City of Manteca
Wastewater Master Plan
FINAL
February 2024



Prepared for:
City of Manteca

Prepared by:
Stantec Consulting Services Inc.
2250 Douglas Blvd., Suite 260
Roseville, CA 95661

ATTACHMENT 2

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Disclaimer: Presently, the latest General Plan Update relied upon for purposes of this Master Plan is stayed, subject to a potential referendum and litigation. As such, the information from the General Plan relied upon herein may be subject to change.



2/13/2024

_____
Recommended for Approval
Somporn Boonsalat
Acting Deputy Director of Engineering

_____
Approved by
Kevin Jorgensen II
Director of Engineering/City Engineer

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February 29, 2024

Project/File: 184031535

Somporn Boonsalat
1001 W. Center St. Manteca, CA 95337

Dear Somporn Boonsalat,

Reference: Wastewater Peaking Factor

Stantec reviewed the wastewater flow data collected for use in the development of a hydraulic model of the City's existing wastewater collection system. This hydraulic model was used to evaluate the existing and future wastewater collection system needs identified in the City's Wastewater Master Plan (February 2024). The flow data and model results were used to develop a peaking factor equation for use in the City's Design Standards.

The existing City Standards provide design flow calculations for collection system facilities. The design standards do not address flow modeling methodologies and assumptions related to the simulation of peak wet weather flow (PWWF) in the collection system. After establishing average dry weather flow (ADWF) conditions based on existing flow monitoring data and projecting future conditions with wastewater generation factors, the hydraulic model is used to apply a diurnal flow pattern to the ADWF and then the infiltration/inflow (I/I) resulting from a simulated severe storm event is superimposed on the dry weather flow pattern.

The 2012 Wastewater Collection System Master Plan (NV5, 2013) estimated peak flows based on an empirical equation instead of the use of a hydraulic model as described above. The original equation from the 2012 Master Plan is shown below, where ADWF is in million gallons per day (MGD).

$$PF = 2e^{(-2xADWF)} + 2.05$$

To update the equation, flow monitoring data and the results of the hydraulic model within the future collection system were plotted against the original equation and the equation was adjusted until it sufficiently matched model results. The resulting equation is shown below.

$$PF = 3e^{(-2xADWF)} + 3.00$$

ATTACHMENT 2

Reference: **Wastewater Peaking Factor**

Table 1. Recommended Peaking Factors

ADWF (MGD)	PF	PWWF (MGD)
0.00	6.00	0.00
0.05	5.71	0.29
0.10	5.46	0.55
0.25	4.82	1.20
0.50	4.10	2.05
0.75	3.67	2.75
1.00	3.41	3.41
2.00	3.05	6.11
4.00	3.00	12.00

Thanks,

STANTEC CONSULTING SERVICES INC.

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Appendix D F3 Survey Results
Appendix E Manteca Design Standards

Appendix E Manteca Design Standards
Appendix F Hydraulic Model Calibration & Scenario Results
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Appendix H Solids Mass Balances Flow Diagrams
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Appendix J CIP Schedule and Costs

Abbreviations

3W	plant effluent
AACE	Association for the Advancement of Cost Engineering
AAF	annual average flow
ABS	acrylonitrile butadiene styrene
ACP	asbestos cement pipe
ADWF	average dry weather flow
ADMMF	average day maximum monthly flow
ADMML	average day maximum month load
AOI	area of interest
ATS	automatic transfer switch
BioCNG	biogas renewable compressed natural gas
BOD	biochemical oxygen demand
BWWF	base sanitary wastewater flow
CalOSHA	California Occupational Safety and Health Administration
CAS	chemical
CCTV	closed-circuity television
CCS83	California Coordinate System of 1983
CEC	contaminants of emerging concern
CEQA	California Environmental Quality Act
cfm	cubic feet per minute
CIMIS	California Irrigation Management Information System
CIP	capital improvement project
CIP	cast iron pipe
CIPP	cured in place pipe (lining for sewer rehabilitation)
City	City of Manteca
CIWEM	Chartered Institution of Water and Environmental Management
CIWQS	California Integrated Water Quality System

CMCS	Central Manteca Collection Strategy
CNG	compressed natural gas
DAFT	dissolved air flotation thickener
d/D	flow depth/ pipe diameter
DEIR	Draft Environmental Impact Report
DGE	diesel gallon equivalents
DIP	ductile iron pipe
DO	dissolved oxygen
DTRW	disinfected tertiary recycled water
D/V	drain/vent
DWF	dry weather flow
EC	Electrical Conductivity
Eckert	Eckert Cold Storage
EDR	electrodialysis reversal
EDU	equivalent dwelling unit
ENRCCI	Engineering News-Record Construction Cost Index
EPA	Environmental Protection Agency
F3	F3 & Associates
FFPS	Filter Feed Pump Station
FOG	fats, oil, and grease
FPC	full pipe capacity
FRP	fiberglass reinforced plastic
fps	foot per second
ft	feet
ft/ft	foot per foot
FY	fiscal year
GIS	geographic information system
gpd	gallons per day
gpcd	gallons per capita day

GWI	ground water infiltration
H2S	hydrogen sulfide
HDPE	high-density polyethylene
HGL	hydraulic grade line
HP	horse power
IMLR	internal mixed liquor recycle
IFAS	integrated fixed-film activated sludge
I/I	inflow and infiltration
in	inches
IPP-3	Industrial Pipeline Project
IPS	Influent Pump Station
kW	kilowatt
lb/d	pounds per day
LF	linear feet
LiDAR	light detection and ranging
LOS	level of service
LS	lift station
MBR	membrane bioreactor
MCC	motor control centers
MCL	maximum contaminant levels
Mgal/d	million gallons per day
mg/L	milligrams per liter
MLSS	mixed liquor suspended solids
MSCA	Manteca Sewer Conditions Assessment
MSR	Municipal Services Review
NAD 83	North American Datum of 1983
NASSCO	National Association of Sewer Service Companies
NAVD 88	National Geodetic Vertical Datum of 1988
NF	nanofiltration

NGVD 29	National Geodetic Vertical Datum of 1929
NMCS	North Manteca Collection Strategy
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NTU	nephelometric turbidity units
NWRI	National Water Research Institute
O&M	operation and maintenance
OIT	operator interfaced terminal
OIT	Operator-in-Training
OPCC	opinion of probable construction costs
ORP	oxidation reduction potential
PAC	poly aluminum chloride
PCSWMM	personal computer storm water management model
PDF	peak day flow
PDL	peak day load
PDWF	peak dry weather flow
PFAs	per- and polyfluorinated substances
PG&E	Pacific Gas & Electric
PHF	peak hour flow
PLC	programmable logic controller
PPIG	Public Project Infrastructure Group
PS	pump station
PVC	polyvinyl chloride
PWWF	peak wet weather flow
RAS	return activated sludge
RCP	reinforced concrete pipe
RDI	rainfall dependent infiltration
RDII	rainfall dependent inflow and infiltration
RO	reverse osmosis

ROW	right of way
RWQCB/Regional Board	Regional Water Quality Control Board
SBR	sequencing batch reactor
SCADA	supervisory control and data acquisition
SEEP	Secondary Effluent Equalization Pond
SESP	Secondary Effluent Storage Pond
SMCS	South Manteca Collection Strategy
SND	simultaneous nitrification and denitrification
SOI	sphere of influence
SP	steel pipe
SRT	solids retention time
SS	sanitary sewer
SSMP	Sanitary Sewer Management Plan
SVI	sludge volume index
SWRCB	State Water Resources Control Board
TDH	total dynamic head
TDS	total dissolved solids
TKN	Total Kjeldahl Nitrogen
TM	technical memorandum
TMDL	total maximum daily load
TSS	total suspended solids
TWAS	thickened waste activated sludge
URPS	Union Road Pump Station
UTS	Utility Technology Services
UVT	UV transmittance
V&A	V&A Consulting Engineers, Inc.
VCP	vitrified clay pipe
VFD	variable frequency drive
WAS	Waste Activated Sludge

WDR	Waste Discharge Requirements
WGF	wastewater generation factors
WRF	Water Research Foundation
WWF	wet weather flow
WWMP	Wastewater Master Plan
WQCF	Wastewater Quality Control Facility
WQO	water quality objectives

Acknowledgements

Stantec wishes to acknowledge the following City staff: Elba Mijango (Associate Engineer), Somporn Boonsalat (Acting Deputy Director of Engineering), Carl Brown (Public Works Director), George Montross (Deputy Director of Public Works - Water Resources), Dustin Valiquette (Plant Manager), Greg Showerman (Deputy Director of Engineering), and Kevin Jorgensen (Director of Engineering/City Engineer) for providing the information, access, history, and guidance that were vital to developing this Wastewater Master Plan. Their pride and dedication as stewards of the community's resources is evident and commendable.

Executive Summary

ES.1 INTRODUCTION AND BACKGROUND

ES.1.1 Scope of Work

The City of Manteca Wastewater Master Plan (WWMP) encompasses the City's wastewater collection system and Wastewater Quality Control Facility (WQCF). The objectives of this WWMP are to evaluate the available capacity of existing facilities, determine what facility improvements are required to meet the demands for near-term and long-term growth, and develop a comprehensive road map for the City's Capital Improvement Program.

The most recent update to the City's General Plan, in conjunction with changing wastewater generation rates over time, have created a need to reassess the City's wastewater collection infrastructure and treatment capacity needs for existing and future conditions. The primary goals of this WWMP are: 1) to evaluate historical and existing wastewater flows; 2) to refine collection system performance and planning criteria; 3) to build and calibrate the City's wastewater collection system hydraulic model; 4) to evaluate the need for new wastewater collection and treatment facilities to meet existing and future needs; and 5) to update and prioritize the City's Capital Improvement Program for wastewater collection and treatment improvements.

This WWMP report is organized into the following chapters, which are summarized in this Executive Summary:

- Chapter 1.0 Introduction and Background
- Chapter 2.0 Existing Wastewater Collection System
- Chapter 3.0 Hydraulic Model Development and Calibration
- Chapter 4.0 Basis for Collection System Analysis
- Chapter 5.0 Collection System Capacity Evaluation
- Chapter 6.0 Wastewater Collection System Condition Assessment
- Chapter 7.0 WQCF Background and Regulatory Requirements
- Chapter 8.0 WQCF Wastewater Flows and Loads
- Chapter 9.0 WQCF Assessment of Existing Facilities and Recommended Interim Improvements
- Chapter 10.0 WQCF Phase IV Expansion Project
- Chapter 11.0 Staffing Plan
- Chapter 12.0 Capital Improvement Program
- Chapter 13.0 References

ES.1.2 Study Area

The City of Manteca (Manteca) is located in the Central Valley of California within San Joaquin County, approximately 70 miles east of San Francisco, with an estimated population of 85,792 people (2021 US Census Bureau). The existing City limits encompasses an area of 13,728 acres or approximately 21.5

square miles. The existing wastewater collection system includes residential (69%), commercial (8%), industrial (9%), municipal (9%), and mixed-use (4%) areas within the City. The Manteca WQCF also services surrounding member jurisdictions including a portion of the City of Lathrop, Oakwood Shores, and Raymus Village in San Joaquin County.

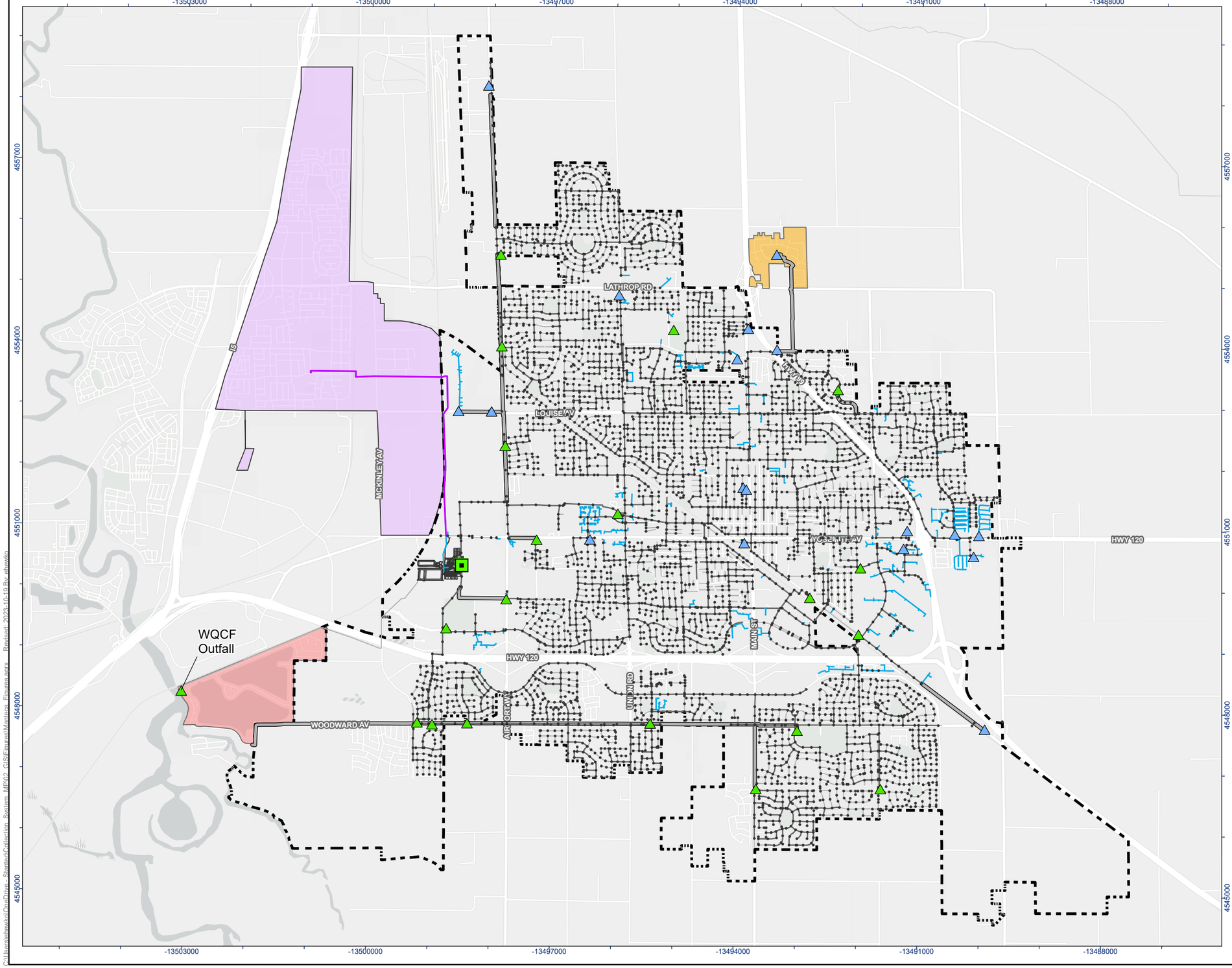
Manteca operates its own sewer collection system serving connections within City boundaries while member jurisdictions (Lathrop, Raymus Village, and Oakwood Shores) own and operate their own collection systems which convey wastewater flows to the City's collection system. **Figure ES-1** shows an overview of the existing sewer collection system, including city limits and member jurisdiction service areas, sewer lines, sanitary sewer pump stations, and the location of the WQCF.

ES.1.3 Background Information & Review

The following information was reviewed and incorporated into the development of this WWMP, including regulatory plans, service agreements, technical reports, and City planning documents.

- The City's collection system is currently permitted to operate under State Water Resources Control Board General Order No. 2006-0003-DWQ, Statewide General Waste Discharge Requirements for Sanitary Sewer Systems, which requires the City to develop and implement a Sewer System Management Plan (SSMP) that describes how the City operates and maintains the collection system in compliance with General Order requirements. The City of Manteca's current SSMP dated January 8, 2020, is included in **Appendix A**.
- The City provides sanitary sewer service to the City of Lathrop in accordance with a regional service agreement, most recently amended on May 26th, 2016, originally signed on March 5th, 1985. The terms of the current agreement outline the rights and responsibilities of each party, treatment capacities, costs, discharge limitations, and define the legal parameters associated with the regional treatment agreement. The agreement allocates 14.7% of the Manteca WQCF capacity to flows discharged from Lathrop. The City also provides sanitary sewer service to the Oakwood Lake Water District in accordance with a regional service agreement, amended in 2020, originally signed May 9, 2019. Like the agreement with Lathrop, the agreement outlines terms of the regional service agreement.
- The City's previous Wastewater Collection System Master Plan Update (2012 Master Plan) was completed by NV5 Global Inc. in January 2013 as an update to the City's 2006 Wastewater Collection System Master Plan (2006 Master Plan). The recommended overall trunk sewer strategy consisted of a combination of trunk sewer gravity collection system with lift stations located along the alignment to convey wastewater to an influent pump station at the WQCF.
- The City of Manteca has recently updated and amended their General Plan. The General Plan is a long-range (20-30 years) planning document that is considered the City's "constitution" or blueprint, because it identifies the City's goals and vision for growth, traffic patterns, economic development, housing, and more. Land uses within the General Plan serve as the basis to estimate wastewater flow rates from future development. Population projections from the City's General Plan indicate a build out population of 211,003 people.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain

Lift Station

- City Owned
- Privately Owned
- Modeled Sanitary Sewer
- Sanitary Network
- Private Sanitary Network
- Water Quality Control Facility Structures
- City of Lathrop Discharge
- City of Lathrop Collection Boundary
- Raymus Village Collection Boundary
- Oakwood Shores Collection Boundary
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-1

Title
Existing Sewer Collection System Overview

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ES.2 EXISTING WASTEWATER COLLECTION SYSTEM

This section highlights Chapter 2, which presents an overview of the existing sewer system and flows.

ES.2.1 Collection System Overview

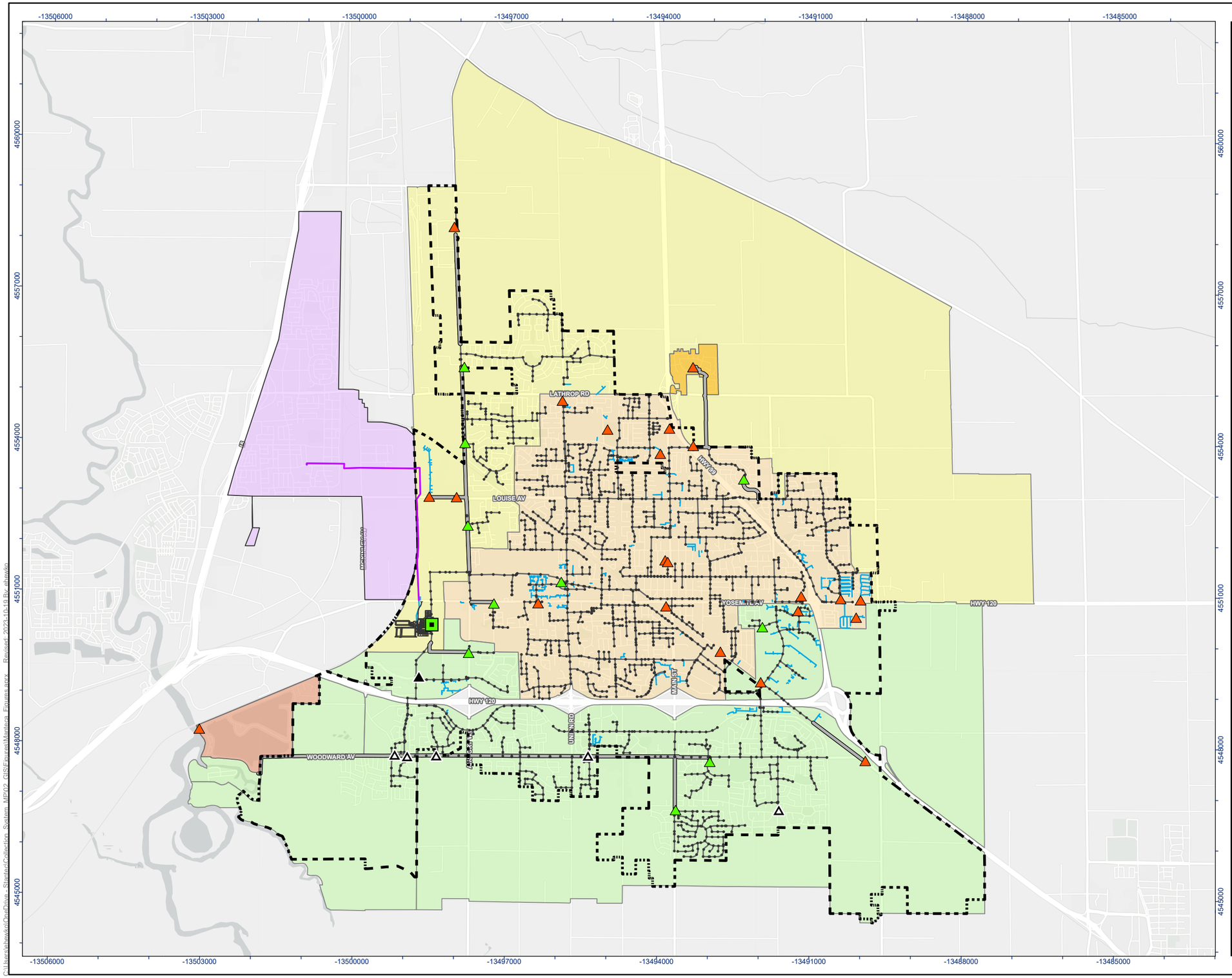
The Manteca WQCF is located southwest of downtown Manteca at 2450 West Yosemite Avenue. The WQCF treats typical municipal wastewater generated in the City of Manteca, a portion of the City of Lathrop, and the surrounding communities of Raymus Village and Oakwood Shores. A separate industrial line accepts food processing wastewater seasonally from Eckert Cold Storage from May through November. The sewer collection system is contiguous with city limits and includes more than 19,500 service connections, 4,672 manholes, approximately 250 miles of 4-inch to 60-inch diameter collector and trunk sewer mains, and 21 miles of sewer force main that the City of Manteca is responsible for operating and maintaining. There are several privately and publicly owned lift stations in the system, data was collected for 18 of the largest pump stations.

Information regarding these conveyances and facilities is presented in this WWMP as reported by the City's GIS database and provided by City staff. The GIS database provides pipeline diameter, material, and installation year information of sewer lines. Approximately 77% of the existing gravity sewer system is comprised of 6-inch and 8-inch diameter sewers. The most common sewer pipe materials are polyvinyl chloride (PVC) and vitrified clay pipe (VCP), which combined account for almost 88% of the system by pipe length. Approximately 40% of the existing sewer lines were installed after the year 2000, with the earliest installation year listed as 1906. The GIS database indicates that half of the sewer force mains are 12-inches in diameter and a quarter of them are 6-inches in diameter with the largest being 24-inches. Over 80% of force mains are PVC material and 95% have unknown installation years. The GIS database included 39 sewer lift stations, data was provided for 18 lift stations, after reviewing the data 10 of which were included in the hydraulic model.

The existing sewer service area can be divided into North, South, and Central service sewershed areas. The North Shed contributes 10 percent of the total flow, the South Shed contributes 30 percent, and the Central Shed contributes 60 percent. The majority of the collection system serves the core of the City (Central Shed), approximately bounded by State Highway 120 (SR-120) to the south, Austin Road to the east, Airport Way to the west, and Lathrop Road to the north. Within the Central Shed, the majority of the collection system flows by gravity to the Union Road Pump Station (URPS). The North Shed includes the City planning area north of SR120 and Yosemite Avenue outside of the Central Shed. Much of the predicted development is within the North Shed which is largely undeveloped and lacking infrastructure needed to serve development of this area. The South Shed includes the City planning area south of SR120 and Yosemite Avenue outside of the Central Shed. Like the North Shed, much of the South Shed remains undeveloped, though many subdivisions have been constructed and expanded along the Woodward Avenue corridor in the last 10 to 15 years. Two primary trunk sewers discharge flow into the WQCF headworks, the North Trunk Sewer collects flow discharged from the North Shed and Central Shed service areas and the South Trunk Sewer conveys flow from the South Shed service area.

The sewer service areas and the existing collection system are presented in **Figure ES-2**.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Forcemain

Lift Station Status

- Active
- Unmodeled
- Inactive
- Abandoned

- Modeled Sanitary Sewer
- Private Sanitary Network
- Water Quality Control Facility Structures
- City of Lathrop Discharge
- Oakwood Shores Collection Boundary
- Raymus Village Collection Boundary
- City of Lathrop Collection Boundary

Service Area

- Central Shed
- North Shed
- South Shed
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
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Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-2

Title
Sewer Collection System and Service Area

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ES.2.2 Existing Sewer Flows

For this WWMP, a flow monitoring study was conducted from March 18, 2022, through May 19, 2022. A total 18 temporary flow meters were deployed in sewer lines at various locations throughout the collection system, as shown in **Figure ES-3** and detailed in **Appendix B**. Data collected during the flow monitoring study was used in development of the hydraulic model of the City's collection system. The flow monitoring data were used to perform an assessment of both dry and wet weather flow conditions throughout the City's collection system. The overall average dry weather flow recorded by V&A was 4.7 Mgal/d and the peak wet weather flow (PWWF) recorded during the flow monitoring study was over 8.0 Mgal/d. There was only one primary storm event during the study which occurred on March 27 – 28. This event only produced 0.72 inches of rain, which would be equivalent to just less than a 1-year return frequency storm event.

The flow monitoring program revealed that backwatered conditions (i.e., gravity sewer surcharging during periods when flows are well below the full pipe capacity) routinely occur at the Union Road Lift Station, surcharging was also observed at the Chadwick Unit 5 and Woodward Park pump stations. The I/I analysis revealed that basins 7, 9, and 10 had the highest I/I contributions. Basin 7 includes the Louise Avenue corridor. Basins 9 and 10 are along the south side of Moffat Boulevard on each side of SR-120. Influent flow data recorded at the WQCF from 2016 to 2021 was used in conjunction with United States Census Bureau population data to calculate the average dry weather flow (ADWF) per capita for the service area. The average per capita flow discharged to the WQCF is 61 gallons per person per day (gpcd).

ES.3 HYDRAULIC MODEL DEVELOPMENT & CALIBRATION

This section highlights the content of Chapter 3, which documents the approach used to develop and calibrate the collection system hydraulic model.

Open channel flow hydraulic modeling software platforms were reviewed for purposes of efficiently executing the collection system components of this WWMP. Based on the City's needs, the model of the collection system was developed using PCSWMM software by Computational Hydraulics Inc. This effort is summarized in *Technical Memorandum (TM) No. 1: Hydraulic Model Software Selection*, which is included in **Appendix C**.

