift station in Growth Area D to be downsized and may allow the trunk sewers in Growth Areas C and D to be reduced in size.
2. Directly to the gravity main near the intersection of Bixby Road and Havana Road.
    a. This will allow the lift stations in Growth Areas C and D to be downsized and may allow the trunk sewers in Growth Areas C and D to be downsized as well.

Growth Area F is located at the south edge of the City's growth limits. The gravity portion of this service area is proposed to be served by gravity mains ranging in size from 8-inch to 15-inch in diameter. A lift station will also be required, with the proposed location being west of County Road 45 and south of SW 28th Street. The force main is proposed to terminate at the intersection of Linn Avenue and 18th Street SW into an existing gravity main on Linn Avenue. There are several other locations for the force main to be directed; however, each location will require upsizing of downstream pipelines.

Growth Area G is located in the southwest corner of the City's growth limits south of Highway 14. The gravity portion of this service area is capable of being served by 8-inch gravity mains. A lift station will also be required and is proposed to be located near the south edge of the service area. The force main is proposed pump northward across Highway 14 and into a proposed new gravity main, eventually flowing to Lift Station 16.

Growth Area H is located on the west side of the City's growth limits, generally located west of 24th Avenue SW, east of 39th Avenue SW, south of 8th Street SW, and north of Lemond Street SW. The gravity portion of this service area is capable of being served mainly by 8-inch gravity mains with a small portion of 10-inch gravity main. A lift station will be required and is proposed to be located near the east edge of the service area. The force main is proposed pump eastward into an existing gravity main near the intersection of 24th Avenue SW and Alexander Street.

Growth Area I is located on the west edge of the City's growth limits, generally located west 39th Avenue NW and north of the railroad. The gravity portion of this service area is capable of being served by 8-inch gravity mains. A lift station will be required and is proposed to be located near the west edge of the service area. The force main is proposed pump eastward into an existing gravity main along 39th Avenue NW.

Growth Area J is located on the west side of the City's growth limits, generally located west 24th Avenue NW, south of 26th Street NW, and north of 18th Street NW. The gravity portion of this service area is capable of being served by 8-inch gravity mains. A lift station will be required and is proposed to be located on the north side of the service area. The force main is proposed pump eastward into an existing gravity main along 26th Street NW and east of 24th Avenue NW.

- Alternatively, Growth Area J could gravity into K; however, this requires upsizing downstream sewer and may not be optimal for phasing of growth.

Growth Area K is located in the northwest corner of the City's growth limits. This growth area is capable of being served mainly by 8-inch gravity mains with the exception of a small portion of 12-inch and 15-inch pipelines. A lift station will be required to serve this area and is proposed to be located near the northwest corner of the service area. The force main is proposed to pump eastward into an existing gravity main along the west side of I-35 near the airport.

Growth Area L is located on the east side of the City's growth limits between Growth Areas A and B. This growth area is capable of being served by gravity mains being routed to various existing gravity mains, without the need for a lift station. The additional flows from this growth area will lead to a need for upsizing downstream sewers in some locations. These improvements can be seen in **Figure 8.1** and are discussed in further detail in the following sections.

8.2 Future Collection System Pipeline Evaluation

As discussed in **Chapter 3**, two future planning scenarios were established and evaluated: 1) 30-Year Period; and 2) Buildout. The buildout scenario was evaluated first in order to determine pipeline sizes if improvements would be recommended in the future. Similar to the existing system analysis, the gravity mains were evaluated based on d/D.

Each area with higher than recommended d/D was evaluated to determine if it is being caused by pipeline sizes, insufficient slopes, or a combination of both. In areas being restricted by pipeline sizes, the pipelines would be recommended for improvement. If these areas also have insufficient slopes, the area would be regraded during replacement of the pipeline. Areas with only insufficient slopes are not proposed to be replaced as part of this evaluation. A map showing the proposed improvements is shown in **Figure 8.1**. Additionally, a future system capacity map with the proposed improvements is shown in **Figure 8.2** for buildout conditions.

Following the buildout evaluation, the 30-year planning horizon was evaluated with the flows discussed in **Chapter 4**. Similar to the buildout analysis, areas shown to be over capacity were looked at individually to determine if pipe sizes or slopes were causing excessive d/D. The areas that were determined to be limited by pipe sizes were identified to be replaced (**Figure 8.3**). These pipelines were sized to be capable of handling buildout flows.

The 30-year planning horizon was evaluated with the proposed improvements. Capacities of the collection system with the proposed improvements are shown in **Figure 8.4**. As shown on the map, there are still areas that are shown to be over capacity; however, these areas are caused by insufficient pipe slopes, and the pipe sizes do not appear to be restricting flow.

8.3 Future Lift Station Evaluation

Existing and future lift station flows are provided in **Table 8-1**. The force main and lift station sizes recommended in this study are sized on buildout conditions. Through facility planning, the lift station capacity and force mains for growth areas may be phased appropriately as development occurs. A majority of existing lift stations are not expected to increase in flow as they do not experience growth in service area.

Several future lift stations, particularly in the southeastern growth area, may pump into one another. As discussed in **Section 8.1**, alternate force main routing may allow for smaller lift stations at the expense of additional length or multiple force mains routing to larger trunk sewers. Additional feasibility studies for these lift stations are recommended.

Existing lift stations were reviewed for 30-year growth and buildout conditions. As discussed in **Section 7.1.2**, lift station 8 was modeled to be near capacity. The 30-year growth is modeled to increase flows to lift station 8 minimally (less than 10-percent). It is recommended that the City monitor flows and likelihood of growth in the sewershed to determine whether the station needs to be upgraded. Lift stations 9 and 16 may require upsize to meet buildout conditions, depending on how dense the growth area develops.

Table 8-1: Future Lift Station Summary

Lift Station	Firm Capacity (gpm)	Exist Avg Inflow (gpm)	Exist Peak Inflow (gpm)	30-Yr Avg Inflow (gpm)	30-Yr Peak Inflow (gpm)	Buildout Avg Flow (gpm)	Buildout Peak Flow (gpm)	Force Main Diameter (inches)	Force Main Velocity[1] (ft/s)
LS1	1,850	14	40	14	40	14	40	12	5.2
LS2	800	11	40	11	40	11	40	6	9.1
LS3	160	5	5	5	5	5	5	4	4.1
LS4	2,400	98	330	127	485	326	1,425	16	3.8
LS5	1,360	40	155	40	155	40	155	12	3.9
LS6	410	8	30	8	30	8	30	6	4.7
LS7	800	89	360	92	380	112	490	8	5.1
LS8	2,800	1,024	3,850	1,115	4,180	1,735	6,285	12	7.9
LS9	1,740	52	105	106	410	468	2,060	12	4.9
LS10	940	30	80	45	170	144	690	8	6.0
LS11	450	13	45	13	45	13	45	4	11.5
LS12	250	8	25	8	25	8	25	4	6.4
LS13	450	69	330	69	330	69	330	6	5.1
LS14	850	43	145	43	145	43	145	6	9.6
LS15	300	7	40	7	40	8	40	8	1.9
LS16	500	4	10	37	205	255	1,280	6	5.7
LS-A				10	65	76	435	6	4.9
LS-B				12	80	95	530	8	3.4
LS-C				174	915	1,347	5,380	24	3.8
LS-D				100	555	772	3,370	21	3.1
LS-E				28	170	214	1,105	12	3.1
LS-F				35	210	271	1,360	12	3.9
LS-G				17	105	129	700	8	4.5
LS-H				17	105	132	715	8	4.6
LS-I				4	30	32	195	4	5.0
LS-J				18	115	140	750	10	3.1
LS-K				11	70	83	470	8	3.0

[1]Velocity for existing stations 1-16 is based on firm capacity. Velocity for future stations A-K is based on buildout peak flow.

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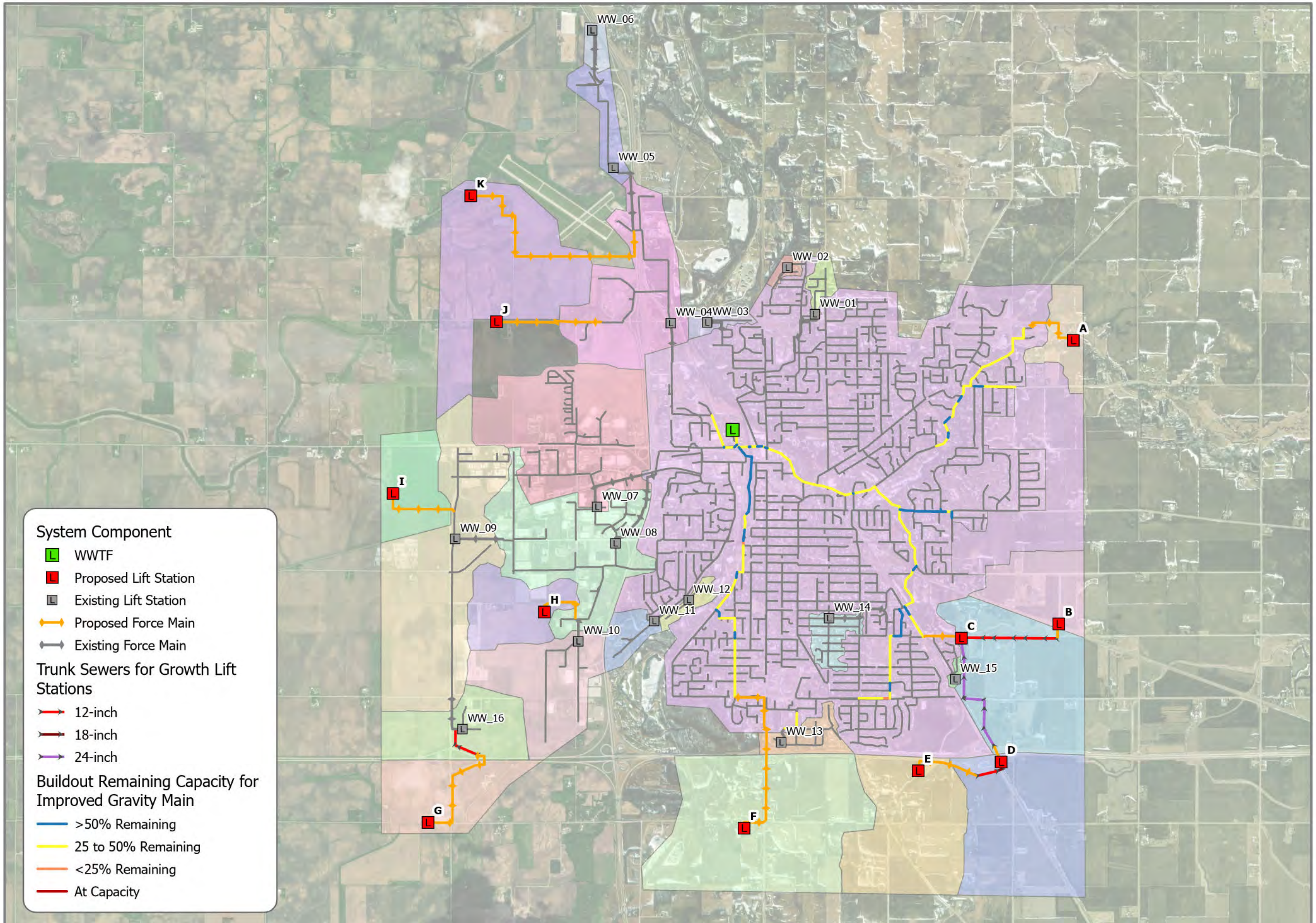

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1 inch equals 4,000 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 8.2

WASTEWATER COLLECTION SYSTEM

REMAINING CAPACITY OF BUILDOUT SYSTEM IMPROVEMENTS

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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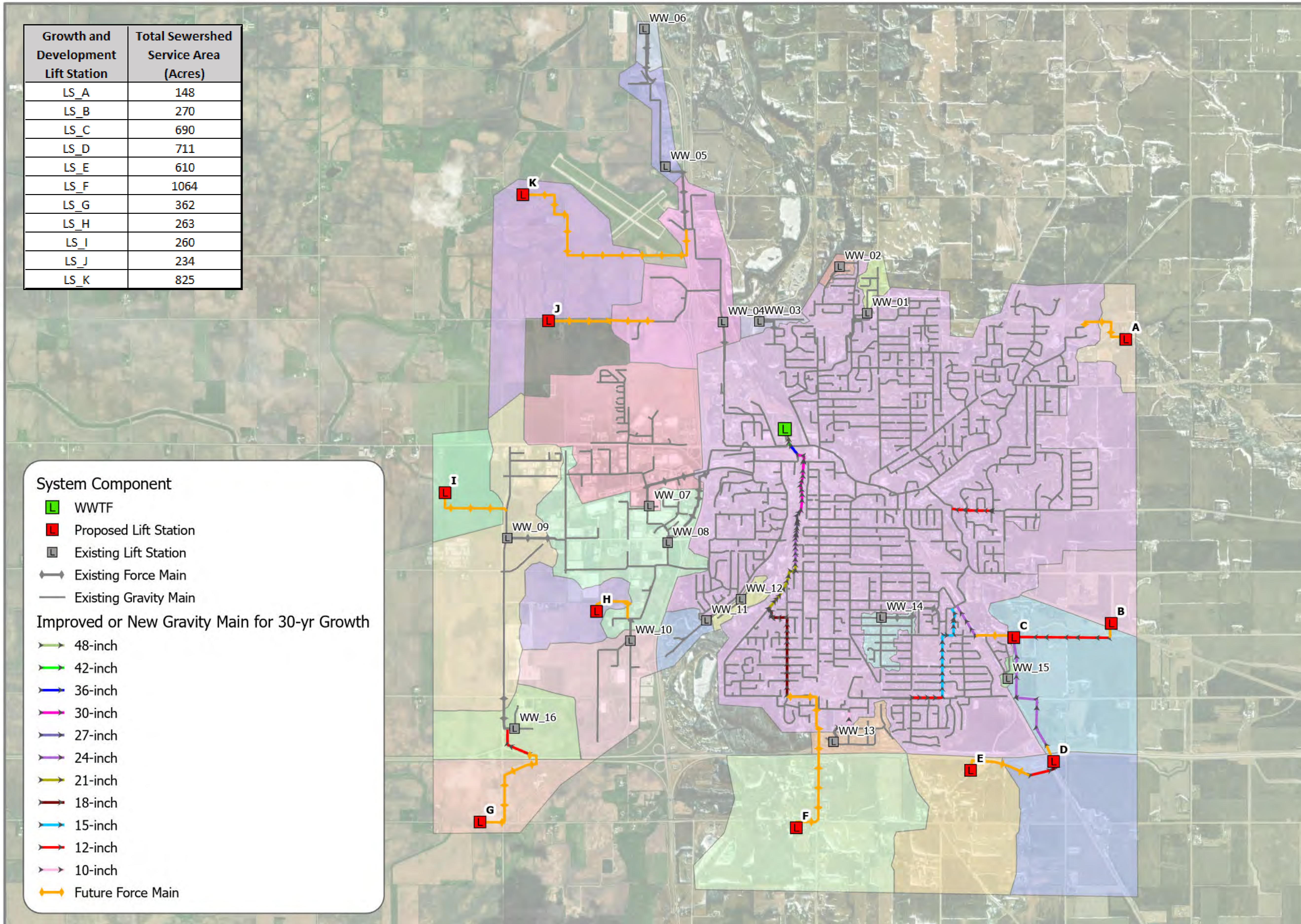

Growth and Development Lift Station	Total Sewershed Service Area (Acres)
LS_A	148
LS_B	270
LS_C	690
LS_D	711
LS_E	610
LS_F	1064
LS_G	362
LS_H	263
LS_I	260
LS_J	234
LS_K	825

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Feet
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Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 8.3

WASTEWATER COLLECTION SYSTEM

30-YEAR IMPROVEMENTS PROJECTS

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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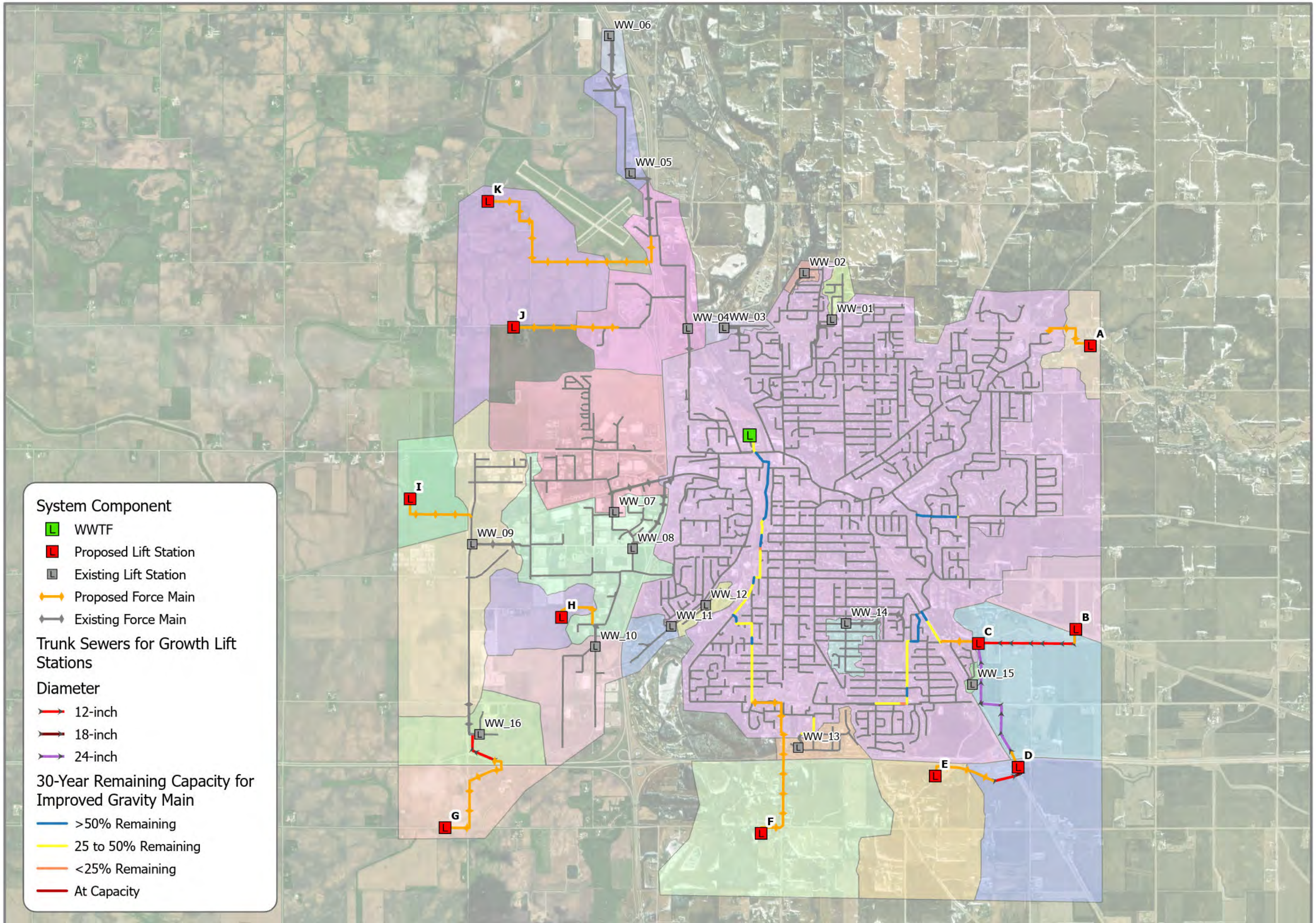

Owatonna
Steele County, MN

FIGURE 8.4

WASTEWATER COLLECTION SYSTEM

REMAINING CAPACITY OF 30-YEAR IMPROVEMENTS

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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CHAPTER 9 RECOMMENDED IMPROVEMENTS

This chapter presents recommended CIP projects identified in the course of assessing the current wastewater collection system and evaluating the 30-year growth period and buildout. The recommended wastewater collection system improvement projects represent the results of:

- The existing system evaluation.
- The future system evaluation.
- Multiple meetings with City staff.

This chapter includes descriptions of the CIP projects, cost estimate methodology, and project implementation considerations.

9.1 30-Year CIP Project List

Several improvement projects were identified to correct existing system deficiencies and additional flow from the 30-year planning horizon. A map showing the proposed improvements was previously shown in **Figure 8.3**. The 30-year improvements are proposed to be broken into six main improvement projects with a summary of each provided below:

1. Replace the main trunk sewer from the WWTF to the south along the Straight River to approximately Rose Street. This project would consist of replacing the existing gravity main with gravity mains ranging in size from 30-inch to 48-inch at the WWTF. The project would also revise the grading of the gravity sewer to eliminate improper slopes. If construction access is difficult in the pipeline replacement location, it may be possible for this pipeline to cross the Straight River approximately at Rose Street and continue along the west side of the river to the WWTF.
2. Continue replacement of the main trunk sewer from Rose Street to School Street along Walnut Avenue. This project would consist of replacing the existing trunk sewer with gravity mains ranging in size from 21-inch and 30-inch.
3. Replace the gravity mains along 18th Street SE, Smith Avenue, Havana Road, and Cardinal Drive starting at Truman Avenue and ending at approximately Bixby Road, and along Bixby Road between Havana Road and approximately Johnson Place SE.
4. Connect the existing 8-inch gravity mains between Carriage Lane and Pebble Beach Drive and replace the existing 8-inch and 10-inch gravity mains along Rose Street from Pebble Beach Drive to Izaak Walton Creek. An alternative to this could be to replace the existing 8-inch gravity main along Oakwood Lane between Crestview Lane and Rose Street with a 12-inch gravity main.

5. Continue replacement of the main trunk sewer along the east side of the Straight River by replacing the existing 12-inch pipeline along Mosher Avenue from School Street to approximately Plainview Street.
6. Replace the existing 8-inch and 10-inch gravity mains along Linn Avenue between 18th Street and Southview Street, and west to Mosher Avenue with an 18-inch pipeline.

9.1.1 Additional Buildout Project Considerations

In addition to the improvements that were identified in the 30-year system analysis, there were several other improvements that were identified with the addition of buildout flows into the collection system. A map showing the proposed buildout improvements was previously shown in **Figure 8.1**. The following is a summary of the three potential trunk sewer improvement projects beyond those discussed in the 30-year improvements. It should be noted that the timing of these improvements depends greatly on the timing, locations, and density of development throughout growth areas:

1. **Additional Trunk Sewer Improvements:**
   a. Replace the existing 24-inch and 27-inch gravity main along Maple Creek from Industrial Road approximately to Maple Drive with 30-inch and 36-inch pipelines.
   b. Replace the existing 18-inch and 21-inch gravity main along Izaak Walton Creek between Cherry Street and Bixby Road with 24-inch and 27-inch pipelines.
   c. Replace the existing 10-inch and 12-inch gravity main along Maple Creek between approximately Mineral Springs Parkway to Majestic Lane NE with 12-inch and 18-inch pipelines.
2. **Future Lift Stations:**
   a. Future lift stations were not included in the recommended CIP list as the timing of the lift stations are dependent on development timing in the areas experiencing growth. It is recommended that the City use the station sizing outlined within this report as a preliminary plan for lift station sizing and budgeting. Each lift station should be further studied as the project enters planning phases. Future studies should consider alternate force main routing, lift stations pumping to downstream lift stations, and potential land use changes.
3. **Wastewater Flow Monitoring:**
   a. It is recommended that the City monitor wastewater flow rate along major trunk lines as well as flows into lift station 8. Long-term monitoring will allow the City to measure I/I changes over time, determine benefit of lining programs, determine replacement areas, and plan for lift station sizing.

9.2 Opinion of Probable Project Cost for CIP Development

This section describes the methodology used to develop the Opinion of Probable Project Cost (OPPC) for the various types of projects outlined in the OWCSS and contains the following information:

- Opinion of Probable Project Cost Basis
- Estimate Classification
- Estimating Exclusions
- Total Estimated Project Cost
- Total Opinion of Probable Project Cost

9.2.1 Opinion of Probable Project Costs Basis

The OPPC values were based on the total capital investment necessary to complete a project from engineering design through construction. All estimates are based on engineering experience and judgment, recent bid tabulations for projects of similar scope, and input from area contractors and material suppliers. All costs are presented in 2023 dollars and inflated for each CIP project based on the estimated year it will be bid or constructed.

Total estimated project costs were divided into five main components, as follows:

- Hard Costs – The actual physical construction of the project (i.e., excavation, materials, labor, restoration).
- Soft Costs – Fees not directly related to labor and building materials (i.e., architecture and engineering fees, permitting/environmental, contract administration, legal).
- Property Acquisition Costs – The cost to obtain property, right-of-way, and easements.
- Contingency – Amount added to the estimated cost to cover both identified and unidentified risk events that occur on the project.
- Inflation – The application of the average annual inflation rate anticipated between the time an estimate is prepared and when the project is bid or projected for construction.

The sum of these five components is the total OPPC. The OPPC values are based on the preliminary concepts and layouts of the wastewater system components developed as a result of the hydraulic modeling of the system and corresponding recommendations. The estimate is to be an indication of fair market value and is not necessarily a reflection of the lowest bid. Fair market value is assumed to be mid-range tender considering four or more competitive bids.

9.2.2 Estimate Classification

The Association for the Advancement of Cost Engineering (AACE) provides guidelines for applying the general principles of estimate classification to project cost estimates (i.e., cost estimates that are used to evaluate, approve, and/or fund projects). The purpose for following a classification process is to align the level of estimating with the use of the information. The estimates provided in the OWCSS are classified in accordance with the criteria established by AACE cost estimating classification system referred to as Standard Practice 18R-97.

In accordance with AACE criteria, the OPPC values are representative of Class 4 estimates. A Class 4 estimate is defined as a study or feasibility estimate. Typically, the engineering effort is from 1 to 15 percent complete. Class 4 estimates are used to prepare planning-level effort cost scopes or complete an evaluation of alternative schemes, technical feasibility, and preliminary budget approval or approval to proceed to the next stage of implementation.

Expected accuracy for Class 4 estimates typically range from -30 to +50 percent, depending on the technical complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances.

9.2.3 Estimating Exclusions

Unless specifically identified, the following estimating exclusions were assumed in the development of the cost estimates:

- Environmental mitigation of hazardous materials and/or disposal.
- O&M costs for the project components.

9.2.4 Total Estimated Project Cost

The following sections provide a breakdown of each of the different items included in each cost component associated with developing the total OPPC for each project.

9.2.4.1 Hard Costs

Hard costs, sometimes referred to as contractor construction costs, represent the actual physical construction of a project. This section was divided into component unit costs and hard cost markups. The following sources of information were used to compile the hard cost estimates:

- Review of past construction bid tabs for similar projects.
- Review of current city estimates of construction costs.

- Review of recently bid projects for city replacement projects.
- Vendor, supplier, and contractor estimates for specific equipment and materials.

9.2.4.1.1 Component Unit Costs

All estimates are based on engineering experience and judgment, recent bid tabulations for projects of similar scope, cost indexing, and input from area contractors and material suppliers. For specific equipment and materials, information was requested from vendors and suppliers and the costs were increased by applying a multiplication factor to include the related costs and expenses (such as labor, connections, and miscellaneous materials) required to complete the installation.

9.2.4.1.2 Unpaved Gravity Sewer Main

The pipe material assumed for new, unpaved, gravity sewer mains located outside public right-of-way in an easement was ASTM D3034 SDR35 PVC for pipes ranging from 8 inches to 15 inches in diameter. Pipe material for pipe sizes between 18 inches and 36 inches was assumed to be ASTM F679 PS46 PVC. **Table 9-1** presents the unpaved gravity main construction costs. The cost is based on the following assumptions:

- Earthwork
    - Trench depth of 8 feet to 20 feet to the top of pipe.
    - Utility bedding for pipe and compaction of bedding in the trench.
    - Full depth import backfill and compaction.
- 48-inch diameter sewer manhole every 200 ft. (on average) for 8- to 18-inch pipe sizes.
- 60-inch diameter sewer manhole every 200 ft. (on average) for 36-inch pipe size.
- Includes hydroseeding surface restoration of unpaved areas.

Table 9-1: Unpaved Gravity Main Cost per Linear Foot

Pipe Diameter (inches)	C900 PVC Pipe ($/linear foot)
8	$165
10	$170
12	$180
15	$185
18	$190
36	$275

9.2.4.1.3 Paved Gravity Sewer Mains

The pipe material assumed for new gravity sewer mains located within paved public right-of-way was ASTM D3034 SDR35 PVC for pipes ranging from 8 inches to 15inches in diameter, while pipe sizes between 18-inches and 36-inches were assumed to be ASTM F679 PS46 PVC. **Table 9-2** presents the paved gravity main construction costs. The cost is based on the following assumptions:

- Earthwork
  - Trench depth of 8 feet to 12 feet to the top of pipe.
  - Utility bedding for pipe and compaction of bedding in the trench.
  - Full depth import backfill and compaction.
- 48-inch diameter sewer manhole every 200 ft. (on average) for 8- to 18-inch pipe sizes.
- 60-inch diameter sewer manhole every 200 ft. (on average) for 30- to 36-inch pipe sizes.
- Includes asphalt pavement removal and replacement of existing paved areas.

Table 9-2: Paved Gravity Main Cost per Linear Foot

Pipe Diameter (inches)	C900 PVC Pipe ($/linear foot)
8	$250
10	$255
12	$260
15	$270
18	$275
21	$290
24	$305
27	$320
30	$330
36	$360
42	$390
48	$425

Please note that the costs of curb and gutter or sidewalk removal and replacement are not included.

9.2.4.1.4 Paved and Unpaved Sewer Force Mains

The pipe material assumed for new paved and unpaved sewer force mains located within public right-of-way was DR18 C900 PVC for pipes ranging from 4 inches to 12 inches in diameter. **Table 9-3** presents the paved and unpaved sewer force main construction costs. The cost is based on the following assumptions:

- Earthwork
  - Trench depth of 6 feet to 8 feet to the top of pipe.
  - Utility bedding for pipe and compaction of bedding in the trench.
  - Full depth import backfill and compaction.
- Includes a plug valve every 1,000 feet (on average).
- Includes hydroseeding surface restoration of unpaved areas.
- Includes asphalt pavement removal and replacement of existing paved areas.