The collection system model only considers the City of Manteca's collection system. Although the City's WQCF accepts flows from neighboring jurisdictions, the hydraulic model only simulates the City's collection system and flows.

ES.3.1 Hydraulic Model Approach

The hydraulic modeling approach included the following:

- Develop the model using Manteca's existing GIS and survey data. Manhole rim and invert elevations were also updated and incorporated into the model.

- Assign initial sewer loads based on water meter data and then update the loads based on individual flow monitoring data.
- Identify dry and wet weather events to use for calibration.
- Undertake rainfall dependent inflow and infiltration analysis for each of the meter subcatchments.
- Calibrate the model using the collected flow monitoring data.

ES.3.2 Model Inputs and Structure

The hydraulic model of the collection system includes all gravity mains of 8-inch diameter and larger, plus smaller force mains and gravity sewers required for connectivity of the system. The model also includes a total of 10 pump stations and their associated force mains. Modeled facilities are shown in **Figure ES-3**.

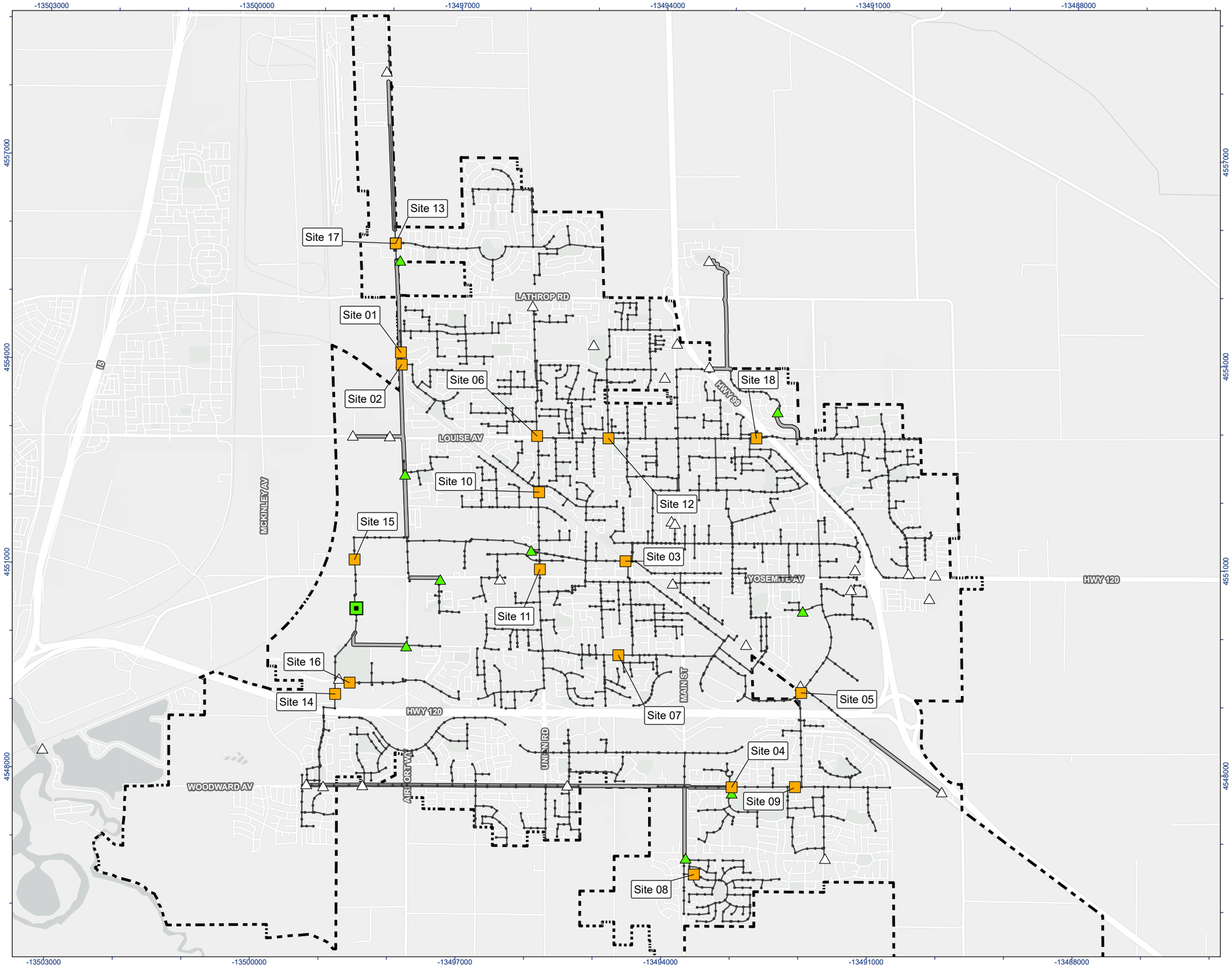
During model development, the physical network of sewers, manholes, pump stations, and structures were established based on the City's GIS database, specifically the physical information contained therein for the existing collection system. This physical network becomes the underlying framework for the model. Therefore, it is crucial that the infrastructure is reviewed for completeness and proper connectivity. Pipe invert elevations are derived from a combination of field survey data, record drawings, and City GIS data, with adjustments applied as described in **Chapter 3.0**. Ground surface elevations are derived from a combination of City GIS data, field survey, and LiDAR (Laser Imaging, Detection, and Ranging) data.

Stantec subcontracted with F3 & Associates (F3) to conduct a manhole survey of 50 manholes in the system. A complete list of manholes surveyed is included in **Appendix D** along with the information provided by F3. Missing pipe inverts for manholes that are not surveyed are interpolated using the closest upstream and downstream manhole invert data. The model includes a total of 2,132 manholes, which includes some nodes that reflect elevation changes along force mains, clean outs or lamp holes to complete the network. A total of 2,103 sewer segments are included in the model with a total length of approximately 107 miles. A total of 10 city owned sewer lift stations are included in the model with approximately 10 miles of force main.

ES.3.3 Flow Allocation

This section describes how flows are assigned to the appropriate nodes within the collection system model. Flow inputs are assumed to originate at a parcel level. Parcels were assigned to modeled manholes based on proximity and associated water meter billing records. Sanitary flow loadings for users i.e., Base Wastewater Flow (BWWF) were developed based on water meter billing records. City of Manteca staff supplied Stantec with average daily water usage data from 2016 to 2021 for address points within the service area. These totals were used to distribute the percentage of sewer flow recorded at each of the sewer system flow monitoring locations. The groundwater infiltration (GWI) component was assumed to be 80 percent of the minimum nighttime flow and was distributed to manholes proportionally based on contributing area.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Other Lift Station
- Flow Monitor
- Modeled Forcemain
- Modeled Sanitary Sewer
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-3

Title
Flow Monitoring Locations and Modeled Facilities

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ES.3.4 Model Calibration

The model was calibrated first to dry weather conditions and then to wet weather conditions. The dry weather calibration was based on sewer flow data collected from March to May 2022. Due to lack of significant rainfall during this flow monitoring period, the wet weather calibration was initially calibrated to the limited rainfall response observed in the flow monitoring data before being adjusted to reflect more recent storm events that occurred between December 2022 and January 2023 using influent flow data recorded at the WQCF. The most significant influent flow response and corresponding rainfall event occurred between December 29, 2022, and January 1, 2023, where 3.29-inches of rainfall was recorded.

The assignment of parcel-based flows to the model, the calibration process, and the rainfall analysis are all described in detail in **Chapter 3**. Comparisons of the metered versus modeled dry weather results for the 18 monitoring locations are presented in **Appendix F**. A comparison of the modeled vs. measured wet weather influent response at the WQCF is shown in **Figure 3-7** in **Chapter 3**. The model was successfully calibrated such that the simulated flows satisfactorily matched the conditions observed during the flow monitoring period and influent flow data based on calibration guidelines developed by the Chartered Institution of Water and Environmental Management (CIWEM).

ES.4 BASIS FOR COLLECTION SYSTEM ANALYSIS

This section highlights the content of Chapter 4, which includes the planning, design, and performance criteria applicable to the City's wastewater collection system.

ES.4.1 Design Criteria

The criteria presented in this chapter are considered adjunct to the existing City Standards and Specifications and are not intended to replace or supersede those standards unless specifically stated otherwise. The City's Standards can be found in **Appendix E** of this report. Key criteria addressed in this WWMP include wastewater generation factors (WGF) for General Plan land use categories, modeling of PWWF conditions, and capacity assessment of existing facilities.

Land-use based wastewater generation rates are used to establish ADWF estimates for future development. To match the modeling assumptions included in the existing system model and general development patterns observed in the City, it was determined that approximately 80% of the gross area contributes to wastewater flow generation, leaving 20% open for open space and right of way (ROW). Therefore, the net area was used to calculate wastewater flow estimates from future developments using the WGFs presented in **Chapter 4.0**.

The WGFs presented in the City's 2012 Master Plan were reviewed and updated based on the most recent General Plan land use densities and an updated wastewater unit rate of 195 gpd/EDU. This unit rate was derived from the calculated per capita flow of 61 gpcd and average household density reported by US census data from 2017 to 2021 of 3.19 persons per EDU. No adjustments were made to WGFs for non-residential land use designations from those presented in the 2012 Master Plan, aside from that of parks which was reduced from 400 gpd/acre to 100 gpd/acre. Parks typically have very low to no

wastewater generation component because they generally consist of open space with the majority of water use attributed to irrigation.

The estimation of PWWFs in the collection system is based on the use of a 10-year, 24-hour design storm event, per standard practice. According to the National Oceanic and Atmospheric Administration (NOAA), the 10-year, 24-hour storm for Manteca has a magnitude of 2.20 inches. For this analysis the target level of service (LOS) is based on the capacity in the collection system and the risk of surcharging that may result, as defined in **Chapter 4**. Pump stations are considered undersized if the associated firm capacity (i.e., with the largest pump out of service) is not sufficient to accommodate modeled peak flows. Force mains are considered undersized of the maximum velocity exceeds 8 fps at modeled peak flows.

ES.4.2 Future Growth Assumptions

The study area considered in this Master Plan encompasses the planning areas to which the City of Manteca will provide sewer service and ultimately be responsible for operating and maintaining under build-out development conditions. This includes the North, Central, and South service areas previously described in this report each having their own collection strategy. This assumes that future development flows outside of the existing City Limits boundary and sewer service area will be routed through their respective systems. For example, future flows originating from within the North Shed boundary should flow through the North Trunk system down Airport Way to the WQCF, while flows from within the Central Shed boundary should pass through the Union Road Sewage Lift Station and Central trunk network, and flow originating from the South Shed area should be routed through the South Trunk that follows Woodward Avenue.

Future population projections from the City's General Plan and Municipal Services Review (MSR) were reviewed for consistency with future flow projections and of level of development scenarios. The General Plan projects a buildout population of 211,003 people and the MSR projects a buildout population of 236,000 people. This WWMP assessed system performance for existing level of development conditions as well as the following projected growth scenarios, the areas served in each scenario are presented in **Figure ES-4**. ADWF projections for each scenario are summarized in **Table ES-1**.

Scenario 1 – Existing Conditions Model: This modeled scenario simulates flow in the existing collection system during a 10-year, 24-hour design storm event. This model was constructed using the calibrated wet weather flow model and applying a 10-year, 24-hour rainfall event.

Scenario 2 – Buildout of City Limits: This scenario simulates PWWF in the future collection system upon development of infill areas within the existing city limits. The majority of infill development is in the South Shed.

Scenario 3 – Buildout of the SOI Boundary: This scenario simulates PWWF in the future collection system upon development of the SOI that lies outside City Limits, as shown in **Figure ES-4**. The majority of SOI development is in the North Shed and South Shed.

Scenario 4 – Full General Plan Buildout: This scenario simulates PWWF in the future collection system upon development of the remaining general plan development area. The majority of the remaining development area is in the North Shed.

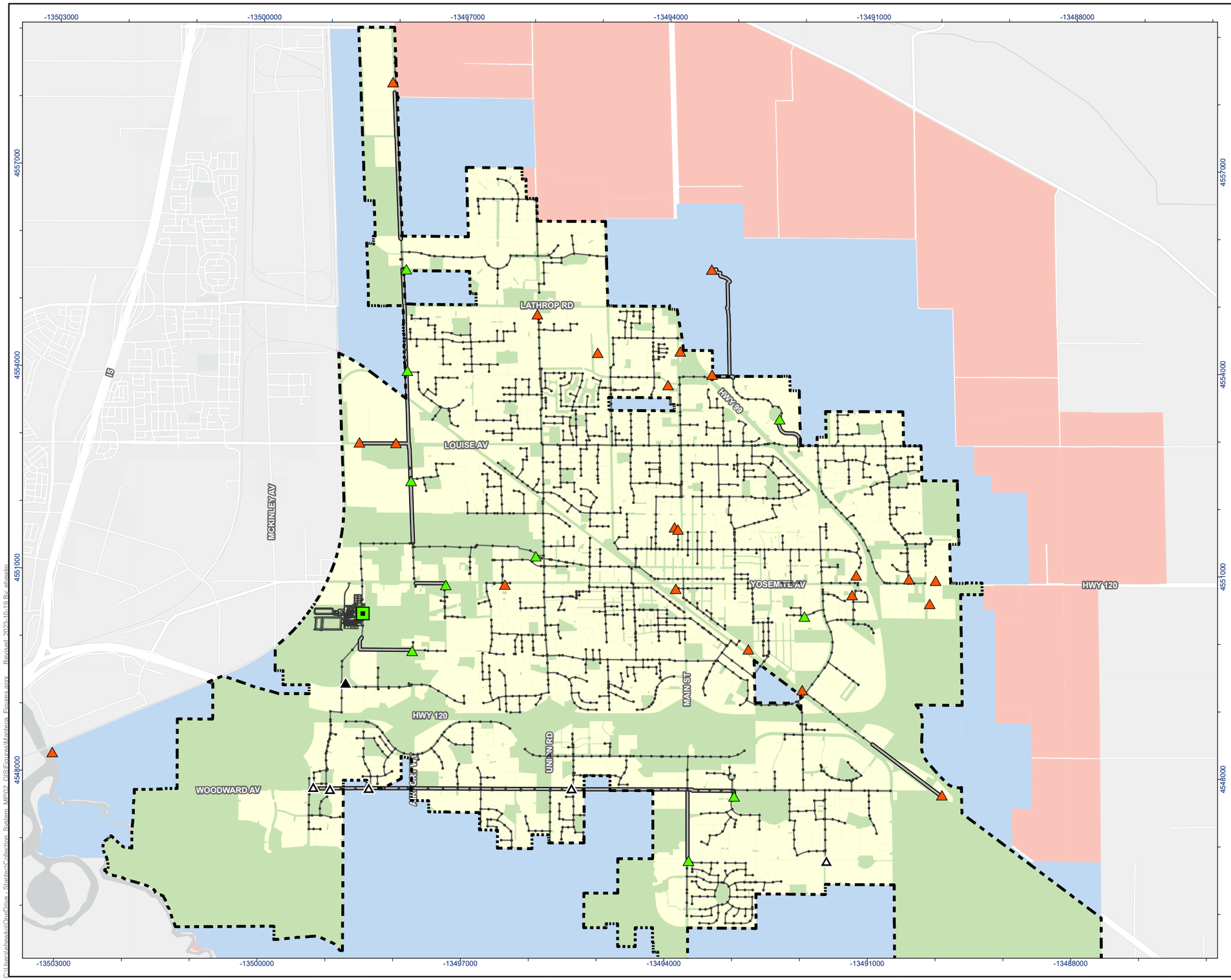
Table ES-1. Design Horizon Flow Projections

Scenario	Area (Acres)	ADWF (Mgal/d)	Total ADWF (Mgal/d) [2]
1 – Existing	6,520	4.79 [1]	4.79
2 – City Limits	5,102	4.09	8.88
3 – SOI	6,253	3.84	12.72
4 – Full General Plan	6,426	2.57	15.19
Total:	**24,301**	**15.19**	

Note:
[1] Actual measured flows from V&A flow monitoring study.
[2] Flow projections exclude City of Lathrop flows, flows presented in the table reflect modeled flows from the City of Manteca service area..
Key:
Mgal/d = Million Gallons per Day

The development of the servicing strategy for future areas prioritized gravity sewers over lift stations and forcemains to the extent deemed feasible for this WWMP. Lift stations and forcemains were identified in recommended improvements when the depth of gravity sewers exceeded approximately 25-feet.

ATTACHMENT 2



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MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes

Lift Station Status

- Active
- Unmodeled
- Inactive
- Abandoned
- Water Quality Control Facility
- City of Manteca Limit
- Modeled Sanitary Sewer
- Forcemain
- Water Quality Control Facility Structures
- Private Sanitary Network
- City of Manteca Limit
- Scenario 1 - Existing Service Area
- Scenario 2 - City Limits
- Scenario 3 - Sphere of Influence
- Scenario 4 - Remaining Planning Area

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-4

Title
Modeled Scenario Planning Areas

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ES.5 COLLECTION SYSTEM CAPACITY EVALUATION

This section highlights the content of **Chapter 5**, which presents the results of the collection system hydraulic model, evaluate the system's ability to meet the LOS performance criteria under existing and future development conditions, and presents recommended system improvements to address existing deficiencies and serve future development.

The results of each of these scenarios are evaluated using the LOS performance criteria described in **Chapter 4**. The model results are used to evaluate system capacity, hydraulic performance, identify system deficiencies, and develop recommended improvements. These recommended improvements are summarized in a prioritized CIP for the collection system which includes an estimate of probable costs.

ES.5.1 Modeled Design Horizon Scenarios

This WWMP assessed collection system level of service and capacity under four different scenarios. Each scenario represents the cumulative development of growth areas within the service area. Simulated scenarios are summarized below and in **Table ES-2**.

Table ES-2. Summary of Modeled Scenarios

Scenario	Description	Cumulative Planning Areas	ADWF [1] (Mgal/d)	Simulated Peak Flow [2] (Mgal/d)
Scenario 1	Existing Conditions	• Existing Service Area	4.8	18.6
Scenario 2	Buildout of City Limits	• Vacant Areas within City Limits	8.9	31.0
Scenario 3	Buildout of SOI	• SOI Planning Areas	12.7	42.2
Scenario 4	Buildout of General Plan	• Remaining Planning Area	15.2	48.5

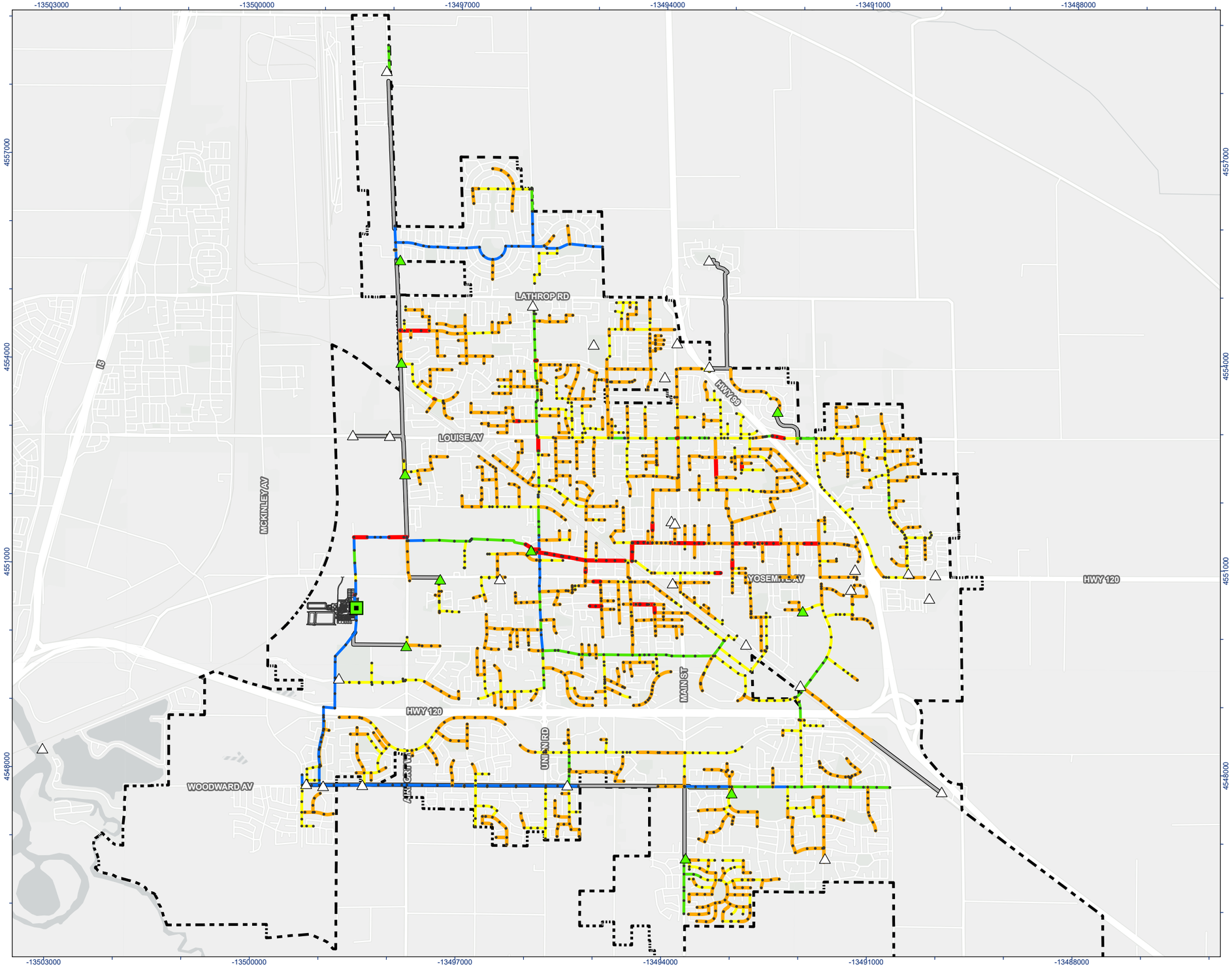
Note:
1 The modeled ADWF represents only the City of Manteca service area.
2 Unattenuated peak wet weather flow for 10-year design storm after including recommended improvements.

ES.5.2 Scenario 1 – Existing Development Results

The model simulates an ADWF of approximately 4.8 Mgal/d, with a daily dry weather peak flow of 7.1 Mgal/d (existing conditions in 2022). The existing system has adequate capacity to convey dry weather flows without surcharging.

For wet weather conditions in the existing system, the model simulates a PWWF of 17.6 Mgal/d at the WQCF for the existing system 10-year, 24-hour design storm (prior to considering capacity improvements). The peak wet weather flows result in several sections within the existing system surcharging due to inadequate gravity capacity or from limited capacity of a downstream lift station. **Figure ES-5** shows the existing PWWF LOS of the calculated residual capacity for each modeled sewer segment for the 10-year, 24-hour design storm condition. Residual pipe capacity is defined as the remaining capacity in a sewer under peak flow conditions or the calculated full pipe capacity (FPC) subtracted by the peak simulated flow.

ATTACHMENT 2



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Legend

- Modeled Sanitary Manholes
- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

Residual Capacity = Full Pipe Flow - Peak Flow

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/25/2023
TR by MA on 10/25/2023
IR Review by MVD on 10/25/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-5

Title
Residual System Capacity
10-year, 24-hour Design Storm

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Figure ES-5 color codes gravity sewer residual capacity as follows:

- Red lines indicate that there is no residual capacity remaining. These sewers are flowing either at or over their FPC. Those over capacity are further discussed in the following sections.
- Orange lines indicate that there is less than 0.5 Mgal/d of capacity available.
- Yellow lines indicate that there is 0.5 to 2.0 Mgal/d of capacity available.
- Green lines indicate that there is 2.0 to 5.0 Mgal/d of capacity available.
- Blue lines indicate that there is more than 5.0 Mgal/d of capacity available.

There are several sewer sections, primarily within the Central Shed, that have limited to no residual capacity under PWWF conditions including:

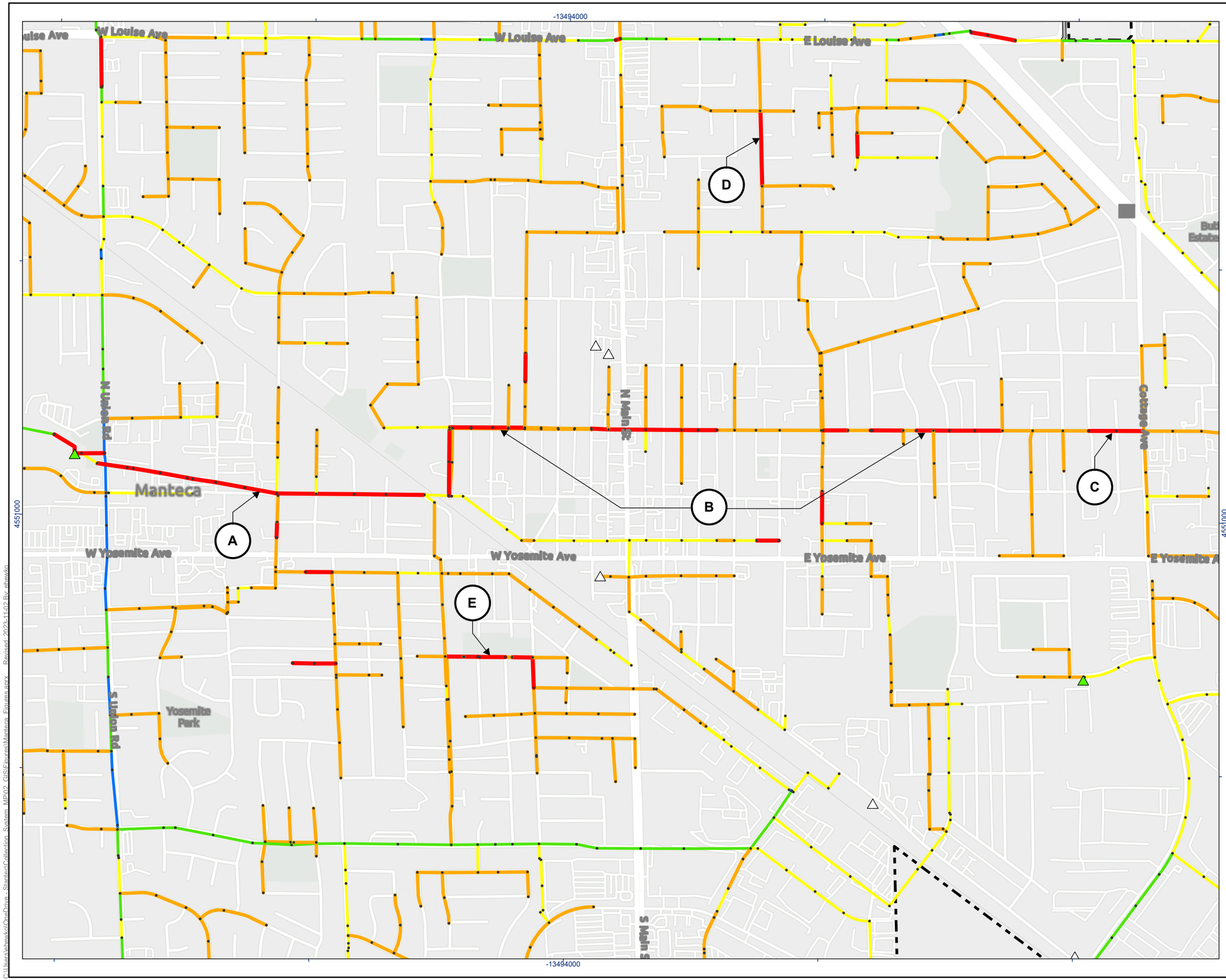
- A: The 15-inch trunk in Center Street from the Union Road lift station to Elm Avenue,
- B: The 10-inch sewer upstream in Elm Avenue and W. North Street,
- C: The 8-inch sewer in W. North Street between Charles and Cottage Avenue,
- D: The 15-inch sewer in Garden Gate Drive between Edison and Jason Street, and
- E: The 8-inch sewer in Oregon Street between Sequoia and Park Avenue
- The 12-inch sewer upstream of the Chadwick Unit 5 pump station in Hastings Drive between South Airport Way and North Landreth Lane
- The 54-inch North Trunk sewer west of Airport Way is showing no residual capacity due to very flat sewers but does not cause surcharging under this condition.