Table 9-3: Paved and Unpaved Sewer Force Main Cost per Linear Foot

Pipe Diameter (inches)	C900 PVC Pipe ($/linear foot)
4 (Unpaved)	$115
8 (Unpaved)	$125
10 (Unpaved)	$135
4 (Paved)	$195
10 (Paved)	$215

9.2.4.1.5 Other Sewer Main Items

Additional items included in the sewer main cost estimates are presented below:

- Sewer Main Connections of proposed mains to other mains in the system (**Table 9-4**).
- Sewer Main Crossings (**Table 9-5**).

Table 9-4: Sewer Main Connection Costs

Connecting Pipe Diameter (inches)	Cost per Connection ($/each)
Existing Sewer Service Connection	$2,200
Existing Sewer Main Connection	$6,400
Lift Station Connection	$6,400

Table 9-5: Sewer Main Crossing Costs

Pipe Diameter (inches)	Crossing Type	Cost ($/linear foot)
18 - 24	Road Crossing/Bore	$1,000
<18	Road Crossing/Bore	$500

9.2.4.1.6 Sewer Lift Station Facilities

Project costs for proposed lift station facilities were prepared for several different sizes. Costs were based on information obtained from package lift station vendors, previous construction experience, and recently bid projects for similar lift station projects. The cost is based on the following assumptions:

- Wet well structures vary depending on associated capacity requirements.
- Includes major components (i.e. pumps, fittings, valves, electrical, emergency generator, odor control, and communications).
- Includes site access, grading, fencing, and landscaping.

Project cost estimates for construction of sewer lift stations were based on planning level costs depending on overall capacity and whether it was for a retrofit of an existing lift station or construction of a new lift station facility, as shown in **Table 9-6**. Costs assigned to lift stations were general in definition and items such as vault assemblies associated with force mains were not included but would likely be covered as part of project contingencies if needed.

Table 9-6: Sewer Lift Station Facility Costs

Lift Station Size and Type	Cost ($)
New Lift Station (small pumps less than 150 gpm)	$500,000
New Lift Station (medium pumps 150 gpm to 500 gpm)	$750,000
New Lift Station (large pumps 500 gpm to 1,000 gpm)	$950,000
New Lift Station (very large pumps 1,000 gpm to 2,500 gpm)	$1,500,000

9.2.4.2 Hard Cost Markups

Hard costs markups are applied to the hard costs and construction costs to calculate total construction costs. The hard cost markups are reflected in the individual capital improvement project cost estimates. Markups vary depending on the size and type of the project.

- Mobilization/demobilization/insurance/permits/bonds – 0-8 percent
  - Mobilization costs include the administrative costs and expenses to mobilize materials, equipment, and labor to the jobsite and demobilize upon project completion. Costs associated with contractor insurance, permits, and bonding are also included.
- Traffic Control – 0-5 percent
  - Traffic control was assigned to projects that occur in the public right-of-way, primarily gravity main replacement or force main projects.
- Erosion Control – 0-1 percent
  - Erosion control is required for all construction projects to ensure compliance with Storm Water Pollution Prevention Plans.
- Testing and Construction Surveying – 0-3 percent
  - Costs associated with materials testing during construction in addition to construction surveying and staking.

9.2.4.3 Soft Costs

To adequately complete the planning, design, and construction of projects listed in this OWCSS, there are significant soft costs that will be required. Soft costs are non-construction labor costs consisting of architecture and engineering fees, permitting and environmental compliance, contract administration, legal fees, etc. Soft costs are applied to the hard costs plus the hard cost markups. A breakdown and summary of the soft costs that were included in the cost estimates are provided below.

- Engineering Design – 0-20 percent
  - Costs include preliminary engineering through final design, which involves the development of final project plans and specifications that will be stamped by a professional consulting engineer. Engineering costs include disciplines such as process, civil, electrical, mechanical, architectural, and structural. Costs also include surveying, testing, investigations, and inspections during the design phase. Examples include surveys of pipeline alignments and facility parcels,

security and safety inspections, material and geological testing, and inspection services.

- Construction Administration and Management – 0-10 percent
  - Costs include services to provide quality control, quality assurance, and construction management during the construction phase and services associated with the initial operation including training of operational, maintenance, and supervisory staff.
- Legal and Administrative – 0-5 percent
  - Costs associated with the local and State project approval process, and any legal costs, are included in this category. Responsible tasks may include road crossing permits, construction permits, county building permits, inter-disciplinary team meetings, NEPA compliance, expenses incurred by the City, etc.

9.2.4.3.1 Contingency

A contingency is an amount added to the base cost to cover both identified and unidentified risk events that occur on the project. A contingency value of 25 percent was assumed for the proposed projects. The contingency values were added to the overall project base cost (i.e. hard and soft costs) in anticipation of uncertainties inherent to the planning-level analysis completed for the OWCSS.

9.2.4.3.2 Inflation

Projects intended for construction several years in the future include a factor for inflationary impacts to address the general trend of cost indices, which accounts for future labor, material, and equipment cost increases beyond values at the time the estimate is prepared. For this planning-level analysis, the 2023 project costs were inflated to the construction year anticipated for each CIP project. An annual average inflation rate was generated based on historic inflation data to estimate inflation trends into the future.

9.2.4.4 Summary of Estimate Markups

Table 9-7 provides a summary of suggested hard costs markups, soft costs, and contingency rate percentages.

Table 9-7: Total Estimate Project Markup Summary

Item	Rate Range (%)
Hard Cost Markups	
Mobilization/Demobilization/Insurance/Permits/Bonds	0-8
Traffic Control	0-5
Erosion Control	0-1
Testing and Construction Surveying	0-3
Soft Costs	
Engineering Design	0-20
Construction Administration and Management	0-10
Legal and Administrative	0-5
Other	
Contingency	25
Estimated Annual Inflation	5

9.2.5 Opinion of Probable Project Cost (OPPC) Sheets

Appendix E provides the OPPC cost sheets used to generate estimated cost information for each proposed 30-year capital improvement project identified in this chapter. **Appendix F** provides the OPPC cost sheets used to generate estimated cost information for each proposed future lift station based on 30-year flow rates.

9.3 CIP Timing, Prioritization, and Implementation

Following the basis of planning detailed in **Chapter 3**, CIPs identified within this OWCSS were prioritized primarily based on existing system deficiencies. The prioritization of the projects is shown in **Figure 9.1**. For the purposes of this report, it was assumed that one of these capital improvements projects would be completed each year beginning in 2024. The estimated project costs for the proposed 30-year capital improvement projects, as well as the proposed year of construction, are summarized in **Table 9-8**. Cost estimates were also developed for each proposed future lift station. A summary of the costs for each lift station is provided in **Table 9-9**. Due to unknown timing of development, the lift station costs were not indexed and are shown in 2023 dollars.

Table 9-8: 30-Year CIP OPPC

Project Number	Capital Improvement Project	Anticipated CIP Year	Estimated CIP Cost[1]
WW-01	Straight River Trunk Sewer #1	2024	$2,759,619
WW-02	Straight River Trunk Sewer #2	2025	$1,523,750
WW-03	18th St and Smith Ave Trunk Sewer	2026	$3,142,929
WW-04	Oakwood Lane Sewer Replacement	2027	$999,442
WW-05	Straight River Trunk Sewer #3	2028	$1,412,103
WW-06	Linn Ave Trunk Sewer	2029	$2,936,955
		TOTAL	**$12,774,798**

[1]*Costs are indexed to the year of construction.*

Table 9-9: Future Lift Station and Force Main Costs

Project No.	Peak Flow – 30-yr (gpm)	Force Main Diam (in)	Force Main Length (ft)	Anticipated CIP Cost[1]
LS_A	65	4	2,640	$1,468,541
LS_B	80	4	620	$1,186,288
LS_C	915	10	1,680	$3,783,528
LS_D	555	8	750	$2,601,329
LS_E	170	4	3,000	$1,892,782
LS_F	210	4	8,200	$3,848,490
LS_G	105	4	5,100	$2,623,708
LS_H	105	4	2,400	$1,759,714
LS_I	30	4	3,300	$1,614,916
LS_J	115	4	4,500	$2,225,452
LS_K	70	4	10,600	$3,233,910
			TOTAL	**$26,238,655**

[1]*Costs are in 2023 dollars.*

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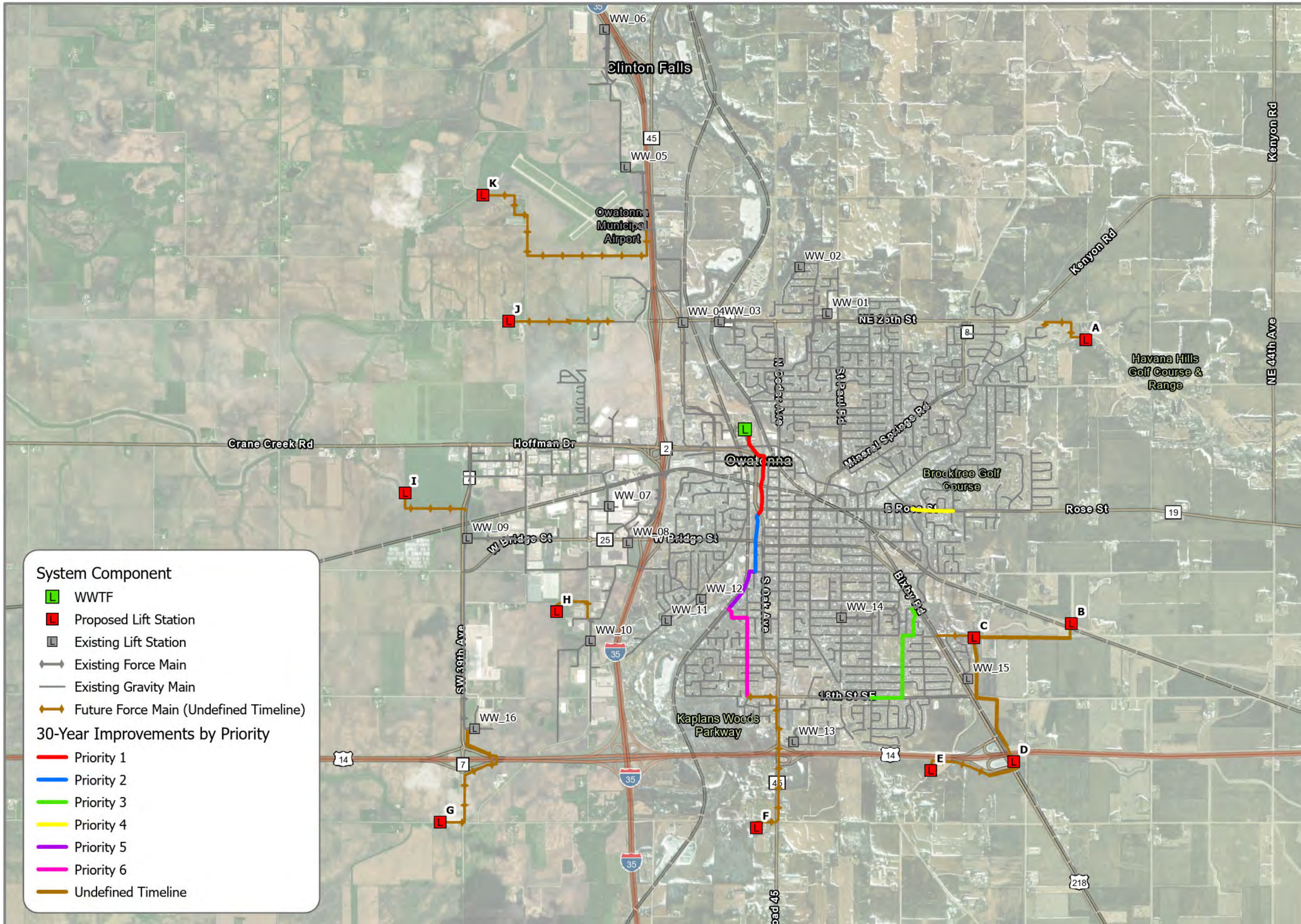

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1 inch equals 4,000 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

FIGURE 9.1

WASTEWATER COLLECTION SYSTEM

30-YEAR IMPROVEMENTS PRIORITIZATION

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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Appendix A – Flow Monitoring Locations

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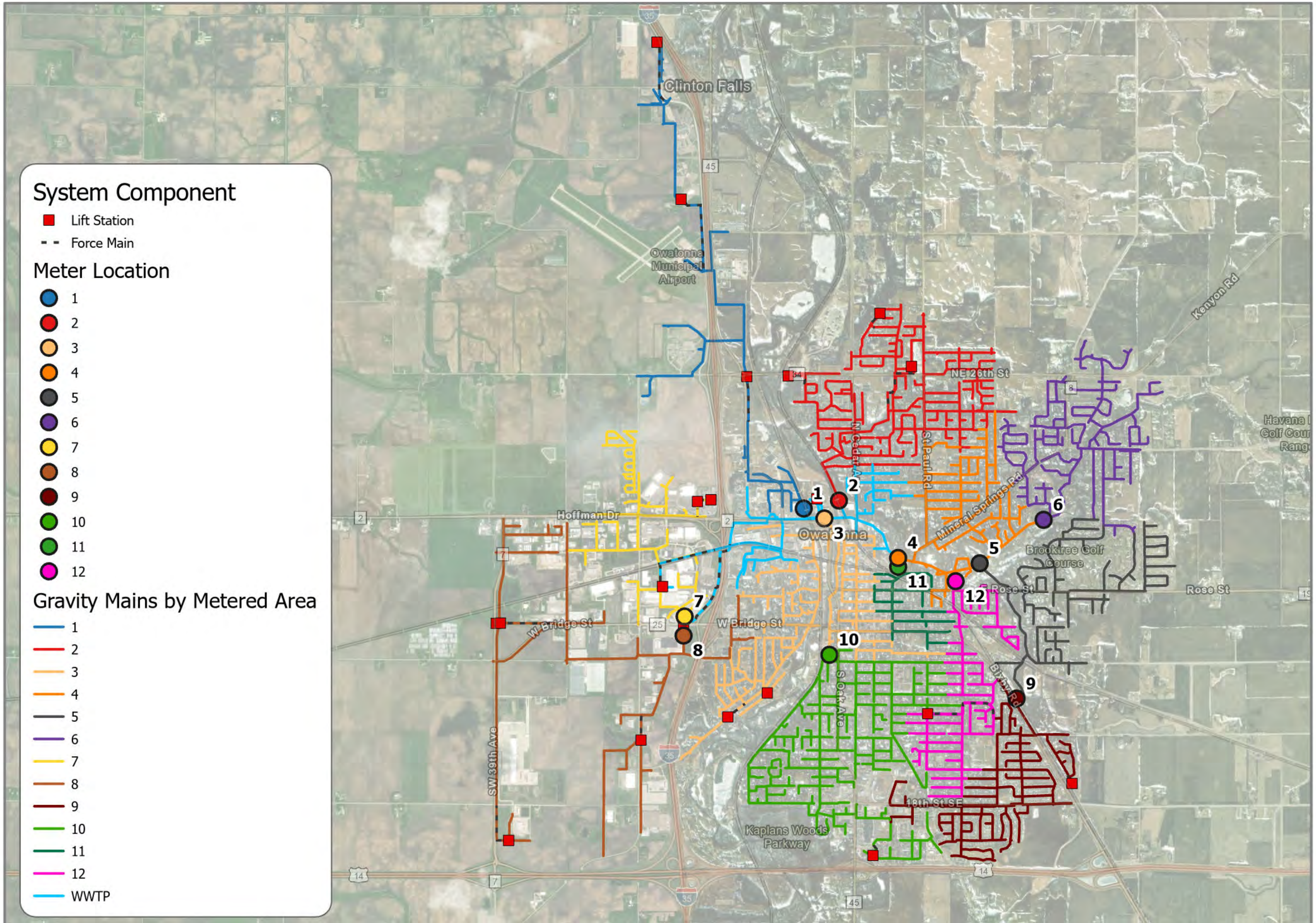

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Feet

1 inch equals 3,500 feet

Locator Map Not to Scale

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WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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Feet

1 inch equals 200 feet

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WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location

1 (15" VCP)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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Feet

1 inch equals 200 feet

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WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location

2 (24" RCP)

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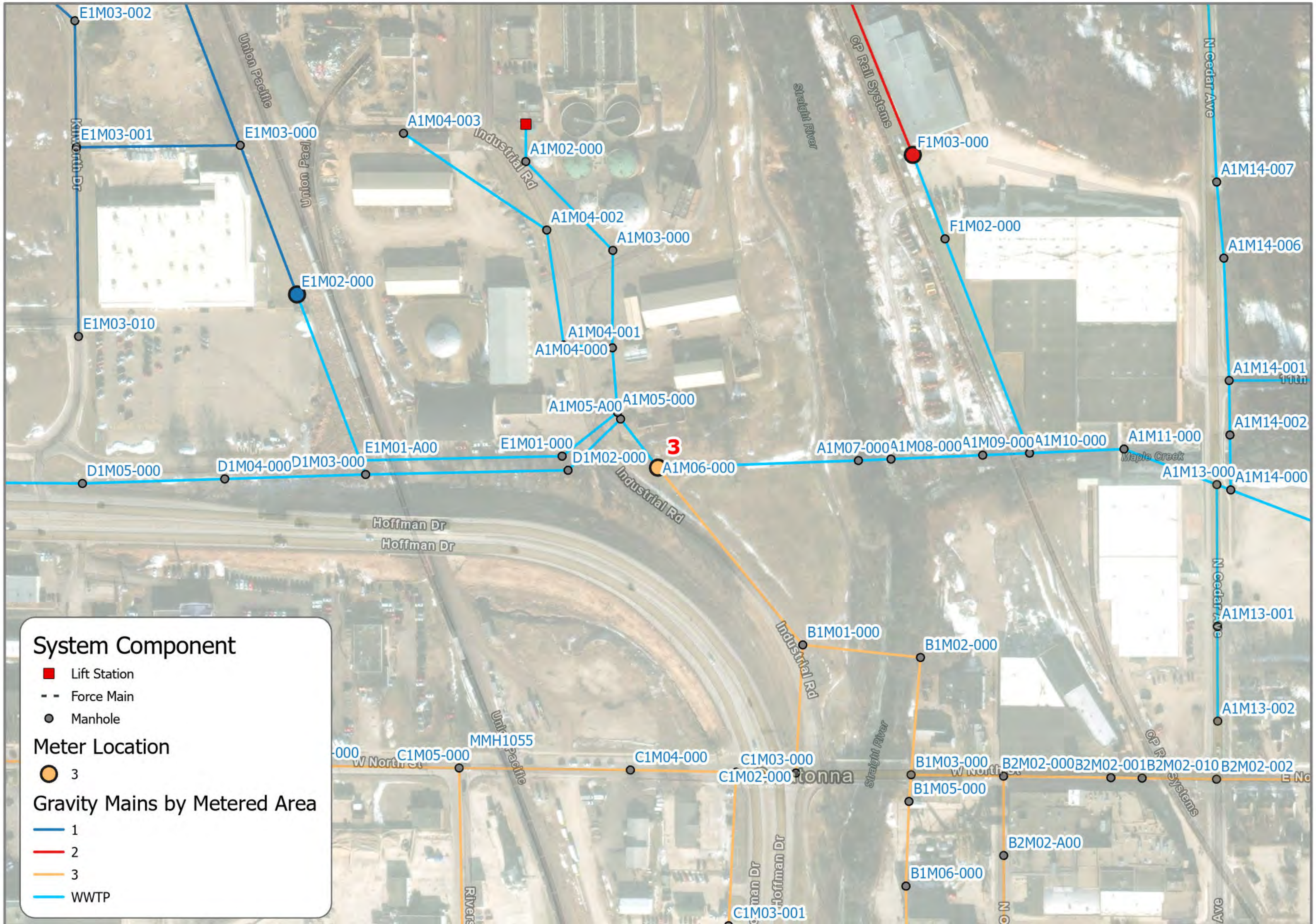

N

0 50 100 Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location
3 (24" VCP)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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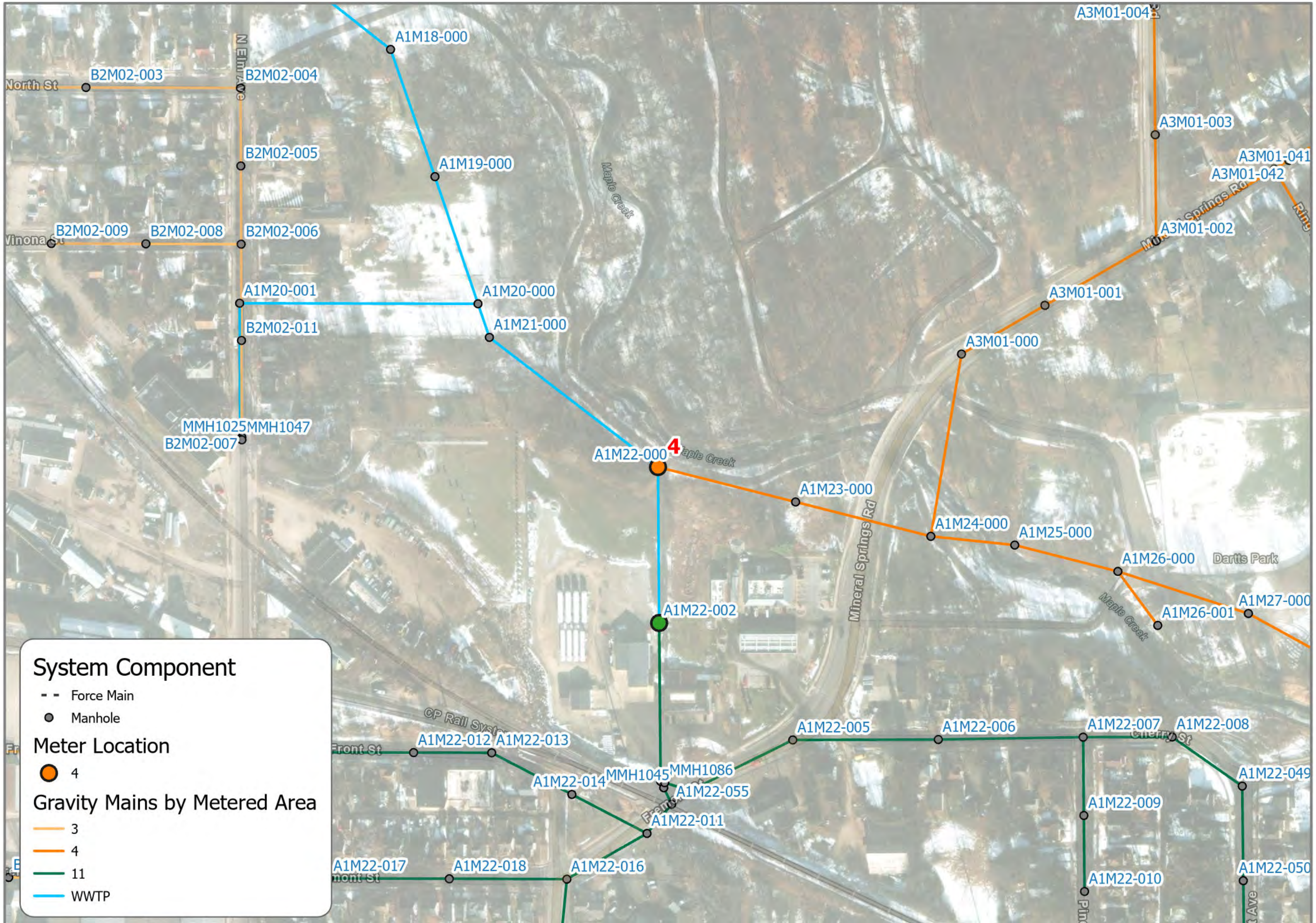

N

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Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location

4 (27" RCP)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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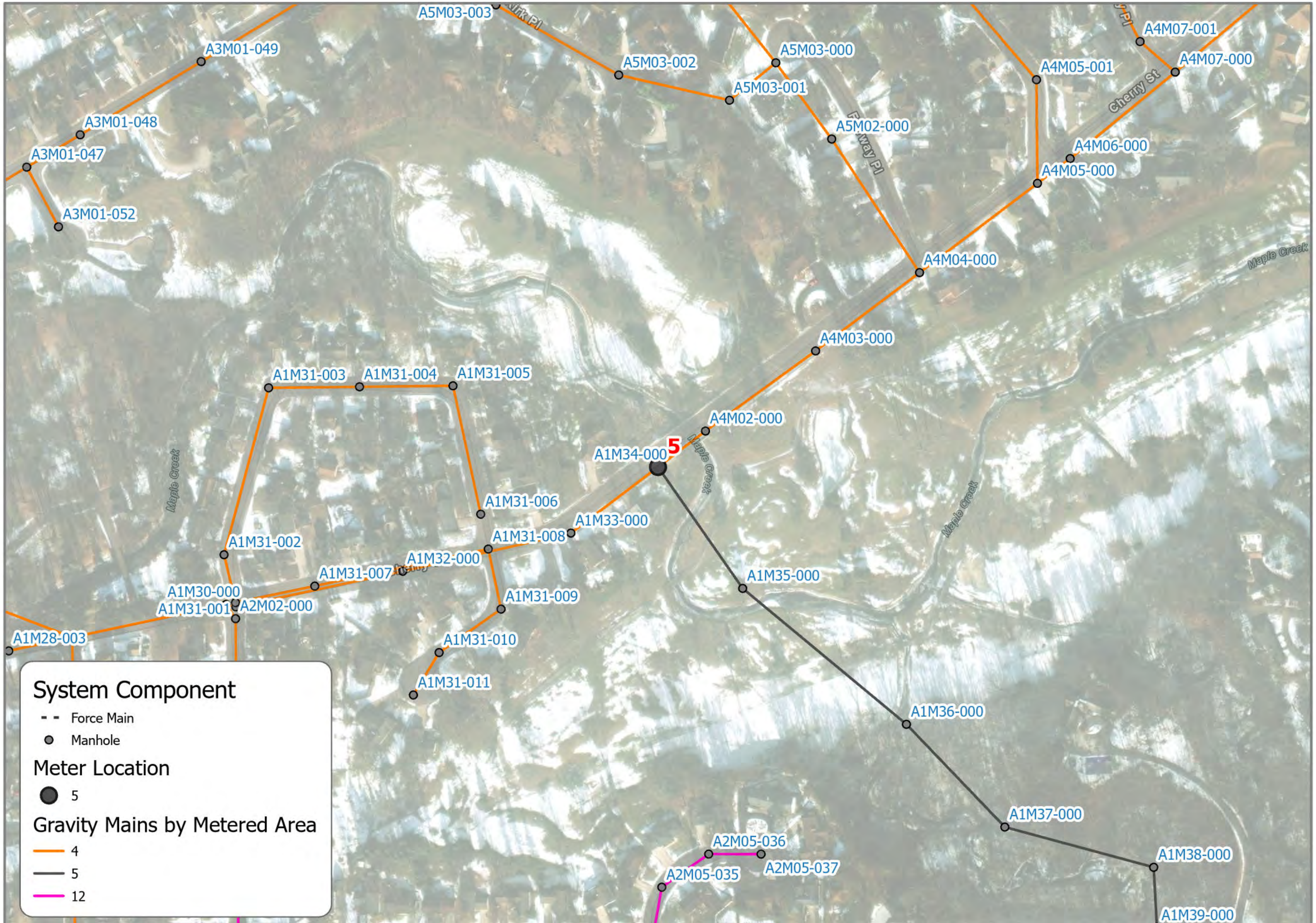

N
0 50 100
Feet
1 inch equals 200 feet


Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location

5 (21" RCP)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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N
0 50 100
Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location
6 (18" PVC)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

AE2S

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Coordinate System: NAD 1983 HARN Adj MN Steele Feet | Edited by: DVoeller | E:\Data\Projects\O\Owatonna\Wastewater Collection System\Hydraulic Model\Owatonna Mapping\Owatonna Maps.aprx | 03 - Meter Location Map Book

N
0 50 100
Feet
1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location
7 (21" PVC)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

AE2S

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N

0 50 100

Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location

8 (24" RCP)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

AE2S

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Coordinate System: NAD 1983 HARN Adj MN Steele Feet | Edited by: DVoeller | E:\Data\Projects\O\Owatonna\Wastewater Collection System\Hydraulic Model\Owatonna Mapping\Owatonna Maps.aprx | 03 - Meter Location Map Book