Areas A through E are within the Central Shed and are identified on **Figure ES-6**. There are also some isolated sewer segments within the Central Shed that were identified as having no residual capacity due to very shallow slopes but are unlikely to cause upstream surcharging issues unless blockages occur. These segments should be checked condition and maintained through O&M activities.

Exceedances of the pump station firm capacity are predicted at two lift stations:

- The Woodward Park lift station, where PWWF exceeds the firm and total capacity of the station.
- The Chadwick Unit 5 lift station, where PWWF exceeds the firm capacity of the station by 0.03 Mgal/d.

In addition, while not specifically a capacity constraint, the Shadowbrook lift station forcemain velocity exceeds 8 fps (maximum LOS velocity) when operating at the firm capacity, which can result in high headlosses and energy consumption as well as potential waterhammer effects. It is recommended that the pumping capacity and efficiency of the Shadowbrook Park lift station be further evaluated.



Legend

- Modeled Sanitary Manholes
- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

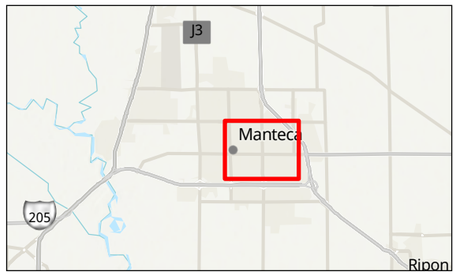
Residual Capacity = Full Pipe Flow - Peak Flow

N

0 500 1,000 Feet
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Notes

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2. Data Sources: City of Manteca
3. Background: Esri, NASA, NGA, USGS, Esri Community Maps Contributors, San Joaquin County GIS/Planning, San Joaquin County Public Works, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS



Project Location
Manteca,
California

Prepared by EH on 11/2/2023
TR by MA on 11/2/2023
IR Review by MVD on 11/2/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-6

Title
Residual System Capacity
Area of Concern

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The deficiencies noted above were further analyzed against the severity of other LOS criteria and it was determined that the following improvements should be considered:

- Replacement of several segments of sewers upstream of the Union Road Lift Station including:
    - Project 1: Replacement of the existing 15-inch sewer from the Union Lift Station from the Union Road lift station along W Center Street to Elm Avenue with an 18-inch sewer.
    - Project 2: Replacement of the existing 10-inch sewer along Elm Ave W North Stret and E North Street to W Fremont Ave with a 15-inch sewer.
    - Project 3: Replacement of the existing 10-inch sewer along E North Street from W Fremont Ave to Marie Ave with a 12-inch sewer.
    - Project 4: Replacement of the existing 8-inch sewer along E North Street from Charles Ave to Cottage Ave with a 10-inch sewer. The sewers within the gap between Project 3 and Project 4 should also be evaluated for condition and considered for replacement if required.
- Project 5: Capacity improvements at the Woodward Park lift station. The two alternative improvements for the Woodward Park pump station are discussed in detail in Section 5.3.1, and include:

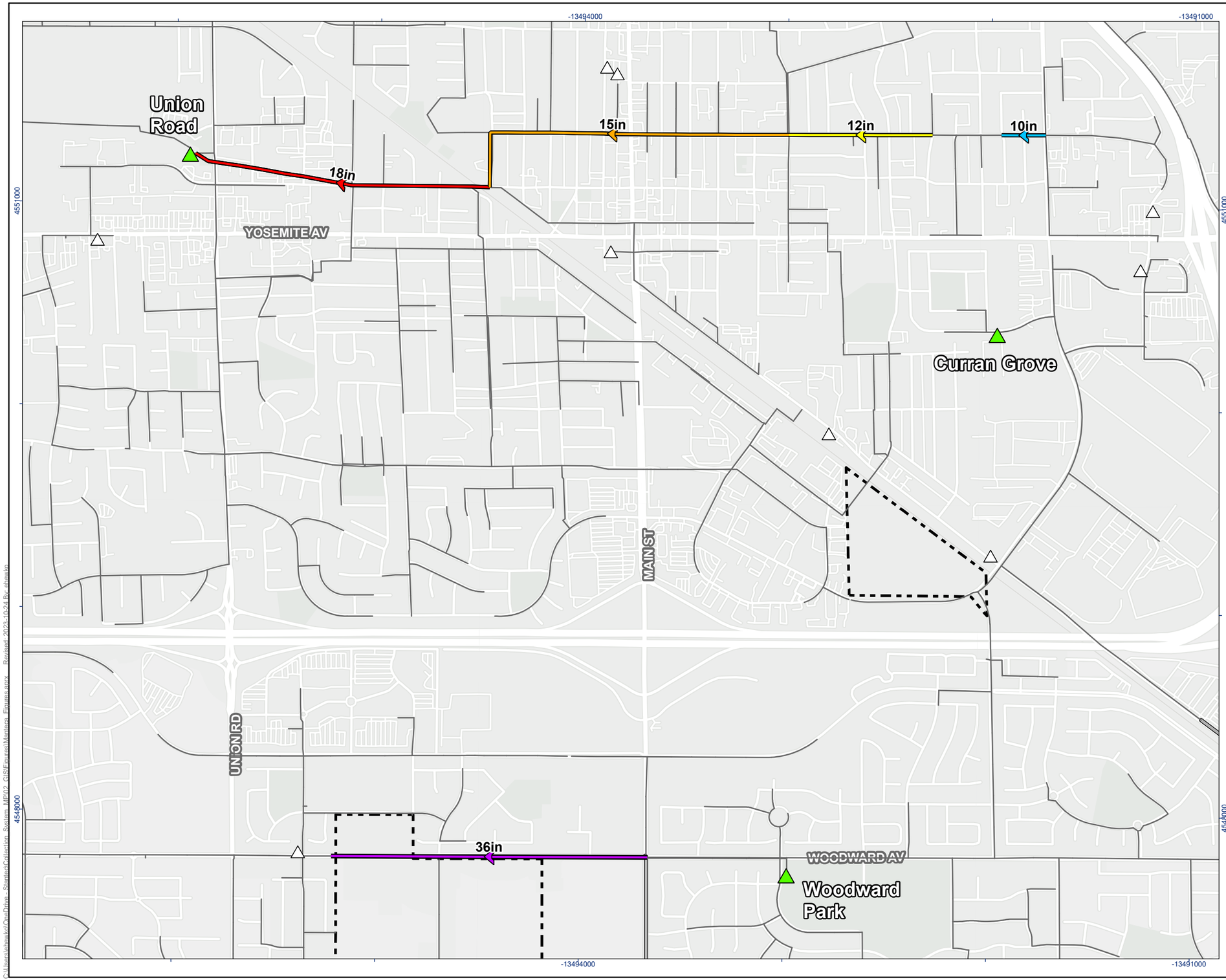
    A installing 4,030 LF of 36-inch sewer to extend the existing South Trunk in Woodward Avenue to reach the unused existing 36-inch sewer at the intersection of Woodward Avenue and South Main Street.

    B increasing the firm pumping capacity to meet the simulated maximum inflow of approximately 2.8 Mgal/d by adding an additional pump to the station or swapping out the existing pumps.

    The recommended alternative is Alternative A which would allow the lift station to be taken offline.

These improvements as shown in plan-view on **Figure ES-7** were incorporated into the model, which resulted in an approximate 1 MGD increase to the total peak flow at the WQCF at 18.6 Mgal/d as noted in **Table ES-2**. The increase in peak flow after the improvements are included is a result of less attenuation in the system due to capacity constraints. The other locations that were noted as residual capacity LOS deficiencies are not recommended for capital improvements but should be further evaluated and / or monitored regularly with O&M activities.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

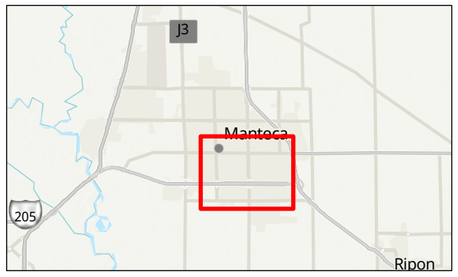
Legend
- Modeled Lift Station
- Other Lift Station
- Forcemain
- Modeled Sanitary Sewer

Master Plan Project
- Project 1
- Project 2
- Project 3
- Project 4
- Project 5
- City of Manteca Limit

N

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Notes
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Project Location
Manteca,
California

Prepared by EH on 10/24/2023
TR by MA on 10/24/2023
IR Review by MVD on 10/24/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-7

Title
Recommended Improvements to Address Existing Capacity Deficiencies

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ES.5.3 Scenarios 2 to 4 – Future Growth Analysis

Following the evaluation of the existing system capacity and identification of improvements in Scenario 1, the model was progressively expanded with sewage loading characteristics consistent with the future development conditions defined by the City's General Plan, including:

- Scenario 2 – Buildout of City Limits
- Scenario 3 – Buildout of the SOI
- Scenario 4 – Full General Plan Buildout

The modeled results for the 10-year, 24-hour design storm conditions under each level of development scenario are included in **Appendix F**.

The following deficiencies and associated improvements were identified as part of this evaluation:

Woodbridge Park lift station: This pump station has the largest improvement need, requiring firm capacity to increase from 2.09 Mgal/d to 12.29 Mgal/d at buildout.

Chadwick Unit 5 lift station: Firm capacity would need to be expanded from 1.26 Mgal/d to 2.31 Mgal/d at buildout.

Villa Ticino lift station: Firm capacity would need to be expanded from 0.73 Mgal/d to 0.90 Mgal/d at buildout.

Roberts Estates lift station: Firm capacity would need to be expanded from 0.29 Mgal/d to 0.52 Mgal/d at buildout.

Evans Estates lift station: Firm capacity would need to be expanded from 1.05 Mgal/d to 4.52 Mgal/d and the existing 8-inch force main would need to be expanded to 14-inches at buildout.

Woodward Park lift station: If not addressed by gravity improvement recommended in Project 5A for existing system improvements, firm capacity will ultimately need to be expanded from 0.85 Mgal/d to 5.80 Mgal/d and the 12-inch force main would need to be expanded to at least 20-inches at buildout to accommodate flows from both Evans Estates and Woodward Park.

The City of Manteca has already made investments in their future collection system by preemptively installing oversized lines for future gravity sewers. The following improvements were previously identified by the City as system improvements required to complete the network of these gravity sewers.

Project 5A: South Woodward Trunk Extension – This project was presented as the recommended alternative to upgrading the Woodward Park lift station under existing conditions. The existing 36-inch South Trunk sewer in Woodward Avenue is missing a segment between Pagola Way and South Main Street. In the upstream, the City has already installed a 36-inch sewer to convey flows that currently conveyed through the Woodward Park pump station by gravity. This project would eliminate the need to expand both the Woodward Park and Evan's pump stations under future development conditions. The 36-inch pipe has a capacity of approximately 10.6 Mgal/d at a slope of at least 0.0006 ft/ft.

Project 6: Central Union Road Trunk Extension – The City recently completed a project replacing the North Trunk Sewer, which replaced the 36-inch trunk sewer with a larger and deeper 54-inch sewer. This project was the first leg of an overall project intended to take the Union Road lift station offline. The Central Trunk could be extended from the upstream point of North Trunk project to bypass the lift station and allow flow from the Central Shed to flow by gravity to the WQCF. City staff have noted many on-going issues with the lift station that were observed in the flow monitoring data collected as part of this WWMP. Although the capacity of the lift station appears to be sufficient, this project is recommended to eliminate surcharge experienced during operating conditions and O&M costs associated with the station. There appears to be enough fall to achieve a slope greater than 0.002 ft/ft which would provide capacity greater than 19.0 Mgal/d.

Project 7A: North Trunk Extension on Airport Way – A 48-inch sewer exists at the upstream end of Airport Way, where flow is currently conveyed to the Woodbridge Park pump station. The City recently installed approximately 2,900 LF of 36-inch sewer in Airport Way between the Manteca Park Golf Course and Louise Avenue. Extending the North Trunk sewer along Airport Way to the Woodbridge Park pump station would allow the station to be taken offline in addition to those that lie within the project extents, including Chadwick Unit 5, Assieh Development, MUSD, and Villa Trinco. Another un-used existing line exists to take the Centerpoint Pump Station offline and serve the northern planning area. The 48-inch sewer should be constructed at a slope of 0.00057 ft/ft providing 22.2 Mgal/d of capacity.

Project 7B: Expand North Shed Lift Stations – As an alternative to Project 7A, the North Trunk Extension on Airport Way, the lift stations in the North Shed could be expanded to provide sufficient capacity for buildout flows. This would require expanding Woodbridge Park, Villa Ticino, and Chadwick Unit 5. No improvements to the existing 24-inch force main would be required. The Woodbridge Park lift station would require the most extensive improvements to expand it from its current capacity of 2.1 Mgal/d to approximately 12.3 Mgal/d. Villa Ticino would need to be expanded to approximately 1.0 Mgal/d and Chadwick Unit 5 would need to be expanded to approximately 2.4 Mgal/d. The Villa Ticino and Chadwick Unit 5 lift stations are located in the sidewalk and do not have room to expand and with such a large expansion at Woodbridge Park it's likely that each of these lift station expansions would require land acquisition. The Villa Ticino lift station could currently be taken offline if flows were redirected to the existing 36-inch sewer in Airport Way.

Both Project 7A and Project 7B present their own unique challenges that warrant further investigation. Therefore, costs for both alternatives are presented in the final section of **Chapter 5**.

In addition to the previously identified improvements listed above, the following projects are also recommended:

Project 8: South Main Trunk to Evans (Evans) – Upon completion of Project 5, it is recommended that the City install a new 27-inch sewer in South Main Street to allow the Evans lift station to be taken offline. Thereby avoiding future pump station expansions, force main improvements, and the O&M costs associated with the Evans lift station. The 27-inch sewer should be constructed with a minimum slope of 0.0007 ft/ft to achieve capacity of 5.1 Mgal/d.

Project 9: South Airport Way and Yosemite Avenue (Fishback) – The sewer downstream of the Fishback lift station collection shed is predicted to fail LOS criteria under future development conditions and was identified under all three future development scenarios. This deficiency is due to the large amount of infill added to the collection shed. The City's GIS database indicates that the lift station discharges to a gravity line (8-inch) that is smaller than the gravity lines within the collection area (10-inch). As a result, surcharging is predicted to occur in the gravity line downstream of the force main discharge location in North Airport Way, south of the North Trunk Sewer. As an alternative to upsizing the 8-inch gravity line in Airport Way, the City could install a new 10-inch gravity line all the way to the lift station and take it offline. The 10-inch sewer installed at standard slopes (0.0025 ft/ft) has a capacity of approximately 0.7 Mgal/d.

Project 10: South Airport Way Roberts Estates to Daniels (Roberts Estates) – The Roberts Estates lift station can be taken offline by extending a 10-inch sewer down Airport Way from the lift station at Wawona Street to the 12-inch sewer in Daniels Street. The 10-inch sewer installed at standard slopes (0.0025 ft/ft) has a capacity of approximately 0.7 Mgal/d.

The following projects are recommended to serve future development.

Project 11: Yosemite Square Lift Station and Improvements – To serve the area referred to as Yosemite Square a 2.4 Mgal/d lift station will be required to convey flow to the South Trunk in Woodward Avenue. The new 8-inch force main should be routed to an existing 18-inch sewer crossing at the intersection of Woodward Avenue and Moffat Boulevard. It is assumed that the existing 18-inch force main crossing is not being used and will be tied into a new 15-inch sewer in Woodward Avenue to be installed as part of an upcoming roadway realignment project. The cost of this 15-inch sewer in Woodward Avenue is included in this project in addition to approximately 3,230 LF of 15-inch sewer needed to serve the area upstream of the lift station. The 1,425 LF 15-inch sewer in Woodward Avenue should be installed with the highest slope possible, assumed to be 0.006 ft/ft, providing a capacity of 3.2 Mgal/d.

Project 12: Austin Road Industrial Area Trunk – A new trunk extending east from the existing 24-inch sewer in South Main Street to Austin Road is recommended to serve the Austin Road Industrial Area. This project assumes steeper than minimum slopes to follow the existing ground surface. The project assumes the following: 2,950 LF of 24-inch sewer at 0.0012 ft/ft, 5,300 LF of 21-inch sewer at 0.0012 ft/ft, and 2,350 LF of 18-inch sewer at 0.0015 ft/ft. It should be noted that larger pipe sizes may be required if these slopes are not achieved. The project should provide a minimum capacity of 3.8 Mgal/d at the downstream end.

Project 13: North Industrial Area Trunk – A 15-inch sewer extending from the Austin Road Industrial Area Trunk in South Austin Road is recommended to serve the northern portion of the development. The 15-inch sewer at the standard slope (0.0015 ft/ft) has a capacity of approximately 1.6 Mgal/d.

Project 14: Yosemite Square Service Area – To serve the portion of the Yosemite Square lift station service area outside of City Limits a 15-inch sewer in is proposed in Austin Road. The 15-inch sewer at the standard slope (0.0015 ft/ft) has a capacity of approximately 1.6 Mgal/d.

Project 15: Oleander Avenue Extension – To serve the southern SOI area an extension of the existing 12-inch sewer in Oleander Avenue and a new 10-inch sewer in S. Airport Road are recommended. The

12-inch sewer at the standard slope (0.002 ft/ft) has a capacity of approximately 1.0 Mgal/d. The 10-inch sewer installed at standard slopes (0.0025 ft/ft) has a capacity of approximately 0.7 Mgal/d.

Project 16: Highway 99 Crossing at Northland Road – A new 24-inch trunk sewer crossing Highway 99 at Northland Road is recommended to serve the North Shed SOI area and accept flow bypassed from the Central Shed. This trunk ties into the existing 36-inch sewer stub that exists along the Manteca Tidewater Bikeway. A slope of 0.011 ft/ft is recommended for a capacity of 4.9 Mgal/d.

Project 17: East Lathrop Road Trunk – This project proposes a new 18-inch sewer in South Frontage Road extending from the Highway 99 Crossing at Northland Road (Project 16) to Lathrop Road and a 15-inch sewer continuing east to Cottage Avenue. The 18-inch and 15-inch portions of this sewer sit at a slope of 0.0015 ft/ft. The downstream end capacity is approximately 2.6 Mgal/d.

Project 18: Northland Road Trunk – An 18-inch sewer extending east down Northland Road from the proposed Highway 99 crossing in Project 16. The 18-inch sewer at the standard slope (0.0012 ft/ft) has a capacity of approximately 2.3 Mgal/d.

Project 19: Northland Road Branches – Two 12-inch sewers are included to direct flow from the Northern SOI area to the Northland Road Trunk recommended in Project 18. The 12-inch sewers at the standard slope (0.002 ft/ft) have a capacity of approximately 1.0 Mgal/d each.

Project 20: Louise/Nehemiah Branches – This project includes two 12-inch sewer extensions from the existing system to Austin Road to serve development east of the Central Shed. One that ties into the 18-inch sewer in East Louise Avenue at Pestana Avenue and one that ties in to the 18-inch sewer in Pestana Avenue at Nehemiah Drive. The 12-inch sewers at the standard slope (0.002 ft/ft) have a capacity of approximately 1.0 Mgal/d each.

Project 21: South Union Road Extension – To serve the southern SOI area an extension of the existing 12-inch sewer in South Union Road is recommended. The sewer should match the existing slope of 0.002 ft/ft having a capacity of approximately 1.0 Mgal/d.

Project 22: Cottage Avenue – To serve the SOI area south of Lathrop Road a 12-inch sewer is recommended to extend in Cottage Avenue from the 15-inch East Lathrop Road Trunk (Project 17). The 12-inch sewer installed at standard slopes (0.002 ft/ft) has a capacity of approximately 1.0 Mgal/d.

Project 23: North Shed Union Road Trunk – Extending the existing 30-inch sewer north along Union Road to Lovelace Road is recommended to serve the remaining planning area. The 30-inch sewer should match the existing slope of 0.0006 ft/ft providing approximately 6.5 Mgal/d of capacity.

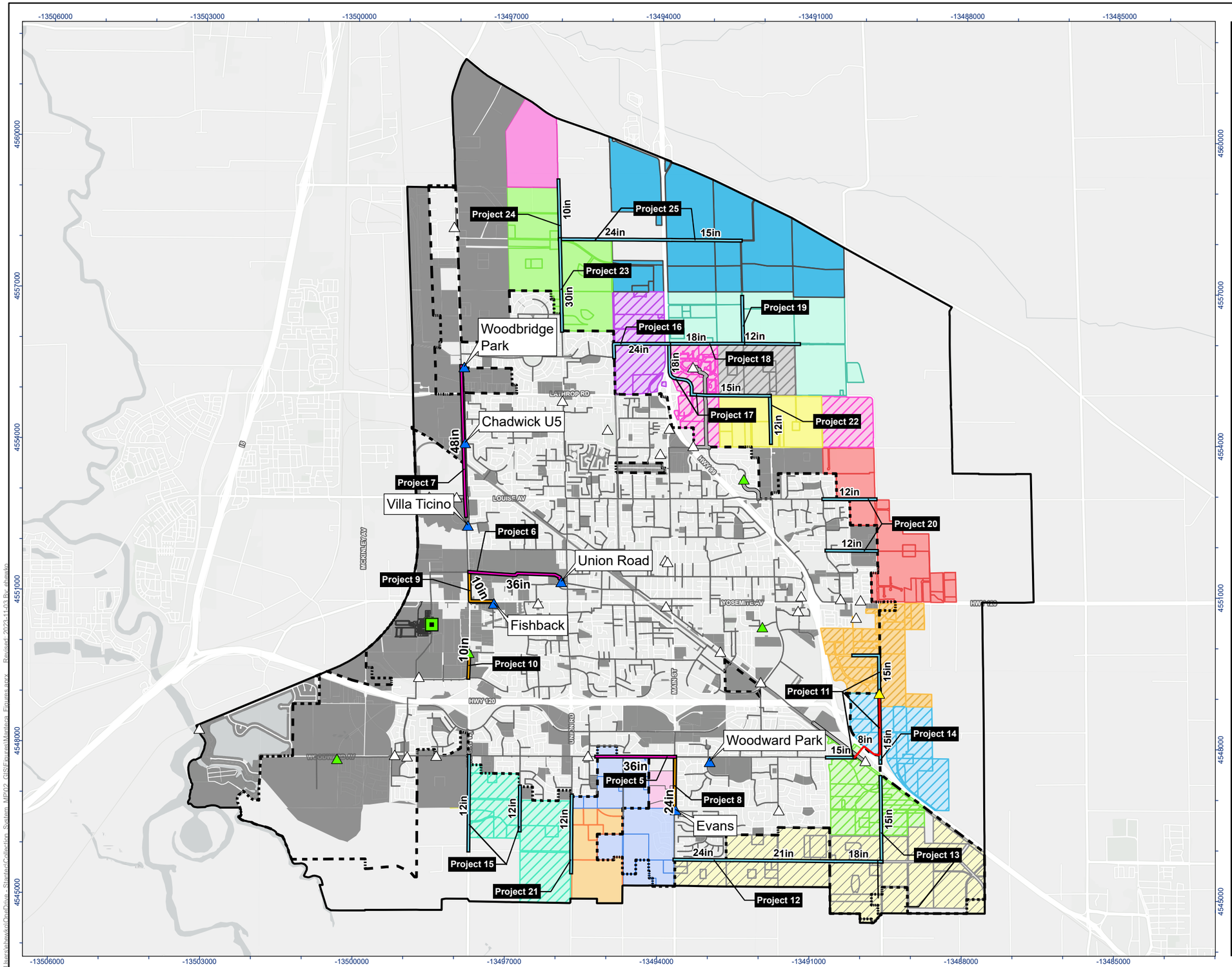
Project 24: Manteca Junction Trunk – This project recommends a 10-inch sewer extending further north along Union Road from Project 23. The 10-inch sewer installed at standard slopes (0.0025 ft/ft) has a capacity of approximately 0.7 Mgal/d.