N
0 50 100
Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location
9 (21" RCP)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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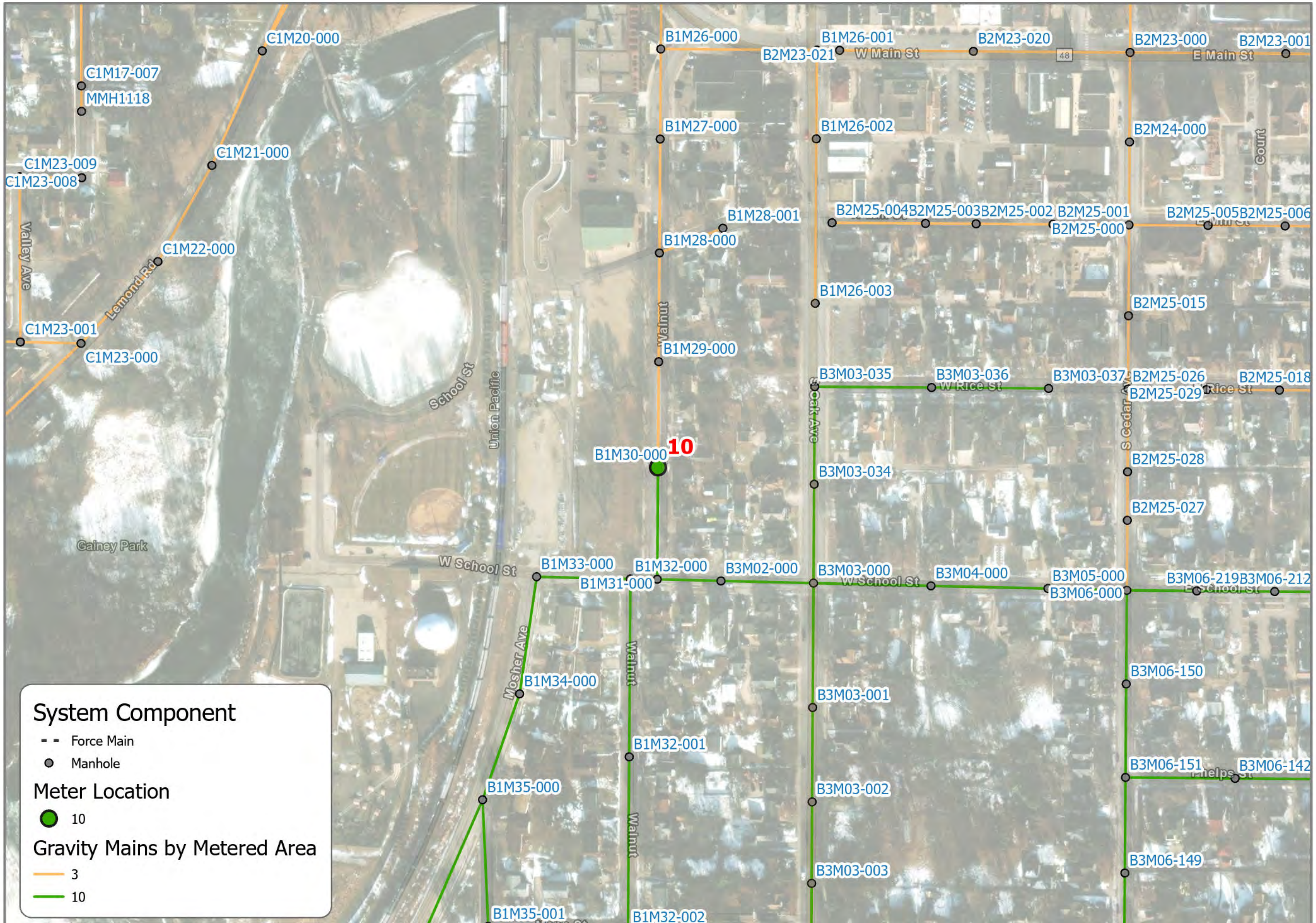
Coordinate System: NAD 1983 HARN Adj MN Steele Feet | Edited by: DVoeller | E:\Data\Projects\O\Owatonna\Wastewater Collection System\Hydraulic Model\Owatonna Mapping\Owatonna Maps.aprx | 03 - Meter Location Map Book



N

0 50 100
Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location
10 (18" PVC)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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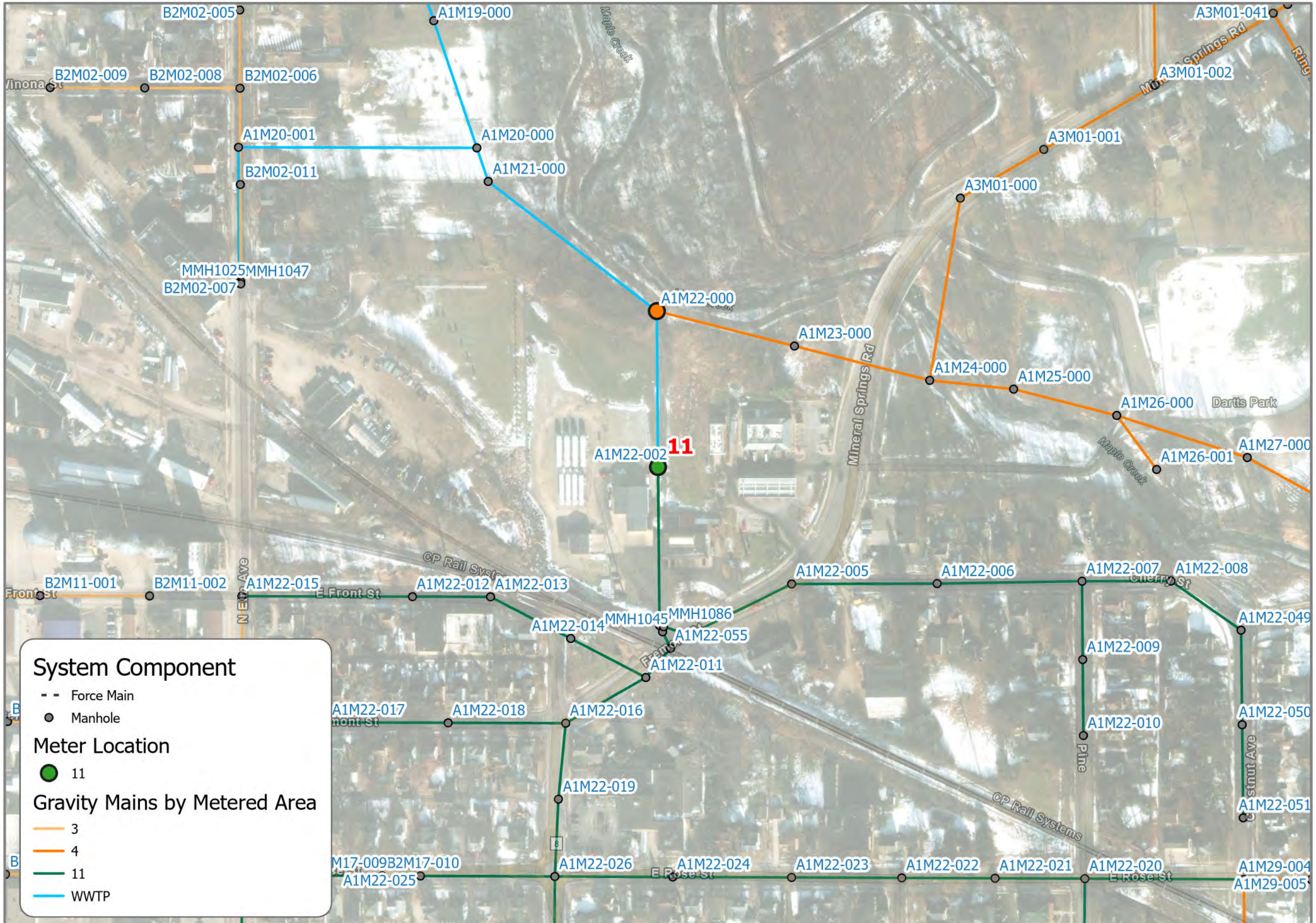
Coordinate System: NAD 1983 HARN Adj MN Steele Feet | Edited by: DVoeller | E:\Data\Projects\O\Owatonna\Wastewater Collection System\Hydraulic Model\Owatonna Mapping\Owatonna Maps.aprx | 03 - Meter Location Map Book



N

0 50 100

Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location

11 (12" PVC)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

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N

0 50 100 Feet

1 inch equals 200 feet

Locator Map Not to Scale

Owatonna
Steele County, MN

WASTEWATER COLLECTION SYSTEM

FLOW MONITORING LOCATIONS AND METERED AREAS

Meter Location

12 (18" PVC)

2022 SANITARY SEWER SYSTEM STUDY

Date: 11/18/2023

AE2S

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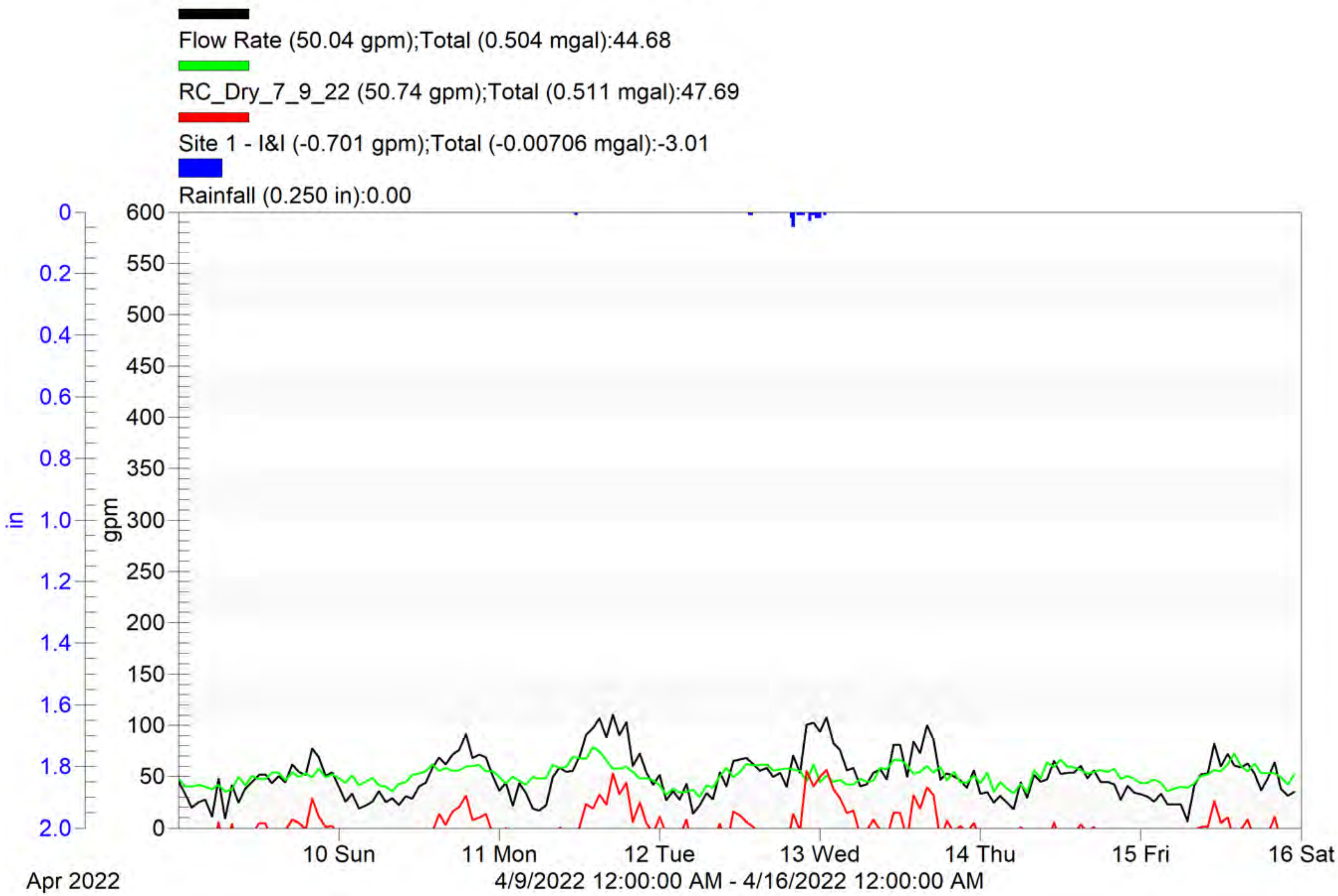
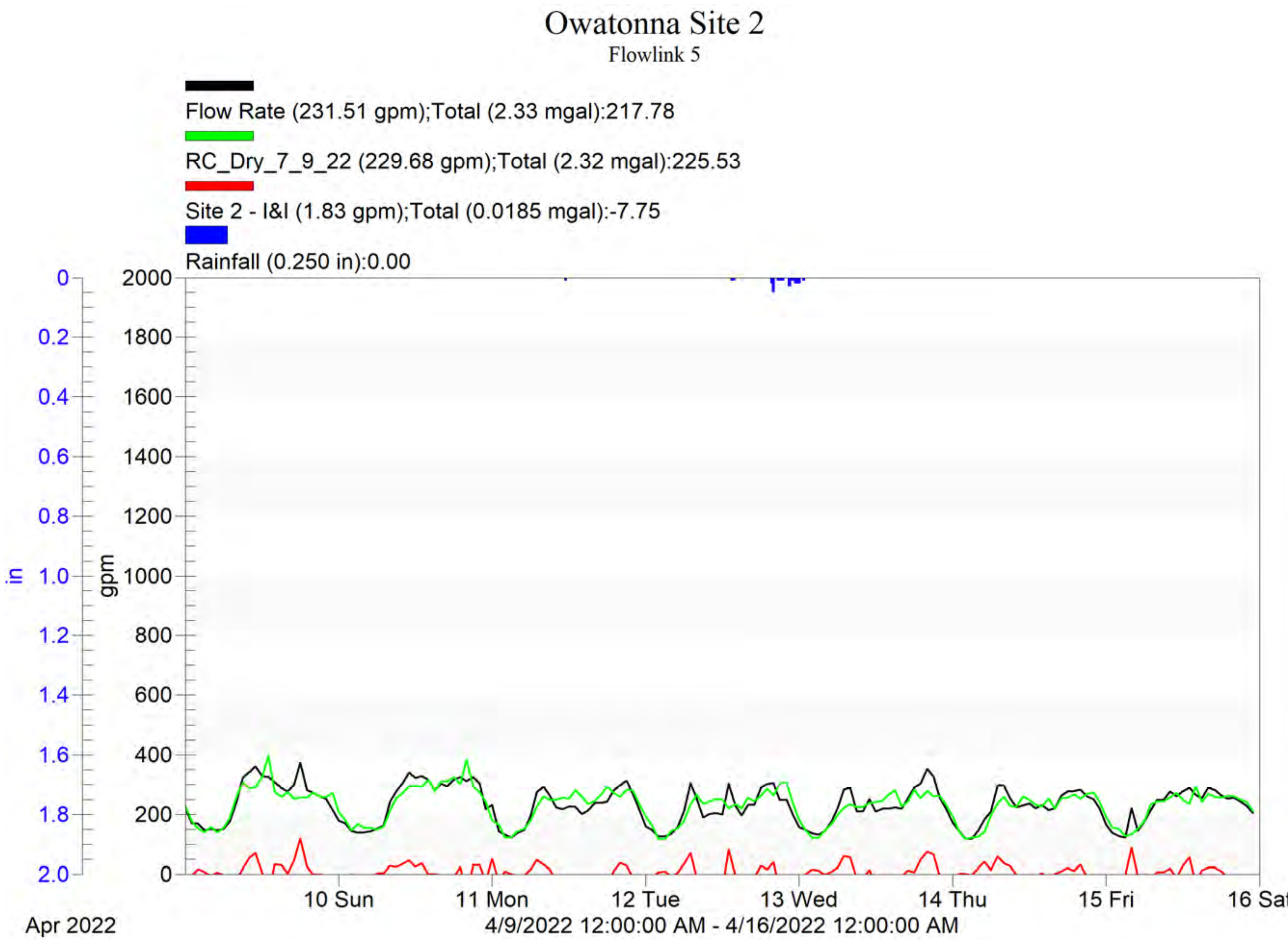
Coordinate System: NAD 1983 HARN Adj MN Steele Feet | Edited by: DVoeller | E:\Data\Projects\O\Owatonna\Wastewater Collection System\Hydraulic Model\Owatonna Mapping\Owatonna Maps.aprx | 03 - Meter Location Map Book

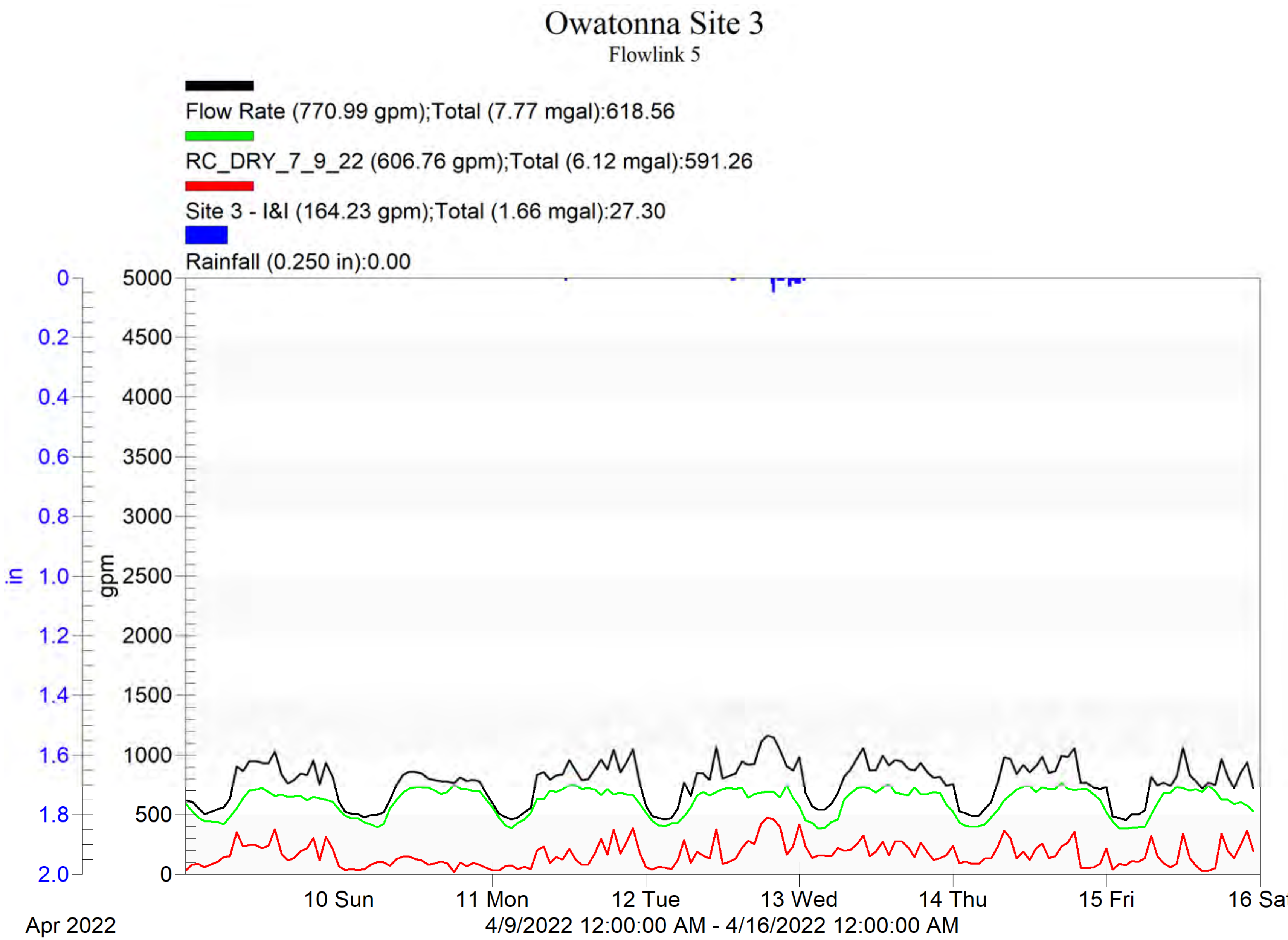
Appendix B – Flow Monitoring Charts for Base Flow

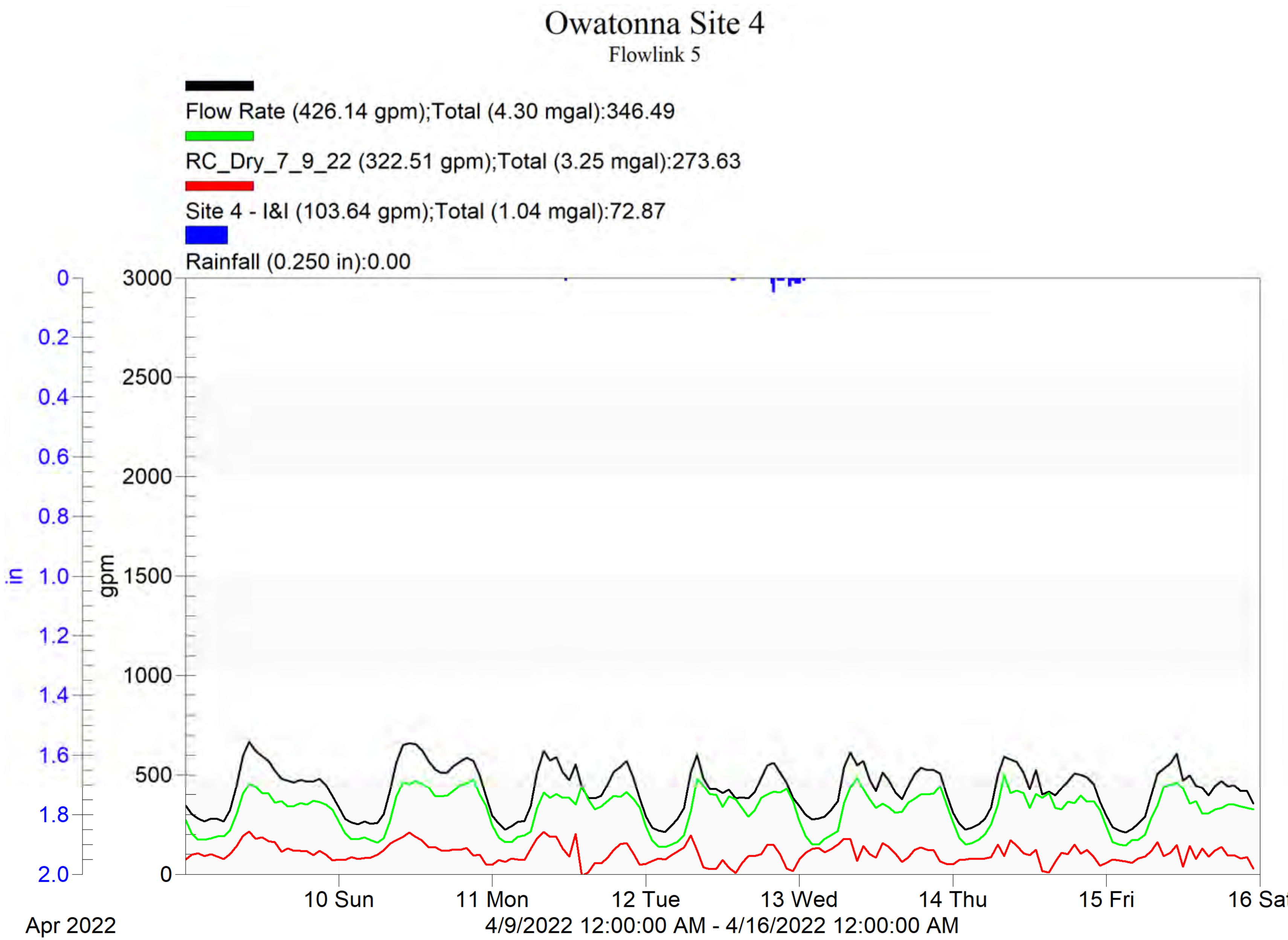
Owatonna site 1

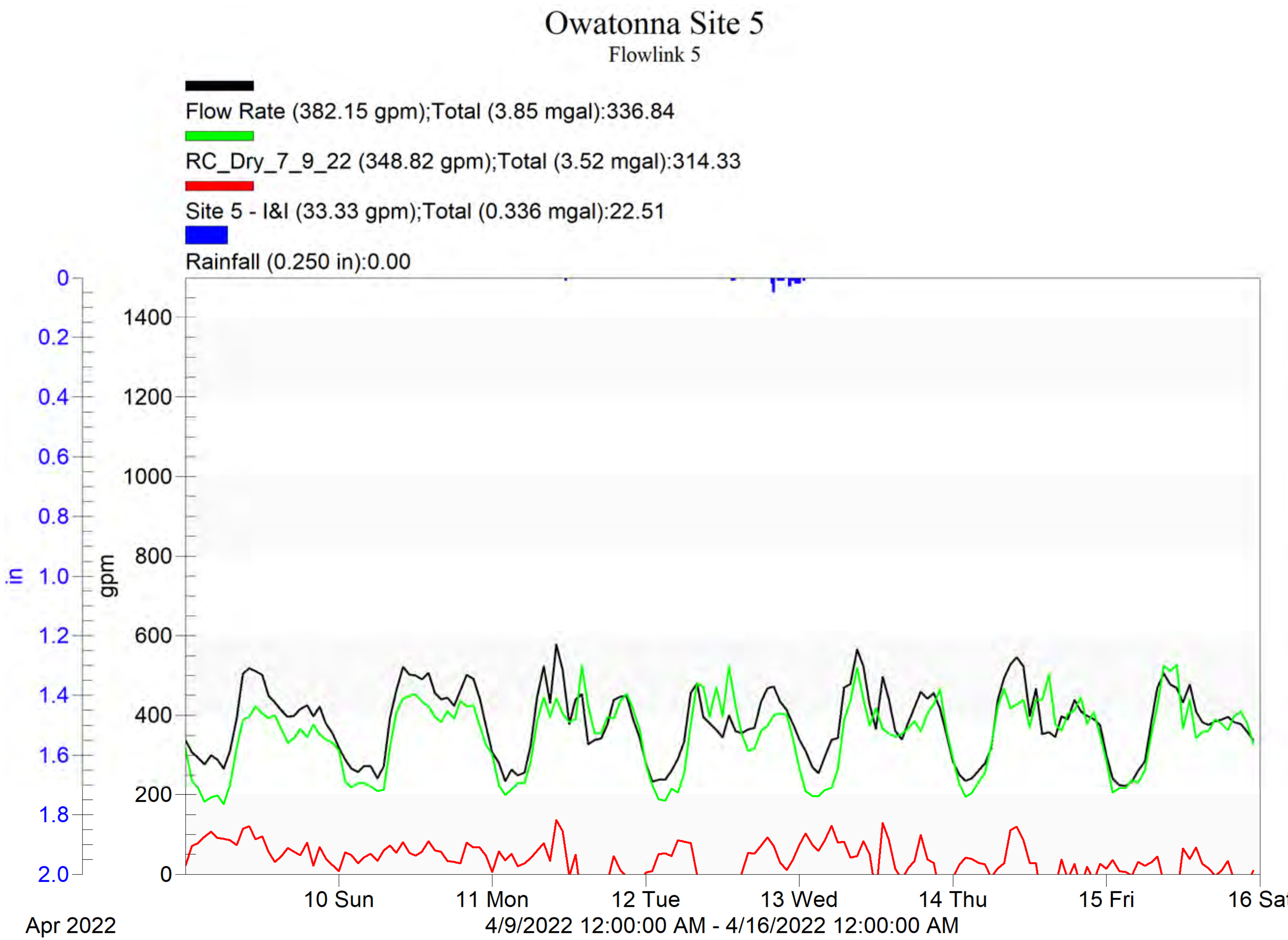
Flowlink 5



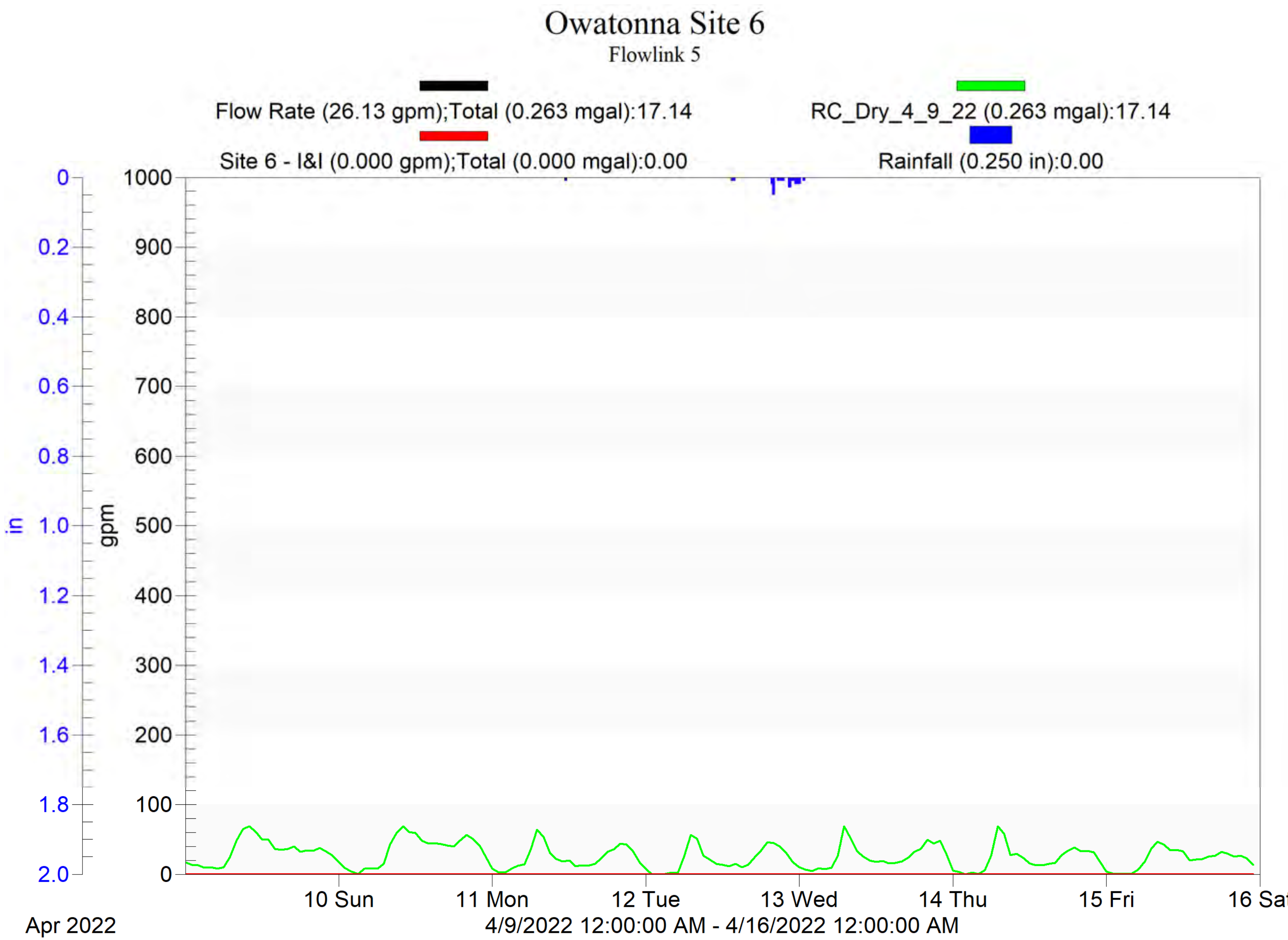

Owatonna Site 2
Flowlink 5
Flow Rate (231.51 gpm);Total (2.33 mgal):217.78
RC_Dry_7_9_22 (229.68 gpm);Total (2.32 mgal):225.53
Site 2 - I&I (1.83 gpm);Total (0.0185 mgal):-7.75
Rainfall (0.250 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
2000
1800
1600
1400
1200
1000
800
600
400
200
0
10 Sun
11 Mon
12 Tue
13 Wed
14 Thu
15 Fri
16 Sat
Apr 2022
4/9/2022 12:00:00 AM - 4/16/2022 12:00:00 AM


Owatonna Site 3
Flowlink 5
Flow Rate (770.99 gpm);Total (7.77 mgal):618.56
RC_DRY_7_9_22 (606.76 gpm);Total (6.12 mgal):591.26
Site 3 - I&I (164.23 gpm);Total (1.66 mgal):27.30
Rainfall (0.250 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
10 Sun
11 Mon
12 Tue
13 Wed
14 Thu
15 Fri
16 Sat
Apr 2022
4/9/2022 12:00:00 AM - 4/16/2022 12:00:00 AM


Owatonna Site 4
Flowlink 5
Flow Rate (426.14 gpm);Total (4.30 mgal):346.49
RC_Dry_7_9_22 (322.51 gpm);Total (3.25 mgal):273.63
Site 4 - I&I (103.64 gpm);Total (1.04 mgal):72.87
Rainfall (0.250 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
3000
2500
2000
1500
1000
500
0
10 Sun
11 Mon
12 Tue
13 Wed
14 Thu
15 Fri
16 Sat
Apr 2022
4/9/2022 12:00:00 AM - 4/16/2022 12:00:00 AM



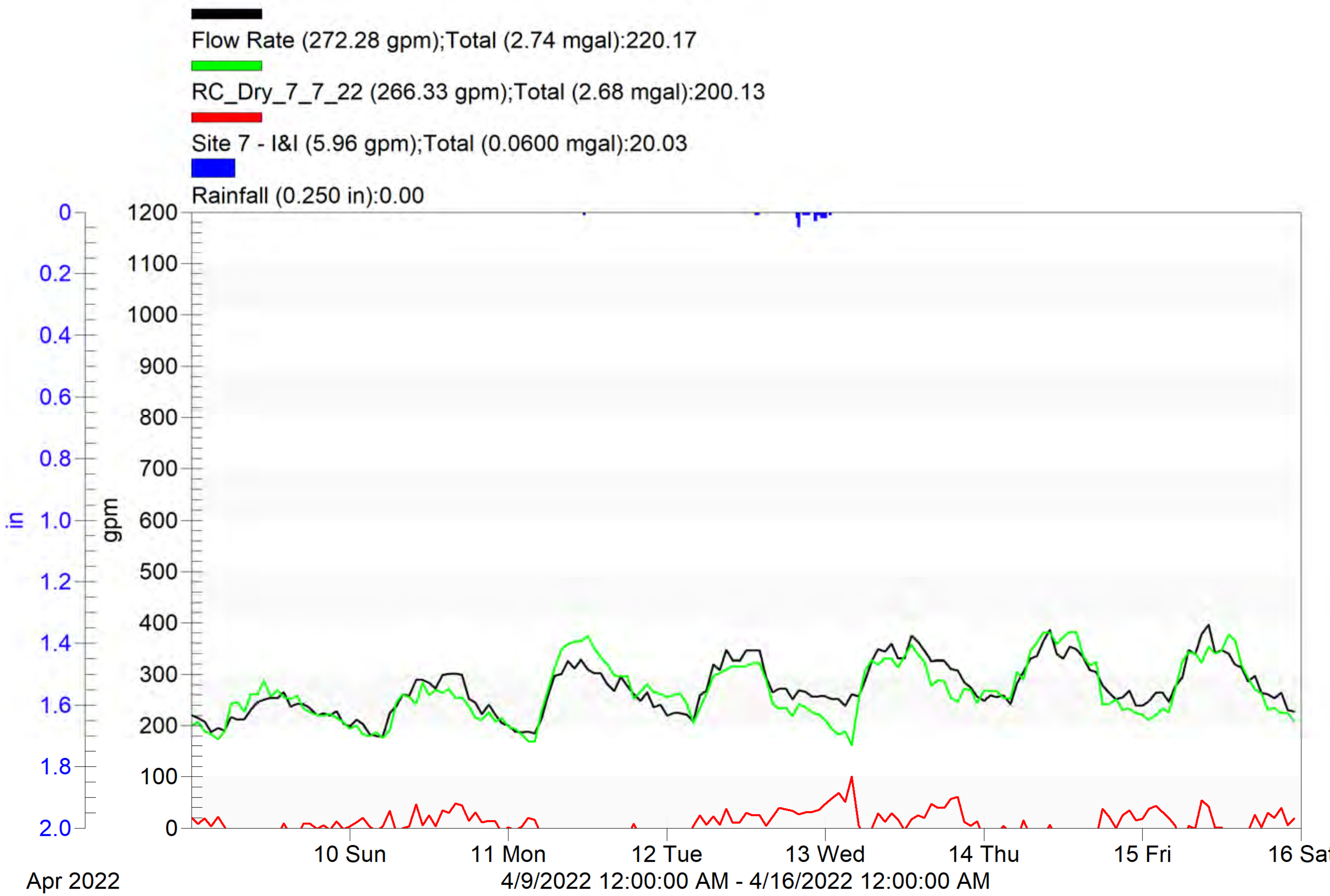
Owatonna Site 5
Flowlink 5
Flow Rate (382.15 gpm);Total (3.85 mgal):336.84
RC_Dry_7_9_22 (348.82 gpm);Total (3.52 mgal):314.33
Site 5 - I&I (33.33 gpm);Total (0.336 mgal):22.51
Rainfall (0.250 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1400
1200
1000
800
600
400
200
0
10 Sun
11 Mon
12 Tue
13 Wed
14 Thu
15 Fri
16 Sat
Apr 2022
4/9/2022 12:00:00 AM - 4/16/2022 12:00:00 AM



Owatonna Site 6
Flowlink 5
Flow Rate (26.13 gpm);Total (0.263 mgal):17.14
RC_Dry_4_9_22 (0.263 mgal):17.14
Site 6 - I&I (0.000 gpm);Total (0.000 mgal):0.00
Rainfall (0.250 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
1000
900
800
700
600
500
400
300
200
100
0
10 Sun
11 Mon
12 Tue
13 Wed
14 Thu
15 Fri
16 Sat
Apr 2022
4/9/2022 12:00:00 AM - 4/16/2022 12:00:00 AM

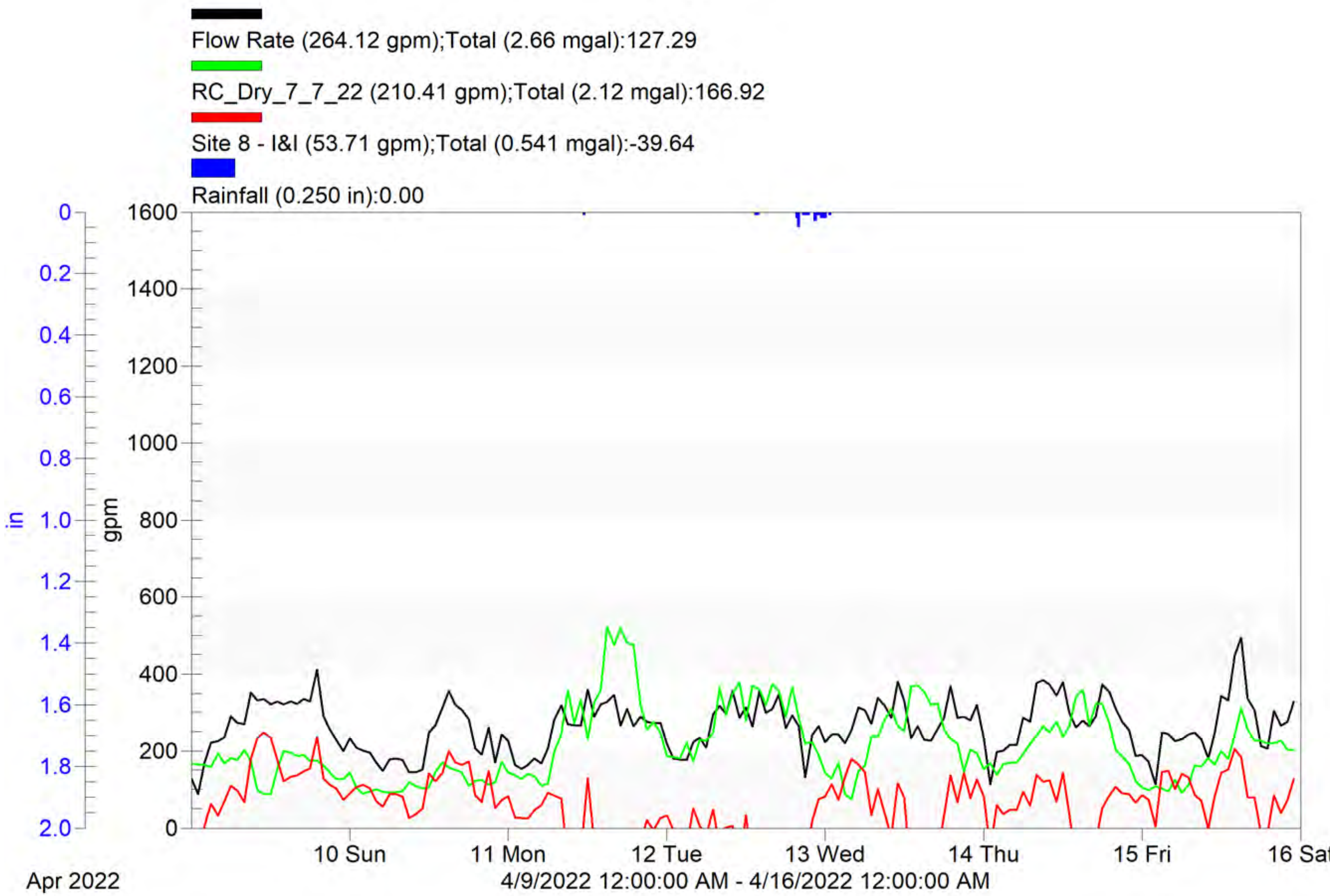
Owatonna Site 7

Flowlink 5



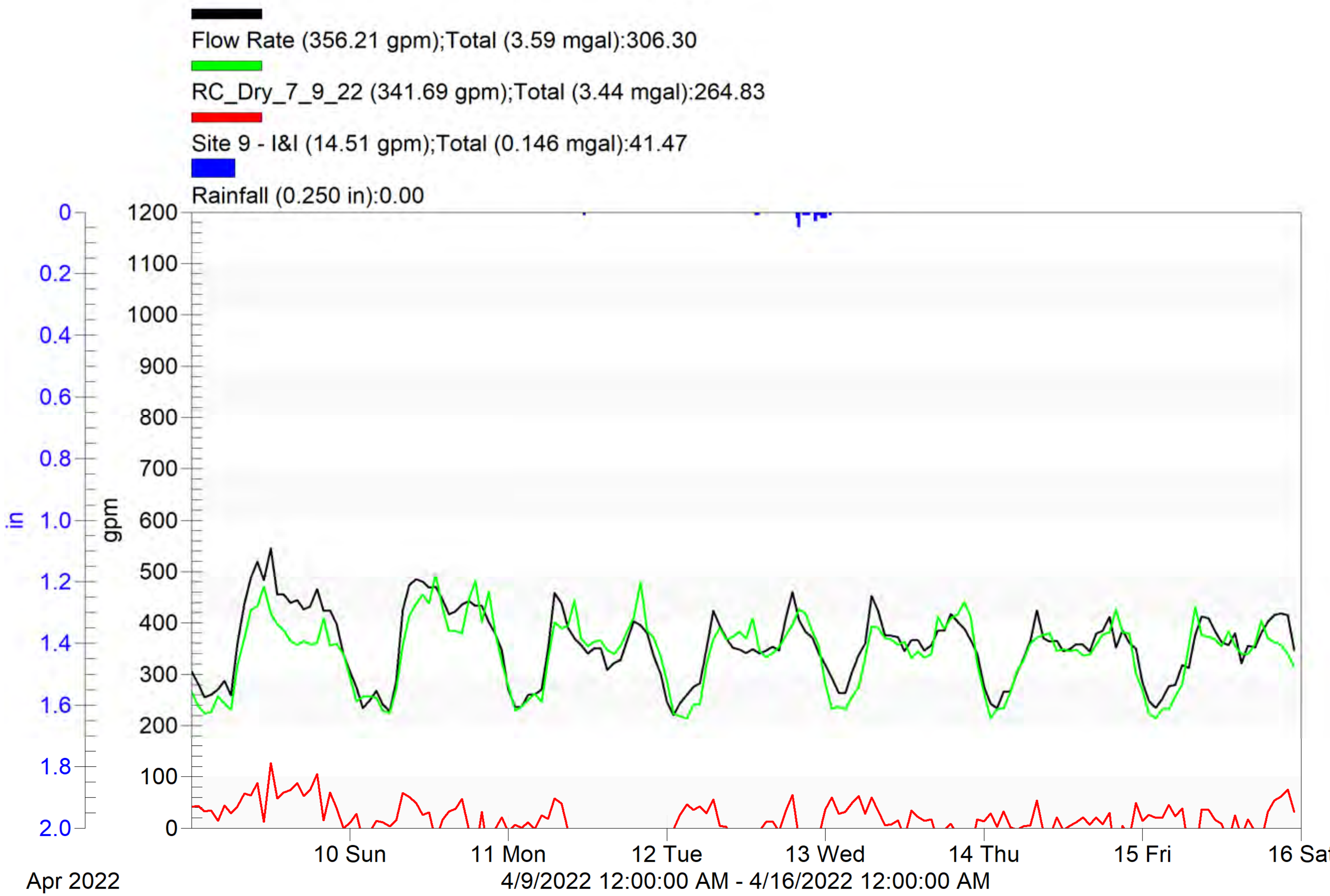
Owatonna Site 8

Flowlink 5



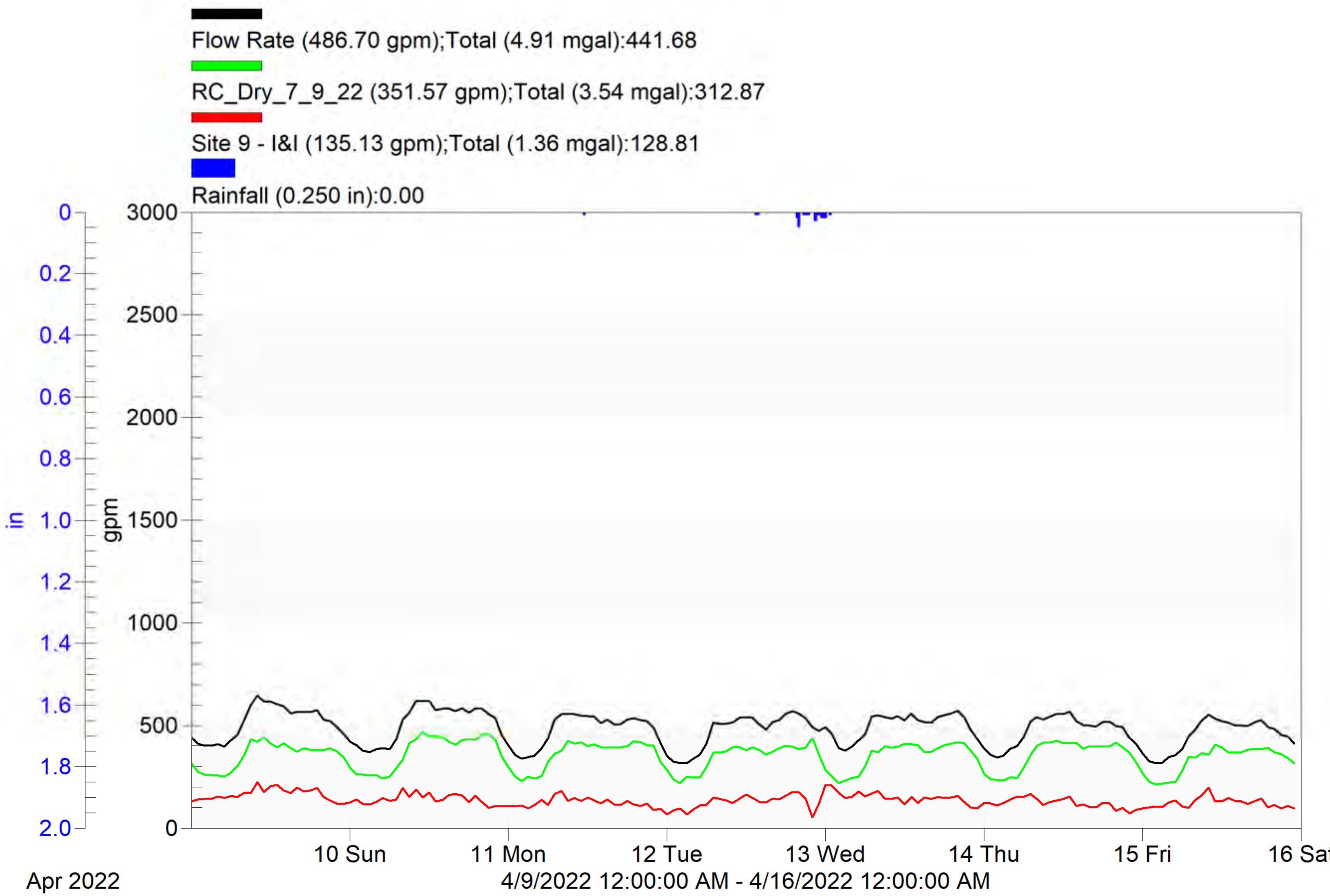
Owatonna Site 9

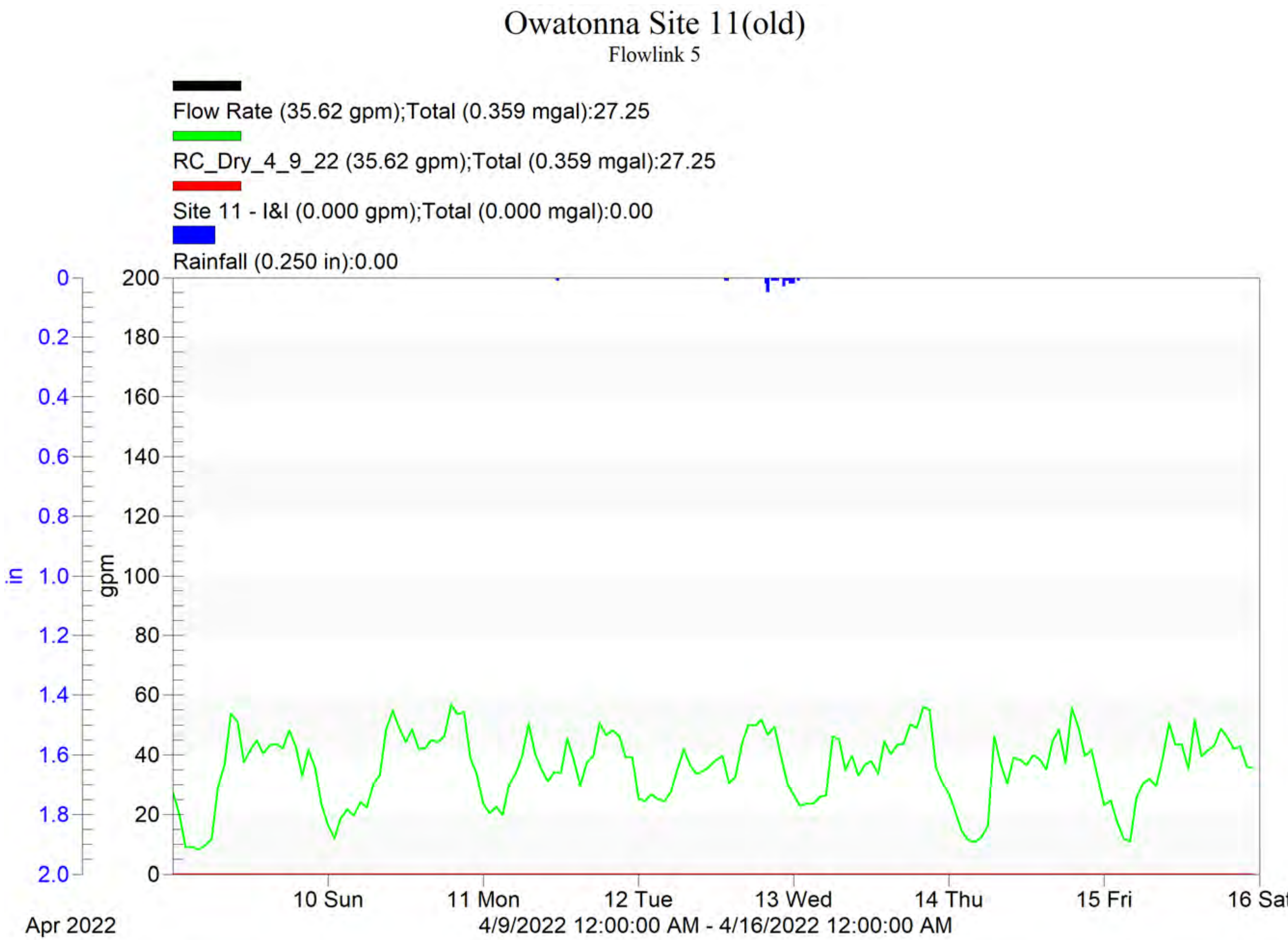
Flowlink 5

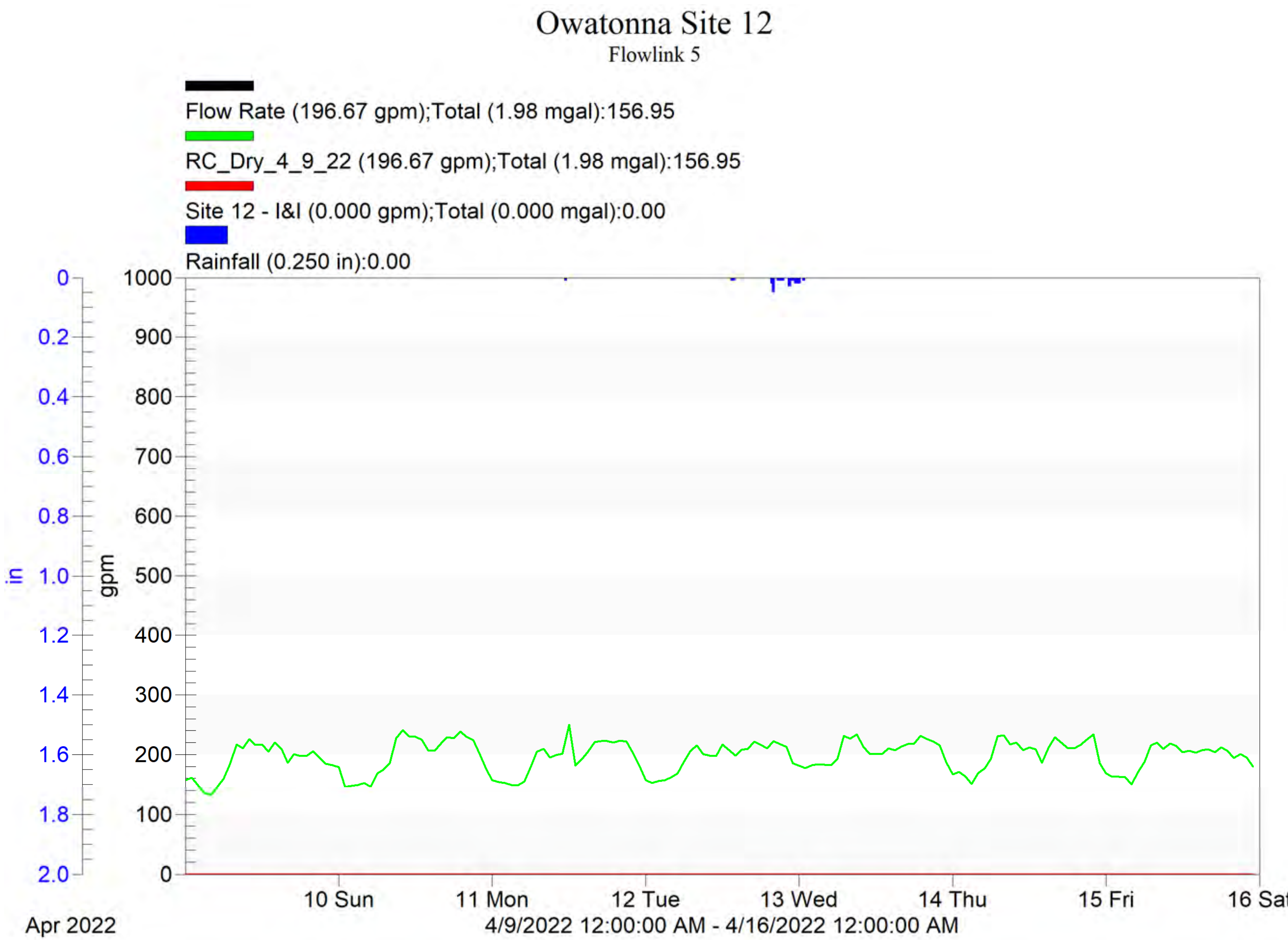


Owatonna Site 10

Flowlink 5

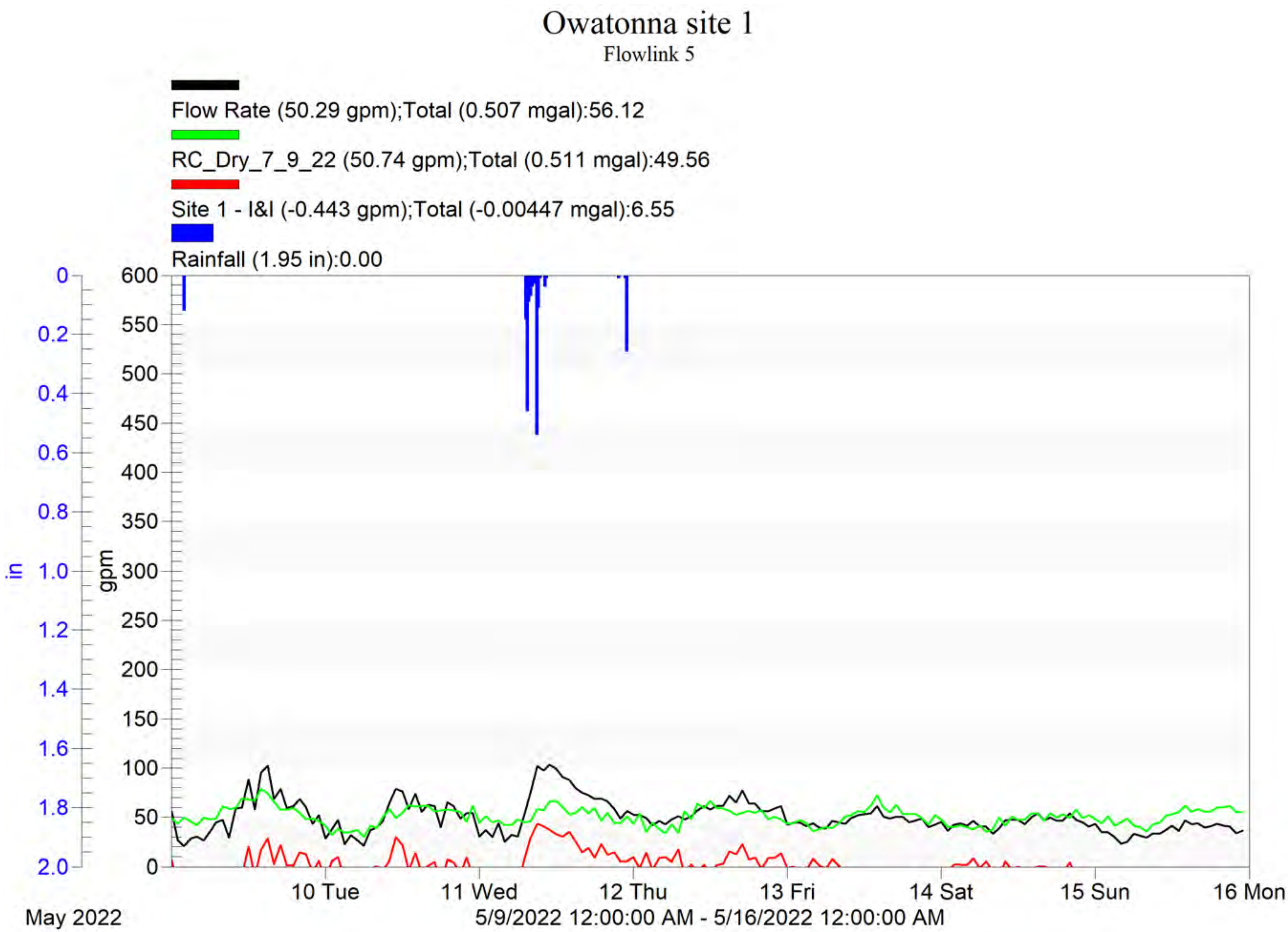



Owatonna Site 11(old)
Flowlink 5
Flow Rate (35.62 gpm);Total (0.359 mgal):27.25
RC_Dry_4_9_22 (35.62 gpm);Total (0.359 mgal):27.25
Site 11 - I&I (0.000 gpm);Total (0.000 mgal):0.00
Rainfall (0.250 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
200
180
160
140
120
100
80
60
40
20
0
10 Sun
11 Mon
12 Tue
13 Wed
14 Thu
15 Fri
16 Sat
Apr 2022
4/9/2022 12:00:00 AM - 4/16/2022 12:00:00 AM