Project 25: Lovelace Road Trunk - 99 Crossing – A 24-inch sewer extension east from Lovelace and Union Road crossing Highway 99 and a 15-inch sewer from Highway 99 to Castle Road. The sewers

should be installed at standard slopes, the 24-inch sewer with a slope of 0.0008 ft/ft has a capacity of 4.1 Mgal/d and the 15-inch sewer with a slope of 0.0015 ft/ft has a capacity of approximately 1.6 Mgal/d,

The newly installed 36-inch North Trunk Sewer in Airport Way is predicted to fail LOS criteria in Scenario 4 due to the addition of flow from the upstream buildout service area. Surcharging depth is predicted to reach 2.6 feet above the pipe crown between Crom Street and Geneva Way, however improvements are not recommended due to its recent installation and significant depth, which maintains freeboard depths greater than 19 feet despite surcharging, resulting in limited risk of impacts to the City. The system infrastructure needed to serve future development at each level of development is shown in **Figure ES-8**.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Lift Station
- Other Lift Station
- Removed with CIP
- Water Quality Control Facility
- Modeled Sanitary Sewer
- Water Quality Control Facility Structures
- Forcemain
- General Plan Boundary
- City of Manteca Limit

Master Plan Projects

- Assumed Projects
- Recommended Improvements to Address Future Capacity Deficiencies
- System Infrastructure to Serve Future Development
- Project 11 Lift Station
- Project 11 Forcemain

CIP Service Area

CIP 5	CIP 15	CIP 21
CIP 8	CIP 16	CIP 22
CIP 11	CIP 17	CIP 23
CIP 12	CIP 18	CIP 24
CIP 13	CIP 19	CIP 25
CIP 14	CIP 20	Tributary to the Existing System

N

0 0.5 1 Miles

(At original document size of 11x17)
1:60,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca, California

Prepared by EH on 11/3/2023
TR by MA on 11/3/2023
IR Review by MVD on 11/3/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-8

Title
Recommended Future System Improvements

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

ES.5.4 Phasing Strategies and Potential Alternatives

The implementation of the recommended projects should prioritize existing system improvements, while the timing and need for the recommended future projects will depend on the location and rate of growth and development within the City's General Plan service area. As such, the recommended project phasing strategy for the CIP as presented in Chapter 12 are subject to these variables and should be periodically reviewed as part of the City's infrastructure planning processes. For the purposes of this WWMP, the collection system CIP projects are presented in the order they should be constructed based on the progression of the modeled scenarios.

Many of the recommended projects are interdependent or will trigger the implementation of the downstream improvements. Project 5 and Project 7 are larger deep gravity sewers that connect gaps in previously constructed oversized portions of the existing system that will facilitate decommissioning of several lift stations. These projects also serve as the major conduit for future growth in the South Shed (Project 5) and North Shed (Project 7), making these projects a key component of the overall collection system CIP. These projects will have significant construction challenges due to their depth, location in crowded utility corridors, and highway/railroad crossings. As such, alternatives for both Project 5 and Project 7 have been presented and included the OPC evaluation.

ES.5.5 Conceptual Opinion of Probable Cost

The purpose of this section is to present a conceptual opinion of probable cost for each of the recommended improvements to the City's wastewater collection system. Cost estimates prepared for this Master Plan are developed in accordance with the guidelines of the Association for the Advancement of Cost Engineering (AACE) International for a Class 5 Estimate. Construction and capital cost estimates are presented in March 2023 dollars corresponding to an Engineering News-Record Construction Cost Index (ENRCCI) of 13,176. Subsequent preliminary and detailed design efforts will serve to refine and confirm the estimates presented herein. Detailed cost estimates and unit costs are included in **Appendix G** for each project.

The recommended CIP list for the wastewater collection system is presented in **Tables ES-3** through **ES-6**. The information presented in the tables includes:

- An ID number assigned to the improvement
- Name of the improvement
- Service Area
- Description of the improvement
- Justification for the improvement
- Level of development scenario identified/needed
- Project quantities involved
- Project actions/notes
- Estimated capital cost

Table ES-3. Recommended Collection System Improvements – Scenario 1

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
1	W. Center Street Trunk	Central Shed	Upsize the existing 15-inch sewer to 18-inches	Existing system model shows surcharge failing LOS criteria.	~3,800 LF of 18-inch sewer pipe	Also included in Chapter 6 condition projects	$4,880,000
2	Elm/West North Street Trunk	Central Shed	Upsize existing 10-inch sewer to 15-inches	Existing system model shows surcharge failing LOS criteria.	~4,510 LF of 15-inch sewer pipe	Also included in Chapter 6 condition projects	$5,080,000
3	10-inch East North Street Trunk	Central Shed	Upsize existing 10-inch sewer to 12-inches	Existing system model shows surcharge failing LOS criteria.	~1,325 LF of 12-inch sewer pipe	Also included in Chapter 6 condition projects	$1,660,000
4	8-inch East North Street Trunk	Central Shed	Upsize existing 8-inch sewer to 10-inches	Existing system model shows surcharge failing LOS criteria.	~560 LF of 10-inch sewer pipe	This area could be monitored as projects 1-3 mitigate most surcharging identified in this portion of the system.	$510,000
5A	South Woodward Trunk Extension	South Shed	Complete existing south trunk with new 36-inch sewer.	Existing system model shows insufficient capacity at Woodward Park pump station.	~4,030 LF of 36-inch sewer pipe	This is a previously identified project and completes previous south trunk planning.	$12,640,000
6	Central Union Road Trunk Extension	Central Shed	Replace existing 36-inch sewer, 24-inch force main, and Union Road LS with new deeper 36-inch trunk.	Existing Union Road lift station suffers from chronic mechanical failures, deterioration, and operational concerns.	~5,030 LF of 36-inch sewer pipe	Also included in Chapter 6 condition projects	$16,170,000

Table ES-4. Recommended Collection System Improvements – Scenario 2

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
7A	North Trunk Extension on Airport Way	North Shed	Replace existing force main system with 48-inch gravity sewer	Insufficient capacity at Woodbridge Park, Chadwick U5, and Villa Ticino pump stations.	~7,670 LF of 48-inch sewer pipe	Constructability of this project may be difficult in an already crowded utility corridor	$34,340,000
7B	Expand North Shed Lift Stations	North Shed	Alternative to Project 7 (North Trunk Extension on Airport Way) Expand Existing Lift Stations	Insufficient capacity at Woodbridge Park, Chadwick U5, and Villa Ticino.	Woodbridge Park (12.3 Mgal/d) Chadwick U5 (2.4 Mgal/d) Villa Ticino (1.0 Mgal/d)	Land acquisition required. No force main improvements. Note: costs exclude land acquisition	$29,530,000
8	S. Main Trunk to Evans	South Shed	Replace existing 8-inch force main with 27-inch gravity sewer	Insufficient capacity at Evans pump station and force main system.	~2,690 LF 27-inch sewer pipe	This project may be combined with Project 5.	$7,180,000
9	S. Airport Way and Yosemite Ave. (Fishback)	South Shed	Replace existing 6-inch force main and 8-inch gravity sewer with 10-inch gravity sewer	Discharge from the Fishback lift station overwhelms downstream gravity sewer.	~2,665 LF 10-inch sewer pipe	Force main routing in model may be incorrect based on discussion with City staff, general service design of surrounding area should consider options to take lift station offline.	$3,100,000
10	S. Airport Way Roberts Estates to Daniels	South Shed	Replace existing 6-inch force main with 10-inch gravity sewer	Insufficient capacity at Roberts Estate pump station.	~1,320 LF of 10-inch sewer pipe	General service design of surrounding area should consider options to take lift station offline.	$1,750,000
11	Yosemite Square Lift Station and Improvements	South Shed	Construct new 2.4 Mgal/d lift station and 15-inch service area sewer. Extend 15-inch sewer downstream of new 8-inch forcemain.	Provide service to Yosemite Square and surrounding area.	~4,660 LF 15-inch sewer pipe, 2.4 Mgal/d pump station, and ~4,860 LF 8-inch force main	Force main should be routed to existing 18-inch highway crossing. The highway crossing should tie into the new 18-inch sewer in the realignment of Woodard Avenue.	$12,880,000
12	Austin Road Industrial Area Trunk	South Shed	New 24 to 18-inch trunk sewer.	Provide service to the Austin Road Industrial Area	~2,355 LF of 18-inch sewer pipe, ~5,300 LF of 21-inch sewer pipe, and ~2,945 LF of 24-inch sewer pipe	Ties into existing 24-inch trunk upstream of Evans lift station.	$20,810,000
13	South Austin Road - Industrial Area	South Shed	Extend 15-inch sewer in Austin Road.	Provide service to the northern portion of the Industrial Area	~4,335 LF of 15-inch sewer pipe	Ties into Austin Road Industrial Area Trunk.	$5,780,000

Table ES-5. Recommended Collection System Improvements – Scenario 3

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
14	Yosemite Square Service Area	South Shed	New 15-inch trunk sewer.	Provide service to the southern portion of the Yosemite Square service area.	~3,575 LF of 15-inch sewer pipe	Ties into Yosemite Square lift station.	$4,240,000
15	Oleander Avenue Extension/ S. Airport Way Sewer	South Shed	Extend existing 12-inch sewer in Oleander Avenue into SOI. Install a new 10-inch sewer in Airport Way.	Provide service to southern SOI area.	~2,255 LF of 12-inch sewer pipe ~3,365 LF 10-inch sewer	Match existing 12-inch slope, 0.002 ft/ft. 10-inch at 0.0025 ft/ft or greater	$6,660,000
16	Highway 99 Crossing at Northland Road	North Shed	Construct new 24-inch sewer and highway crossing.	Provide service to northern SOI area.	~3,515 LF of 24-inch sewer pipe	Ties into existing system at Tidewater bike path. Includes highway crossing	$9,310,000
17	East Lathrop Road Trunk	North Shed	Construct new 18-inch and 15-inch sewer.	Provide service to northern SOI area.	~4,000 LF of 15-inch sewer pipe, ~3,340 LF of 18-inch sewer pipe.	Assumes slope of 0.0015 ft/ft	$12,060,000
18	Construct new 24-inch bypass sewer	North Shed	Construct new 18-inch sewer.	Provide service to northern SOI area.	~3,790 LF of 18-inch sewer pipe	Drop manhole recommended at downstream end to reduce depth.	$6,630,000
19	Northland Road Branches	North Shed	Construct new 12-inch sewers.	Provide service to northern SOI and planning area.	~5,255 LF of 12-inch sewer pipe	Variable routing and pipe sizing depending on actual development.	$6,350,000
20	Louise/ Nehemiah Branches	Central Shed	Construct new 12-inch sewers.	Provide service to eastern SOI area.	~5,250 LF of 12-inch sewer pipe	Ties into Louise and Pestana Avenue lines.	$5,160,000
21	South Union Road Extension	South Shed	Extend existing 12-inch sewer in South Union Road into SOI.	Provide service to southern SOI area.	~3,940 LF 12-inch sewer pipe	Match existing slope, 0.002 ft/ft.	$4,590,000
22	Cottage Avenue	North Shed	Construct new 12-inch sewer.	Provide service to northern SOI area.	~2,410 LF of 12-inch sewer,	Ties into East Lathrop Road Trunk.	$3,080,000

Table ES-6. Recommended Collection System Improvements – Scenario 4

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
23	North Shed Union Road Trunk	North Shed	Construct new 30-inch sewer.	Provide service to remaining planning area.	~4,695 LF of 30-inch sewer pipe	Requires upsizing of existing 18-inch section of Union Road sewer.	$13,130,000
24	Manteca Junction Trunk	North Shed	Construct new 10-inch sewer.	Provide service to remaining planning area.	~3,010 LF of 10-inch sewer pipe	Variable pipe size depending on actual flow routing and development conditions.	$3,730,000
25	Lovelace Road - 99 Crossing	North Shed	Construct new 24 to 15-inch sewer.	Provide service to remaining planning area.	~5,650 LF of 24-inch sewer pipe, ~3,605 LF of 15-inch sewer pipe	Includes highway crossing.	$18,090,000

ES.6 WASTEWATER COLLECTION SYSTEM CONDITION ASSESSMENT

This section highlights the content of Chapter 6, which summarizes the sanitary sewer condition assessment conducted by Stantec Consulting Services Inc. (Stantec) in 2017. This previous assessment included 52,150 lineal feet sewer pipeline from 60-inches to 10-inches in diameter and inspection of 187 manholes. The assessment was summarized in a report titled City of Manteca Sewer Conditions Assessment dated August 2017 (MSCA). The purpose of including this summary is to ensure that the recommendations of the assessment are carried through in the overall wastewater Capital Improvement Program (CIP) developed as part of this WWMP.

This chapter is divided into the following sections:

- Background
- Summary of Sewer Conditions Assessment
- Cost Summary of Recommended Projects

ES.6.1 Background

The City of Manteca currently operates and maintains approximately a 250 miles of sanitary sewer gravity pipeline including 4,672 sanitary sewer manholes. The City is required to have a Sewer System Management Plan (SSMP) in accordance with the State Water Resources Control Board (SWRCB) General Waste Discharge Requirement (WDR) provisions that requires all publicly owned wastewater dischargers with a collection system greater than one mile in length develop a SSMP. Under Section 6.8 (WDR Section D.13.iv.c) the SSMP is required to develop a rehabilitation and replacement program (Program) to identify and prioritize collection system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. This Program includes regular visual and television (TV) inspections of manholes and sewer pipes and a system of ranking the condition of the sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Also, the Program should include a capital improvement plan (CIP) that addresses proper maintenance and protection of the sewer collection system assets.

ES.6.2 Summary of Sewer Condition Assessment

The MSCA used the National Association of Sewer Service Companies (NASSCO) rating system to classify sewer collection system defects by the following groups: structural, operation, construction, and miscellaneous. Each individual pipeline segments and manholes were then bundled into areas to develop projects that could be included in a Capital Improvement Program. The original report identified 14 areas of which 3 are currently identified for upsizing the pipelines under CIP Projects 1, 2 and 6 described in **Chapter 5**. Ongoing project repair work completed by the City since the MSCA has reduced the areas needing rehabilitation or replacement (RR) to the following 7 areas.

- Project No. 26: Alley between Center Street and Yosemite Avenue from west of Sherman Avenue to the intersection of the UPRR right of way and Center Street. Project includes point repair 4 segments of pipeline, dig and replace 3 segments of pipeline, and rehabilitate 9 manholes.

- Project No. 27: Main Street from Garfield Avenue to Moffat Street then along Main Street to alley north of Yosemite Avenue. Project includes dig and replace 3 segments of pipeline and CIPP 5 segments of pipeline.
- Project No. 28: Oak Street from Main Street to Willow Avenue. Project includes point repair 4 segments of pipeline and rehabilitate 7 manholes.
- Project No. 29: Sequoia Avenue from Oregon Street to the alley north of Nevada Street. Project includes point repair 1 segment of pipeline, rehabilitate 1 manhole, and replace 2 manholes.
- Project No. 30: Along Tidewater Bike Path from Sandalwood Lane to Louis Avenue. Project includes point repair 1 segment pipeline, dig and replace 2 segments of pipeline, and rehabilitate 9 manholes.
- Project No. 31: Walnut Avenue from the alley north of Nevada Street to the UPRR right of way. Project includes point repair 3 segments of pipeline, dig and replace 1 segment of pipeline, CIPP 1 segment of pipeline, replace frame/cover on 2 manholes, and rehabilitate 7 manholes.
- Project No. 32: Saint Dominic's Drive from just north of Yosemite Avenue to just south of the golf course. Project includes rehabilitation of 4 manholes.

The RR project areas are shown on **Figure ES-9.**

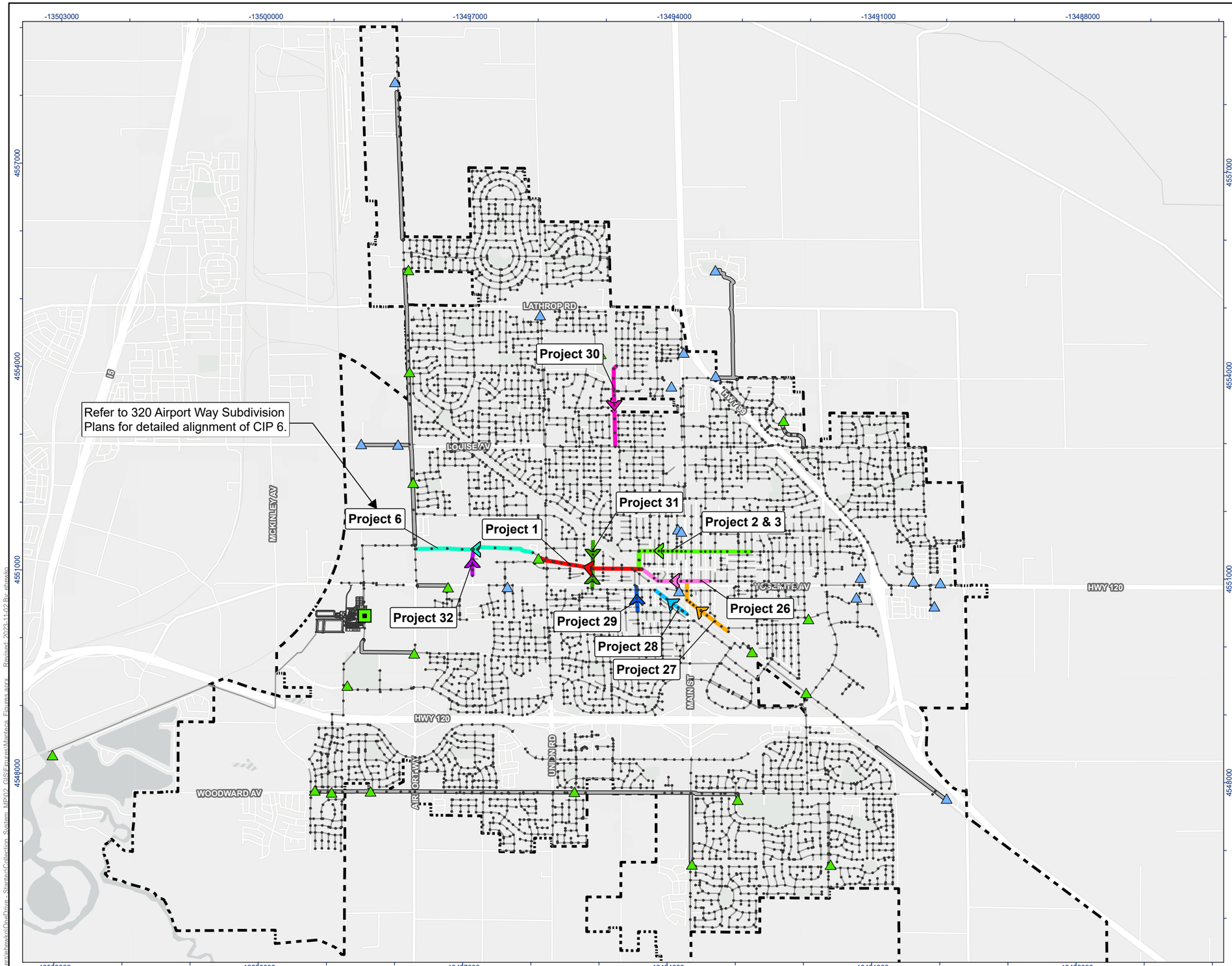
ES.6.3 Cost Summary of Rehabilitation and Replacement Projects

Table ES-7 summarizes the combined pipeline and manhole rehabilitation or replacement costs for each project area. In addition to the improvements to the existing areas, the City should continue inspecting the remainder of their system. Recommendations from the SSMP should be implemented to continue cleaning and inspecting the pipelines (250 miles) and manholes (4,700 manholes) within the system at a rate of approximately 5% to 10% per year, respectively.

Table ES-7. Summary of Project Repair/Rehabilitation/Replacement Costs

ID	Description	Cost
26	UPRR Right of Way and Ally Between Center Street and Yosemite	$489,000
27	Moffat Boulevard and Main Street	$1,022,000
28	Oak Street from Main Street to Willow Avenue	$98,000
29	Sequoia Avenue from Oregon Street to Alley north of Nevada Street	$53,000
30	Tidewater Bike Path from Sandalwood Lane to Louis Avenue	$348,000
31	Walnut Avenue from the alley north of Nevada Street to the UPRR	$279,000
32	St. Dominic's Drive from north of Yosemite Avenue to Golf Course	$29,000
	Total	**$2,318,000**

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain
- Sanitary Network
- Water Quality Control Facility Structures

Lift Station

- City Owned
- Privately Owned
- City of Manteca Limit

Improvement

- Project 1
- Project 2 & 3
- Project 6
- Project 26
- Project 27
- Project 28
- Project 29
- Project 30
- Project 31
- Project 32

Note: Refer to Appendix with CIP descriptions.

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 11/2/2023
TR by MA on 11/2/2023
IR Review by MVD on 11/2/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
ES-9

Title
Condition Assessment (2017) Improvements

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Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

ES.7 WASTEWATER QUALITY CONTROL FACILITY (WQCF) BACKGROUND AND REGULATORY REQUIREMENTS

This section highlights the content of Chapter 7, which documents the history of the WQCF, its overall regulatory requirements and compliance, and details of the effluent discharge Thermal Plan.

ES.7.1 WQCF Background

The Manteca WQCF began operation in 1959. Since then, the plant has been upgraded and expanded multiple times. The last major expansion project (Phase III Expansion) was completed in 2008 which upgraded the WQCF to a Title 22 tertiary treatment facility. Preliminary and primary facilities include a headworks screening structure, influent pump station, aerated grit removal tanks, and primary sedimentation basins. Secondary treatment facilities include conventional activated sludge (CAS) system with aeration basins, return activated sludge (RAS) and waste activated sludge (WAS) pumping stations, secondary clarifiers, and secondary effluent equalization pond (SEEP). Tertiary treatment facilities include filter feed pump station, rapid mix and flocculation basins, cloth media filters, and ultraviolet (UV) disinfection facility. Effluent handling and disposal facilities include secondary effluent storage pond (SESP), irrigation pump station, on-site land application areas for crop irrigation, effluent outfall to the San Joaquin River, and plant recycled water pump station. Solids handling facilities include dissolved air floatation thickeners (DAFTs), centrifuge dewatering building, and anerobic digesters.

The Influent Pump station splits the wastewater flow to parallel treatment systems known as the Northside and Southside plants that include separate aerated grit tanks, primary and secondary treatment facilities. In 2018, improvements were made to the Northside Plant aeration basins to improve energy efficiency and improve control of the aeration process to obtain additional denitrification capabilities. This included replacement of multistage blowers with high efficiency turbo blowers, replacement of the diffuser system with more reliable high efficiency fine bubble diffusers, and installation of control valves and DO controls to all basin zones. These improvements allowed influent flows to increase without violations of the NPDES permit. In 2020 these same improvements were made to the Southside Plant.

The WQCF Digester Improvements Phase I Project, completed in 2019, included new Digesters No. 3 and No.4 and a new Digester Control Building, rehabilitation of Digesters No. 1 and No. 2, replacement the existing gas flare, new FOG and food waste receiving stations. Also completed in 2019 was the Compressed Biogas Fueling Facilities Phase II Project, which included a new biogas renewable compressed natural gas (BioCNG) facility and fill station. A site plan showing the facilities of the Manteca Wastewater Quality Control Facility (WQCF) is shown in **Figure ES-10.**

ATTACHMENT

Stantec

1. HEADWORKS/SCREENS
2. INFLUENT PUMP STATION
3. SEPTAGE RECEIVING STATION
4. FOG RECEIVING
5. FOOD WASTE RECEIVING
6. BIOGAS SULFATREAT SYSTEM
7. ODOR CONTROL BIOFILTER
8. CHLORINE BUILDING
9. NORTHSIDE AERATED GRIT TANKS
10. NORTHSIDE PRIMARY SEDIMENTATION BASINS
11. NORTHSIDE AERATION BASINS
12. SECONDARY CLARIFIER NO.1
13. SECONDARY CLARIFIER NO.2
14. SECONDARY CLARIFIER NO.3
15. NORTHSIDE RAS & N.S. WAS PUMP STATION
16. SOUTHSIDE AERATED GRIT TANKS
17. SOUTHSIDE PRIMARY SEDIMENTATION BASINS
18. SOUTHSIDE AERATION BASINS
19. SOUTHSIDE MCC BUILDING
20. SECONDARY CLARIFIER NO.4
21. SECONDARY CLARIFIER NO.5
22. SEC. CLARIFIERS NO.4 & NO.5 SPLITTER BOX
23. SOUTHSIDE RAS PUMP STATION
24. FILTER FEED PUMP STATION
25. CHEMICAL BUILDING 2
26. RAPID MIX AND FLOCCULATION TANKS
27. TERTIARY FILTERS
28. UV DISINFECTION
29. EFFLUENT PUMP STATION
30. EFFLUENT MCC/GENERATOR BUILDING
31. CHLORINE CONTACT TANK
32. IRRIGATION PUMP STATION
33. RECYCLE WATER PUMP STATION
34. SECONDARY EFFLUENT EQUALIZATION POND
35. SECONDARY EFFLUENT STORAGE POND
36. ECKERT POND
37. DISSOLVED AIR FLOTATION TANKS
38. COLLECTIONS STORAGE BUILDING
39. DIGESTER NO.1
40. DIGESTER NO.2
41. DIGESTER CONTROL BUILDING
42. DIGESTER NO.3
43. DIGESTER NO.4
44. SLUDGE BLENDING TANK
45. DEWATERING BUILDING
46. DEWATERED SLUDGE LOADING AREA
47. RCNG GAS STORAGE/CONDITIONING
48. BIOCNG
49. CNG/TRUCK LOADING
50. FLARE
51. NORTH SLUDGE DRYING BEDS
52. ADMIN BUILDING
53. LABORATORY
54. SHOP/MAINTENANCE BUILDING
55. TRAINING/LOCKER ROOM OPERATION BUILDING
56. BIOTOWERS
57. STAFF LOCKER ROOM

N

0 60 120 180 240 300 FEET

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Figure ES-10
WQCF Existing Site Layout

ES.7.2 Regulatory Requirements

The City of Manteca WQCF is currently regulated by National Pollutant Discharge Elimination System (NPDES) CA0081558 Order R5-2021-0003 (Order). The Order serves as Waste Discharge Requirements (WDR) pursuant to the California Water Code (Section 13260) and Federal Clean Water Act (Section 402). NPDES orders are renewed on a five-year cycle to reflect changes in policy interpretation, updates to regulation and policy regarding the disposal of wastewater, variations in effluent quality, and public input. The current Order became effective on April 1, 2021, and expires on March 31, 2026.

The Order describes explicit effluent limitations for discharge to the San Joaquin River. Some of the key effluent limitations are summarized in **Table ES-8**.