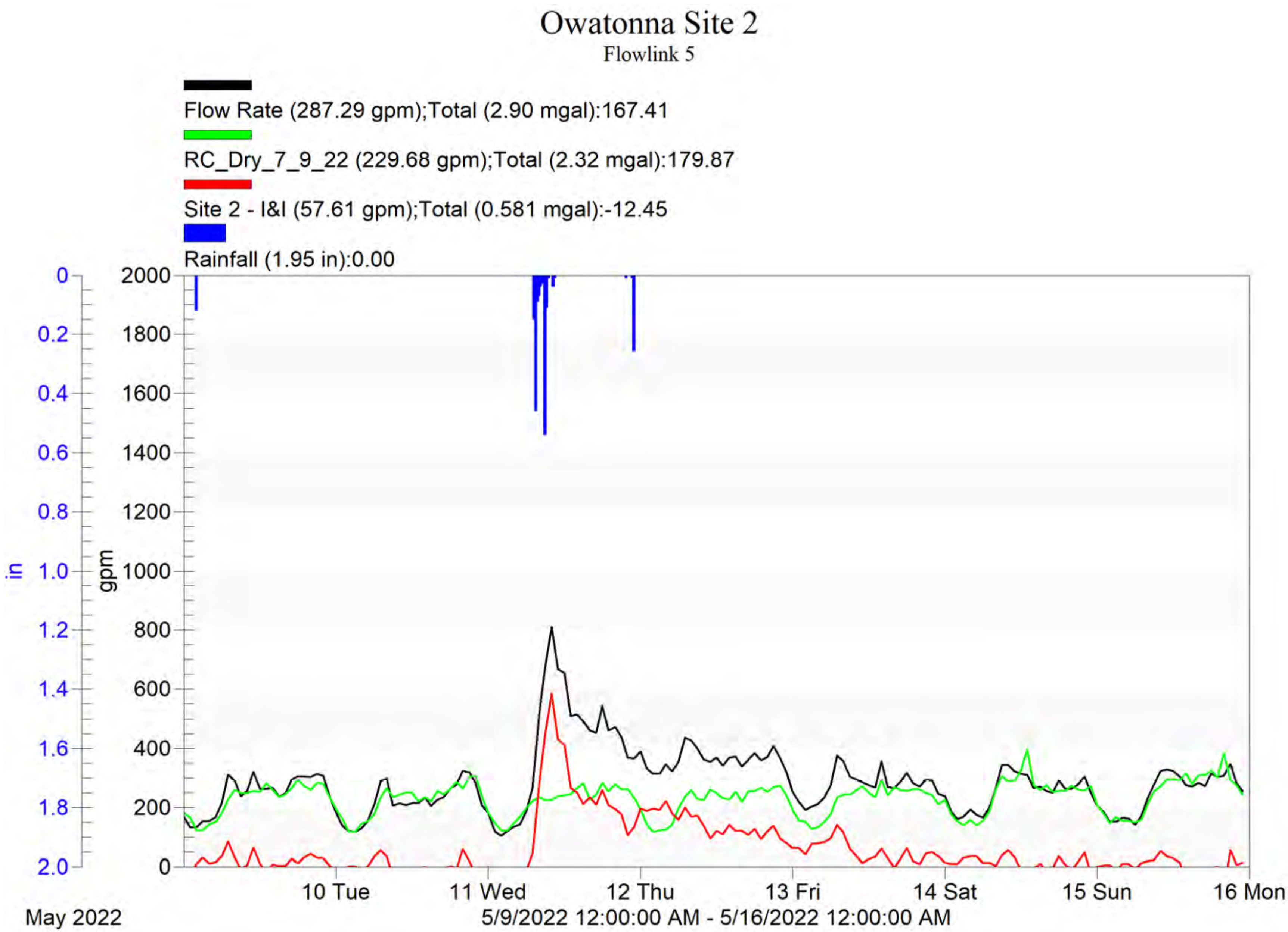


Owatonna Site 12
Flowlink 5
Flow Rate (196.67 gpm);Total (1.98 mgal):156.95
RC_Dry_4_9_22 (196.67 gpm);Total (1.98 mgal):156.95
Site 12 - I&I (0.000 gpm);Total (0.000 mgal):0.00
Rainfall (0.250 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
1000
900
800
700
600
500
400
300
200
100
0
10 Sun
11 Mon
12 Tue
13 Wed
14 Thu
15 Fri
16 Sat
Apr 2022
4/9/2022 12:00:00 AM - 4/16/2022 12:00:00 AM

Appendix C – Flow Monitoring Charts for Rain Event on May 11th, 2022

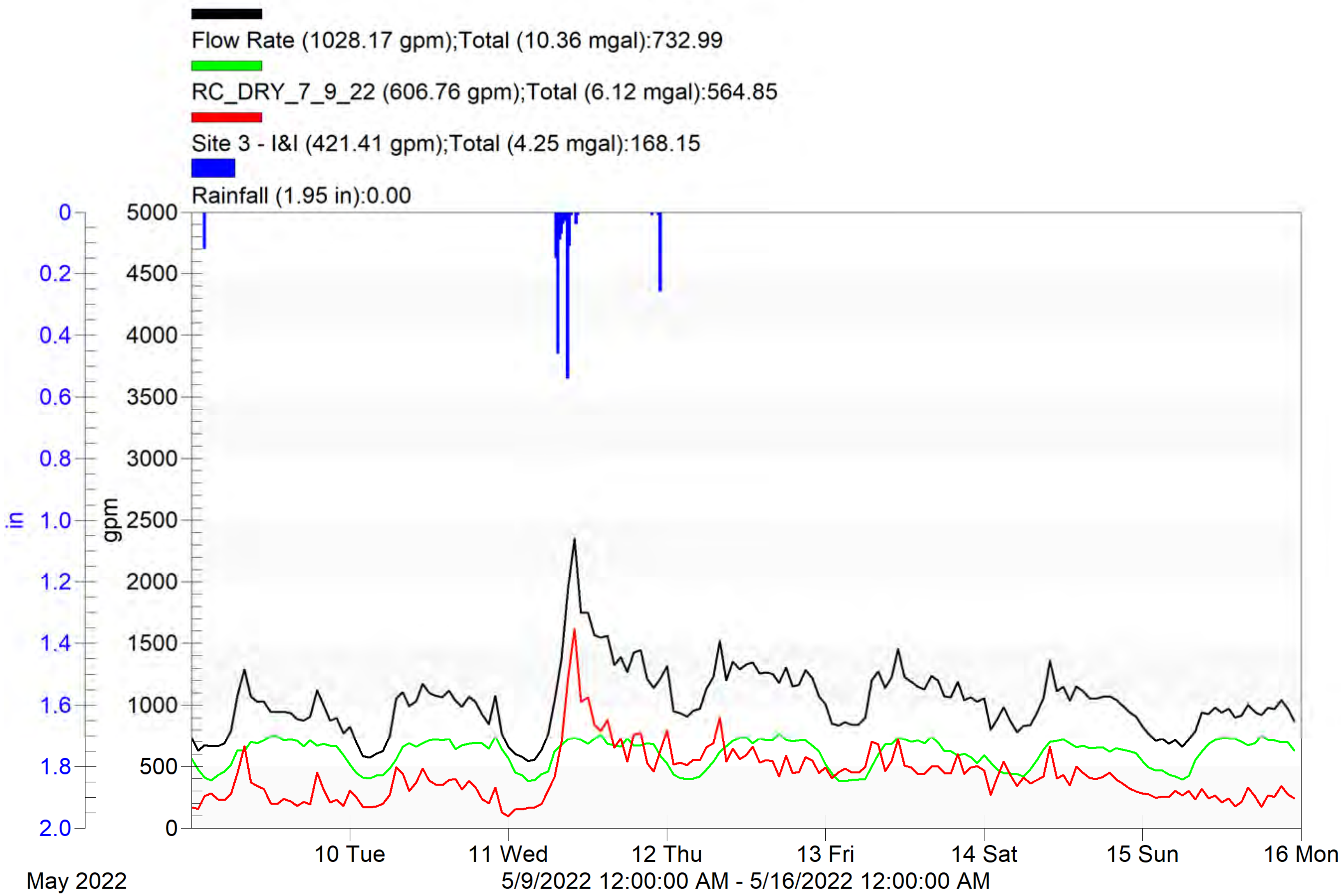


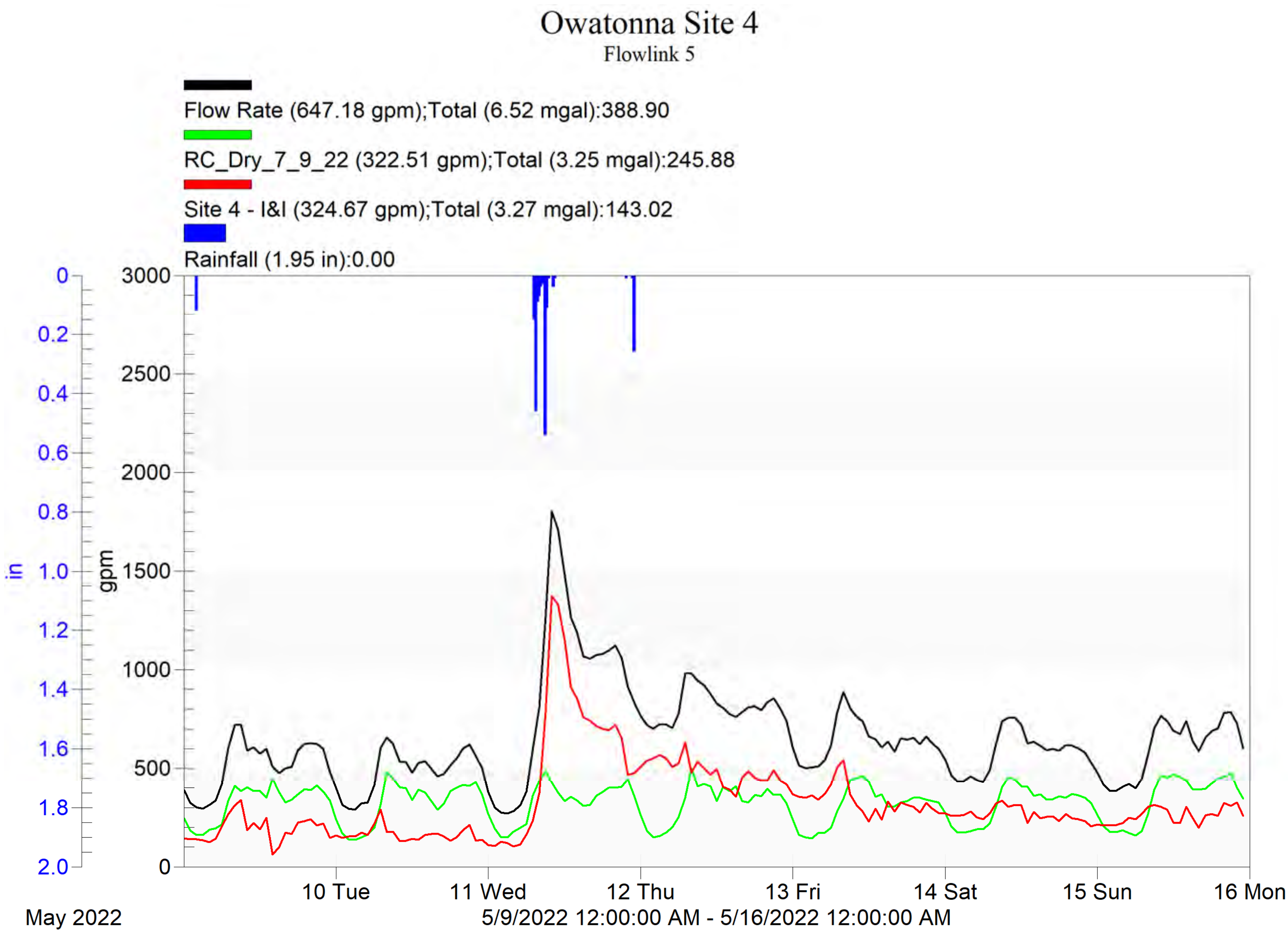
Owatonna site 1
Flowlink 5
Flow Rate (50.29 gpm);Total (0.507 mgal):56.12
RC_Dry_7_9_22 (50.74 gpm);Total (0.511 mgal):49.56
Site 1 - I&I (-0.443 gpm);Total (-0.00447 mgal):6.55
Rainfall (1.95 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
600
550
500
450
400
350
300
250
200
150
100
50
0
10 Tue
11 Wed
12 Thu
13 Fri
14 Sat
15 Sun
16 Mon
May 2022
5/9/2022 12:00:00 AM - 5/16/2022 12:00:00 AM


Owatonna Site 2
Flowlink 5
Flow Rate (287.29 gpm);Total (2.90 mgal):167.41
RC_Dry_7_9_22 (229.68 gpm);Total (2.32 mgal):179.87
Site 2 - I&I (57.61 gpm);Total (0.581 mgal):-12.45
Rainfall (1.95 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2000
1800
1600
1400
1200
1000
800
600
400
200
0
10 Tue
11 Wed
12 Thu
13 Fri
14 Sat
15 Sun
16 Mon
May 2022
5/9/2022 12:00:00 AM - 5/16/2022 12:00:00 AM

Owatonna Site 3

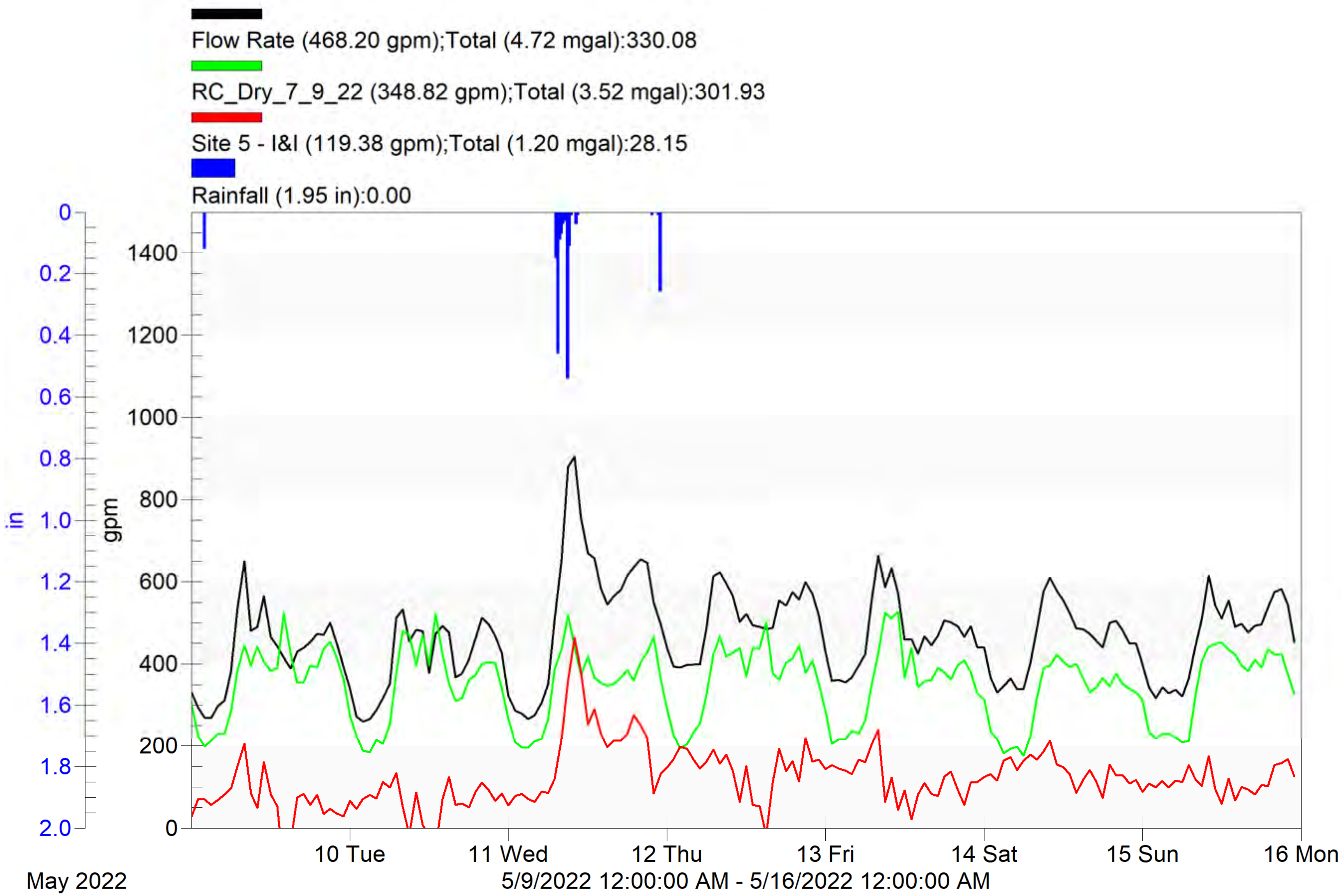
Flowlink 5

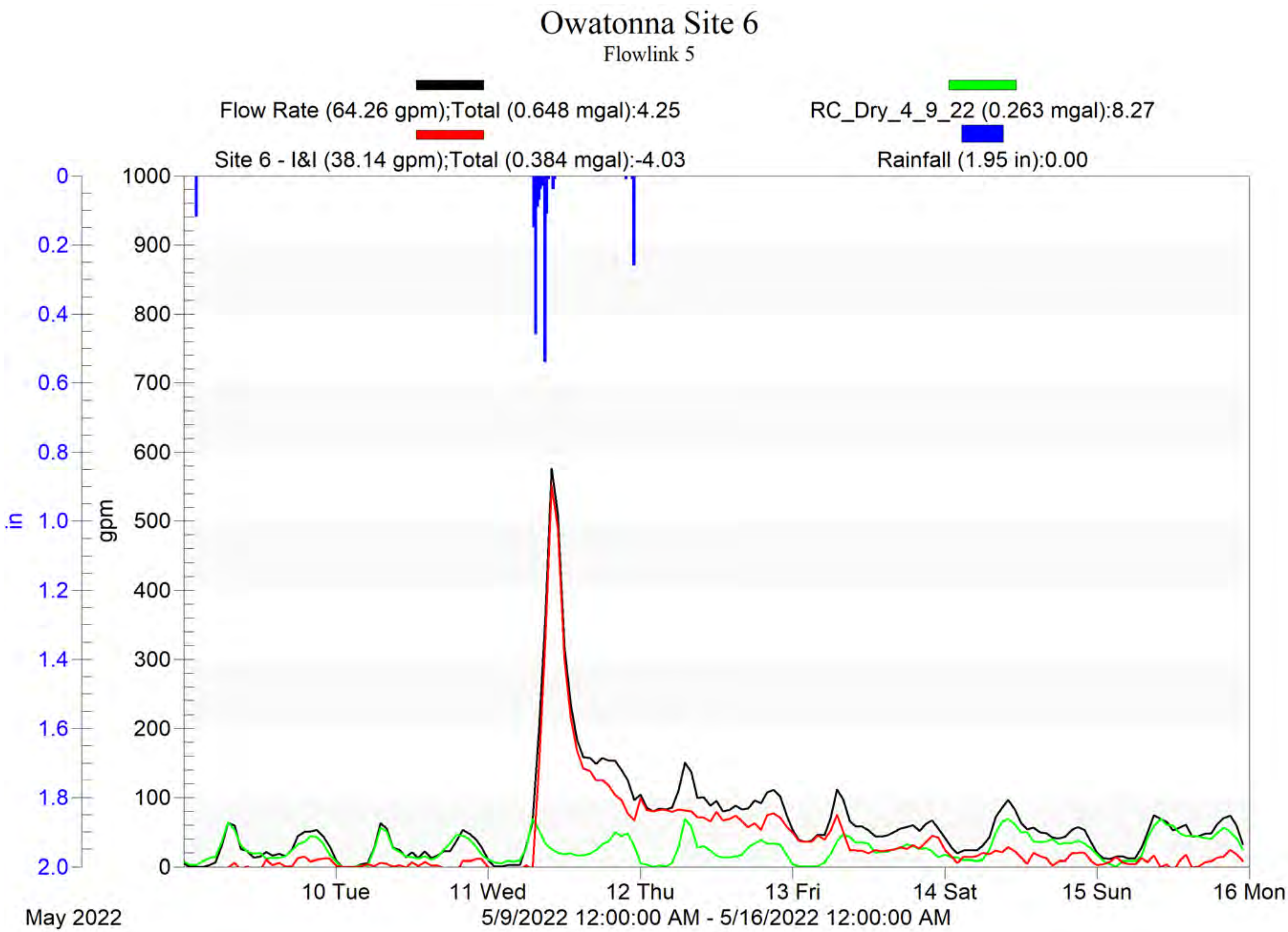



Owatonna Site 4
Flowlink 5
Flow Rate (647.18 gpm);Total (6.52 mgal):388.90
RC_Dry_7_9_22 (322.51 gpm);Total (3.25 mgal):245.88
Site 4 - I&I (324.67 gpm);Total (3.27 mgal):143.02
Rainfall (1.95 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
3000
2500
2000
1500
1000
500
0
10 Tue
11 Wed
12 Thu
13 Fri
14 Sat
15 Sun
16 Mon
May 2022
5/9/2022 12:00:00 AM - 5/16/2022 12:00:00 AM

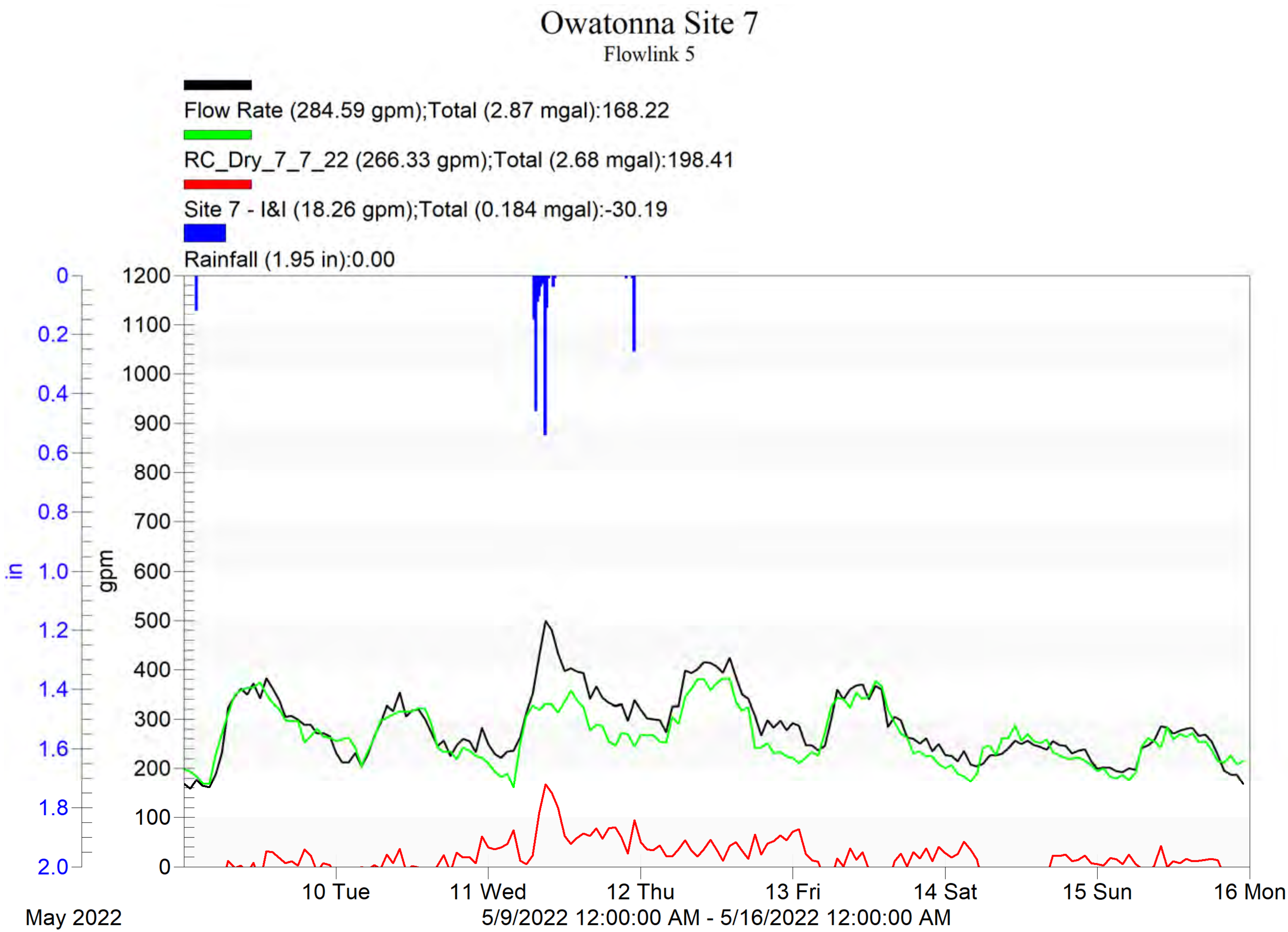
Owatonna Site 5

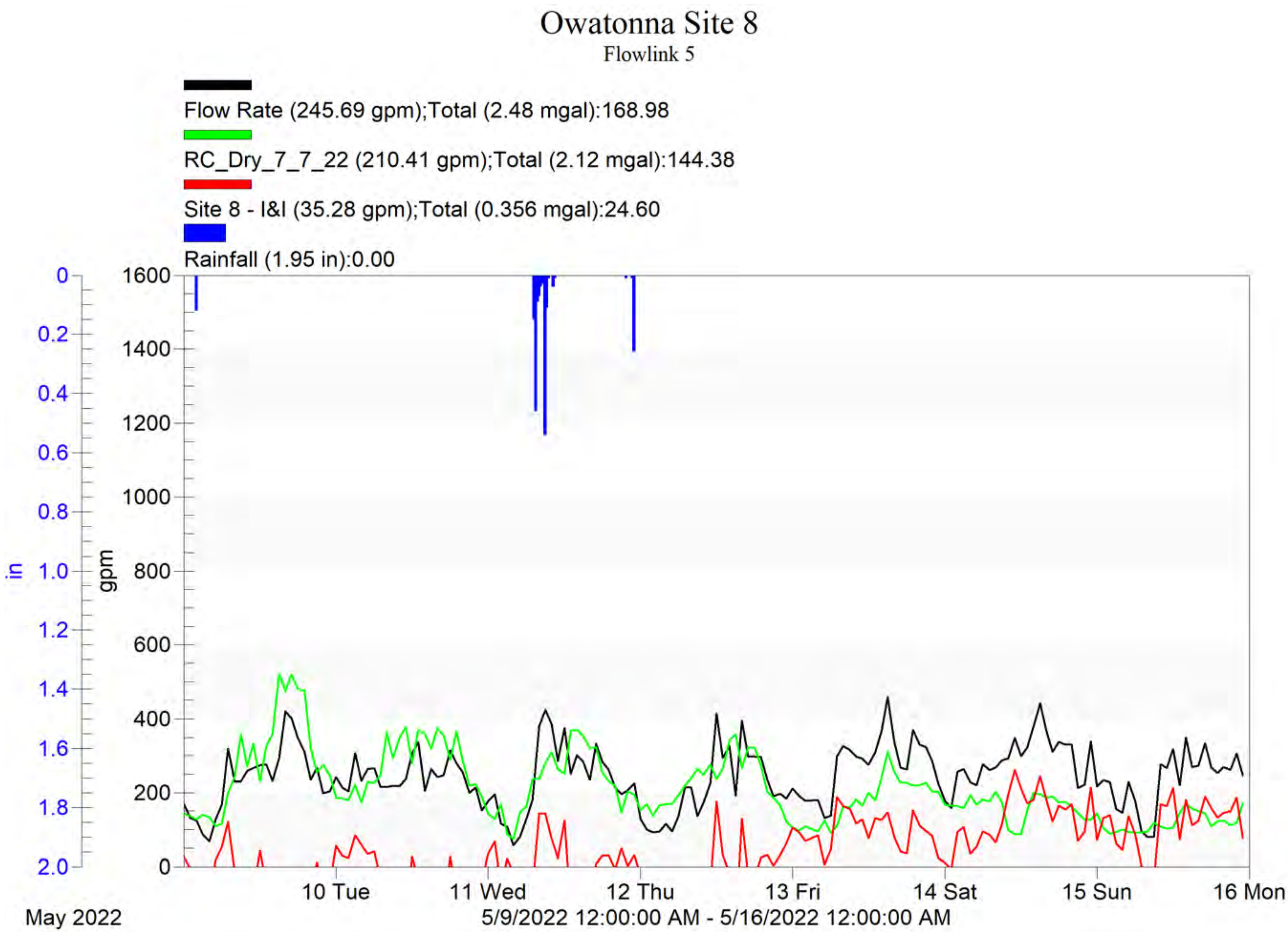
Flowlink 5





Owatonna Site 6
Flowlink 5
Flow Rate (64.26 gpm);Total (0.648 mgal):4.25
RC_Dry_4_9_22 (0.263 mgal):8.27
Site 6 - I&I (38.14 gpm);Total (0.384 mgal):-4.03
Rainfall (1.95 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1000
900
800
700
600
500
400
300
200
100
0
10 Tue
11 Wed
12 Thu
13 Fri
14 Sat
15 Sun
16 Mon
May 2022
5/9/2022 12:00:00 AM - 5/16/2022 12:00:00 AM


Owatonna Site 7
Flowlink 5
Flow Rate (284.59 gpm);Total (2.87 mgal):168.22
RC_Dry_7_7_22 (266.33 gpm);Total (2.68 mgal):198.41
Site 7 - I&I (18.26 gpm);Total (0.184 mgal):-30.19
Rainfall (1.95 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
10 Tue
11 Wed
12 Thu
13 Fri
14 Sat
15 Sun
16 Mon
May 2022
5/9/2022 12:00:00 AM - 5/16/2022 12:00:00 AM