Table ES-8. Select Order Effluent Limitations for Discharge to San Joaquin River

Parameter	Concentration
BOD_5	
Average Monthly, mg/L	10
Average Weekly, mg/L	15
TSS	
Average Monthly, mg/L	10
Average Weekly, mg/L	15
Ammonia Nitrogen (as N) from April 1st to November 30th [1]	
Monthly Average, mg N/L	2.0
Weekly Average, mg N/L	4.2
Ammonia Nitrogen (as N) from December 1st to March 31st [1]	
Monthly Average, mg N/L	2.5
Weekly Average, mg N/L	6.2
Nitrate plus Nitrite as N	
Average Monthly, mg N/L	10
Average Weekly, mg N/L	15.3

Note:
[1] Loading limits for ammonia nitrogen are regulated based on the concentration (mg N/L) x average dry weather flow effluent limit (Mgal/d) x 8.34 conversion factor.
Key:
BOD_5 = Biochemical Oxygen Demand, 5-day at 20°C
mg/L = milligrams per liter
TSS = Total Suspended Solids

The State of California has adopted competing regulations that will impact the WQCF capacity and effluent quality, in particular:

- SB 606 and AB 1688, Water Management Planning (which limits indoor potable water use to 50 gpd/capita by 2030)
- SB 1383, Short-Lived Climate Pollutants Reduction Act (which limits methane emissions to 40% below 2013 levels and reducing disposal of organic waste by 75% from the 2014 levels by 2025)

- Basin Plan Amendments, including salt control programs.

SB 606 and AB 1688, Water Management Planning

SB 606 and AB 1688 limit indoor potable water use to 50 gpd/capita by 2030. For the City of Manteca, this means the residents will have to reduce their current water use by approximately 22% (based on the current estimated usage of 61 gpd/capita). It is noted that when water is conserved, the mass of pollutants discharged by each person is then carried to the treatment plant in less water, resulting in higher pollutant concentrations. This level of water conservation will cause the design organic loading of the plant to be reached before the hydraulic design flow. This further complicates compliance with pollutants that are not removed from the existing process facilities, because they are in such low concentrations or they are not currently permitted (such as salinity, PFAS, pharmaceuticals, pesticides, etc.).

SB 1383, Short-Lived Climate Pollutants Reduction Act

SB 1383 limits methane emissions to 40-percent below 2013 levels and reduces disposal of organic waste by 75-percent from the 2014 levels by 2025. To achieve the goals of this regulation, a key strategy is to divert organic waste from landfills and send the food waste to municipal wastewater treatment facilities for co-digestion in anaerobic digesters, making beneficial use of biogas. However, the diverted organic waste will take up valuable volume in digesters and solids handling facilities that would otherwise be used for wastewater sludge. Further, food waste will increase salinity loading to the plant, as further discussed below.

Salinity

The Regional Water Quality Control Board (Regional Board) amended its Basin Plan to implement a long-term program to control salinity and nitrate build-up in the Central Valley, with input from all stakeholders (agriculture, cities, industries, environmentalists, economists, etc.) and as recommended by the CV-SALTS Initiative. The Basin Plan amendments were approved by the EPA and Office of Administrative Law (OAL) on January 15, 2020, which became the effective date for the Basin Plan Amendments and policies identified therein. One of the major aspects of the amendments includes a Salt Control Program, described below.

Salt Control Program. The Salt Control Program established in the Basin Plan will be implemented in three phases, with each phase expected to take 10 to 15 years, according to the Basin Plan. The initial phase required the City to select either the “Conservative Salinity Permitting Approach” (which applies the Water Quality Objectives of 700 µS/cm, along with other requirements) or the “Alternative Salinity Permitting Approach” (which allows Agencies to join regional efforts to study salinity effects on the ecosystem). Since the City currently does not meet the water quality objectives, the WQCF is operating under the Alternative Approach.

Future Salinity Compliance. Increased water conservation in the City, including State mandated reclamation and water conservation requirements (SB 606 and AB1688, described above), will inhibit compliance with water quality objectives for salinity. Additionally, if the City decides to receive food waste at the WQCF (to comply with SB1383) the concentrated food slurry may further inhibit compliance with

water quality objectives. These external compliance pressures are noted herein to highlight the complexity of competing State interests and help make informed decisions about expansion options. Notably, extreme water conservation has a direct effect on wastewater influent and will increase salinity concentrations entering the WQCF. The mass of pollutants (salt) discharged by each person remains unchanged regardless of water use, but because the mass is conveyed with less water (during water conservation measures), it results in higher pollutant concentrations arriving at the WQCF.

To ensure long-term compliance with the permit, it appears that the City should plan for some future salinity reduction. In this case (and considering the limits of current salt removal technologies), the City would likely install a reverse osmosis (RO) treatment system for only a portion of the total plant flow to remove just the amount of salt needed to comply with regulations.

To reduce salt at the WQCF, RO would be used most likely because other salinity reduction technologies such as nanofiltration (NF), electrodialysis reversal (EDR), and ion exchange tend to leave the more problematic ions, such as sodium and chloride, in the water. However, in 30 years there may be a completely new salt removal technology based on current world-wide research and development of new salt removal technologies, including those identified through the Department of Energy's Water Security Grand Challenge. For now, the City should plan on possible future implementation of RO but can remain flexible to adapt to other technologies that may become available before salinity removal is implemented.

As the City moves forward with expanding the capacity of the WQCF, a reasonable question is whether the expansion should be "in kind" with the existing process, or should be with a newer technology, specifically an MBR (membrane bioreactor). In developing an answer, many factors were considered including near-term and long-term costs, best professional judgement by the design and operations team, and the Basin Plan amendments, **Chapter 10** incorporates these issues into the detailed evaluation. It must be noted that an MBR would not remove any salinity but can act as a pretreatment step in conjunction with a salinity removal system.

Other Compliance Considerations

Long-term compliance is also dependent on future permit requirements, which may include more stringent or added provisions for salinity (described above), biological interferences, pesticides, and contaminants of emerging concern (CEC). These constituent considerations are discussed below.

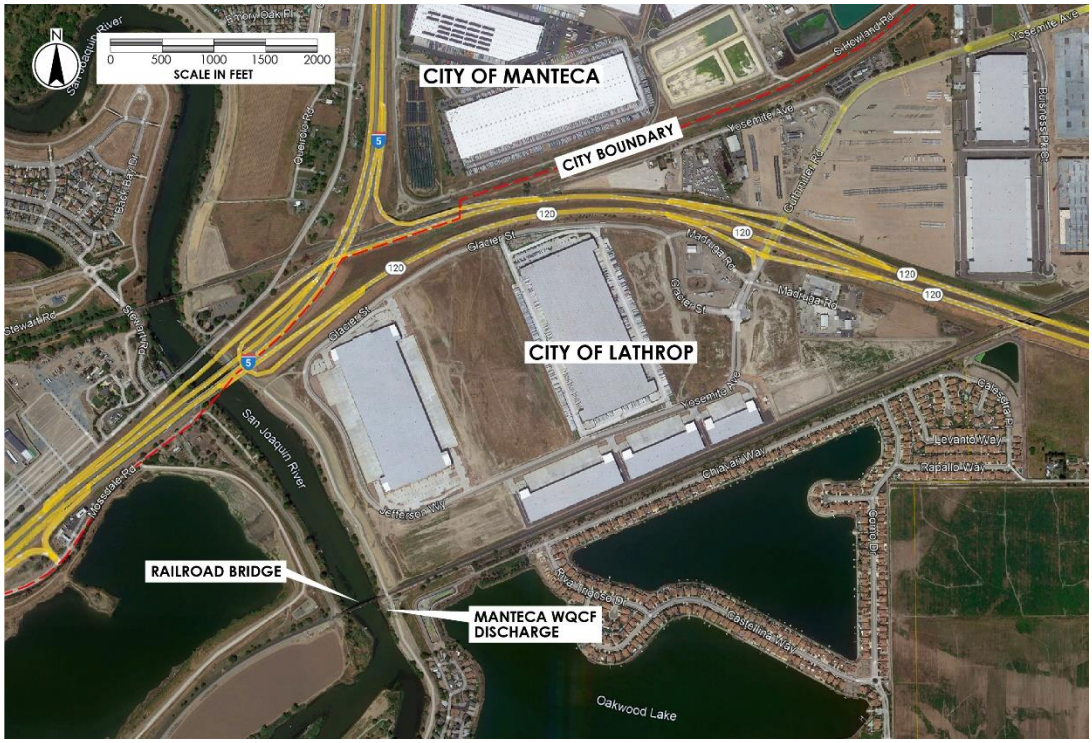
Pesticides. The impacts of pesticides, including insecticides, herbicides, and fungicides, on water quality and aquatic habitats will continue to drive implementation of control programs and development of discharge limits. This has resulted in the inclusion of chlorpyrifos and diazinon limits in the WDR, even when there is no reasonable potential for impacts. Discharge limits for pyrethroid pesticides were adopted in the San Joaquin River Basin Plan and became effective in December 2006, but numerical limits are not specified in the WDR. The Basin is also listed as impaired by Group A pesticides, including organochlorine pesticides, but a TMDL has not been developed and numerical limits are not included in the permit. Future developments in these types of chemicals will require additional analysis of effluent chemistry and potentially require additional treatment to comply.

Constituents of Emerging Concern (CES). CEC, including pharmaceuticals and endocrine disrupting compounds, such as hormones, at variable concentrations have been detected in treated effluent from

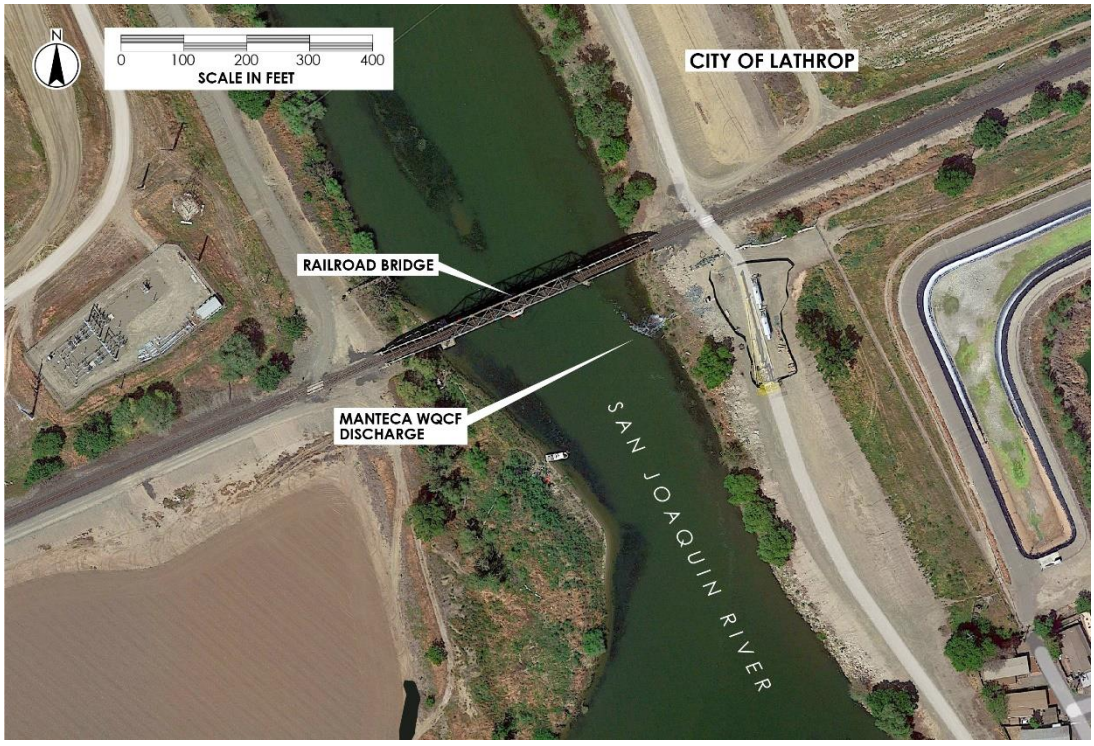
conventional wastewater treatment plants. However, numeric requirements for removal of CEC appear to be unlikely for the foreseeable future. If CEC removal becomes an issue with the current surface water discharge, use of advanced oxidation processes, such as ozonation, combined with biological activated carbon filtration can be considered.

ES.7.3 Thermal Plan Compliance

The WQCF currently disposes of final effluent (the portion not delivered to reclamation) via a 36-inch diameter pipe discharging to the San Joaquin River just south of the railroad bridge upstream of the I-5 bridge at the I-5/CA-120 interchange. The WQCF outfall discharge location is shown on **Figures ES-11**.



Manteca WQCF Outfall Discharge Location



Manteca WQCF Discharge into San Joaquin River

Figure ES-11. WQCF Outfall Discharge Location

In compliance with the California Environmental Quality Act (CEQA), the City prepared and submitted for public review a Draft Environmental Impact Report (DEIR) that addressed the future Phase IV Upgrade and Expansion Project. Since the City determined that it is impracticable to acquire additional agricultural fields (though they are seeking to expand their Title 22 recycled water program through uses such as baseball fields and parks), the increased discharge will be primarily for effluent discharges to the San Joaquin River. The City performed extensive hydrodynamic and thermal modeling as part of the DEIR to determine the effects of the increased effluent discharge flow to the San Joaquin River and to the Sacramento-San Joaquin Delta downstream of the discharge. This modeling is detailed in the following reports.

- Technical Memorandum (TM) – CORMIX Investigation of Cooling Facilities Operations (DRAFT), Larry Walker Associates, February 2008.
- Thermal Plan Exception Analysis Final Report, Larry Walker Associates, Resource Management Associates, Hanson Environmental, Inc. February 2006.

The models showed that future flows greater than 9.87 Mgal/d discharged to the San Joaquin River could at times violate the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California known as the “Thermal Plan”. Based on these models, an exception to the Thermal Plan was requested by Manteca from the RWQCB. This request was denied and the permitted flow expansion greater than 9.87 Mgal/d is only allowed under the existing NPDES permit if compliance with the Thermal Plan limits is achieved. Construction of cooling towers was therefore included in the Phase IV Upgrade and Expansion Project description to the Regional Water Board. The cooling facilities would be designed to reduce temperature of the treated effluent such that the effluent discharge and associated size of the thermal plume will comply with Thermal Plan provisions as necessary to protect sensitive aquatic life.

Measurement of final effluent temperature and the river temperature upstream and downstream of the discharge location is also a requirement under the current NPDES permit. A comparison of recent effluent discharge and river temperatures from 2016 through 2021 has shown an increase in the temperature difference between the effluent and the river of 2°F to 5°F over what was used for all previous modeling. Therefore, a new river modelling study is recommended before proceeding with the design and construction of cooling towers to validate compliance with the Thermal Plan.

ES.8 WQCF WASTEWATER FLOWS AND LOADS

This section highlights the content of Chapter 8, which includes the following assessments:

- Historical Flows and Loads and Changed Conditions
- Plant Recycled Flows and True Influent Flows
- Summary of Existing and Future Wastewater Characteristics
- Equivalent Population Served

ES.8.1 Historical Flows and Loads and Changed Conditions

Historical influent flows from January 2016 through February 2021 are shown in **Figure ES-12**. The 365-day average flow values are centered averages based on available data extending one-half the averaging period before and after the date indicated (i.e., the 365-day average flow on the date indicated includes data beginning 182 days prior to the indicated date and data ending 182 days after the indicated date). The 365-day average flow (annual average flow or AAF) has exhibited a mostly steady increasing trend over the period of record considered, however, the rate of increase accelerated in the final year. The AAF at the end of the study period was 7.13 Mgal/d. The ratio of the average dry weather flow to the annual average flow for each year was calculated. The average of this ratio from 2016 through 2021 is 0.992, which indicates that the ADWF is essentially equal to the AAF. For the intended purpose of this this master plan, the flow will be presented in terms of ADWF. The annual average BOD load was steadily increasing over the same period. The most recent annual average BOD load determined was 22,121 lb/d as shown in **Figure ES-13**.

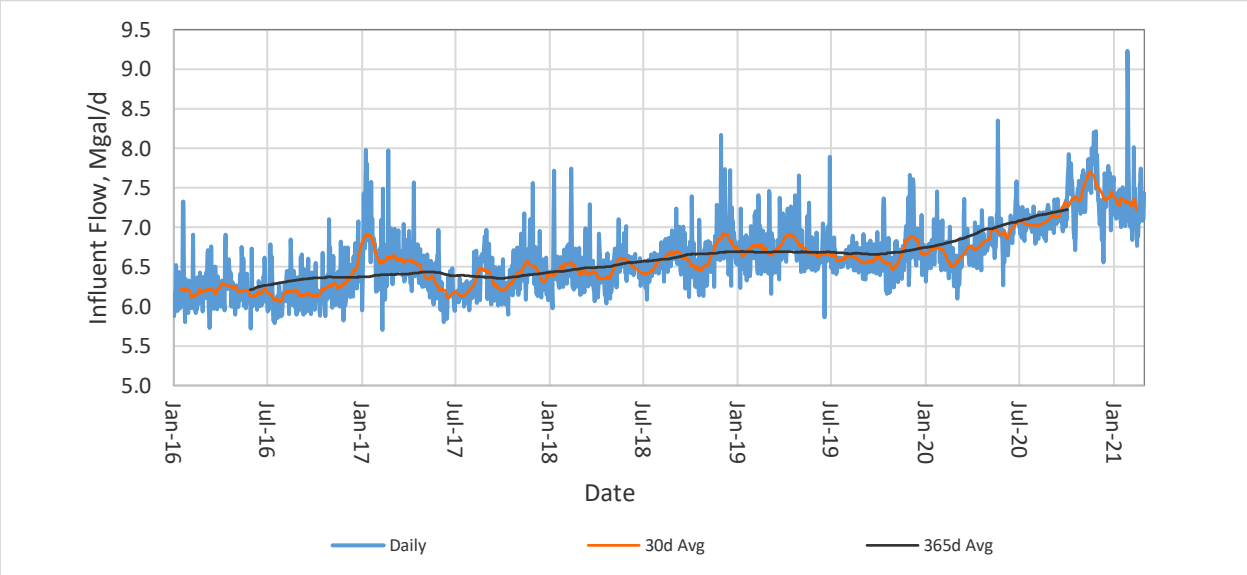


Figure ES-12. Historical Influent Flow

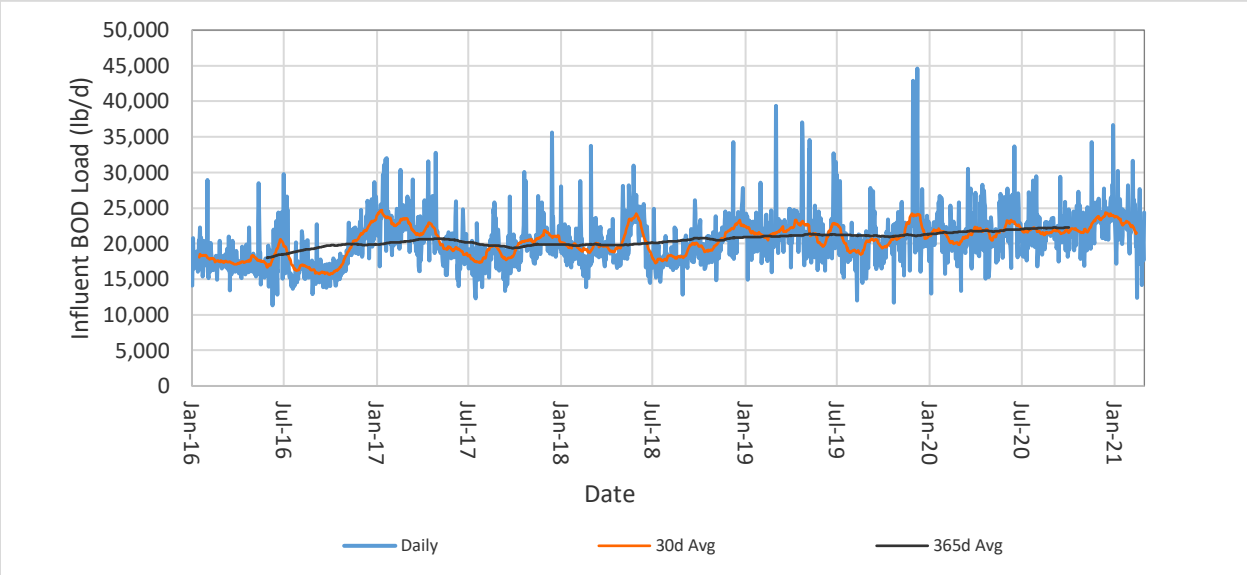


Figure ES-13. Historical Influent BOD Load

The Phase III Expansion Basis of Design Report prepared by Nolte and Associates in July 2001 rated the existing WQCF at an average flow capacity of 9.87 Mgal/d. Of this capacity, 14.7% (1.45 Mgal/d) is contracted to the City of Lathrop. There have been several changed conditions at the WQCF since 2001 that affect the capacity of the WQCF, including the following:

- Drought conditions and water conservation in recent years have resulted in increased wastewater strength as the pollutants contributed by a given population are carried in less water to the WQCF.
- An effluent limit on Nitrate + Nitrite Nitrogen (10 mg/L monthly average) was added to the National Pollution Discharge Elimination System (NPDES) Permit for the WQCF. The Phase III design did not consider or provide adequate facilities to meet this requirement at the original 9.87 Mgal/d design flow.
- The biotowers in the Northside Plant, which provided a portion of the treatment capacity established in the Phase III Basis of Design Report, were removed from service in 2007 because they remove the carbon source needed for denitrification. Therefore, they were incompatible with meeting the new nitrogen permit limit.

Because of these changed conditions the WQCF does not have the treatment capacity to support ongoing growth within the City. The projected near-term future flow of 9.23 Mgal/d which includes the true influent flows from Manteca and Lathrop, as well as in-plant recycle streams from the WQCF corresponds to the likely achievable capacity with the Interim Improvements recommended in the WQCF 2021 Capacity Assessment which are described in **Chapter 9**.

ES.8.2 Plant Recycled Flows and True Influent Flows

The WQCF 2021 Capacity Assessment analyzed in-plant recycle flow from March 2020 to February 2021 to quantify the total recycle flows to determine the true plant influent (without recycle streams) characteristics. The analysis indicates that the total in-plant recycle flow adds up to 0.772 Mgal/d out of the 7.13 Mgal/d measured at the headworks with a true influent flow of 6.358 Mgal/d (7.13 - 0.772). Therefore, the recycle streams account for an approximate 12% increase to the true influent flow (0.772 / 6.358). The true influent flow also includes the flow received from Lathrop (measured directly by separate flow meter) which equaled 1.07 Mgal/d during this period. Therefore, the true average annual influent flow for Manteca was 5.29 Mgal/d.

As indicated in **Table ES-9**, Lathrop's current flow contribution represents 16.8% of the total WQCF flow (1.07 / 6.358). If it is assumed that Lathrop's flow contribution in the future condition will be at the contract amount of 14.7%, then Lathrop's metered flow (not including recycle allowance) would increase from the current value of 1.07 Mgal/d to 1.21 Mgal/d, an increase of 0.14 Mgal/d. During the same time, Manteca's base flow (without recycle allowance) would increase by 1.73 Mgal/d. Therefore, future flow increases would be allocated 7.5% to Lathrop and 92.5% to Manteca. The lower growth allowance for Lathrop is because the current Lathrop flow as a fraction of the total flow is substantially greater than 14.7% and is assumed to decrease to 14.7%.

Table ES-9. Breakdown of Existing and Projected Interim Flows

Condition and Flow Category	Annual Average Flow, Mgal/d		
	Lathrop	Manteca	Total
Existing			
Flow Excluding In-Plant Recycle Streams [1]	1.07	5.29	6.36
Flow Including In-Plant Recycle Streams [2]	1.20	5.93	7.13
Fraction of Total Flow	0.168	0.832	1.000
After Interim Improvements[3]			
Flow Excluding In-Plant Recycle Streams	1.21	7.02	8.23
Flow Including In-Plant Recycle Streams [2]	1.36	7.87	9.23
Fraction of Total Flow	0.147	0.853	1.000
Difference (Future - Existing)			
Flow Excluding In-Plant Recycle Streams	0.14	1.73	1.87
Flow Including In-Plant Recycle Streams [2]	0.16	1.94	2.10
Fraction of Total Flow	0.075	0.925	1.000

Notes:
[1] Existing Lathrop flow based on annual average from Dec 2019 through Nov 2020. Beginning Dec 2020 recorded Lathrop flows decreased and must be verified.
[2] Flow including in-plant recycle streams calculated as 1.121 x base flow.
[3] Future based on total flow with recycle streams = 9.23 Mgal/d. Assuming Lathrop will represent 14.7% of total flow in future.

ES.8.3 Summary of Existing and Future Wastewater Characteristics

Wastewater flows and characteristics from January 2016 through February 2021 (over five years of data) were analyzed. The current wastewater flows and loads presented in this section are summarized and used for projecting future flows and loads as shown in **Table ES-10**. It is presumed that future expansion will provide build-out capacity flows for Manteca plus the Lathrop flow contribution totaling 17.5 Mgal/d (ADWF without recycle). The future projections assume that all average wastewater influent constituent concentrations and flow and load peaking factors remain unchanged from existing conditions. Therefore, future increases in all sewage flows and loads are expected to be proportional to increases in the annual average flow, which should be roughly proportional population growth.

Table ES-10. Existing and Future Flows and Loads

Parameter [1]	Existing 6.37 Mgal/d [2, 3]	Interim 8.23 Mgal/d [2, 4]	Future 17.5 Mgal/d [2, 4]
ADWF (with Recycle)	7.13	9.23	19.6
ADWF (without Recycle)	6.37	8.23	17.5
Flow Ratios			
ADMMF/ADWF	1.04	1.04	1.04
PDF/ADWF	1.25	1.25	1.25
PHF/ADWF	2.10	2.10	2.10
Load Ratios			
ADMML/AAL	1.20	1.20	1.20
PDL/AAL	2.00	2.00	2.00
Flow, Mgal/d			
ADWF	7.13	9.23	19.6
ADMMF	7.42	9.60	20.38
PDF	8.91	11.54	24.50
PHF	14.97	19.38	41.16
Annual Average Load, lb/d			
BOD	22,121	28,636	60,809
TSS	16,591	21,477	45,608
TKN	3,568	4,619	9,808
Average Day Maximum Monthly Load, lb/d			
BOD	26,545	34,363	72,971
TSS	19,909	25,772	54,729
TKN	4,281	5,542	11,770
Average Constituent Concentrations, mg/L			
BOD	372	372	372
TSS	279	279	279
TKN	60	60	60
Constituent Concentrations with ADMMF and ADMML, mg/L			
BOD	429	429	429
TSS	322	322	322
TKN	69	69	69
Constituent Concentrations with AAF and ADMML, mg/L			
BOD	446	446	446
TSS	335	335	335
TKN	72	72	72

Notes:
[1] ADWF = Average Dry Weather Flow, ADMMF = Average Day Maximum Monthly Flow, PDF = Peak Day Flow, PHF = Peak Hour Flow, AAL = Annual Average Load, ADMML = Average Day Maximum Monthly Load, PDL = Peak Day Load
[2] All flows and loads include in-plant recycle streams. Future projections assume recycle flow and load fractions remain unchanged.
[3] Based on ADWF = 7.13 Mgal/d as of August 30, 2020.
[4] The Future condition is based on likely achievable plant capacity with improvements as discussed in Chapter 10. Flow and load peaking factors assumed same as existing.
Key: mg/L = milligrams per liter
Mgal/d = million gallons per day
lb/d = pounds per day

ES.8.4 Equivalent Population Served

Flows from a given population are subject to variation with water conservation (and infiltration and inflows into the sewage collection system, which is not a significant issue for Manteca). However, pollutant loads are generally proportional to population and do not vary with water conservation. Since design loads are the key criteria for sizing wastewater treatment facilities, it is useful to present plant capacities in terms of loading or equivalent population.

The average flow per capita was calculated using five years of plant data (January 2016 to February 2021) to calculate an average influent daily flow using the average BOD load (without in-plant recycle flows and Lathrop's contribution) for each year divided by the State of California Department of Finance population estimates for the City of Manteca. Averaging the five years of data calculates to a per capita wastewater flow of 61 gallons/capita/day and a per capita BOD load of 0.203 lb BOD/capita/day. After the recommended Interim Improvements are completed increasing the true influent flow capacity to 8.23 Mgal/d, the equivalent Manteca population the WQCF can serve is 111,800.

Over the longer time horizon of 20 plus years, the City is projecting an annual population growth rate of 2.8%**.** Using a population growth rate of 2.8% for Manteca and subtracting 14.7% for Lathrop, the equivalent population for Manteca at the build-out flow of 17.5 Mgal/d ADWF would be approximately 236,000 people by fiscal year (FY) 2057/2058.

ES.9 WQCF ASSESSMENT OF EXISTING FACILITIES AND RECOMMENDED INTERIM IMPROVEMENTS

This section highlights the content of Chapter 9, which provides an overview of the City's existing Wastewater Quality Control Facility (WQCF), The information presented in this chapter is based on the review of previous studies, design reports, record drawings, operating records, and discussions with City staff. and presents an assessment of the performance of the existing treatment processes and recommendation for Interim Improvements to keep the plant in compliance with waste discharge requirements until the next major expansion project. Chapter 9 evaluates the following components of the WQCF:

- Headworks and Influent Pump Station
- Aerated Grit Tanks
- Primary Sedimentation Basins
- Secondary Treatment Facilities
- Secondary Effluent Equalization Pond (SEEP)
- Filter Feed Pump Station
- Rapid Mix and Flocculation Tanks
- Tertiary Filters
- UV Disinfection System
- Effluent Handling and Disposal Facilities
- Biosolids Handling and Drying Facilities
- Biogas Utilization Facilities

- Electrical Supply and Distribution
- Instrumentation and Electrical Controls
- Auxiliary Systems
- Recommended Interim Improvements

ES.9.1 Headworks and Influent Pump Station

Currently, the IPS is designed with three duty pumps and one standby pump (the standby pump can convey screened wastewater to either the Northside Plant or the Southside Plant). The operators have noted that during recent severe storm events, all four pumps were needed to convey the high influent flows. There are currently four empty pump bays to facilitate expanding the capacity of the IPS. Therefore, to ensure the IPS has firm capacity, it is recommended to install a fifth pump in one of the empty pump bays to serve as the second duty pump dedicated to the Southside Plant.

In 2022, two new headworks screens were installed to replace the older screens. The third mechanical screen is at the end of its useful life and will need replacing. The Headworks wet well, according to CalOSHA standards, is a hazardous environment in a confined space with improper ventilation, which makes it difficult for plant staff to do inspection and maintenance in this area. It is recommended that the ventilation system be upgraded where foul air from the junction structure, covered channels and room air will be exhausted to the existing biofilter for odor treatment.

On February 6, 2015, a study of the biofilter was prepared by HERWIT and Stantec. According to plant staff the biofilter operated effectively for approximately 5 years before exhibiting operational problems, primarily attributed to excessive head loss across the filter associated with media fouling. The biofilter has not been operational since that time. Air is being exhausted from the Headworks, IPS and Dewatering Building with the odor control fan and discharged without odor treatment. It is recommended that the odor control fan be replaced and the lava rock media in the biofilter be replaced by inorganic media provided by Biorem©, ECS or equivalent. The biofilter media cells (2 total) should be provided with a cover system. The cover will help prevent the migration of dust, soil, and other particulates to the biofilter, and will also help to provide better climatic controls of the media bed.

ES.9.2 Aerated Grit Tanks and Primary Sedimentation Basins

The existing covers for aerated grit tanks and primary sedimentation basins are Enduro XL6 fiberglass reinforced plastic (FRP) covers, which the operators have noted are too heavy to lift to perform routine maintenance inside the tanks and basins. It is recommended that lighter covers be installed. One option would be retractable arch-supported covers made of high-performance UV-protected membranes. The covers are supported on a low-profile aluminum arch frame so they can be quickly detached and re-attached to provide easy access for operators.

ES.9.3 Secondary Treatment Facilities

The existing Northside and Southside Plants are challenged to meet the effluent nitrate + nitrite (10 mg/L as nitrogen monthly average). As discussed in the WQCF 2021 Capacity Assessment, improvements are needed to the secondary treatment facilities to improve nitrogen removal performance and are a pre-requisite to handle increased flows and loads. Improvements to the secondary treatment aeration basins are currently under design by Pacific Advanced Civil Engineering, Inc. (PACE) and improvements to the RAS/WAS pumping systems are currently under design by HERWIT Engineering.

The proposed Northside Plant improvements include increasing the volume of the aeration basins 22 percent by raising the water depth and reconfiguring the biological treatment zones so the first and fourth zones are anoxic. Cyclic aeration has been difficult to operate and therefore will be removed in the second zone so that there are three zones out of five with constant aerobic biological treatment. Exterior improvements will include installation of a new Internal Recycle Pump Station (IRPS) to replace the undersized existing internal mixed liquor recycle pumps, installation of a new Primary Effluent Pump Station (PEPS) to lift the hydraulic profile, and modifications to the existing Influent Channel to accommodate a two-train operation to replace the existing five parallel trains.

For the Southside Plant improvements, the aeration basins will be reconfigured so that the first and fourth biological treatment zones are anoxic. Cyclic aeration will be removed in the second zone so that there are three zones out of five with constant aerobic biological treatment. Exterior improvements will include installation of a new Internal Recycle Pump Station (IRPS) to replace the undersized mixed liquor recycle pumps.

Glycerin feed systems have been added to both the Northside and Southside Plants ahead of the first zone anoxic basins to improve denitrification performance.

To maximize the capacity of the existing secondary clarifiers, it is essential that return activated sludge (RAS) pumping capacity be adequate. Generally, the pumping capacity divided by the clarifier area should give an underflow rate greater than 500 gpd/ft^2. The maximum underflow rates for the Northside and Southside clarifiers are 571 gpd/ft2 and 258 gpd/ft^2, respectively, indicating a severe deficiency in the Southside Plant. The proposed improvements to the Secondary Clarifiers include the following:

- Replace the RAS pumps in the Southside Plant to obtain a reliable capacity of at least 4.8 Mgal/d per secondary clarifier (existing capacity is 1,700 gpm = 2.4 Mgal/d).
- Replace the waste activated sludge (WAS) pumps in both the Northside and Southside Plants to provide reliable wasting as required under future design conditions.
- Also noted by plant operations staff, the secondary clarifier ducking skimmers work poorly and require replacement with a more traditional skimmer rack arm design.
- There are hydraulic issues at the Southside Plant clarifiers with large periodic flow surges. The effluent launder at the Southside Plant aeration basins traps air and then suddenly releases it, modifications are required to avoid pipe damage.

Finally, as noted in the WQCF 2021 Capacity Assessment, sidestream treatment would greatly reduce the recycle TKN load from the solids handling system and would provide major benefits to assist in compliance with the effluent nitrate + nitrite limit, whether the plant accepts food waste or not into the anaerobic digesters. Food waste should not be accepted without providing sidestream treatment.

ES.9.4 Secondary Effluent Equalization Pond (SEEP)

The SEEP liner is in poor condition. When there is a puncture or tear in the liner it is difficult to repair because of the deteriorated condition of the liner material. It is recommended that the liner be replaced in-kind with a new liner.

ES.9.5 UV Disinfection System

In the last two years (January 2021-March 2023), there has been one total coliform violation in June 2022 (prior to 2021, there was one exceedance in 2020, one in 2019, and several in 2018). From January 2018 through March 2023, the daily average UV dose has averaged 206 mJ/cm2, which is significantly greater than the permit required minimum UV dose of 100 mJ/cm2. The width of the existing channels (10-feet 11.5-inches) makes it difficult to get access to the lamps and channels for maintenance and cleaning.

Three UV system alternatives were analyzed for upgrading the UV disinfection system: 1) A closed vessel system; 2) In-kind open channel system with four smaller width channels instead two wide channels; and 3) New higher intensity lamp open channel system with four deeper channels. The recommended alternative based on lowest capital cost and energy efficiency is the Wedeco Duron 8 (800W), or equal manufacturer, to achieve a UV dose of 100 mJ/cm2 based on a peak design flow of 31.08 Mgal/d at a minimum design UVT of 61.3-percent.

ES.9.6 Biosolids Handling Facilities

The existing biosolids handling facilities require the following improvements:

- Digesters No. 1 and 2 need an overflow box that discharges to the solids holding tank similar to Digesters No. 3 and 4.
- New grating and handrailing at the digester gas relief valves is needed for all four digesters.
- The existing waste heat radiator is undersized and needs to be replaced with a larger radiator.
- The existing FOG receiving station basket screen does not work very well. A replacement screening system is recommended for the FOG Receiving Station.

The impact of the centrate return on the nitrogen treatment capabilities of the main process is very significant. The main treatment process is currently overloaded on nitrogen treatment capacity. As a result of this, only one centrifuge can be run at a time with a flow limit of 115 gpm. This is well below the centrifuge capacity of 185 gpm. Side stream treatment of the centrate is needed to reduce the impacts of the dewatering centrate return on the main plant process and allow full use of the dewatering facility, Side stream treatment of the centrate is recommended and included in the Interim Improvement Projects.

Even with side stream treatment, the centrifuge facility will be required to run both centrifuges with the increased plant loadings and will not have a redundant centrifuge. A third centrifuge, new sludge feed pump, and new polymer blending unit are recommended and included in the Interim Improvement Projects. The new centrifuge is recommended to have a minimum capacity of 260 gpm and 3,000 dry lb/hr.

Currently, the plant is required to run both DAFT units continuously to keep up with WAS loading. This will become more critical when the WAS system is expanded. A redundant DAFT is required to allow maintenance on the DAFT system. A new DAFT is recommended and included in the Interim Improvement projects.

ES.9.7 Instrumentation and Electrical Controls

A SCADA Master Plan for the WQCF was completed in 2020 by Carollo Engineers. The following is a list of recommended improvements:

- Provide new core SCADA server and network system migrating to Ignition SCADA HMI software.
- Provide remote site PLC upgrades for sewer and stormwater lift stations.
- Replace existing WQCF legacy PLC systems and associated network hardware as well as the operator interfaced terminals (OITs) for modernization and standardization of equipment and added system reliability.
- Upgrade switchgear and power systems PLCs to latest supported model.

ES.9.8 Biogas Utilization Facilities

Digester heat demand is less than anticipated and the waste gas boiler radiator is too small to handle the excess heat and a larger replacement radiator is recommended for system stability. Plant staff at times are forced to dump heat into the out of service digester which is not a desired long-term solution. It is recommended that the existing waste heat radiator be replaced with a larger radiator.

The H_2S removal system works well. However, the two 1,500-gallon chemical tanks (ferric chloride) are too small for a full bulk chemical delivery, preventing some vendors from servicing the WQCF. The smaller tanks also increase the cost of the chemical as the freight charge on a per gallon basis is higher. It is recommended to replace the two 1,500-gallon chemical tanks with two 2,700-gallon chemical tanks (ferric chloride) so a full bulk chemical delivery can be received, thereby reducing the per gallon cost of the chemical and making it possible for other vendors to service the WQCF.

ES.9.9 Cost Summary of Recommended Interim Improvements

The Interim Improvements project costs were developed from previous study cost estimates adjusted to the March 2023 Engineering News-Record Construction Cost Index (ENRCCI) 20-Cities Average of 13,176. Where previous cost estimates were not available, construction costs were developed using costs for similar construction at other wastewater treatment plants and equipment manufacturer quotes. Project costs for each item in **Table ES-11** were estimated as separate projects with 35 percent added to the construction estimate for engineering, construction management and administration.

Table ES-11. Recommended Interim Improvements Project Costs[1]

WQCF ID	Description	Estimated Project Cost
Recommended Interim Improvements Needed Immediately		
1	North and South Plant WAS Pump Replacement Project	$2,827,000
2	South Plant RAS Pump Replacement Project	$1,652,000
3	North and South Plant Aeration Basins Improvements	$11,696,000
	Subtotal	**$16,175,000**
Interim Improvements for Additional Surety and Ability to Accept Food Waste [2]		
4	Add sidestream treatment of sludge dewatering return flows to reduce nitrogen loads to the secondary treatment system, thereby improving nitrogen compliance and sludge settleability and providing flexibility to accept food waste.	$20,205,000
5	Add Centrifuge No. 3 to process additional solids at the dewatering building.	$5,130,000
6	Add DAFT No. 3 to provide redundant DAFT for thickening of sludge prior to digestion [2]	$3,930,000
	Subtotal	**$29,265,000**
Instrumentation and Electrical Control Improvements [3]		
7	Core Supervisory Control and Data Acquisition (SCADA) System	$1,127,000
8	Remote Site Process Logic Controller (PLC) Upgrades	$1,727,000
9	PLC and Operator Interfaced Terminal (OIT) Replacement	$1,374,000
10	Switchgear PLC Upgrades	$127,000
	Subtotal	**$4,355,000**
Other Improvements		
11	Add Influent Pump No. 5	$1,048,000
12	Lightweight Covers for aerated grit tanks, primary sed. basins, & chlorine contact tank	$5,792,000
13	Repair Biofilter and modify ventilation system at Headworks and IPS [4]	$2,080,000
14	UV Disinfection System Upgrade	$15,583,000
15	Piping Modification to Separate Plant Water System from Off-Site Reclaimed Water	$636,000
16	Replace Secondary Effluent Equalization Pond Liner	$2,101,000
17	Headworks Screen No. 3 [5]	$900,000
18	FOG Receiving Station Screening System	$200,000
19	Bulk Ferric Chloride Solution Tanks	$351,000
20	Construct new overflow boxes and piping for Digesters No. 1 and 2	$706,000
21	Provide platform and handrail for gas pressure relief valves at all digesters	$205,000
22	Install new waste heat radiator	$198,000
	Subtotal	**$29,800,000**
	Grand Total	**$79,595,000**

Notes:
[1] Total project cost includes 35% of the total construction cost for engineering, construction management and administration.
[2] Costs escalated from WQCF 2021 Capacity Assessment.
[3] Costs escalated from the report, City of Manteca WQCF SCADA Master Plan – Technology Drive Solutions for Safe and Reliable Water Quality (Carollo Engineers, Inc., April 2020).
[4] Cost escalated from the technical memo, Manteca WQCF Biofilter Evaluation (HERWIT and Stantec, February 2015).
[5] Cost obtained from the recent project, WQCF Bar Screen Project, which was started up in October 2022.

Key:
WAS = waste activated sludge
RAS = return activated sludge
IMLR = internal mixed liquor recycle
DAFT = Dissolved Air Flotation Thickener

ES.10 WQCF PHASE IV EXPANSION PROJECT

Based on a population growth rate of 2.8% and assuming influent loadings to the WQCF increase proportional to population growth, the proposed Interim Improvements will provide treatment capacity until FY 2030/2031. The Phase IV Expansion Project would then increase the true ADWF capacity (without in-plant recycle) from 8.23 Mgal/d to 17.5 Mgal/d and provide treatment capacity until FY 2057/2058 as shown on **Figure ES-14**.

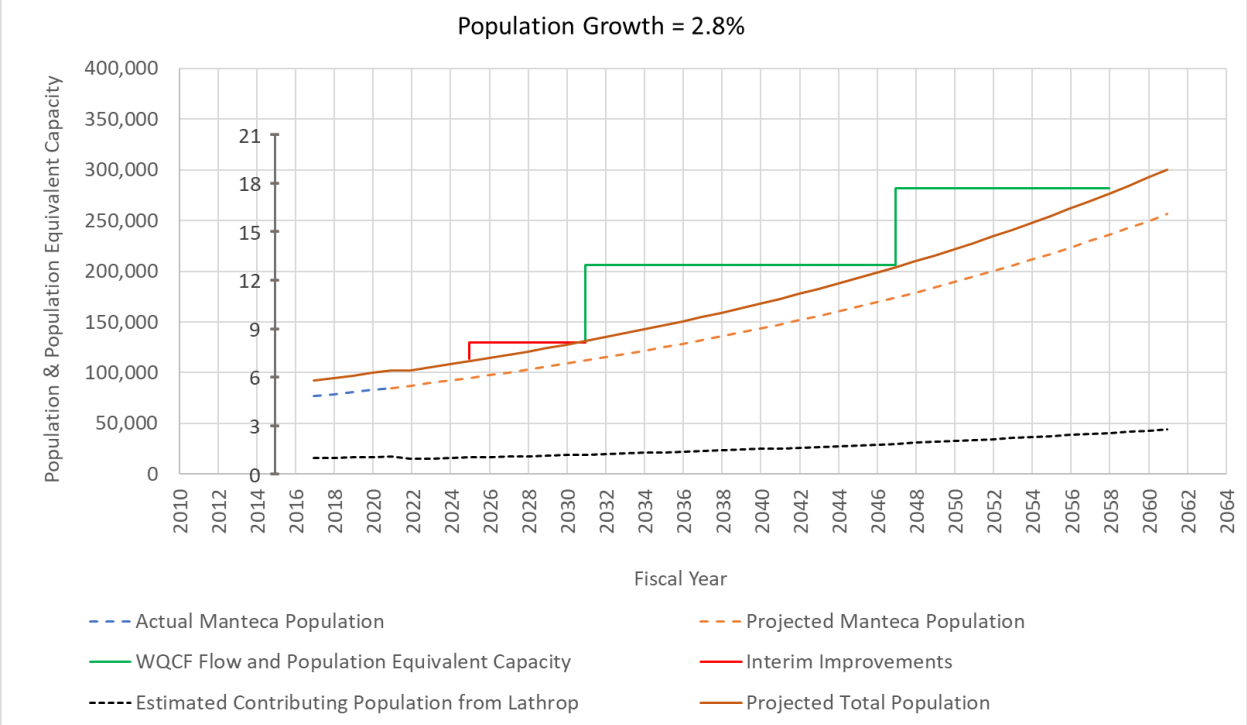


Figure ES-14. Estimated Population Growth and Proposed WQCF Phase IV Expansion

Expansion from 8.23 Mgal/d to 17.5 Mgal/d (i.e., building 27 years of treatment capacity) in one stage is not recommended because discharge permit requirements are subject to change every five years and future wastewater treatment technologies could make the current treatment technologies obsolete a decade from now. It is recommended that Phase IV Expansion Project is constructed in two stages with each stage having an incremental treatment capacity of 4.65 Mgal/d ADWF (approximately 9.3 Mgal/d total of treatment capacity will be added when the two stages are completed).

The remainder of this chapter includes the following sections:

- Treatment Process Selection
- Recommended Phase IV Expansion Project
- Phase IV Expansion Costs

ES.10.1 Evaluation of Shortlisted Alternatives

The following treatment process alternatives for the Phase IV Expansion Project are identified and described in **Chapter 10**:

- Alternative 1: Conventional Activated Sludge (CAS) Process.
- Alternative 2: Membrane Bioreactor (MBR) Process.
- Alternative 3: Sequencing Batch Reactor (SBR) Process.
- Alternative 4: Integrated Fixed-Film Activated Sludge (IFAS) System.
- Alternative 5: Granular Activated Sludge (GAS) Process.

As described in **Chapter 10**, the top two alternatives selected for further evaluation were Alternative 1 - CAS Process and Alternative 2 – MBR Process.

Expansion with Conventional Activated Sludge (CAS)

The conventional activated sludge (CAS) system for biological nitrogen removal uses the Modified Lutzak Ettinger (MLE) process, similar to the existing Southside Plant. Key components of the MLE process include reactor basins, secondary clarifiers, and a RAS pump station. The reactor basins include pre-anoxic zone followed by aerobic zone. At the end of the aerobic zone, there is an internal mixed liquor recycle pumping system that recycle mixed liquor back to the beginning of the pre-anoxic zone. Mixed liquor flows to the secondary clarifiers where sludge settles to the bottom and returned to the anoxic zone, whereas clarified effluent flows over the clarifier weirs.

The CAS Process alternative would expand the WQCF south of the Southside Plant for the first stage expansion with similar facilities except that the aeration basins would have larger anoxic zones for robust denitrification. The proposed facilities would include five aeration basins, two secondary clarifiers, and RAS/WAS pump station. Because there is not enough land for further expansion south, the second stage expansion would be east of the existing Headworks and include similar facilities to the first stage expansion including five aeration basins, two secondary clarifiers, and RAS/WAS pump station. Additional tertiary filters would also be required for the second stage expansion.

Expansion with Membrane Bioreactors (MBRs)

Like conventional activated sludge, the MBR process utilizes suspended growth biological treatment. However, in the MBR, membrane filtration (instead of clarification) is used to achieve solids-liquid separation so that the solids can be returned to the reactor basin. This method of solids-liquid separation does not depend on solids settleability and is, therefore, much more reliable than clarification. Additionally, the MBR eliminates the need for downstream tertiary filtration and provides a superior quality effluent as compared to conventional activated sludge followed by tertiary filtration. The superior quality effluent from the MBR is easier to disinfect and requires lower ultraviolet dosing as compared to a conventional treatment system. Additionally, membrane filtration would serve as a necessary

pretreatment step to possible future reverse osmosis for compliance with effluent salinity requirements (conventional treatment with tertiary filtration is not adequate).

Allowable mixed liquor suspended solids concentrations in an MBR are determined by membrane filtration characteristics, not by settling characteristics, and are much higher than those in conventional activated sludge. Typically, the biological reactors for an MBR are designed based on a MLSS concentration of 8,000 mg/L, compared to 3,000-4,000 mg/L in a conventional activated sludge system. The higher MLSS provides the benefit of greater treatment capacity per unit volume of reactor basin reducing the area footprint required compared to conventional activated sludge. All MBR systems must be preceded by fine screening to protect the membranes from materials in the wastewater such as hair, stringy materials, paper, and small plastic objects that can pass through typical headworks screens and primary clarifiers.

Depending on the selected membrane supplier, maximum allowable screen openings are between 1 and 3 mm. For this analysis, a 2 mm screen is assumed, which is recommended by several leading MBR manufacturers and is the most common screen size based on Stantec experience. The 2 mm screen would be used for screening primary effluent ahead of the MBR.

Primary effluent would flow by gravity from the existing primary clarifiers effluent channel through the proposed new fine screens and to the MBR system. The MBR process flow would be controlled by a modulating gate or valve ahead of the fine screens. All remaining primary effluent flow not going to the MBR treatment system would go to the existing conventional treatment trains.

For this project, the MBR Screenings Facility would be equipped with two (2) in-channel 2-mm drum screens - one duty and one standby. Provisions for the addition of a third screen would be provided for future expansion.

Alternative Analysis

The capital cost and the total present worth cost of the MBR alternative is slightly less than that for the CAS alternative as detailed in **Chapter 10**. In addition to costs, other factors are also important in the evaluation of the alternatives. The two alternatives are rated with respect to several key economic and non-economic criteria, each of which has been assigned an importance weighting factor. The criteria and the weighting factors were developed with the input and review of Manteca staff in an effort to assure that they appropriately reflect the interests and concerns of the City. The criteria, weighting factors, and ratings are shown in **Table ES-12** and discussed briefly below.

Costs: Three different cost criteria are included in **Table ES-12**. The Stage 1 capital cost is considered most important and is assigned a weighting factor of 20%, while the future expansion cost, which might occur 16 years after Stage 1 is less important with a weighting factor of 10%. The comparative annual cost was assigned a weighting factor of 5% in recognition of the fact that these costs are much less important than the capital costs in the overall present worth cost calculation.

Adaptability of Future Permit Requirements: If more stringent salinity limits are enforced in the future, reverse osmosis (RO) will be required and the MBR would provide the pretreatment step necessary for RO. Therefore, the MBR is considered to be more adaptable to future permit requirements. This criterion was assigned a weighting factor of 20% of the total ranking score.

Plant Footprint: The MBR alternative would have the smallest footprint. This was assigned a weighting factor of 10%.

Robustness and Reliability: Robustness and reliability represent the degree to which the process is resilient and can perform consistently well, even in problematic conditions, such as influent flow or load spikes, extreme weather, or other challenging biological process conditions. Because the membranes provide an absolute barrier to the escape of particulate matter from the biological treatment system, very consistent performance can be assured. With a biological treatment system that relies on sludge settling in a clarifier, such as conventional activated sludge, there can be much more variability in effluent quality, which would lead to a higher probability (although still low if properly designed and operated) of potential permit violations. This factor was assigned a weighting factor of 20%.

Ease of Operation: This criterion was given a weighting factor of 15%. There are many considerations that go into ease of operation. The MBR has the benefit of being highly automated and requiring minimal routine operator activity. Sludge settleability monitoring, clarifier sludge blanket monitoring, and adjustments to RAS rates to control the sludge blanket are not required in the MBR. However, an MBR system added in parallel with conventional treatment trains results in operation of two types of processes simultaneously, which is a complication. Considering all factors, the MBR is the highest rated alternative.

Table ES-12. Alternatives Rating and Ranking

Criterion	Weighting Factor %	Alternatives Ratings [1]	
		Alternative 1 CAS	Alternative 2 MBR
Stage 1 Capital Cost	20	10	9
Stage 2 Capital Cost	10	9	10
Annual Cost	5	10	6
Adaptability to Future Permit Requirements	20	8	10
Footprint	10	8	10
Robustness and Reliability	20	8	10
Ease of Operation	15	10	7
Overall Weighted Score [2]	100	8.90	9.15
Rank [3]		**2**	**1**

Notes:
[1] The highest rated alternative is assigned 10. Other alternatives are scored lower, according to the relative concerns.
[2] Summation of individual ratings multiplied by the corresponding weighting factors.
[3] The alternative with the highest score is ranked "1." Other alternatives are ranked according to their score.