Owatonna Site 8
Flowlink 5
Flow Rate (245.69 gpm);Total (2.48 mgal):168.98
RC_Dry_7_7_22 (210.41 gpm);Total (2.12 mgal):144.38
Site 8 - I&I (35.28 gpm);Total (0.356 mgal):24.60
Rainfall (1.95 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1600
1400
1200
1000
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600
400
200
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May 2022
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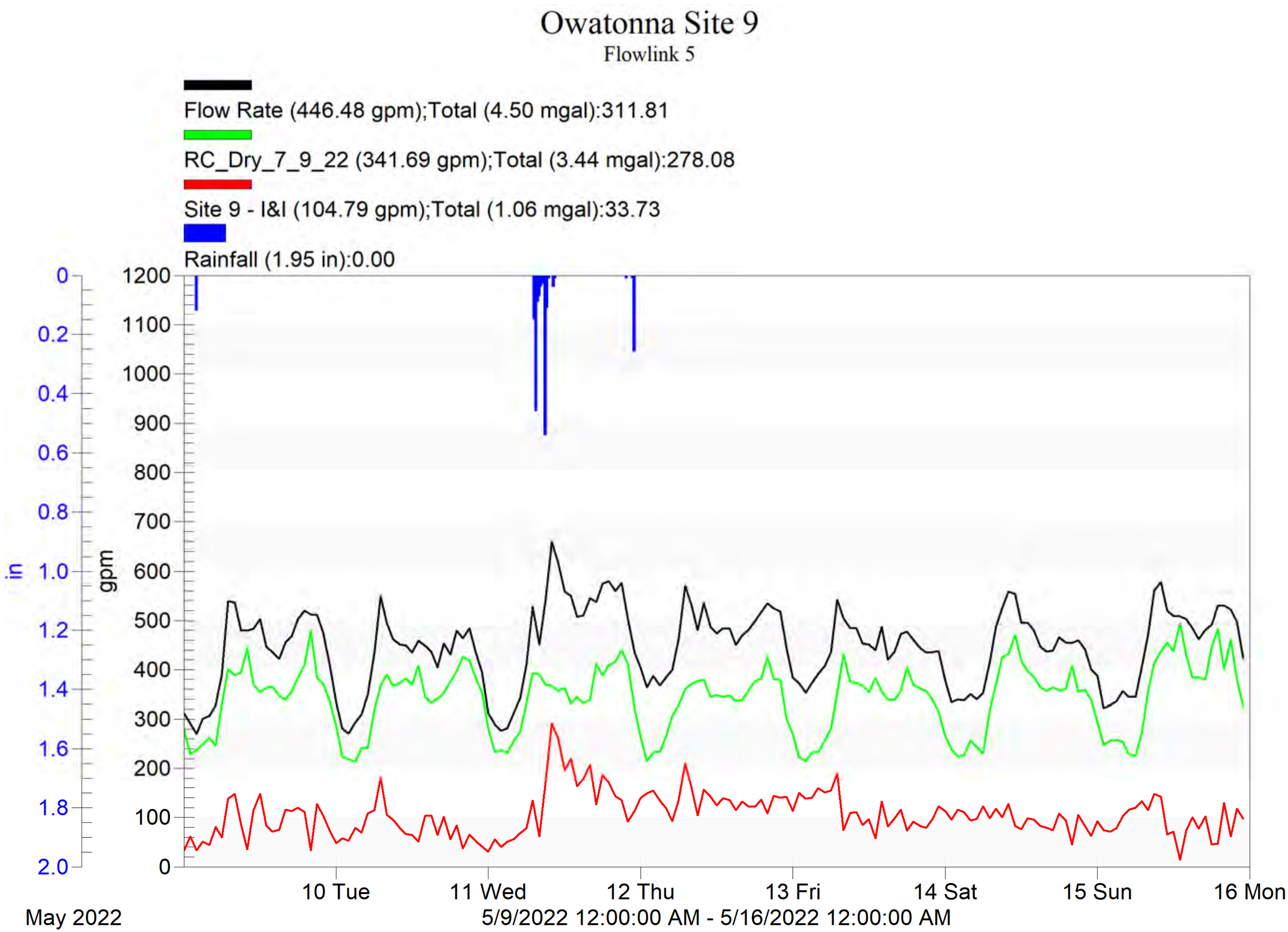

Owatonna Site 9
Flowlink 5
Flow Rate (446.48 gpm);Total (4.50 mgal):311.81
RC_Dry_7_9_22 (341.69 gpm);Total (3.44 mgal):278.08
Site 9 - I&I (104.79 gpm);Total (1.06 mgal):33.73
Rainfall (1.95 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
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16 Mon
May 2022
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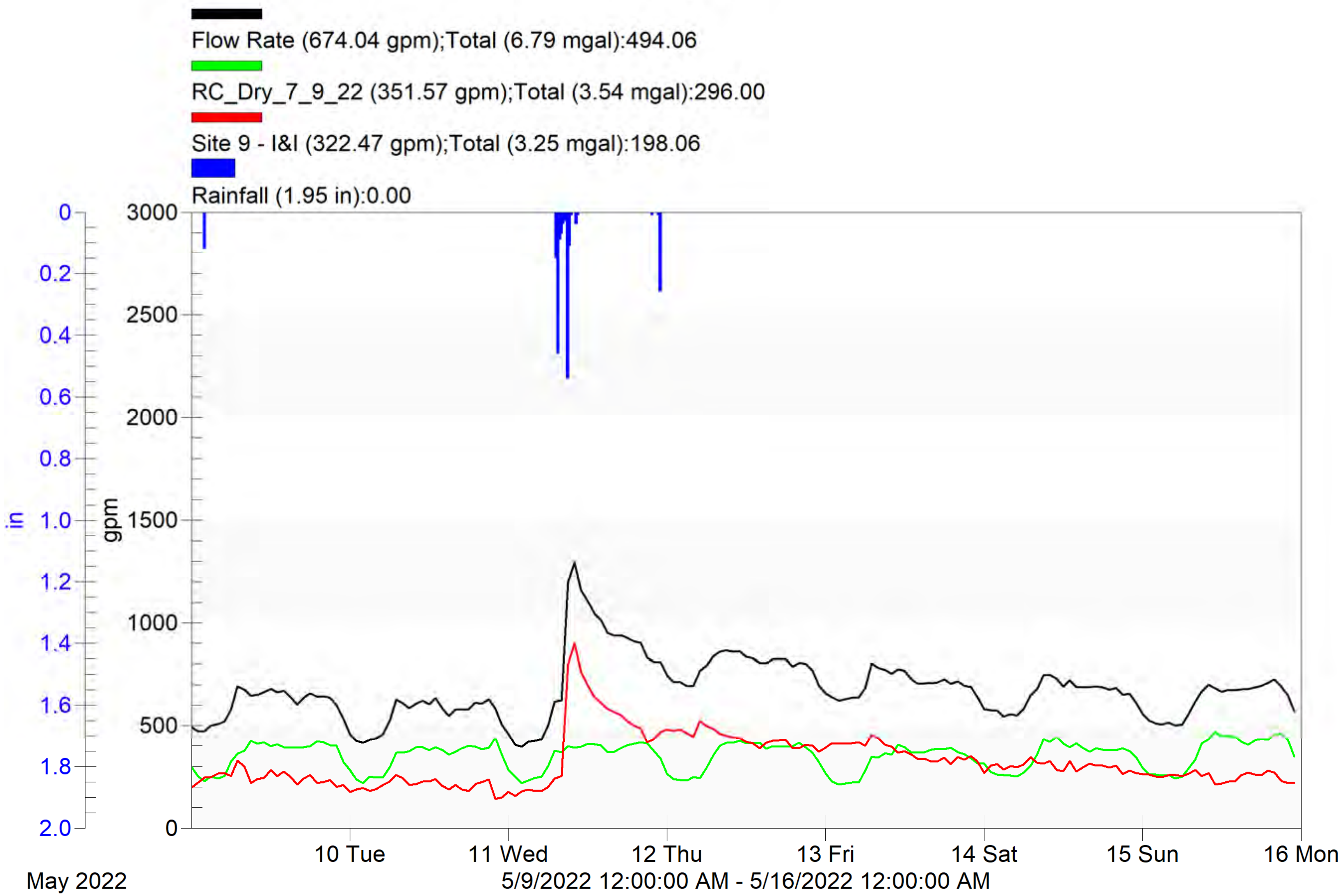
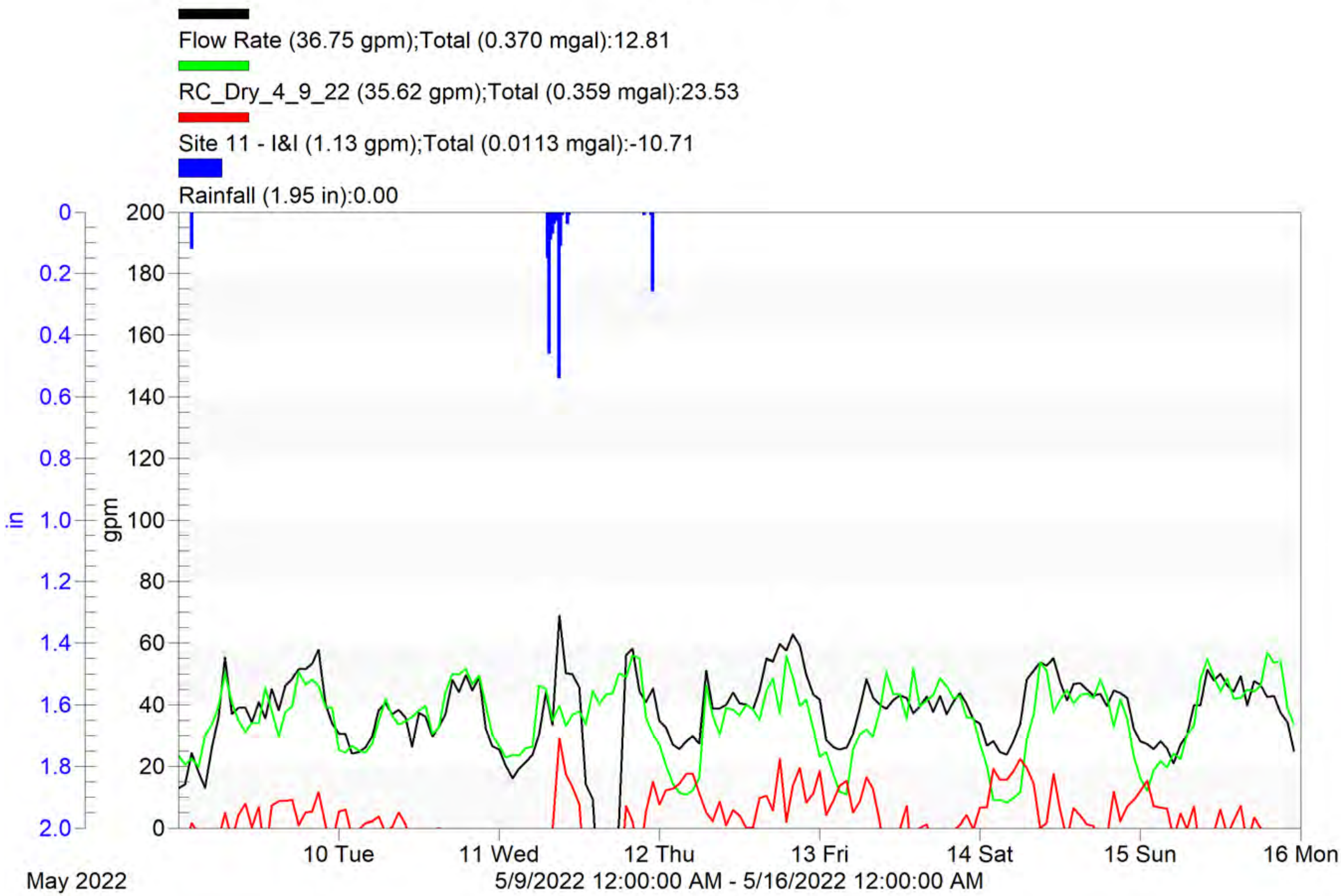
Owatonna Site 10

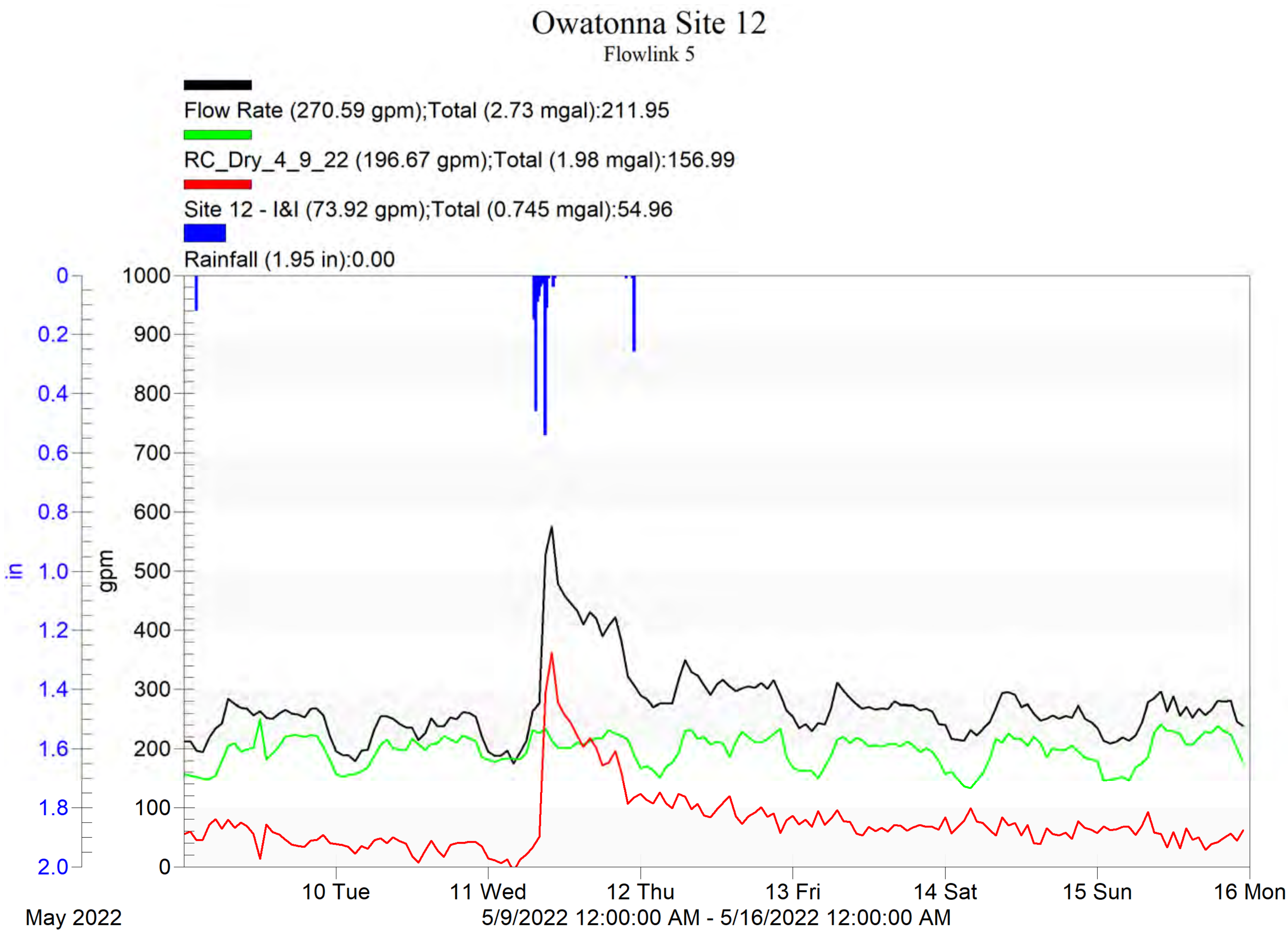
Flowlink 5



Owatonna Site 11(old)

Flowlink 5





Owatonna Site 12
Flowlink 5
Flow Rate (270.59 gpm);Total (2.73 mgal):211.95
RC_Dry_4_9_22 (196.67 gpm);Total (1.98 mgal):156.99
Site 12 - I&I (73.92 gpm);Total (0.745 mgal):54.96
Rainfall (1.95 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1000
900
800
700
600
500
400
300
200
100
0
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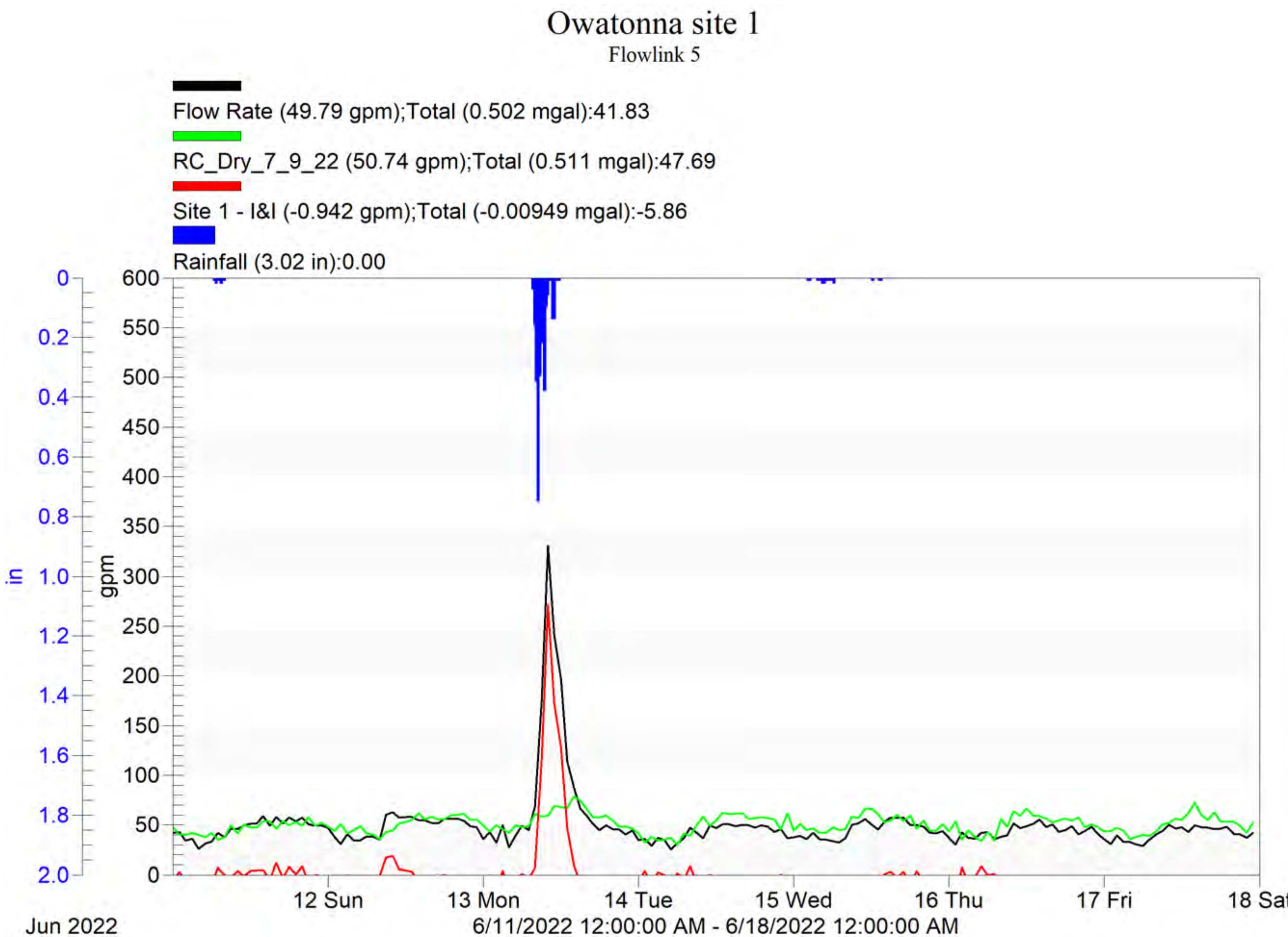
May 2022
5/9/2022 12:00:00 AM - 5/16/2022 12:00:00 AM

Appendix D – Flow Monitoring Charts for Rain Event on June 13th, 2022


Owatonna site 1
Flowlink 5
Flow Rate (49.79 gpm);Total (0.502 mgal):41.83
RC_Dry_7_9_22 (50.74 gpm);Total (0.511 mgal):47.69
Site 1 - I&I (-0.942 gpm);Total (-0.00949 mgal):-5.86
Rainfall (3.02 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
600
550
500
450
400
350
300
250
200
150
100
50
0
12 Sun
13 Mon
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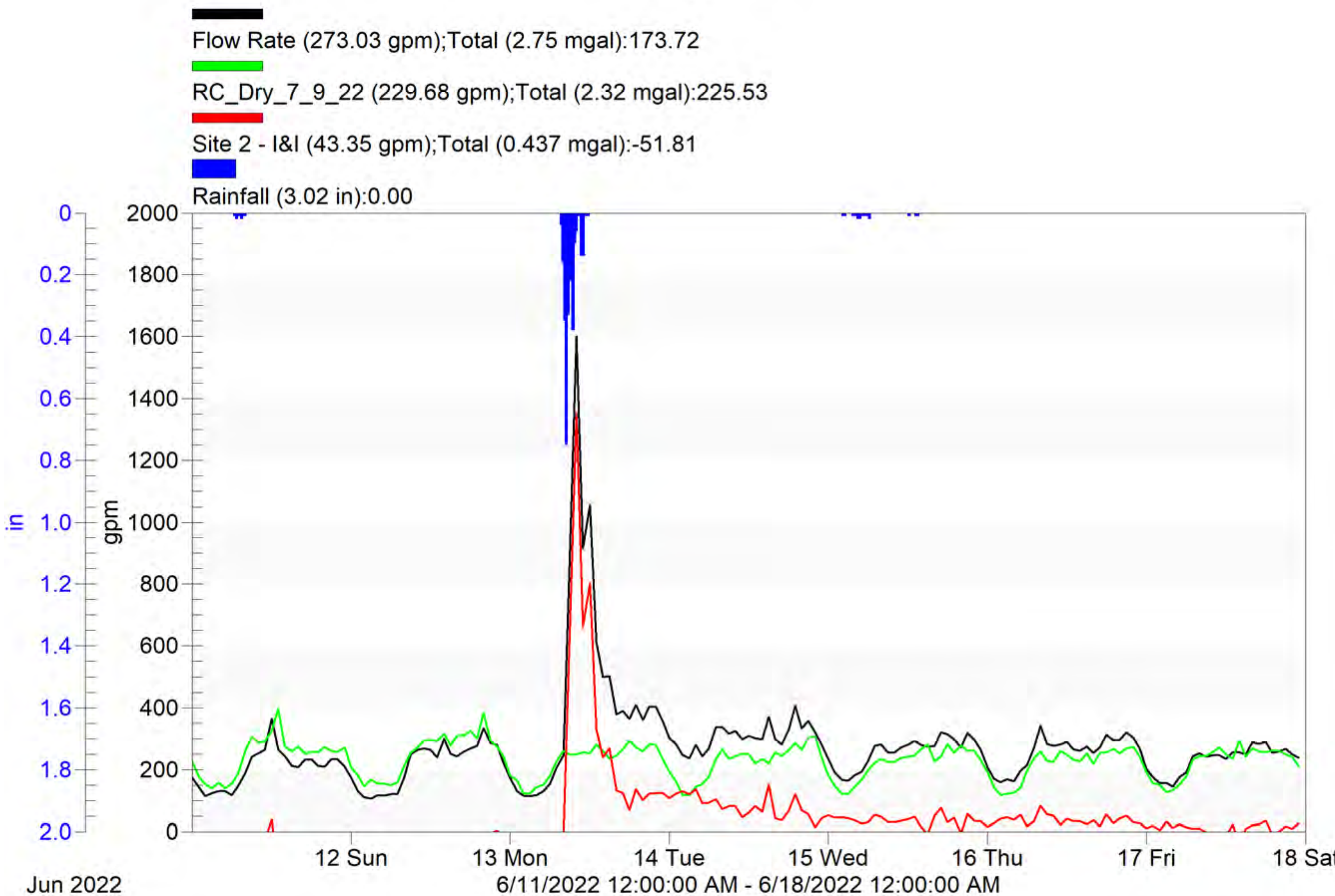
Jun 2022
6/11/2022 12:00:00 AM - 6/18/2022 12:00:00 AM