Recommended Treatment Process Alternative

Based on the rankings shown in **Table ES-12**, the recommended alternative for WQCF Phase IV Expansion based on the detailed evaluation is Alternative 2 – MBR. While the MBR has a higher operating cost than conventional activated sludge, it has slightly lower capital costs, a smaller footprint and is more adaptable to future regulations.

ES.10.2 Recommended Phase IV Expansion Project

The following is brief description of the project recommendations by process area. A more detailed description including design criteria and figures to illustrate these recommendations is provide in **Chapter 10**. A site plan of the Recommended Phase IV Project is shown on **Figure ES-15.**

ATTACHMENT 3

Stantec

60" NORTH INFLUENT FLOW METERING MANHOLE, S1
NEW ACCESS ROAD AT INTERSECTION OF W YOSEMITE & SWANSON RD, S1
ROAD DEMO, S1
PARKING AREA, S1
MUNICIPAL UTILITIES BUILDING, S1
NEW GATES
BIOSOLIDS DRYING FACILITY, S2
BIOSOLIDS DRYING FACILITY, S1
COOLING TOWER 5, S2
COOLING TOWERS 1-4, S1
COOLING EFFLUENT BASIN, S1
MCC, S1
FOG RECEIVING STATION SCREENING SYSTEM, INT
DIGESTER CONTROL BUILDING, S1
DIGESTER, S1
DIGESTER, S2
DIGESTERS PRESSURE RELIEF VALVES PLATFORM & HANDRAILING, INSTALL NEW WASTE HEAT RADIATOR, DIGESTERS NO.1 AND NO.2 OVERFLOW BOXES, INT
NEW SIDESTREAM TREATMENT, INT
BULK FERRIC CHLORIDE SOLUTION TANKS, INT
BIO TOWERS DEMO, S1
HEADWORKS, IPS, BIOFILTER IMPROVEMENTS, INT
COOLING BASIN EFFLUENT PUMP 4, S2
COOLING BASIN EFFLUENT PUMP STATION, S1
PRIMARY EFFLUENT PUMP STATION, INT
NEW DAFT, S1
NEW DAFT, INT
REPLACE SECONDARY EFFLUENT EQUALIZATION POND LINER, INT
UV, INT
AERATED GRIT & PRIMARY SEDIMENTATION BASINS COVERS REPLACEMENT, INT
NEW WAS PUMPS, INT
INFLUENT PUMP, S2
INFLUENT PUMP, S1
INFLUENT PUMP, INT
NEW CENTRIFUGE, INT
NEW CENTRIFUGE, S2
NEW CENTRIFUGE, S1
HEADWORKS SCREEN NO.3 , INT
EFFLUENT PUMP, S1
EFFLUENT PUMP, S2
CHECK VALVE, S1
NORTH AND SOUTH AERATION BASIN IMPROVEMENTS, INT
SPLITTER STRUCTURE, S1
NEW RAS PUMPS, INT
AERATED GRIT & PRIMARY SEDIMENTATION BASINS COVERS REPLACEMENT, INT
AERATION BASINS, S1
PSB, S1
AERATED GRIT TANKS, S1
PSB, S2
AERATED GRIT TANKS, S2
BLOWER AND EQUIPMENT BUILDING, S1
MBR, S1
60" SOUTH INFLUENT FLOW METERING MANHOLE, S1
FINE SCREENS, S1
FINE SCREENS, S2
BLOWER AND EQUIPMENT BUILDING, S2
MBR, S2

N

0 80 160 240 320 400 FEET

LEGEND

- INT Interim - 8.23 MGD
- S1 Stage 1 - 12.87 MGD
- S2 Stage 2 - 17.5 MGD

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Figure ES-15

Site Plan of Recommended Phase IV Expansion Project

Influent Flow Meters

It is recommended to install new flow meters upstream of the return of the in-plant recycle streams to measure the true influent flows (one on both the north trunk and south trunk of the sanitary sewers entering the WQCF).

Headworks and Influent Pump Station

In addition to the pump recommended to be installed during the Interim Improvement Projects, the Phase IV Expansion project will require one new IPS pump for Stage 1 and an additional IPS pump for Stage 2. At the Stage 2 peak flow of 32.59 Mgal/d, the velocity in the 30-inch force main would be 10.3 fps, which will incur significant headloss. Therefore, for the Stage 2 expansion, it is recommended to also install a parallel 30-inch force main to the Southside Plant.

Aerated Grit Tanks

The Phase IV Expansion Project will require 2 new Aerated Grit Tanks for Stage 1 and additional 2 tanks for Stage 2.

Primary Sedimentation Basins

The Phase IV Expansion Project will require 2 new Primary Sedimentation Basins for Stage 1 and additional 2 for Stage 2. It is expected that the four additional primary sedimentation tanks will be constructed at the Southside Plant.

New Membrane Bioreactors (MBRs)

The proposed MBR for the Phase IV Expansion Project is based on two 4.65 Mgal/d stages. Each 4.65 Mgal/d expansion stage will consist of two biological trains and two membrane tanks. Membrane sizes and costs are based on a preliminary proposal by Veolia. To allow competitive bidding by multiple MBR manufacturers, an evaluated bid pre-selection process is recommended before selecting a final MBR system which would be used to develop detailed construction drawings and specifications for the overall construction of the wastewater treatment plant expansion.

Biosolids Handling and Disposal Facilities

Sludge thickening facilities are currently comprised of two DAFTs and a third DAFT is recommended to be installed during the Interim Improvement Projects. The Phase IV Expansion Project will require one new DAFT for the Stage 1 project to meet the estimated peak month flow (no additional DAFTs are needed for the Stage 2 project). The fourth DAFT is proposed to match the design of existing DAFTs.

Sludge dewatering facilities are currently comprised of two small centrifuges. A third larger centrifuge is recommended to be installed during the Interim Improvement Projects. Since the existing Dewatering Building only has space for three centrifuges, the Phase IV Expansion Project will require replacement of the existing two small centrifuges with larger centrifuges to avoid having to expand the Dewatering

Building. One centrifuge will be replaced for Stage 1 and the second existing centrifuge will be replaced for Stage 2.

A fifth and sixth digester is required for Stage 1 and Stage 2 of the Phase IV Expansion project, respectively. The fifth and sixth digesters are proposed to have a 65 ft diameter to hold 662,000 gallons of sludge. The existing Digester Control Building will be expanded and include sludge control equipment, sludge transfer pumps, hot water equipment, heated sludge pumps, plant air system, and the biogas management system.

Biosolids disposal alternatives were evaluated in the Biosolids and Biogas Utilization Plan by HERWIT Engineering, April 2016. The recommendation from this study is to process the biosolids to Class A, or to Exceptional Quality (EQ) criteria. This is most easily achieved by drying dewatered biosolids from the centrifuge to greater than 75% solids. The benefit of this is additional flexibility in reuse, and reduction in biosolid hauling costs. This level of processing allows for sales to the public, and reuse of the product in City landscaping. Site space at the WQCF should be preserved to allow for future drying options as shown on **Figure ES-15**.

Effluent Cooling and Disposal

The existing NPDES permit currently limits the maximum flow capacity to 9.87 Mgal/d average dry weather flow before cooling the effluent is required. This requirement is based on hydrodynamic and thermal modeling studies of the San Joaquin River in 2006 and 2008. A comparison of recent effluent discharge and river temperatures from 2016 through 2021 has shown an increase in the temperature difference between the plant effluent and the river of 2°F to 5°F over what was used for all previous modeling. Therefore, a new river temperature study is recommended before proceeding with the design of the effluent cooling system.

Instead of constructing cooling towers as recommended in the previous studies, effluent could be used for groundwater recharge to help mitigate overdraft of the Eastern San Joaquin Groundwater Basin. However, because of the relatively shallow depth to groundwater in the Manteca area, this use is not considered feasible in the central Manteca area. An export pump station and pipeline several miles in length would have to be constructed to an area of the basin with a greater groundwater deficit. As discussed in the Reclaimed Water Facilities Master Plan (Woodard & Curran, January 2023), this alternative has not been carried forward to the level of project alternative development but could be studied further in the context of the Sustainable Groundwater Management Act of 2014 which will require implementation of a Groundwater Sustainability Plan in the region.

Another potential alternative to the cooling towers is tertiary storage ponds where natural cooling can occur. A model was developed to estimate the magnitude of heat losses and gains by various mechanisms. Heat loss to the environment is dependent on the altitude, ambient air temperature, humidity, wind speed, and cloud coverage. Monthly average values for these parameters in Manteca were used. Since these calculations are not exact, a pilot study would be required to verify cooling effectiveness by this method before embarking on the construction of a full-scale tertiary storage ponds.

If a suitable groundwater recharge project is not found and effluent cooling basins can't provide sufficient cooling, then effluent cooling towers are recommended. Because the plant must comply with the permit at all times, a redundant cooling tower is recommended to allow maintenance of the cooling towers. Cooling towers are sized based on total effluent flow. To provide blending of the cooling tower effluent for temperature averaging, a cooling effluent storage basin will be constructed for storing the cooled effluent before delivery to the San Joaquin River. A new pump station will be required to pump the cooled effluent from the basin through the existing outfall pipeline to the San Joaquin River.

New Municipal Utilities Building and Entrance Road

The WQCF has inadequate building space for the existing plant staff. New building space will also be required for additional staff to operate and maintain new treatment facilities for the next plant expansion. To provide the required building space, it is recommended that a new Municipal Utilities Building be constructed at the WQCF. The proposed building, as shown on **Figure ES-15,** would be located adjacent to a new entrance road at the northeast end of the WQCF property just south of the intersection of West Yosemite Avenue and Swanson Road where a new intersection with traffic signal lights is being planned.

The proposed Municipal Utilities Building will serve all departments in public works including water, solid waste, and wastewater. The estimated construction cost (in current dollars) is $30M which will be shared equally between the three departments.

The recommended project will also include an asphalt paved parking lot for the building and automated road access gates on the entrance road after the building to restrict public access to the main treatment plant as shown on **Figure ES-15**.

ES.10.3 Phase IV Expansion Costs

Preliminary estimates of total project costs are presented in the following **Table ES-13**. Construction costs were developed using costs for similar construction at other wastewater treatment plants and equipment manufacturer quotes. These costs are based on an Engineering News Record Construction Cost Index (ENRCCI) 20-Cities Average of 13,176 (representing costs in March 2023 dollars).

The total project costs (including project construction, engineering, administration, and construction management) are estimated at $146.3 million and $70.6 million for the Stage 1 and Stage 2 expansions, respectively. It should be noted that these costs will have to be escalated as appropriate to get costs at the actual times of construction.

Table ES-13. Phase IV Expansion Project Costs

Description	Stage 1 Project Cost	Stage 2 Project Costs
Influent Flow Meter	$896,000	$0
Influent Pumps	$597,000	$989,000
Aerated Grit Tanks at Southside Plant	$1,055,000	$1,055,000
Primary Sedimentation Basins at Southside Plant	$4,611,000	$4,611,000
Extend Aeration Basins at Southside Plant	$936,000	$0
Splitter Structure	$468,000	$63,000
Fine Screens for MBRs	$2,802,000	$900,000
MBRs Structure & Equipment	$15,399,000	$15,399,000
MBR Blower Building and Equipment	$1,878,000	$1,878,000
Effluent Pump Station Expansion & Pumps	$806,000	$582,000
Cooling Effluent Basin	$2,013,000	$0
Effluent Cooling Towers	$11,835,000	$2,555,000
Cooling Basin Effluent Pump Station	$2,658,000	$582,000
DAFTs	$2,240,000	$0
Biotower Demolition	$500,000	$0
Anaerobic Digesters	$2,660,000	$2,660,000
Digester Control Building Extension & Equipment	$1,095,000	$255,000
Centrifuge and Ancillary Equipment	$2,923,000	$2,923,000
Municipal Utilities Building and Entrance Road	$10,685,000	$0
Biosolids Drying Facilities	$17,308,000	$5,769,000
Subtotal Construction Estimate	**$83,365,000**	**$40,221,000**
Construction Estimating Contingency @30%	$25,010,000	$12,066,000
Construction Cost with Contingency	**$108,375,000**	**$52,287,000**
Engineering, CM, and Admin @35%	$37,931,000	$18,300,000
Total Project Cost	**$146,306,000**	**$70,587,000**

Key:
MBR = Membrane Bioreactor
DAFT = Dissolved Air Flotation Thickener
CM = Construction Management

ES.11 STAFFING PLAN

The WQCF will undergo Interim capacity improvements that will increase capacity to 8.23 Mgal/d and then a proposed Phase IV Expansion in two stages. Stage 1 will expand the WQCF treatment capacity from about 8.23 Mgal/day to 12.9 Mgal/day and Stage 2 will expand it to a capacity of 17.5 Mgal/day.

The purpose of this chapter is to estimate the manpower requirements to operate the collection and treatment systems and to discuss the personnel qualifications, responsibilities, and certifications. Further, this chapter provides recommendations on staffing levels needed to manage the future WQCF and sewer collection infrastructure.

A summary of the staffing recommendations for before and after the expansions detailed in **Chapter 11** are summarized in **Table ES-14**.

Table ES-14. Summary of Staffing Recommendations

Parameter	Persons			
	Existing	Recommended for Existing	Stage 1 (12.9 Mgal/d)	Stage 2 (17.5 Mgal/d)
WQCF Operations	8	10	13	13
WQCF Maintenance	10	10	13	16
Laboratory & Regulatory Compliance	5	7	8	8
SCADA	1	1	1	1
Collection System	10	13	14	15
Supervisory/Admin	11	12	12	12
Net Total	**45**	**53**	**61**	**65**

A total of eight (8) more FTE are recommended for the existing WQCF and collection system. After the Stage 1 expansion, total personnel will increase to a total of 61 and after the Stage 2 expansion it will increase to a total of 65. SCADA and Supervisory staff will experience no change during the expansions unless it is deemed necessary.

ES.12 CAPITAL IMPROVEMENT PROGRAM

This section highlights the content of Chapter 12, that presents a Capital Improvement Program (Program) that summarizes the Capital Improvement Projects (CIPs) identified in the previous chapters of this Master Plan. CIPs are presented chronologically to distribute costs over time in keeping with each project's criticality or other City priorities, but final project inclusion in the adopted City CIP and associated dates are approximate and adjustable. No CIP is final until acted on by the City Council.

This chapter is divided into the following sections:

- Background
- Project Prioritization
- Cost Estimating Methodology
- Proposed Capital Improvement Program

ES.12.1 Background

Based on the completed hydraulic modeling and evaluation of the City of Manteca's wastewater collection system and capacity assessment of the Manteca Wastewater Quality Control Facility (WQCF), a Capital Improvement Program (Program) was prepared. The Program includes recommended CIPs segmented into two categories: 1) Wastewater Collection System Projects (WCS), and 2) Wastewater Quality Control Facility Projects (WQCF).

ES.12.2 Project Prioritization

CIP prioritization is based on giving the highest priority to those projects that pose the most risk to the community. The priority raking is as follows: 1) The highest risk to the community is infrastructure that is in poor condition that could potentially cause failure such as a collapsed gravity sewer pipe or treatment process that is not functioning properly; 2) The second highest risk is failure to comply with regulatory requirements such as non-compliant wastewater discharged to the San Joaquin River subjecting the City to mandatory fines; 3) The third highest risk is limited capacity under current flows to convey and treat the wastewater such as gravity sewers that are surcharging at the manholes, 4) The fourth highest priority is limited capacity to serve future growth; and 5) The lowest priority are projects desired by City staff to improve operation and maintenance.

ES.12.3 Cost Estimating Methodology

A key element to the Program is determining budgets for each of the identified CIPs. The projects and associated costs identified herein are presented in March 2023 dollars (Engineering News Record Construction Cost Index [ENRCCI] of 13,176) and should be reviewed and updated on an annual basis using the ENRCCI or another recognized index.

Construction costs were developed based on a combination of equipment quotes supplied from manufacturers, bids on other City wastewater facilities projects, construction cost estimates from similar type construction projects, and standard cost estimating guidelines.

Soft costs include a 30 percent mark-up for construction cost estimating and a 35 percent mark-up of the total construction cost for engineering, construction management and administration.

ES.12.4 Proposed Capital Improvement Program

The wastewater collection system CIPs are listed in **Table ES-15** and WQCF CIPs are listed in **Table ES-16**. Project costs for each CIP (in 2023 dollars) and a rough estimated of the project's scheduled completion (fiscal year) are provided for each CIP. **Figure ES-16** shows the annual estimated expenditures for both wastewater CIP categories.

Table ES-15. Summary of Wastewater Collection System CIP Projects

CIP	Description	Project Costs	Scheduled Completion (FY)
Existing Wastewater Collection System Capacity Improvements			
WCS-01	W. Center Street Trunk	$4,880,000	2032
WCS-02	Elm/West North Street Trunk	$5,080,000	2032
WCS-03	10-inch East North Street Trunk	$1,660,000	2032
WCS-04	8-inch East North Street Trunk	$510,000	2032
Previously Identified Wastewater Collection System Improvements			
WCS-05	South Woodward Trunk Extension	$12,640,000	2032
WCS-06	Central Union Road Trunk Extension	$16,170,000	2027
WCS-07	North Trunk Extension on Airport Way	$34,340,000	2036
Future Wastewater Collection System Improvements			
WCS-08	S. Main Trunk to Evans	$7,180,000	2033
WCS-09	S. Airport Way and Yosemite Ave. (Fishback)	$3,100,000	2033
WCS-10	S. Airport Way Roberts Estates to Daniels	$1,750,000	2033
WCS-11	Yosemite Square Lift Station and Improvements	$12,880,000	2033
WCS-12	Austin Road Industrial Area Trunk	$20,810,000	2036
WCS-13	South Austin Road - Industrial Area	$5,780,000	2037
WCS-14	Yosemite Square Service Area	$4,240,000	2038
WCS-15	Oleander Avenue Extension/ S. Airport Way Sewer	$6,660,000	2037
WCS-16	Highway 99 Crossing at Northland Road	$9,310,000	2039
WCS-17	East Lathrop Road Trunk	$12,060,000	2041
WCS-18	Construct new 24-inch bypass sewer	$6,630,000	2040
WCS-19	Northland Road Branches	$6,350,000	2041
WCS-20	Louise/ Nehemiah Branches	$5,160,000	2041
WCS-21	South Union Road Extension	$4,590,000	2042
WCS-22	Cottage Avenue	$3,080,000	2043
WCS-23	North Shed Union Road Trunk	$13,130,000	2044
WCS-24	Manteca Junction Trunk	$3,730,000	2045
WCS-25	Lovelace Road - 99 Crossing	$18,090,000	2045
Ongoing Rehabilitation and Replacement Projects			
WCS-26	UPRR Right of Way and Ally Between Center Street and Yosemite	$489,000	2025
WCS-27	Moffat Boulevard and Main Street	$1,022,000	2025
WCS-28	Oak Street from Main Street to Willow Avenue	$98,000	2025
WCS-29	Sequoia Avenue from Oregon Street to Alley north of Nevada Street	$53,000	2025
WCS-30	Tidewater Bike Path from Sandalwood Lane to Louis Avenue	$348,000	2025
WCS-31	Walnut Avenue from the alley north of Nevada Street to the UPRR	$279,000	2025
WCS-32	St. Dominic's Drive from north of Yosemite Avenue to Golf Course	$29,000	2025
	Wastewater Collection System CIP Projects Total	**$222,128,000**	-

Table ES-16. Summary of WQCF CIP Projects

CIP	Description	Project Costs	Scheduled Completion (FY)
WQCF Capacity Assessment Interim Projects			
WQCF-01	North and South Plant WAS Pump Replacement Project	$2,827,000	2025
WQCF-02	South Plant RAS Pump Replacement Project	$1,652,000	2025
WQCF-03	North and South Plant Aeration Basins Improvements	$11,696,000	2026
WQCF-04	Sidestream Treatment System	$20,205,000	2029
WQCF-05	Add Centrifuge No. 3	$5,130,000	2027
WQCF-06	Add DAFT No. 3	$3,930,000	2027
Instrumentation and Electrical Improvements			
WQCF-07	I&E Core Supervisory Control and Data Acquisition (SCADA) System	$1,127,000	2027
WQCF-08	I&E Remote Site Process Logic Controller (PLC) Upgrades	$1,727,000	2027
WQCF-09	I&E PLC and Operator Interfaced Terminal (OIT) Replacement	$1,374,000	2030
WQCF-10	I&E Switchgear PLC Upgrades	$127,000	2028
Other Interim Improvement Projects			
WQCF-11	Add Influent Pump No. 5	$1,048,000	2025
WQCF-12	Lightweight Covers for Process Basins	$5,792,000	2030
WQCF-13	Headworks, IPS and Biofilter Improvements	$2,080,000	2027
WQCF-14	UV Disinfection System Upgrade	$15,583,000	2027
WQCF-15	Plant Water System Piping Modifications	$636,000	2025
WQCF-16	Replace Secondary Effluent Equalization Pond Liner	$2,101,000	2025
WQCF-17	Headworks Screen No. 3	$900,000	2028
WQCF-18	FOG Receiving Station Screening System	$200,000	2025
WQCF-19	Bulk Ferric Chloride Solution Tanks	$351,000	2025
WQCF-20	Digesters No. 1 and 2 Overflow Boxes	$706,000	2025
WQCF-21	Digester Pressure Relief Valves Platform & Handrailing	$205,000	2025
WQCF-22	Install New Waste Heat Radiator	$198,000	2025
WQCF Phase IV Expansion Project			
WQCF-23	WQCF Phase IV Stage 1 Expansion Project	$146,306,000	2031
WQCF-24	WQCF Phase IV Stage 2 Expansion Project	$70,587,000	2047
	WQCF CIP Projects Total	**$296,488,000**	-

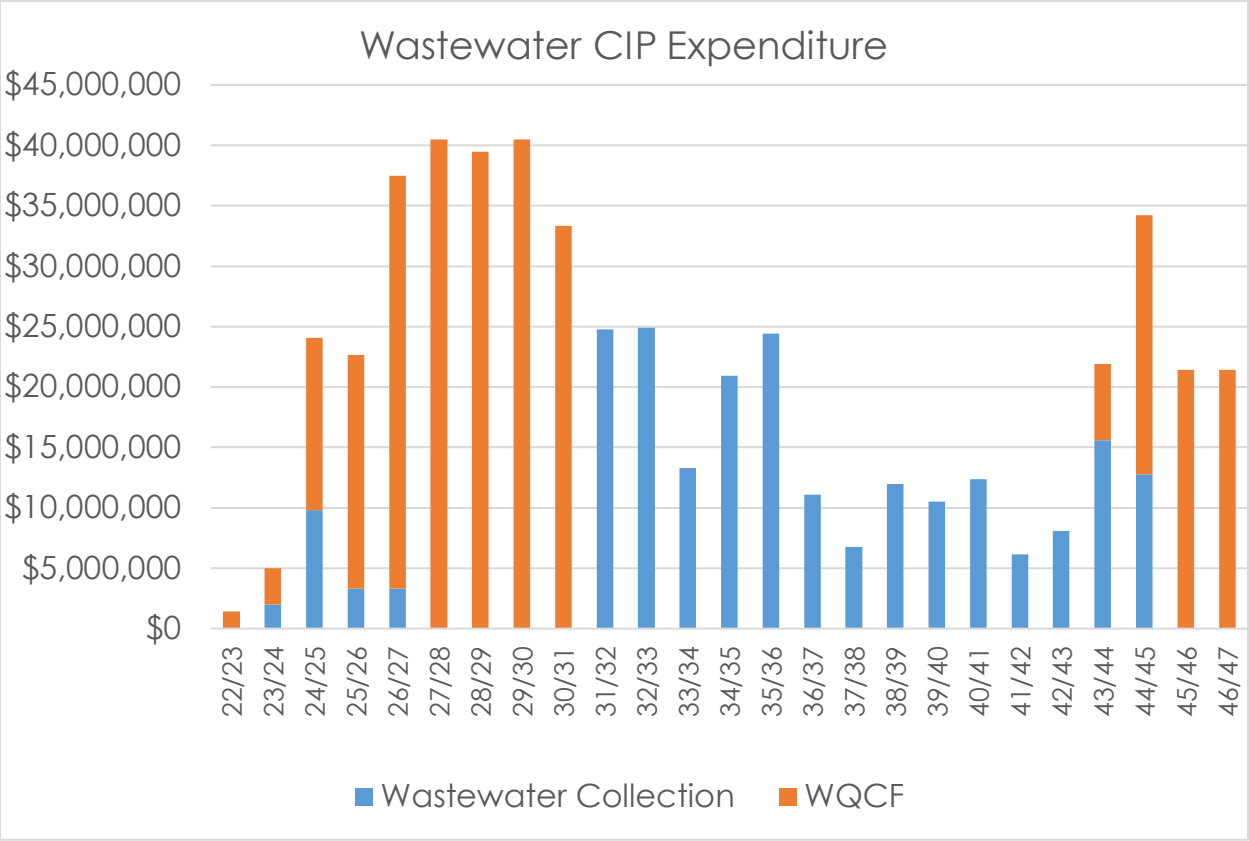


Figure ES-16. Proposed CIPs Annual Estimated Expenditures

The following is a bulleted summary of the recommendations presented in this Wastewater Master Plan:

ES.12.5 Conclusions and Recommendations

Key conclusions and recommendations from this WWMP include:

- The average per capita ADWF discharged to the WQCF is 61 gallons per person per day (gpcd). The United States Census Bureau identifies an average household density of approximately 3.19 persons per household, or persons per equivalent dwelling unit (EDU) within the City of Manteca and was used to translate the per capita flow into the ADWF unit rate of 195 gpd/EDU.
- The Manteca full build-out flow (see **Chapter 5**) is approximately 15.3 Mgal/d (ADWF). Adding Lathrop's flow contribution of 1.45 Mgal/d gives a total flow of 16.8 Mgal/d (ADWF). Master Planning for 17.5 Mgal/d (ADWF) would provide enough capacity for Manteca's full build-out flow plus Lathrop and other flow contributions from developments outside of the City such as Oakwood Shores and Raymus Village. Based on an annual population growth rate of 2.8% and assuming influent loadings to the WQCF increase proportional to population growth, 17.5 Mgal/d would provide capacity until FY 2057/2058 serving an equivalent Manteca population of 236,000.