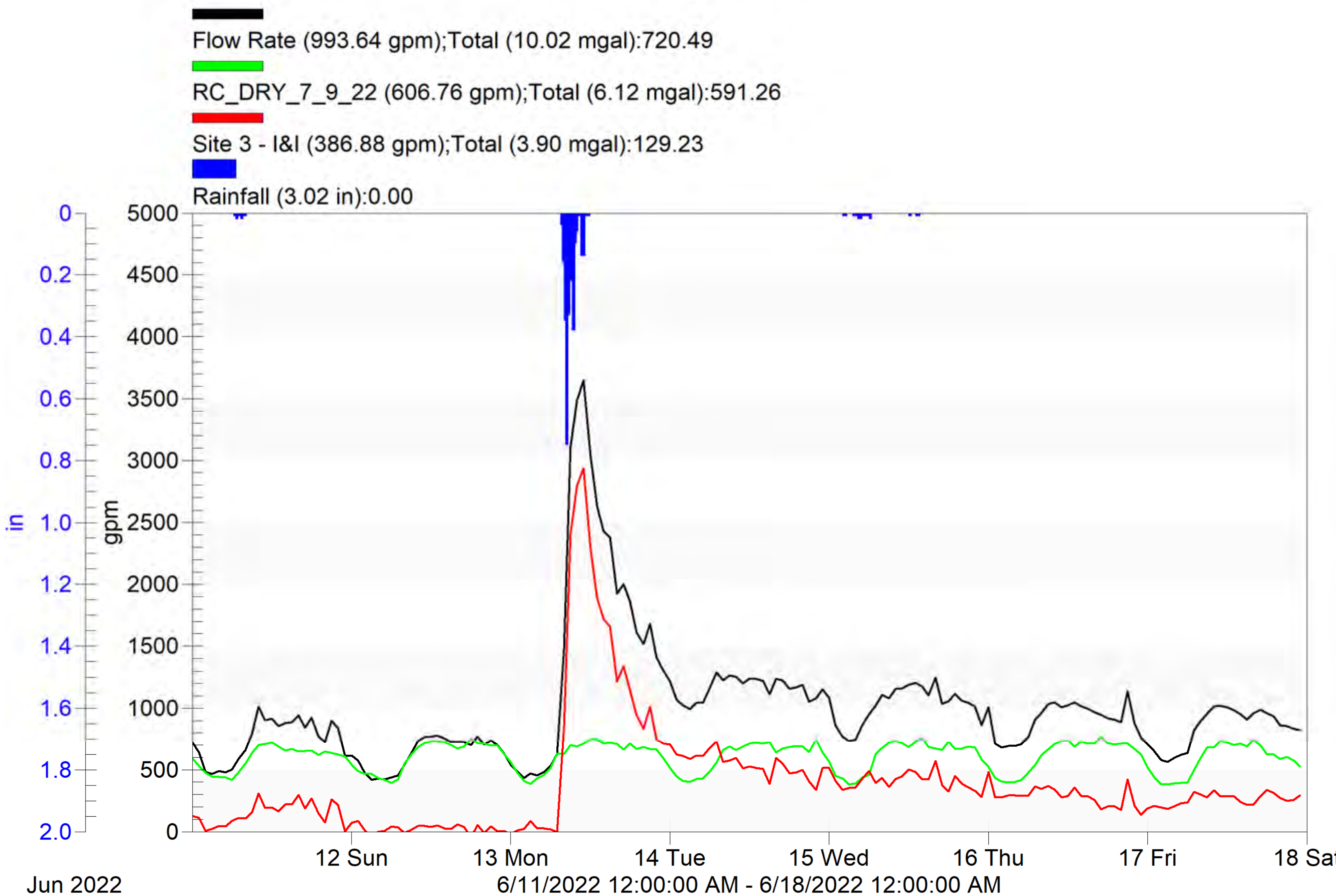
Owatonna Site 2

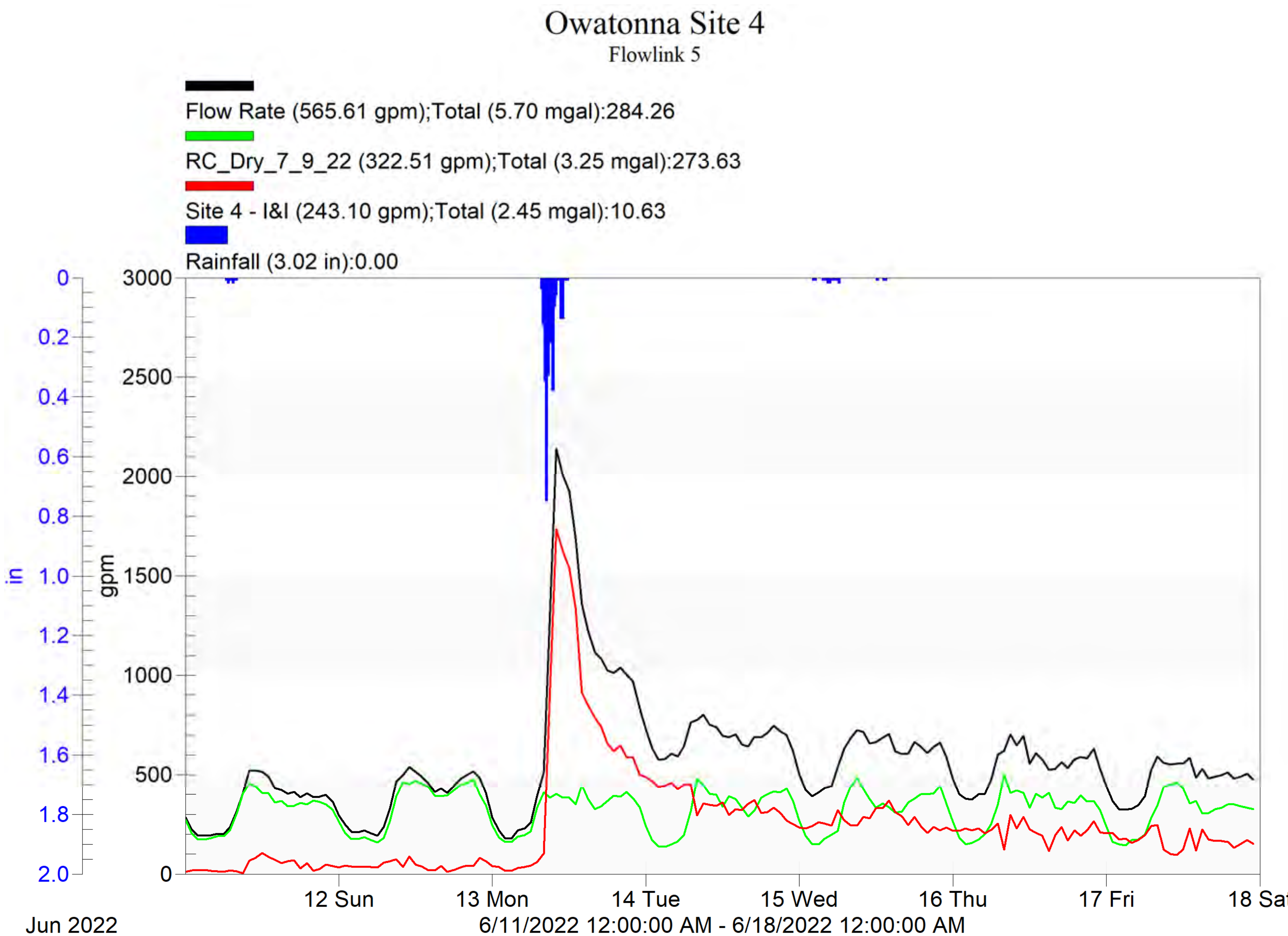
Flowlink 5



Owatonna Site 3

Flowlink 5





Owatonna Site 4
Flowlink 5
Flow Rate (565.61 gpm);Total (5.70 mgal):284.26
RC_Dry_7_9_22 (322.51 gpm);Total (3.25 mgal):273.63
Site 4 - I&I (243.10 gpm);Total (2.45 mgal):10.63
Rainfall (3.02 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
3000
2500
2000
1500
1000
500
0
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Jun 2022
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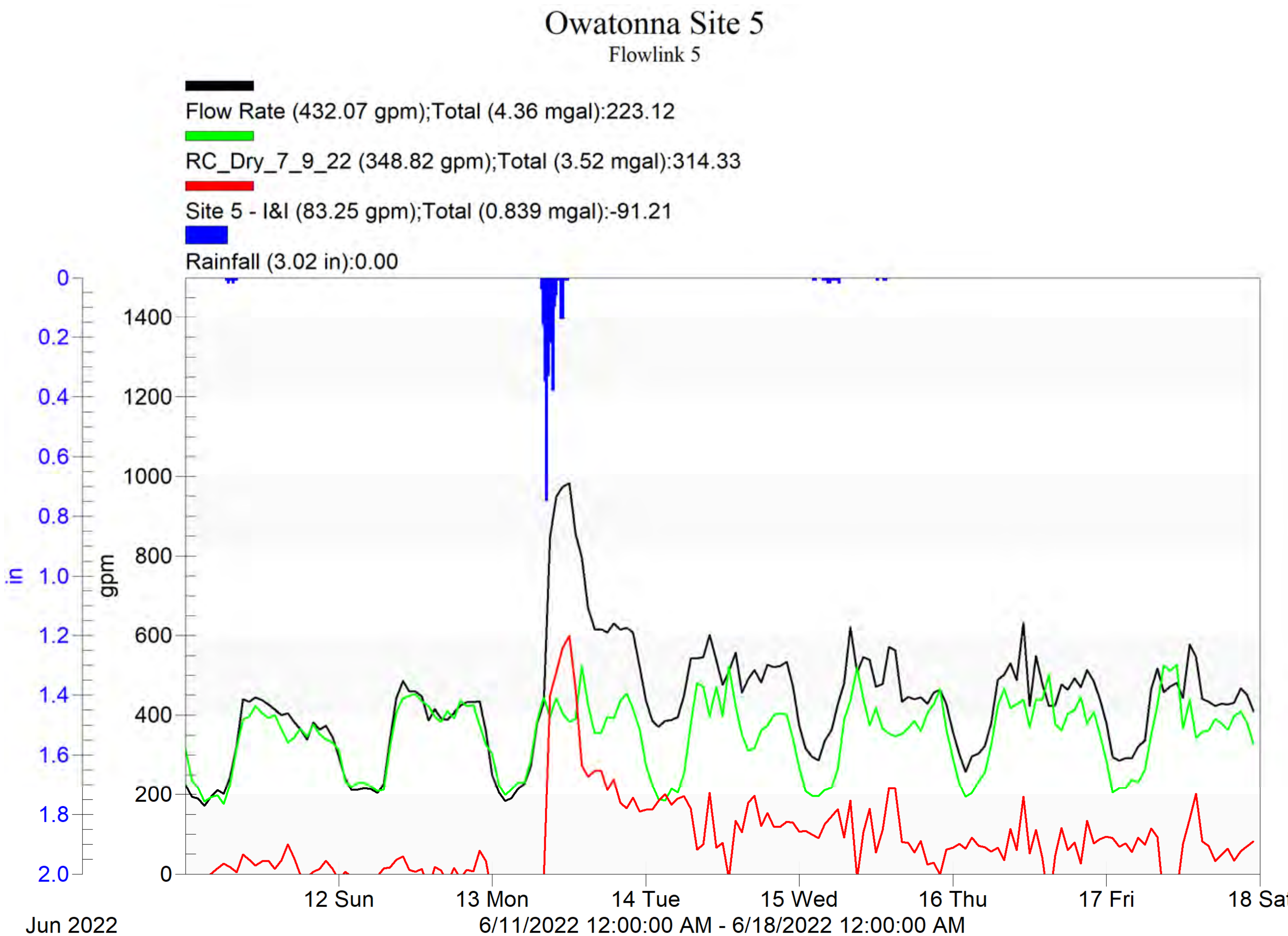

Owatonna Site 5
Flowlink 5
Flow Rate (432.07 gpm);Total (4.36 mgal):223.12
RC_Dry_7_9_22 (348.82 gpm);Total (3.52 mgal):314.33
Site 5 - I&I (83.25 gpm);Total (0.839 mgal):-91.21
Rainfall (3.02 in):0.00
in
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
gpm
1400
1200
1000
800
600
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Jun 2022
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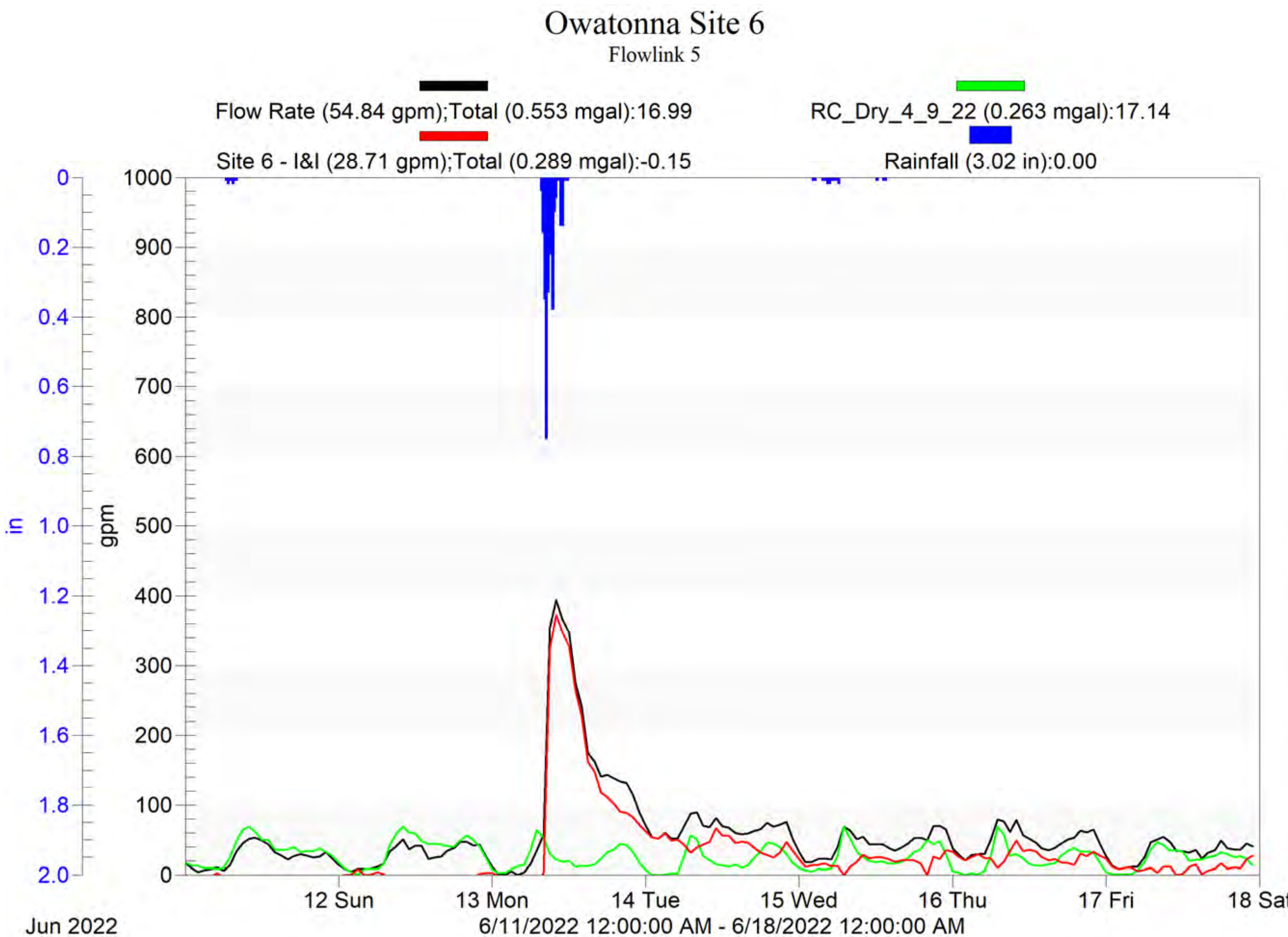
Owatonna Site 6
Flowlink 5
Flow Rate (54.84 gpm);Total (0.553 mgal):16.99
RC_Dry_4_9_22 (0.263 mgal):17.14
Site 6 - I&I (28.71 gpm);Total (0.289 mgal):-0.15
Rainfall (3.02 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1000
900
800
700
600
500
400
300
200
100
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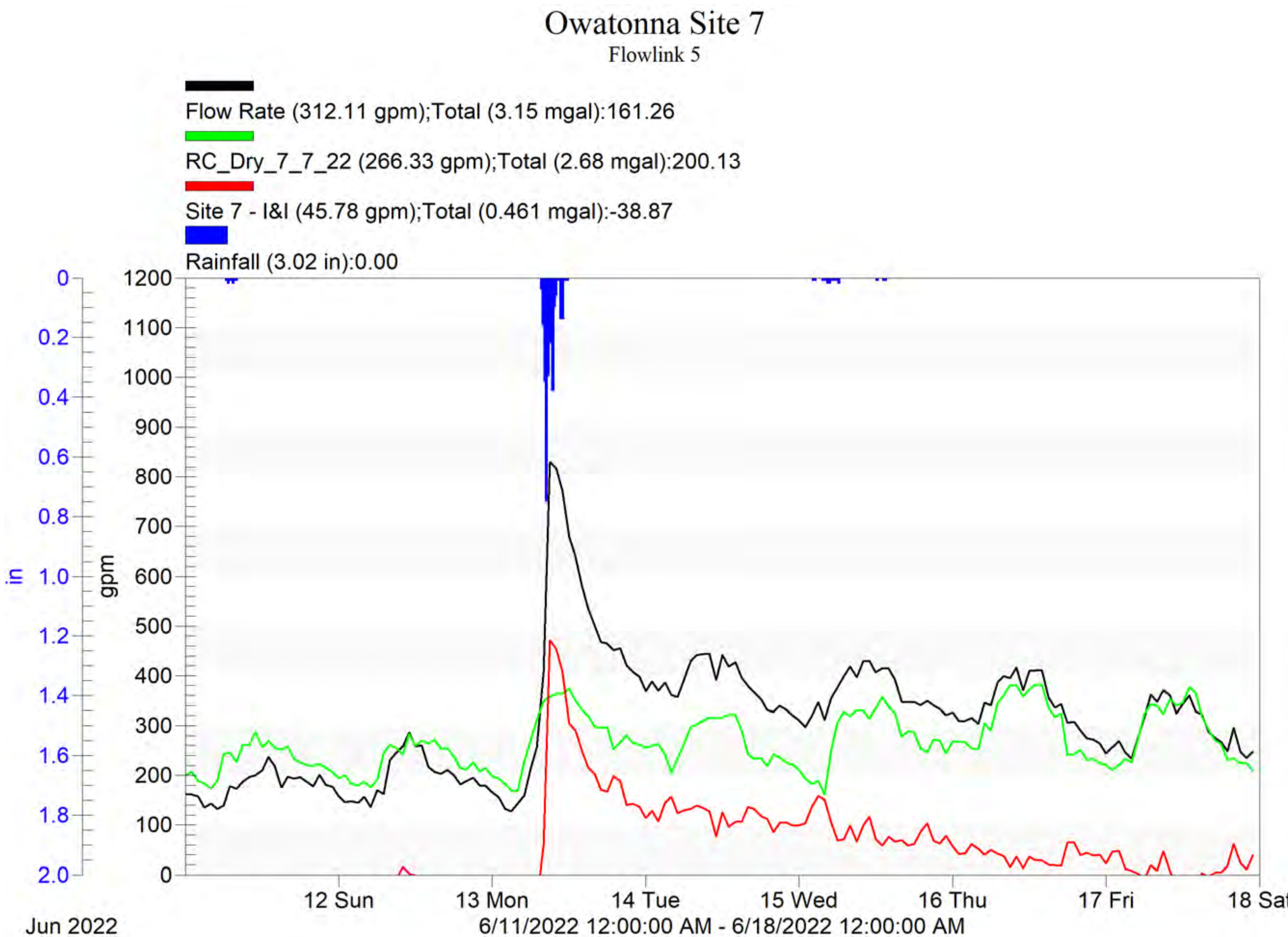

Owatonna Site 7
Flowlink 5
Flow Rate (312.11 gpm);Total (3.15 mgal):161.26
RC_Dry_7_7_22 (266.33 gpm);Total (2.68 mgal):200.13
Site 7 - I&I (45.78 gpm);Total (0.461 mgal):-38.87
Rainfall (3.02 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
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Jun 2022
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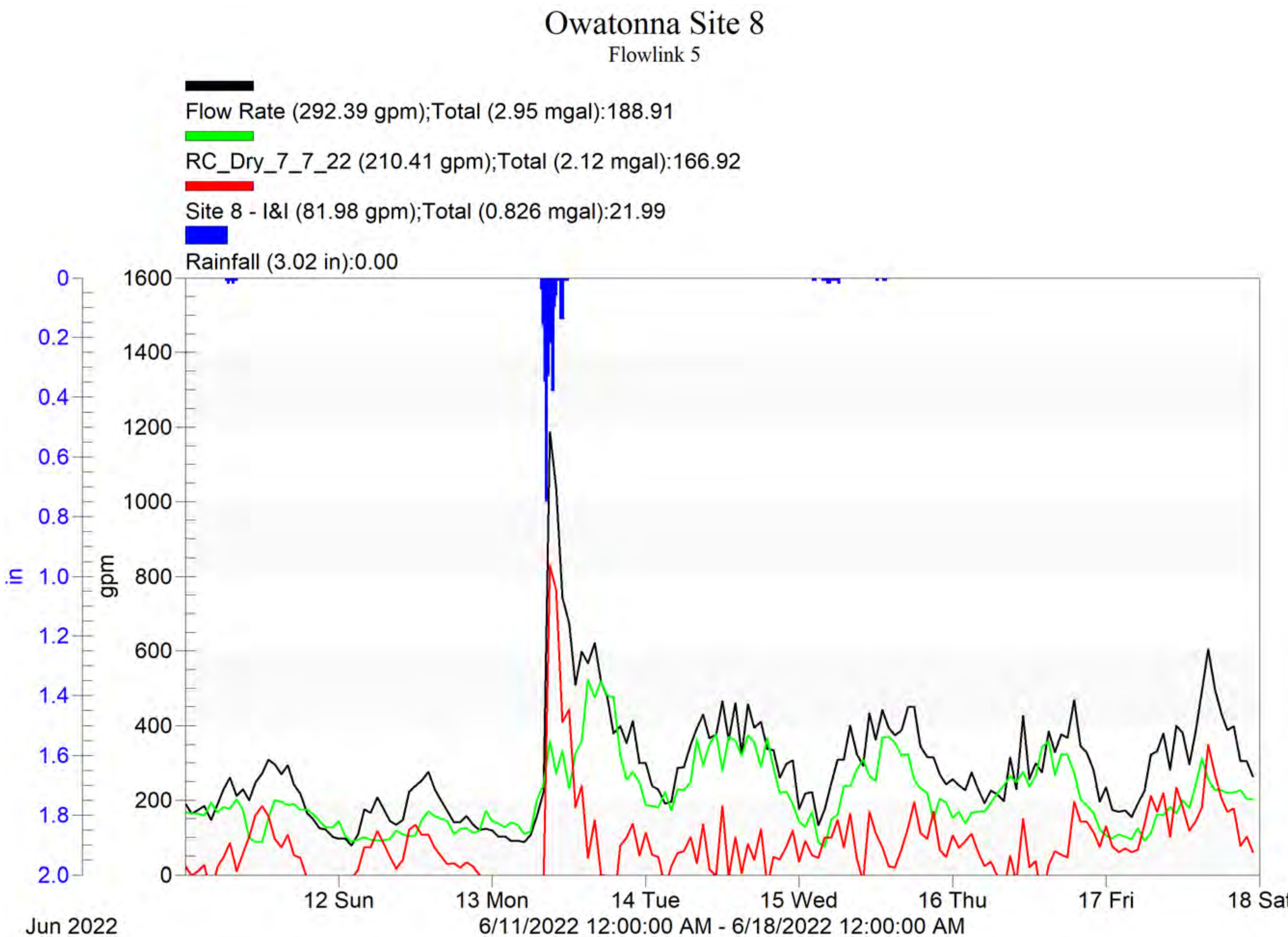

Owatonna Site 8
Flowlink 5
Flow Rate (292.39 gpm);Total (2.95 mgal):188.91
RC_Dry_7_7_22 (210.41 gpm);Total (2.12 mgal):166.92
Site 8 - I&I (81.98 gpm);Total (0.826 mgal):21.99
Rainfall (3.02 in):0.00
in
gpm
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1600
1400
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Jun 2022
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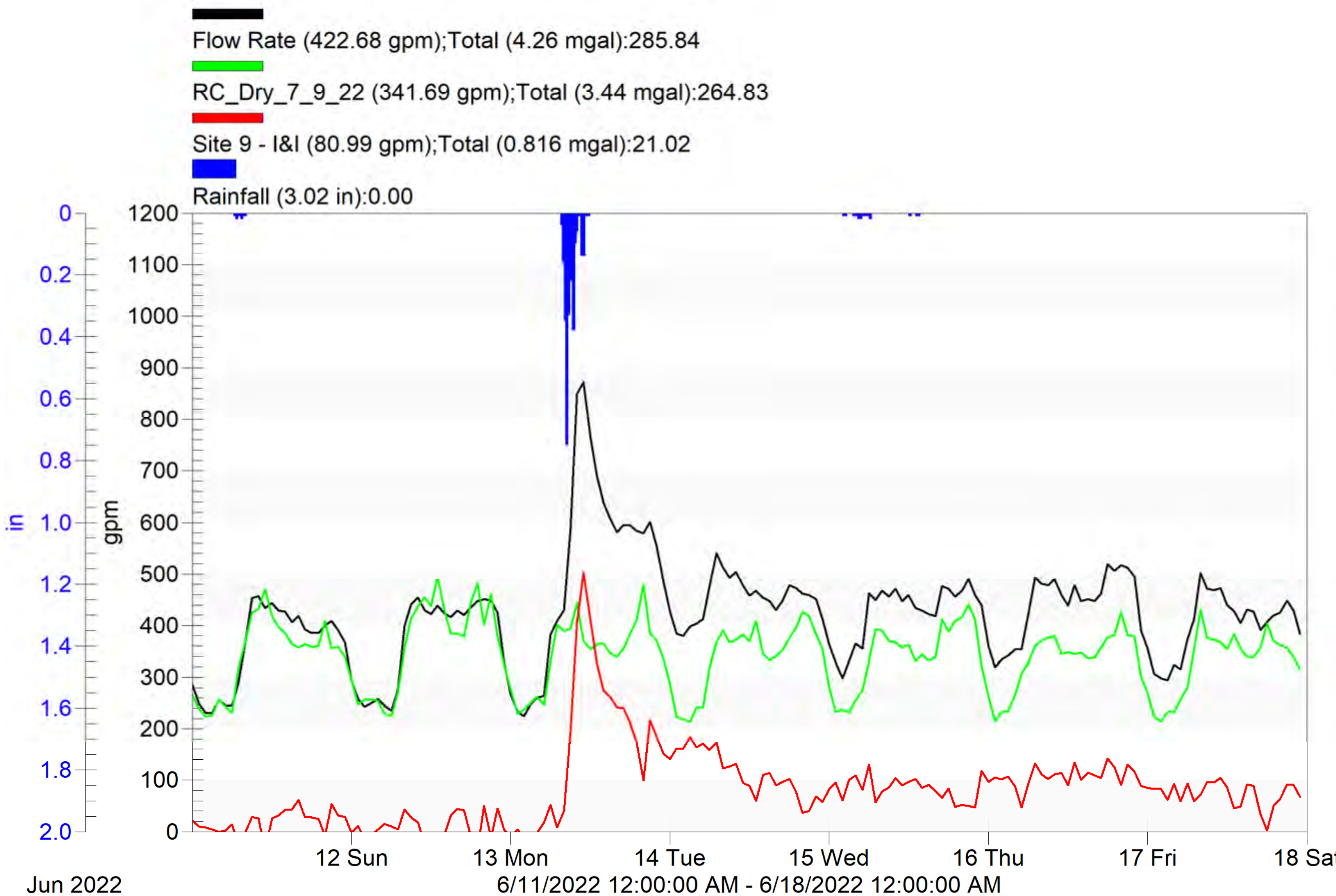
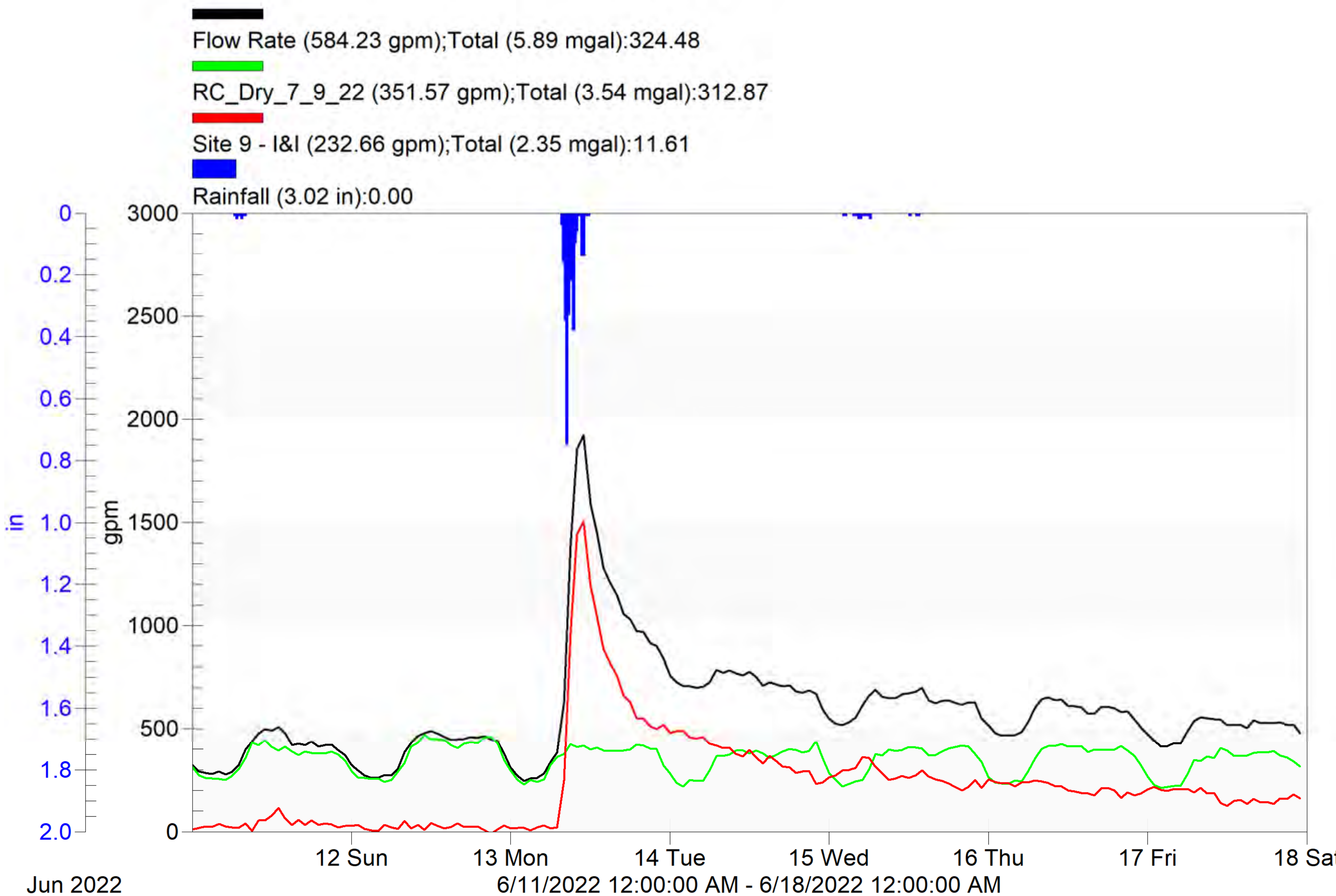
Owatonna Site 9

Flowlink 5



Owatonna Site 10

Flowlink 5



Appendix E – Opinion of Probable Project Costs for CIP Projects

Owatonna Wastewater Collection System Study
Capital Improvement Program (CIP) Projects
Opinion of Probable Project Cost (OPPC) Summary
February 2023

***Estimate Classification Note:** OPPC values are representative of a Class 4 estimate (Advancement of Cost Engineering), which are used to prepare planning-level effort cost scopes or complete an evaluation of alternative schemes, technical feasibility, and preliminary budget approval or approval to proceed to the next stage of implementation. Expected accuracy for Class 4 estimates typically range from -30 to +50 percent.*

Project Number	Capital Improvement Project	Anticipated CIP Year	Estiatmed CIP Cost (2023 Dollars)	Estimated CIP Cost (Indexed)[1]	Planning Level* Cost Estimates for Anticipated Fiscal Year FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029
WW-01[2]	Straight River Trunk Sewer #1	2024	$ 2,628,209	$ 2,759,619	$ 2,759,619					
WW-02	Straight River Trunk Sewer #2	2025	$ 1,382,086	$ 1,523,750		$ 1,523,750				
WW-03	18th St and Smith Ave Trunk Sewer	2026	$ 2,714,980	$ 3,142,929			$ 3,142,929			
WW-04	Oakwood Lane Sewer Replacement	2027	$ 822,244	$ 999,442				$ 999,442		
WW-05	Straight River Trunk Sewer #3	2028	$ 1,106,420	$ 1,412,103					$ 1,412,103	
WW-06	Linn Ave Trunk Sewer	2029	$ 2,191,601	$ 2,936,955						$ 2,936,955
	Total Project Costs			**$ 12,774,798**	**$ 2,759,619**	**$ 1,523,750**	**$ 3,142,929**	**$ 999,442**	**$ 1,412,103**	**$ 2,936,955**

[1] Anticipated CIP costs are indexed at 5% for each project to the anticipated year of construction.

[2] Costs for this project follow the existing trunk sewer alignment. Note Alternate WW-01-A costs are included in the following pages

Owatonna Wastewater Collection System Study

Capital Improvement Program (CIP) Projects
Planning Level Unit Prices
February 2023

	DESCRIPTION	UNIT	AVG. 2023 COSTS	NOTES
Unpaved Gravity Sewer Main:	8" SDR35 PVC Gravity Sewer Main (Unpaved)	LF	$165	**Unpaved Gravity Main per foot cost includes the following items and assumptions:**
	10" SDR35 PVC Gravity Sewer Main (Unpaved)	LF	$170	- Pipe Size with full depth import backfill (8' to 12' assumed depth)
	12" SDR35 PVC Gravity Sewer Main (Unpaved)	LF	$180	- Manhole every 200 ft. plus extra vertical depth
	15" SDR35 PVC Gravity Sewer Main (Unpaved)	LF	$185	- Hydroseed at 20 sq. ft. per foot
	18" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	LF	$190	
	30" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	LF	$250	
	30" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved-Difficult Access)	LF	$300	
	36" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	LF	$275	
	42" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	LF	$310	
Paved Gravity Sewer Main:	8" SDR35 PVC Gravity Sewer Main (Paved)	LF	$250	**Paved Gravity Main per foot cost includes the following items and assumptions:**
	10" SDR35 PVC Gravity Sewer Main (Paved)	LF	$255	- Pipe Size with full depth import backfill (8' to 12' assumed depth)
	12" SDR35 PVC Gravity Sewer Main (Paved)	LF	$260	- Manhole every 200 ft. plus extra vertical depth
	15" SDR35 PVC Gravity Sewer Main (Paved)	LF	$270	- Pavement sawcut and removal
	18" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$275	- 4" asphalt paving at 14 sq. ft. per foot
	21" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$290	
	24" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$305	
	27" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$320	
	30" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$330	
	36" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$360	
	42" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$390	
	48" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	LF	$425	
Unpaved Sewer Force Main:	4" DR18 C900 PVC Sewer Force Main (Unpaved)	LF	$115	**Unpaved Force Main per foot cost includes the following items and assumptions:**
	8" DR18 C900 PVC Sewer Force Main (Unpaved)	LF	$125	Includes a plug valve every 1,000 ft.
	10" DR18 C900 PVC Sewer Force Main (Unpaved)	LF	$135	
Paved Sewer Force Main:	4" DR18 C900 PVC Sewer Force Main (Paved)	LF	$195	**Paved Force Main per foot cost includes the following items and assumptions:**
	10" DR18 C900 PVC Sewer Force Main (Paved)	LF	$215	Includes a plug valve every 1,000 ft.
Other:	Existing Sewer Service Connection	EA	$2,200	
	Existing Sewer Main Connection	EA	$6,400	
	Lift Station Connection	EA	$6,400	
	30" River Crossing	LF	$750	
	18" - 24" Road Crossing/Bore	LF	$1,000	Includes outer casing, carrier pipe, casing spacers every 6 ft., end seals, trench
	< 18" Road Crossing/Bore	LF	$500	boxes and space constraints in tight urban areas.
Lift Stations:	New Lift Station (Small Pumps, <100 gpm)	LS	$500,000	Includes pre-cast wet well, pumps (<100 gpm), piping, electrical, site improvements.
	New Lift Station (Medium Pumps, 100-250 gpm)	LS	$700,000	Includes pre-cast wet well, pumps (100-250 gpm), piping, electrical, site improvements.
	New Lift Station (Large Pumps, 250-750 gpm)	LS	$1,300,000	Includes cast-in-place wet well, pumps (250-750 gpm), piping, electrical, site improvements.
	New Lift Station (Very Large Pumps, 750-1000 gpm)	LS	$1,800,000	Includes cast-in-place wet well, pumps (750-1,000 gpm), piping, electrical, site improvements.
Inflation:	*Inflation rate is estimated based on historic data from www.usinflationcalculator.com/inflation/historical-inflation-rates/.		5%	

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: Replace the main trunk sewer from the WWTF to the south along the Straight River to approximately Rose Street. This project would consist of replacing the existing gravity main with gravity mains ranging in size from 30-inch to 48-inch at the WWTF. The project would also revise the grading of the gravity sewer to eliminate improper slopes. If construction access is difficult in the pipeline replacement location, it may be possible for this pipeline to cross the Straight River approximately at Rose Street and continue along the west side of the river to the WWTF (See Project Costs for WW-01-A).

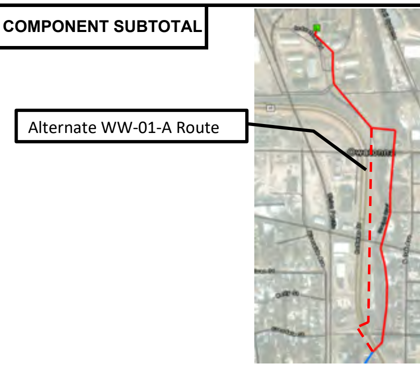
CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
WW-01	Straight River Trunk Sewer #1	2024	$2,759,619

COST COMPONENT	ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**	**Sewer System**						
	a.	Sewer Main						
	1.	30" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved-Difficult Access)	2,736	LF	$300	$820,800		
	2.	36" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	484	LF	$275	$133,100		
	3.	42" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	130	LF	$310	$40,300		
	4.	48" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	702	LF	$425	$298,350		
	5.	30" River Crossing	250	LF	$750	$187,500		
		Subtotal				$1,480,050		
Hard Cost - Markups	**2.0**							
	a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$88,803		
	b.	Traffic Control	1	LS	2%	$29,601		
	c.	Erosion Control	1	LS	1%	$14,801		
	d.	Testing and Construction Surveying	1	LS	3%	$44,402		
		Subtotal				$177,606.00		
							$1,657,656	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**							
	a.	Engineering Design	1	LS	10%	$165,766		
	b.	Construction Administration and Management	1	LS	8%	$132,612		
	c.	Legal and Administrative	1	LS	5%	$82,883		
		Subtotal				$381,261		
							$381,261	**Estimated Soft Costs**
Property Acquisition	**4.0**							
	a.	Right-of-way	3,350	LF	$19.00	$63,650		
		Subtotal				$63,650		
							$63,650	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**							
	a.	Total Project Contingency	1	LS	25%	$525,642		
		Subtotal				$525,642		
							$525,642	**Project Contingency**
Inflation	**6.0**							
	a.	Inflation	1	LS		$131,410		
		Subtotal				$131,410		
							$131,410	**Inflation**
		Average annual inflation rate	5%					
		Year of original CIP cost estimate	2023					
		Year of anticipated construction	2024					
		Number of years of inflation	1					
		Additional cost of inflation	$131,410					
							$2,759,619	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: Alternate route for Project WW-01. Replace the main trunk sewer from the WWTF to the south along the Straight River to approximately Rose Street. This project would consist of replacing the existing gravity main with gravity mains ranging in size from 30-inch to 48-inch at the WWTF. The project includes crossing the Straight River approximately at Rose Street and continuing along the west side of the river to the WWTF. The existing gravity main on the east side of the river would be abandoned.

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
WW-01-A	Straight River Trunk Sewer #1-A	2024	$2,715,682



COST COMPONENT	ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**	**Sewer System**						
	a.	Sewer Main						
	1.	30" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	2,736	LF	$250	$684,000		
	2.	36" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	484	LF	$275	$133,100		
	3.	42" PS46 ASTM F679 PVC Gravity Sewer Main (Unpaved)	130	LF	$310	$40,300		
	4.	48" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	702	LF	$425	$298,350		
	5.	30" River Crossing	400	LF	$750	$300,000		
		Subtotal				$1,455,750		
Hard Cost - Markups	**2.0**							
	a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$87,345		
	b.	Traffic Control	1	LS	2%	$29,115		
	c.	Erosion Control	1	LS	1%	$14,558		
	d.	Testing and Construction Surveying	1	LS	3%	$43,673		
		Subtotal				$174,690.00		
							$1,630,440	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**							
	a.	Engineering Design	1	LS	10%	$163,044		
	b.	Construction Administration and Management	1	LS	8%	$130,435		
	c.	Legal and Administrative	1	LS	5%	$81,522		
		Subtotal				$375,001		
							$375,001	**Estimated Soft Costs**
Property Acquisition	**4.0**							
	a.	Right-of-way	3,350	LF	$19.00	$63,650		
		Subtotal				$63,650		
							$63,650	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**							
	a.	Total Project Contingency	1	LS	25%	$517,273		
		Subtotal				$517,273		
							$517,273	**Project Contingency**
Inflation	**6.0**							
	a.	Inflation	1	LS		$129,318		
		Subtotal				$129,318		
							$129,318	**Inflation**
		Average annual inflation rate	5%					
		Year of original CIP cost estimate	2023					
		Year of anticipated construction	2024					
		Number of years of inflation	1					
		Additional cost of inflation	$129,318					
							$2,715,682	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: Continue replacement of the main trunk sewer from Rose Street to School Street along Walnut Avenue. This project would consist of replacing the existing trunk sewer with gravity mains ranging in size from 21-inch and 30-inch.

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
WW-02	Straight River Trunk Sewer #2	2025	$1,523,750

COST COMPONENT	ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**	**Sewer System**						
	a.	Sewer Main						
	1.	21" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	236	LF	$290.00	$68,440		
	2.	24" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	1,564	LF	$305.00	$477,020		
	3.	27" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	696	LF	$320.00	$222,720		
		Subtotal				$768,180		
Hard Cost - Markups	**2.0**							
	a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$46,091		
	b.	Traffic Control	1	LS	2%	$15,364		
	c.	Erosion Control	1	LS	1%	$7,682		
	d.	Testing and Construction Surveying	1	LS	3%	$23,045		
		Subtotal				$92,181.60		
							$860,362	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**							
	a.	Engineering Design	1	LS	10%	$86,036		
	b.	Construction Administration and Management	1	LS	8%	$68,829		
	c.	Legal and Administrative	1	LS	5%	$43,018		
		Subtotal				$197,883		
							$197,883	**Estimated Soft Costs**
Property Acquisition	**4.0**							
	a.	Right-of-way	2,496	LF	$19.00	$47,424		
		Subtotal				$47,424		
							$47,424	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**							
	a.	Total Project Contingency	1	LS	25%	$276,417		
		Subtotal				$276,417		
							$276,417	**Project Contingency**
Inflation	**6.0**							
	a.	Inflation	1	LS		$141,664		
		Subtotal				$141,664		
							$141,664	**Inflation**
		Average annual inflation rate	5%					
		Year of original CIP cost estimate	2023					
		Year of anticipated construction	2025					
		Number of years of inflation	2					
		Additional cost of inflation	$141,664					
							$1,523,750	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: Replace the gravity mains along 18th Street SE between Truman Avenue and Smith Avenue, along Smith Avenue between 18th Street SE and Havana Road, along Havana Road between Smith Avenue and Cadrinal Drive, along Cardinal Drive between Havana Road and approximately Bixby Road, and along Bixby Road between Havana Road and approximately Johnson Place SE.

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
WW-03	18th St and Smith Ave Trunk Sewer	2026	$3,142,929

COST COMPONENT	ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**	**Sewer System**						
	a.	Sewer Main						
	1.	12" SDR35 PVC Gravity Sewer Main (Paved)	1,316	LF	$260.00	$342,160		
	2.	15" SDR35 PVC Gravity Sewer Main (Paved)	4,286	LF	$270.00	$1,157,220		
		Subtotal				$1,499,380		
Hard Cost - Markups	**2.0**							
	a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$89,963		
	b.	Traffic Control	1	LS	2%	$29,988		
	c.	Erosion Control	1	LS	1%	$14,994		
	d.	Testing and Construction Surveying	1	LS	3%	$44,981		
		Subtotal				$179,926		
							$1,679,306	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**							
	a.	Engineering Design	1	LS	10%	$167,931		
	b.	Construction Administration and Management	1	LS	8%	$134,344		
	c.	Legal and Administrative	1	LS	5%	$83,965		
		Subtotal				$386,240		
							$386,240	**Estimated Soft Costs**
Property Acquisition	**4.0**							
	a.	Right-of-way	5,602	LF	$19.00	$106,438		
		Subtotal				$106,438		
							$106,438	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**							
	a.	Total Project Contingency	1	LS	25%	$542,996		
		Subtotal				$542,996		
							$542,996	**Project Contingency**
Inflation	**6.0**							
	a.	Inflation	1	LS		$427,949		
		Subtotal				$427,949		
							$427,949	**Inflation**
		Average annual inflation rate	5%					
		Year of original CIP cost estimate	2023					
		Year of anticipated construction	2026					
		Number of years of inflation	3					
		Additional cost of inflation	$427,949					
							$3,142,929	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: connect the existing 8-inch gravity mains between Carriage Lane and Pebble Beach Drive, and replace the existing gravity main along Rost Street between Carriage Lane to Izaak Walton Creek with a 12-inch gravity main. An alternative to this project could be to replace the existing 8-inch gravity main along Oakwood Lane between Crestview Lane and Rose Street with a 12-inch gravity main.

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
WW-04	Oakwood Lane Sewer Replacement	2027	$999,442

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	12" SDR35 PVC Gravity Sewer Main (Paved)	1,744	LF	$260.00	$453,440		
			Subtotal				$453,440		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$27,206		
		b.	Traffic Control	1	LS	2%	$9,069		
		c.	Erosion Control	1	LS	1%	$4,534		
		d.	Testing and Construction Surveying	1	LS	3%	$13,603		
			Subtotal				$54,413		
								$507,853	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$50,785		
		b.	Construction Administration and Management	1	LS	8%	$40,628		
		c.	Legal and Administrative	1	LS	5%	$25,393		
			Subtotal				$116,806		
								$116,806	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	1,744	LF	$19.00	$33,136		
			Subtotal				$33,136		
								$33,136	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$164,449		
			Subtotal				$164,449		
								$164,449	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$177,199		
			Subtotal				$177,199		
								$177,199	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2027					
			Number of years of inflation	4					
			Additional cost of inflation	$177,199					
								$999,442	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: Continue replacement of the main trunk sewer along the east side of the Straight River by replacing the existing 12-inch pipeline along Mosher Avenue from School Street to approximately Plainview Street.

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
WW-05	Straight River Trunk Sewer #3	2028	$1,412,103

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
		a.	Sewer Main						
		1.	21" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	2,115	LF	$290.00	$613,350		
			Subtotal				$613,350		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$36,801		
		b.	Traffic Control	1	LS	2%	$12,267		
		c.	Erosion Control	1	LS	1%	$6,134		
		d.	Testing and Construction Surveying	1	LS	3%	$18,401		
			Subtotal				$73,602		
								$686,952	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$68,695		
		b.	Construction Administration and Management	1	LS	8%	$54,956		
		c.	Legal and Administrative	1	LS	5%	$34,348		
			Subtotal				$157,999		
								$157,999	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	2,115	LF	$19.00	$40,185		
			Subtotal				$40,185		
								$40,185	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$221,284		
			Subtotal				$221,284		
								$221,284	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$305,683		
			Subtotal				$305,683		
								$305,683	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2028					
			Number of years of inflation	5					
			Additional cost of inflation	$305,683					
								$1,412,103	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: Replace the existing 8-inch and 10-inch gravity mains along Linn Avenue between 18th Street and Southview Street, and west to Mosher Avenue with an 18-inch pipeline.

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
WW-06	Linn Ave Trunk Sewer	2029	$2,936,955

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	18" PS46 ASTM F679 PVC Gravity Sewer Main (Paved)	4,407	LF	$275.00	$1,211,925		
			Subtotal				$1,211,925		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$72,716		
		b.	Traffic Control	1	LS	2%	$24,239		
		c.	Erosion Control	1	LS	1%	$12,119		
		d.	Testing and Construction Surveying	1	LS	3%	$36,358		
			Subtotal				$145,431		
								$1,357,356	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$135,736		
		b.	Construction Administration and Management	1	LS	8%	$108,588		
		c.	Legal and Administrative	1	LS	5%	$67,868		
			Subtotal				$312,192		
								$312,192	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	4,407	LF	$19.00	$83,733		
			Subtotal				$83,733		
								$83,733	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$438,320		
			Subtotal				$438,320		
								$438,320	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$745,354		
			Subtotal				$745,354		
								$745,354	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2029					
			Number of years of inflation	6					
			Additional cost of inflation	$745,354					
								$2,936,955	**Total Probable Project Cost**

Appendix F – Opinion of Probable Project Costs for Future Lift Stations

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
Lift Station and Force Main Projects
February 2023

Growth and Development Lift Station[1]	Peak Flow – 30-yr (gpm)	30-yr Sewershed Service Area (Acres)[2]	30-yr Force Main Diameter (in.)	Force Main Length (LF)	Estimated Lift Station and Force Main Costs[3]
LS_A	62	19	4	2,640	$ 1,468,541
LS_B	77	35	4	620	$ 1,186,288
LS_C	914	90	10	1,680	$ 3,783,528
LS_D	551	92	8	750	$ 2,601,329
LS_E	167	79	4	3,000	$ 1,892,782
LS_F	208	138	4	8,200	$ 3,848,490
LS_G	103	47	4	5,100	$ 2,623,708
LS_H	105	34	4	2,400	$ 1,759,714
LS_I	27	34	4	3,300	$ 1,614,916
LS_J	112	30	4	4,500	$ 2,225,452
LS_K	67	107	4	10,600	$ 3,233,910
TOTALS					**$ 26,238,655**

[1] *Refer to sewershed maps for future lift station locations.*
[2] 30-yr sewershed area is based on 13% of total buildout as discussed in the report
[3] *2023 Total Project Costs Include Lift Stations and Force Mains for 30-yr* Capacity

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: **65 gpm lift station and 4-inch force main from future Lift Station A to the northwest to the existing gravity main on Haddonstone Lane NE**

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
LS_A	Lift Station A	2023	$1,468,541

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	2,640	LF	$115	$303,600		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Small Pumps, <100 gpm)	1	LS	$500,000	$500,000		
			Subtotal				$816,400		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$48,984		
		b.	Traffic Control	1	LS	2%	$16,328		
		c.	Erosion Control	1	LS	1%	$8,164		
		d.	Testing and Construction Surveying	1	LS	3%	$24,492		
			Subtotal				$97,968.00		
								$914,368	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$91,437		
		b.	Construction Administration and Management	1	LS	8%	$73,149		
		c.	Legal and Administrative	1	LS	5%	$45,718		
			Subtotal				$210,305		
								$210,305	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	2,640	LF	$19.00	$50,160		
			Subtotal				$50,160		
								$50,160	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$293,708		
			Subtotal				$293,708		
								$293,708	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$1,468,541	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: 80 gpm lift station and 4-inch force main from future Lift Station B to the south across County Road 180 and the railroad to a proposed gravity main along Havana Road

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
LS_B	Lift Station B	2023	$1,186,288

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	1.0		Sewer System						
	a.		Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	370	LF	$115	$42,550		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Small Pumps, <100 gpm)	1	LS	$500,000	$500,000		
		5.	< 18" Road Crossing/Bore	250	LF	$500	$125,000		
			Subtotal				$680,350		
Hard Cost - Markups	2.0								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$40,821		
		b.	Traffic Control	1	LS	2%	$13,607		
		c.	Erosion Control	1	LS	1%	$6,804		
		d.	Testing and Construction Surveying	1	LS	3%	$20,411		
			Subtotal				$81,642.00		
								$761,992	Estimated Hard/Construction Costs
Soft Costs	3.0								
		a.	Engineering Design	1	LS	10%	$76,199		
		b.	Construction Administration and Management	1	LS	8%	$60,959		
		c.	Legal and Administrative	1	LS	5%	$38,100		
			Subtotal				$175,258		
								$175,258	Estimated Soft Costs
Property Acquisition	4.0								
		a.	Right-of-way	620	LF	$19.00	$11,780		
			Subtotal				$11,780		
								$11,780	Estimated Property Acquisition Costs
Project Contingency	5.0								
		a.	Total Project Contingency	1	LS	25%	$237,258		
			Subtotal				$237,258		
								$237,258	Project Contingency
Inflation	6.0								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	Inflation
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$1,186,288	Total Probable Project Cost

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: **915 gpm lift station and 10-inch force main from future Lift Station C to the west along Havana Road to the existing gravity main near the intersection of Bixby Road and Havana Road**

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
LS_C	Lift Station C	2023	$3,783,528

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	10" DR18 C900 PVC Sewer Force Main (Paved)	1,680	LF	$215	$361,200		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Very Large Pumps, 750-1000 gpm)	1	LS	$1,800,000	$1,800,000		
			Subtotal				$2,174,000		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$130,440		
		b.	Traffic Control	1	LS	2%	$43,480		
		c.	Erosion Control	1	LS	1%	$21,740		
		d.	Testing and Construction Surveying	1	LS	3%	$65,220		
			Subtotal				$260,880.00		
								$2,434,880	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$243,488		
		b.	Construction Administration and Management	1	LS	8%	$194,790		
		c.	Legal and Administrative	1	LS	5%	$121,744		
			Subtotal				$560,022		
								$560,022	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	1,680	LF	$19.00	$31,920		
			Subtotal				$31,920		
								$31,920	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$756,706		
			Subtotal				$756,706		
								$756,706	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$3,783,528	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: 555 gpm lift station and 8-inch force main from future Lift Station D to the north across I-14 along the east side of County Road 48-S to a proposed gravity main

CIP ID: LS_D

CIP Name: Lift Station D

Estimated CIP Year: 2023

Estimated CIP Cost: $2,601,329

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
		a.	Sewer Main						
		1.	8" DR18 C900 PVC Sewer Force Main (Unpaved)	500	LF	$125	$62,500		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Large Pumps, 250-750 gpm)	1	LS	$1,300,000	$1,300,000		
		5.	< 18" Road Crossing/Bore	250	LF	$500	$125,000		
			Subtotal				$1,500,300		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$90,018		
		b.	Traffic Control	1	LS	2%	$30,006		
		c.	Erosion Control	1	LS	1%	$15,003		
		d.	Testing and Construction Surveying	1	LS	3%	$45,009		
			Subtotal				$180,036.00		
								$1,680,336	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$168,034		
		b.	Construction Administration and Management	1	LS	8%	$134,427		
		c.	Legal and Administrative	1	LS	5%	$84,017		
			Subtotal				$386,477		
								$386,477	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	750	LF	$19.00	$14,250		
			Subtotal				$14,250		
								$14,250	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$520,266		
			Subtotal				$520,266		
								$520,266	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$2,601,329	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: 170 gpm lift station and 4-inch force main from future Lift Station E to the east to a proposed gravity main along the south side of I-14

CIP ID: LS_E

CIP Name: Lift Station E

Estimated CIP Year: 2023

Estimated CIP Cost: $1,892,782

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
		a.	Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	3,000	LF	$115	$345,000		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Medium Pumps, 100-250 gpm)	1	LS	$700,000	$700,000		
			Subtotal				$1,057,800		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$63,468		
		b.	Traffic Control	1	LS	2%	$21,156		
		c.	Erosion Control	1	LS	1%	$10,578		
		d.	Testing and Construction Surveying	1	LS	3%	$31,734		
			Subtotal				$126,936.00		
								$1,184,736	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$118,474		
		b.	Construction Administration and Management	1	LS	8%	$94,779		
		c.	Legal and Administrative	1	LS	5%	$59,237		
			Subtotal				$272,489		
								$272,489	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	3,000	LF	$19.00	$57,000		
			Subtotal				$57,000		
								$57,000	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$378,556		
			Subtotal				$378,556		
								$378,556	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$1,892,782	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: **210 gpm lift station and 4-inch force main from future Lift Station F to the north along South Cedar Avenue to 18th Street S, and west to Linn Avenue to an existing gravity main.**

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
LS_F	Lift Station F	2023	$3,848,490

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	3,900	LF	$115	$448,500		
		2.	4" DR18 C900 PVC Sewer Force Main (Paved)	3,900	LF	$195	$760,500		
		3.	Lift Station Connection	1	EA	$6,400	$6,400		
		4.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		5.	New Lift Station (Medium Pumps, 100-250 gpm)	1	LS	$700,000	$700,000		
		6.	< 18" Road Crossing/Bore	400	LF	$500	$200,000		
			Subtotal				$2,121,800		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$127,308		
		b.	Traffic Control	1	LS	2%	$42,436		
		c.	Erosion Control	1	LS	1%	$21,218		
		d.	Testing and Construction Surveying	1	LS	3%	$63,654		
			Subtotal				$254,616.00		
								$2,376,416	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$237,642		
		b.	Construction Administration and Management	1	LS	8%	$190,113		
		c.	Legal and Administrative	1	LS	5%	$118,821		
			Subtotal				$546,576		
								$546,576	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	8,200	LF	$19.00	$155,800		
			Subtotal				$155,800		
								$155,800	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$769,698		
			Subtotal				$769,698		
								$769,698	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$3,848,490	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: **105 gpm lift station and 4-inch force main from future Lift Station G to the northeast to a proposed gravity main on the north side of I-14**

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
LS_G	Lift Station G	2023	$2,623,708

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	4,700	LF	$115	$540,500		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Medium Pumps, 100-250 gpm)	1	LS	$700,000	$700,000		
		5.	< 18" Road Crossing/Bore	400	LF	$500	$200,000		
			Subtotal				$1,453,300		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$87,198		
		b.	Traffic Control	1	LS	2%	$29,066		
		c.	Erosion Control	1	LS	1%	$14,533		
		d.	Testing and Construction Surveying	1	LS	3%	$43,599		
			Subtotal				$174,396.00		
								$1,627,696	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$162,770		
		b.	Construction Administration and Management	1	LS	8%	$130,216		
		c.	Legal and Administrative	1	LS	5%	$81,385		
			Subtotal				$374,370		
								$374,370	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	5,100	LF	$19.00	$96,900		
			Subtotal				$96,900		
								$96,900	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$524,742		
			Subtotal				$524,742		
								$524,742	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$2,623,708	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: 105 gpm lift station and 4-inch force main from future Lift Station H to the east to and existing gravity main near the intersection of 24th Avenue and Alexander Street SW

CIP ID: LS_H
CIP Name: Lift Station H
Estimated CIP Year: 2023
Estimated CIP Cost: $1,759,714

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	2,400	LF	$115	$276,000		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Medium Pumps, 100-250 gpm)	1	LS	$700,000	$700,000		
			Subtotal				$988,800		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$59,328		
		b.	Traffic Control	1	LS	2%	$19,776		
		c.	Erosion Control	1	LS	1%	$9,888		
		d.	Testing and Construction Surveying	1	LS	3%	$29,664		
			Subtotal				$118,656.00		
								$1,107,456	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$110,746		
		b.	Construction Administration and Management	1	LS	8%	$88,596		
		c.	Legal and Administrative	1	LS	5%	$55,373		
			Subtotal				$254,715		
								$254,715	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	2,400	LF	$19.00	$45,600		
			Subtotal				$45,600		
								$45,600	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$351,943		
			Subtotal				$351,943		
								$351,943	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$1,759,714	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: 30 gpm lift station and 4-inch force main from future Lift Station I to the east to an existing gravity main on the east side of 39th Avenue NW north of the the railroad

CIP ID: LS_I

CIP Name: Lift Station I

Estimated CIP Year: 2023

Estimated CIP Cost: $1,614,916

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
	a.		Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	3,300	LF	$115	$379,500		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Small Pumps, <100 gpm)	1	LS	$500,000	$500,000		
			Subtotal				$892,300		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$53,538		
		b.	Traffic Control	1	LS	2%	$17,846		
		c.	Erosion Control	1	LS	1%	$8,923		
		d.	Testing and Construction Surveying	1	LS	3%	$26,769		
			Subtotal				$107,076.00		
								$999,376	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$99,938		
		b.	Construction Administration and Management	1	LS	8%	$79,950		
		c.	Legal and Administrative	1	LS	5%	$49,969		
			Subtotal				$229,856		
								$229,856	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	3,300	LF	$19.00	$62,700		
			Subtotal				$62,700		
								$62,700	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$322,983		
			Subtotal				$322,983		
								$322,983	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$1,614,916	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: **115 gpm lift station and 4-inch force main from future Lift Station J to the east to an existing gravity main along 26th Street NW east of Harvest Lane**

CIP ID:	CIP Name:	Estimated CIP Year:	Estimated CIP Cost:
LS_J	Lift Station J	2023	$2,225,452

COST COMPONENT	ITEM #		ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**		**Sewer System**						
		a.	Sewer Main						
		1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	4,500	LF	$115	$517,500		
		2.	Lift Station Connection	1	EA	$6,400	$6,400		
		3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
		4.	New Lift Station (Medium Pumps, 100-250 gpm)	1	LS	$700,000	$700,000		
			Subtotal				$1,230,300		
Hard Cost - Markups	**2.0**								
		a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$73,818		
		b.	Traffic Control	1	LS	2%	$24,606		
		c.	Erosion Control	1	LS	1%	$12,303		
		d.	Testing and Construction Surveying	1	LS	3%	$36,909		
			Subtotal				$147,636.00		
								$1,377,936	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**								
		a.	Engineering Design	1	LS	10%	$137,794		
		b.	Construction Administration and Management	1	LS	8%	$110,235		
		c.	Legal and Administrative	1	LS	5%	$68,897		
			Subtotal				$316,925		
								$316,925	**Estimated Soft Costs**
Property Acquisition	**4.0**								
		a.	Right-of-way	4,500	LF	$19.00	$85,500		
			Subtotal				$85,500		
								$85,500	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**								
		a.	Total Project Contingency	1	LS	25%	$445,090		
			Subtotal				$445,090		
								$445,090	**Project Contingency**
Inflation	**6.0**								
		a.	Inflation	1	LS		$0		
			Subtotal				$0		
								$0	**Inflation**
			Average annual inflation rate	5%					
			Year of original CIP cost estimate	2023					
			Year of anticipated construction	2023					
			Number of years of inflation	0					
			Additional cost of inflation	$0					
								$2,225,452	**Total Probable Project Cost**

Owatonna Wastewater Collection System Study
OPINION OF TOTAL PROBABLE PROJECT COST
February 2023

Project Description: 70 gpm lift station and 4-inch force main from future Lift Station K to the east to and existing gravity main on the west side of County Road 45 near the airport

CIP ID: LS_K

CIP Name: Lift Station K

Estimated CIP Year: 2023

Estimated CIP Cost: $3,233,910

COST COMPONENT	ITEM #	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMPONENT SUBTOTAL	
Hard Cost	**1.0**	**Sewer System**						
	a.	Sewer Main						
	1.	4" DR18 C900 PVC Sewer Force Main (Unpaved)	10,600	LF	$115	$1,219,000		
	2.	Lift Station Connection	1	EA	$6,400	$6,400		
	3.	Existing Sewer Main Connection	1	EA	$6,400	$6,400		
	4.	New Lift Station (Small Pumps, <100 gpm)	1	LS	$500,000	$500,000		
		Subtotal				$1,731,800		
Hard Cost - Markups	**2.0**							
	a.	Mobilization/Demobilization/Insurance/Permits/Bonds	1	LS	6%	$103,908		
	b.	Traffic Control	1	LS	2%	$34,636		
	c.	Erosion Control	1	LS	1%	$17,318		
	d.	Testing and Construction Surveying	1	LS	3%	$51,954		
		Subtotal				$207,816.00		
							$1,939,616	**Estimated Hard/Construction Costs**
Soft Costs	**3.0**							
	a.	Engineering Design	1	LS	10%	$193,962		
	b.	Construction Administration and Management	1	LS	8%	$155,169		
	c.	Legal and Administrative	1	LS	5%	$96,981		
		Subtotal				$446,112		
							$446,112	**Estimated Soft Costs**
Property Acquisition	**4.0**							
	a.	Right-of-way	10,600	LF	$19.00	$201,400		
		Subtotal				$201,400		
							$201,400	**Estimated Property Acquisition Costs**
Project Contingency	**5.0**							
	a.	Total Project Contingency	1	LS	25%	$646,782		
		Subtotal				$646,782		
							$646,782	**Project Contingency**
Inflation	**6.0**							
	a.	Inflation	1	LS		$0		
		Subtotal				$0		
							$0	**Inflation**
		Average annual inflation rate	5%					
		Year of original CIP cost estimate	2023					
		Year of anticipated construction	2023					
		Number of years of inflation	0					
		Additional cost of inflation	$0					
							$3,233,910	**Total Probable Project Cost**