- Based on the review of the previous wastewater collection system planning documents, the City has alternated between two collection system strategies: 1) The 2012 Master Plan strategy includes a shallower collection system with a number of interim and permanent sewage lift stations; and 2) The 2006 Master Plan strategy which includes deeper trunk sewers minimizing the overall need for sewage lift stations. This WWMP assumes a deeper trunk strategy to avoid major upgrades to the existing sewage lift stations that would be required to accommodate growth, and to reduce the maintenance costs associated with operating numerous pump stations in the system.

- The City recently completed a project replacing the North Trunk Sewer. The project replaced the 36-inch trunk sewer with a larger and deeper 54-inch sewer. The Central Trunk should be extended from the upstream point of the North Trunk project to bypass the Union Road Sewage Lift Station and allow flow from the Central Shed to flow by gravity to the WQCF. This project identified as the Central Union Road Truck Extension (WCS-06) in the Capital Improvement Program would allow decommissioning of the Union Road Sewage Lift Station which is beyond its useful life and in very poor operating condition.

- The alternative improvements recommended for the Woodward Park Sewage Lift Station include: 1) increasing the firm pumping capacity to meet the maximum inflow of approximately 2.8 Mgal/d by adding an additional pump to the station or swapping out the existing pumps, or 2) installing 4,030 LF of 36-inch sewer to extend the existing South Trunk in Woodward Avenue to reach the unused existing 36-inch sewer at the intersection of Woodware Avenue and S. Main Street. The recommended project (WCS-05) is to install the 36-inch sewer pipe which would eliminate the Woodward Park Sewage Lift Station and the Evan's Sewage Lift Station.

- Seven rehabilitation and replacement projects identified in **Chapter 6** were given the highest priority rating in the Capital Improvement Program due to the potential for failure such as a collapsed sewer pipe or sanitary sewer overflow due to blockage. It is recommended these projects be scheduled as soon as practical and to continue cleaning and inspecting the pipelines and manholes within the system at a rate of approximately 5% to 10% per year, respectively.

- A capacity study of the WQCF completed in 2021 determined immediate improvements to the WQCF that are needed for nitrogen removal. Without these improvements, the WQCF will be challenged to meet permit discharge requirements. The proposed improvements, including side-stream treatment to remove nitrogen from the digester centrate, will provide an estimated 8.23 Mgal/d of ADWF capacity.

- Measured influent flows at the WQCF include plant recycle flows and are not the true influent flow from Manteca's wastewater collection system and City of Lathrop. The measured influent flow at the WQCF includes plant recycle flows which are approximately 12% of the total measured flow. From December 2019 through November 2020, the City of Lathrop's average annual flow was 1.07 Mgal/d or 16.8% of the total true influent flow of 6.36 Mgal/d. Lathrop's flow limit, if they participate in funding their share of the proposed Interim Improvements, would increase to 1.21 Mgal/d (14.7% x 8.23 Mgal/d).

- Several other Interim Improvement projects to correct WQCF deficiencies are identified in Chapter 9. These projects, listed on **Table ES-11**, include safety items such as improving the ventilation system for the Headworks and Influent Pump Station, and permit compliance improvements such as upgrading the UV disinfection system.

- The recommended WQCF Phase IV Expansion Project to increase the plant capacity to 17.5 Mgal/d ADWF will be constructed in two stages. The first stage project scheduled for completion in FY 2030/2031, will add Membrane Bioreactors (MBRs) that will be operated in parallel with the existing Conventional Activated Sludge (CAS) treatment system. The project will also include in-kind expansion of pumps, aerated grit tanks, primary sedimentation basins, DAFT, dewatering equipment, digesters, and cooling towers.

- Instead of constructing cooling towers as recommended in the previous studies, effluent could be used for groundwater recharge to help mitigate overdraft of the Eastern San Joaquin Groundwater Basin. However, because of the relatively shallow depth to groundwater in the Manteca area, this use is not considered feasible in the central Manteca area. Further investigation of a suitable groundwater recharge site is recommended as the preferred alternative to cooling towers.

1.0 INTRODUCTION AND BACKGROUND

The purpose of this chapter is to present the Master Plan scope of work, study area, and background information.

This chapter includes the following:

- Scope of Work
- Study Area Definition
- Background Information and Review

1.1 SCOPE OF WORK

This Wastewater Master Plan (WWMP) summarizes the comprehensive evaluation of the capacity and condition of the City of Manteca's wastewater system's to safely convey and treat current and projected future wastewater flows and develop a sustainable and defendable plan to address level of service deficiencies through a prioritized long-term Capital Improvement Program (CIP).

The objectives of the WWMP include:

- Review and incorporate information, analysis, and recommendations from previous relevant studies and reports.
- Collect and analyze sewer flow data at various locations within the collection system to determine both dry weather wastewater generation characteristics and influence on flows during wet weather conditions. This was completed through a temporary flow monitoring study that collected in-sewer flow data over a period of approximately two months at 18 locations throughout the system, which was analyzed and used as a critical input to the hydraulic modeling analysis and basis for projecting flows from future City growth.
- Collect, analyze, and combine information from City supplied information including existing geographic information systems (GIS) databases, record drawings, operational information, and other related information to develop the representation of the collection system in a computational hydraulic model in the PCSWMM software. The flow data collected by the flow monitoring study as well as meter data obtained from the Wastewater Quality Control Facility (WQCF) was used as inputs to the model and the basis for calibration to varying flow conditions.
- Using the PCSWMM model, assess the capacity of the existing collection system to safely convey peak dry weather flows (PDWF) and peak wet weather flows (PWWF), identify locations within the existing system that do not meet the minimum level of service (LOS) criteria, and evaluate potential conceptual solutions to address the identified deficiencies.
- Conduct an evaluation of the capacity of the City's existing system to convey projected flows from future City growth areas and infill developments as identified in the General Plan, under

three future design horizon scenarios (near term, interim and build-out) and identify capacity deficiencies and potential improvement requirements to meet the same LOS criteria as evaluated for the existing system.

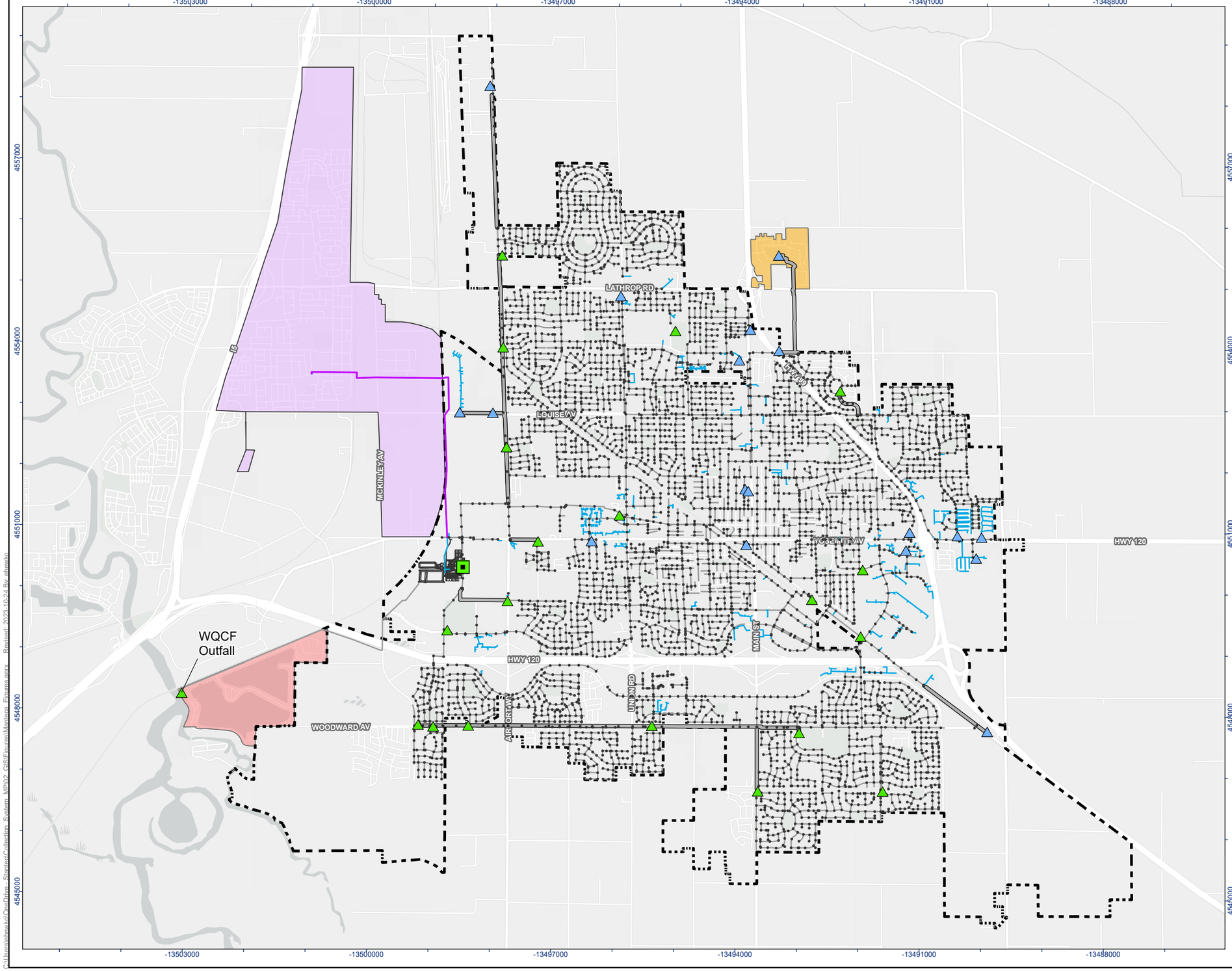
- Review the 2017 Condition Assessment Study and update the summary of recommended improvements from this study.
- Conduct an evaluation of the City's Wastewater Quality Control Facility (WQCF). The evaluation included 1) describing the WQCF background and regulatory requirements, 2) conducting a flow and load analysis (including a solids mass balance) to estimate the flows and loads needing to be treated under existing and future conditions, 3) assessing the WQCF existing facilities to determine what improvements (and the associated estimated budgetary project costs) are needed for the Interim Improvement Projects to meet permit requirements for the projected near-term flows and loads, and 4) determining improvements and associated estimated budgetary project costs that are needed for the Phase IV Expansion Project to increase the WQCF treatment capacity to 17.5 million gallons per day (Mgal/d).
- Prepare a prioritized Capital Improvement Plan (CIP) for strategic projects including capacity and rehabilitation upgrades to existing infrastructure and recommendations for construction of new infrastructure to meet system needs in the near-term (5 years) and long-term (20 years) along with conceptual opinions of probable construction costs (OPCC).

1.2 STUDY AREA

The City of Manteca (Manteca) is located in the Central Valley of California within San Joaquin County, approximately 70 miles east of San Francisco, with an estimated population of 85,792 people (Source: 2021 US Census). The City's Municipal Services Review cites a population growth rate of 3.8% between 2000 and 2010, and approximately 2.6% over the last decade. The growth rate used in this WWMP is 2.8% to conservatively reflect more recent trends. The existing City limits encompasses an area of 13,728 acres or approximately 21.5 square miles. The existing wastewater collection system includes residential (69%), commercial (8%), industrial (9%), municipal (9%), and mixed-use (4%) areas within the City and accepts flow from surrounding member jurisdictions.

Manteca operates and maintains the WQCF which accepts flows from the City of Manteca, City of Lathrop, Oakwood Shores, and Raymus Village in San Joaquin County. Manteca operates its own sewer collection system serving connections within City boundaries while member jurisdictions (Lathrop, Raymus Village, and Oakwood Shores) own and operate their own collection systems which convey wastewater flows to the City's collection system. Flow from the City of Lathrop discharges through a force main connecting to the north trunk influent sewer at Yosemite Avenue leading to WQCF influent headworks. Flow from Raymus Village discharges through a force main that ties into the existing system at Southland Road near Highway 99, and Oakwood Shores discharges through a force main that ties into the existing system at the intersection of Woodward Avenue and McKinley Avenue. **Figure 1-1** shows an overview of the existing sewer collection system.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain

Lift Station

- City Owned
- Privately Owned
- Sanitary Network
- Private Sanitary Network
- Water Quality Control Facility Structures
- City of Lathrop Discharge
- City of Lathrop Collection Boundary
- Raymus Village Collection Boundary
- Oakwood Shores Collection Boundary
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:50,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/24/2023
TR by MA on 10/24/2023
IR Review by MVD on 10/24/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
1-1

Title
Existing Sewer Collection System Overview

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Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

1.3 BACKGROUND INFORMATION AND REVIEW

The following provides a summary of the background information reviewed and incorporated into the development of this WWMP, including regulatory plans, service agreements, technical reports, and City planning documents.

1.3.1 Sewer System Management Plan (SSMP)

The City's collection system is currently permitted to operate under State Water Resources Control Board General Order No. 2006-0003-DWQ, Statewide General Waste Discharge Requirements for Sanitary Sewer Systems, which requires the City to develop and implement a Sewer System Management Plan (SSMP) that describes how the City operates and maintains the collection system in compliance with General Order requirements.

The SSMP describes how the collection system is operated and maintained and includes the following sections:

- Introduction
- Organization
- Overflow Response Plan
- Fats, Oils and Grease Control Program
- Legal Authority
- Operations and Maintenance
- Design and Construction Standards
- Capacity Management
- Monitoring, Measurement and Program Modifications
- Outreach and Communications Program
- Sewer System Management Plan – Summary of Recommendations

The City of Manteca's current SSMP dated January 8, 2020, is included in **Appendix A**.

The General Order 2006-0003-DWQ has been recently updated (December 6, 2022) with the adoption of Order WQ 2022-0103-DWQ, which became effective on June 5, 2023. The new Order can be viewed and downloaded via the State Water Resources Control Board Website.

In particular, the new Order contains the following notable reporting changes (among others):

- Annual reports (formerly the sewer system questionnaire) must be submitted by April 1st.
- All SSMPs must be updated on or before May 25, 2025, and at least every 6 years thereafter. There are also new requirements for the content of SSMPs, and SSMP documents must be uploaded in CIWQS.
- The first Program Audit under the new Order must be performed within 2 years of the last audit performed under the existing Order, and at least every 3 years afterward. Audit Reports must be uploaded in California Integrated Water Quality System, CIWQS.

- At a minimum the audit must:
  - Evaluate the implementation and effectiveness of the enrollee's SSMP in preventing spills;
  - Evaluate the Enrollee's compliance with the General Order;
  - Identify SSMP deficiencies in addressing ongoing spills and discharges to waters of the State; and
  - Identify necessary modifications to the SSMP to correct deficiencies.

1.3.2 Service Agreements

The City of Manteca provides sanitary sewer service to the City of Lathrop in accordance with a regional service agreement, most recently amended on May 26, 2016, originally signed on March 5, 1985. The terms of the current agreement outline the rights and responsibilities of each party, treatment capacities, costs, discharge limitations, and define the legal parameters associated with the regional treatment agreement. The agreement allocates 14.7 percent of the Manteca WQCF capacity to accommodate flows discharged to the plant from Lathrop. The City of Manteca maintains and operates the WQCF and its own wastewater collection system. Lathrop maintains its collection systems as well as its own wastewater treatment plant, the Lathrop Consolidated Treatment Facility which serves a portion of the City.

Lathrop's wastewater generated east of I-5 and north of Louise Avenue in the Historic Lathrop area is conveyed via gravity sewers and lift stations to a regional pump station, the O Street PS. Wastewater generated in industrial parcels located near McKinley Avenue is conveyed to the McKinley Avenue PS. Wastewater from the McKinley Avenue PS and O Street PS converge at the McKinley intertie, which is capable of sending converged flow via a 12-inch and/or a 16-inch diameter force main to the Manteca WQCF. These force mains discharge to the Manteca North Trunk sewer at Yosemite Avenue and also convey wastewater from the Louise Avenue and other private pump stations that serve the industrial areas east of I-5.

The City also provides sanitary sewer service to the Oakwood Lake Water District (which includes the Oakwood Shores Subdivision and the Islander Mobile Home Park) in accordance with a regional service agreement, amended in 2020, originally signed May 9, 2019. Like the agreement with Lathrop, the agreement outlines terms of the regional service agreement. The agreement includes the entitlement of up to 436 single family residences (Entitled Units) and related parks, semipublic sites, and open space facilities, together with any and all onsite and offsite private and public improvements. The agreement also entitles the 57 units within the Islander Mobile Home Park and allows as many as an additional 150 units ranging from low to high density residential that could possibly be approved by the County and included in the agreement.

In February 2022 the Oakwood Lake Water District commissioned new wastewater facilities and began to pump untreated wastewater to Manteca. This allowed the District to begin to decommission their existing wastewater treatment and disposal facilities. The new facilities include a pump station and an 8-inch force main that discharges to the existing City collection system at the intersection of West Woodward Avenue and South McKinley Avenue. This infrastructure was not included in the hydraulic model developed as part of this Master Plan.

1.3.3 2012 Collection System Master Plan

The City's previous Wastewater Collection System Master Plan Update (2012 Master Plan) was developed by NV5 Global Inc. in January 2013 as an update to the City's 2006 Wastewater Collection System Master Plan (2006 Master Plan). The 2012 Master Plan update incorporated current planning and sewer alignment information, revised wastewater generation factors (WGF), and updated construction costs.

The primary objective of the 2012 Master Plan was to ensure that the City's trunk sewer system can cost-effectively meet the demands of development goals adopted in the General Plan with appropriate consideration for construction costs and operation and maintenance issues. The 2012 Master Plan goals were to address:

1. Current and future land uses from the General Plan 2023 Policy Document.
2. Design of trunk sewers, force mains, pump stations, and lift stations to accommodate service areas.
3. Capacity of the trunk sewer system.
4. Phased capital improvement plan (CIP) for the proposed conveyance option.

The 2006 Master Plan proposed the construction of three large diameter trunk sewers to collect wastewater from the north, central, and south sections of the City for conveyance to an influent pump station located at the WQCF. This strategy of deep gravity trunk sewers was consistent with previous master plans.

The depth and size of trunk sewers required to implement the strategy set forth in the 2006 Master Plan presented significant capital costs. A revised conveyance strategy including a combination of gravity sewers, force mains, lift stations, and pump stations was evaluated as part of the 2008 Addendum to the Wastewater Collection System Master Plan (2008 Addendum).

The 2012 Master Plan updated the 2008 Addendum with current planning and alignment information, revised WGFs incorporating water conservation requirements and historic commercial and industrial water use data, and updated construction costs. The conveyance strategy evaluated as part of this 2012 Master Plan was to minimize pipe size and depth based on pipes flowing 70-80% full at peak flows with lift or pump stations constructed as needed to reach the trunk sewers.

The recommended overall trunk sewer strategy consisted of a combination of trunk sewer gravity collection system with pump or lift stations located along the alignment to convey wastewater to an influent pump station at the WQCF. The 2012 Master Plan presents recommended improvements in the following categories the North Manteca Collection Strategy (NMCS), South Manteca Collection Strategy (SMCS), and Central Manteca Collection Strategy (CMCS). The NMCS and SMCS will collect flow from areas where future growth is expected, including Sphere of Influence (SOI) areas, while the CMCS will connect the existing system to the NMCS.

1.3.4 Manteca General Plan Update

The City of Manteca adopted an update to their General Plan. The General Plan is a long-range planning document that is considered the City's "constitution" or blueprint, because it identifies the City's goals and vision for growth, traffic patterns, economic development, housing, and more. The General Plan is intended to serve the following purposes:

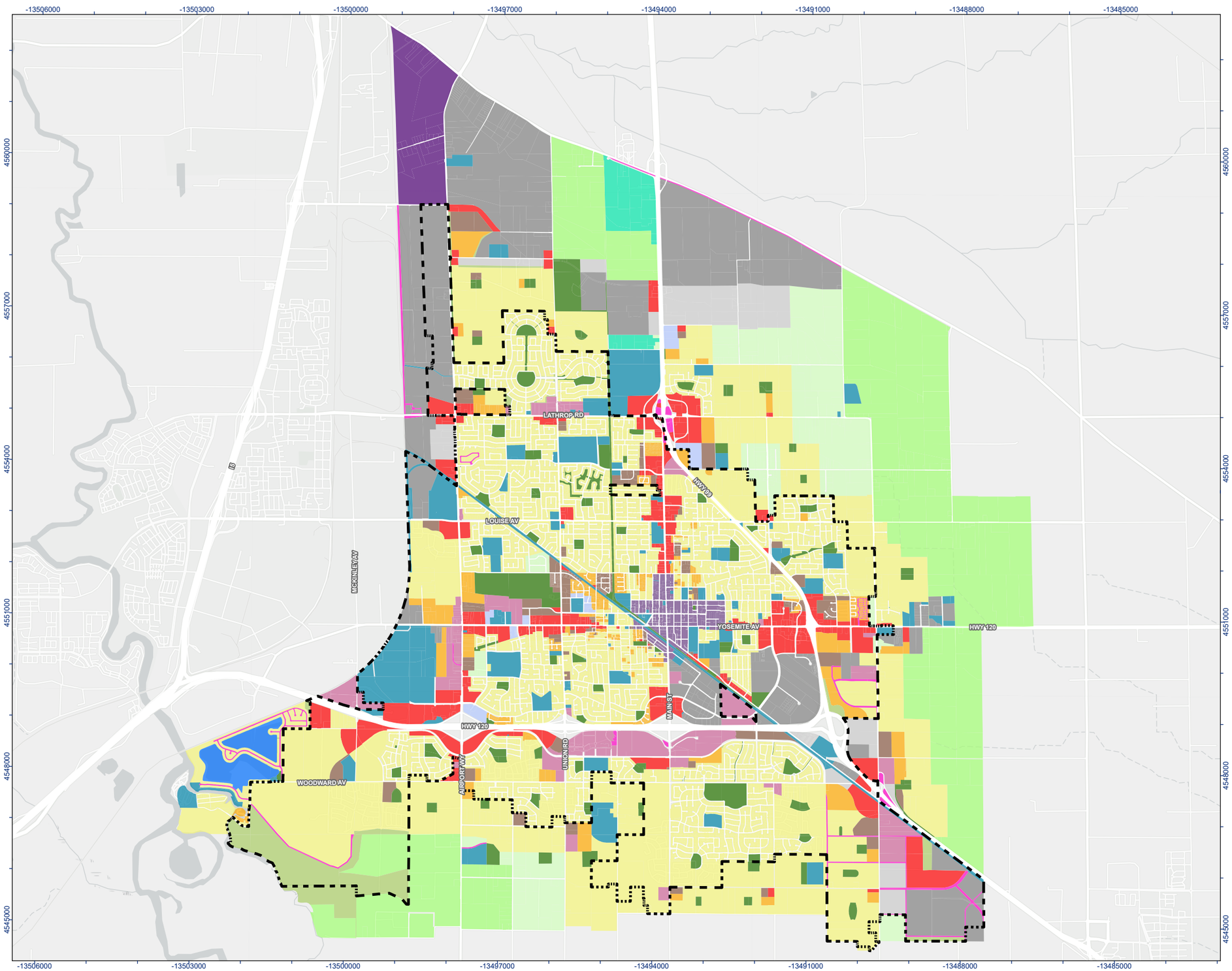
- To identify Manteca's land use, growth, transportation, environmental, economic, and social goals and policies as they relate to land use, conservation, development, and provision of community services and facilities.
- To enable the City Council and the Planning Commission to establish long-range conservation and growth goals and policies.
- To provide a basis for judging whether specific private development proposals and public projects are in harmony with these goals and policies.
- To inform citizens, developers, decision makers, and other jurisdictions of the policies that will guide development and conservation within the Manteca.

The General Plan process includes a comprehensive evaluation of the City's planning boundaries, including the City's Sphere of Influence (SOI). The City provided a copy of the Revised Public Review Draft of the Manteca General Plan Update (October 2022) report and GIS land use file for use in the initial development of this WWMP. The City provided subsequent updates and changes throughout the planning process and the final amended version of the General Plan land use was provided in January 2024. The City of Manteca's General Plan estimates a buildout population of 211,003 people. Land uses within the General Plan serve as the basis to estimate wastewater flow rates from future development. The total acreage, sorted by land use designation, within the existing City General Plan planning area is presented in **Table 1-1**. The City of Manteca General Plan land use map is shown on **Figure 1-2**.

Table 1-1. Manteca General Plan Land Use

Land Use Description	Area (Acres)
Agricultural Industrial	232
Agriculture	4,004
Business Industrial Park	584
Business Professional	83
Commercial	1,205
Commercial Mixed Use	673
Downtown	160
High Density Residential	477
Industrial	3,143
Low Density Residential	8,766
Medium Density Residential	701
Not in Planning Area	473
Open Space	475
Park	808
Public/Quasi-Public	1,375
Right of Way	179
Very Low Density Residential	1,267
Water	180
Total	**24,784**

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

City of Manteca Limit

Land Use Designation

- AI - Agricultural Industrial
- AG - Agriculture
- C - Commercial
- CMU - Commercial Mixed Use
- DW - Downtown
- VLDR - Very Low Density Residential
- LDR - Low Density Residential
- MDR - Medium Density Residential
- HDR - High Density Residential
- BIP - Business Industrial Park
- BP - Business Professional
- I - Industrial
- OS - Open Space
- P - Park
- PQP - Public/Quasi-Public
- ROW - Right Of Way
- Water
- Not in Planning Area

N

0 0.5 1 Miles

(At original document size of 11x17)
1:60,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 2/7/2024
TR by MA on 2/7/2024
IR Review by MVD on 2/7/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
1-2

Title
Manteca General Plan

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2.0 EXISTING WASTEWATER COLLECTION SYSTEM

This chapter provides an overview of the City's existing wastewater collection system. The information presented in this chapter is based on the review of previous studies, design reports, maps, plans, operating records, GIS data, and discussions with City staff. This chapter also presents existing sewer flows and population data, including data collected as part of the collection system flow monitoring study.

This chapter is divided into the following sections:

- Collection System Overview
- Existing Sewer Flows

2.1 COLLECTION SYSTEM OVERVIEW

The Manteca WQCF is located southwest of downtown Manteca at 2450 West Yosemite Avenue. The WQCF treats typical municipal wastewater generated in the City of Manteca (City) and the neighboring City of Lathrop, which is discharged upstream of the WQCF influent meter at the intersection of the North Trunk sewer and Yosemite Avenue. A separate industrial line accepts food processing wastewater seasonally from Eckert Cold Storage from May through November.

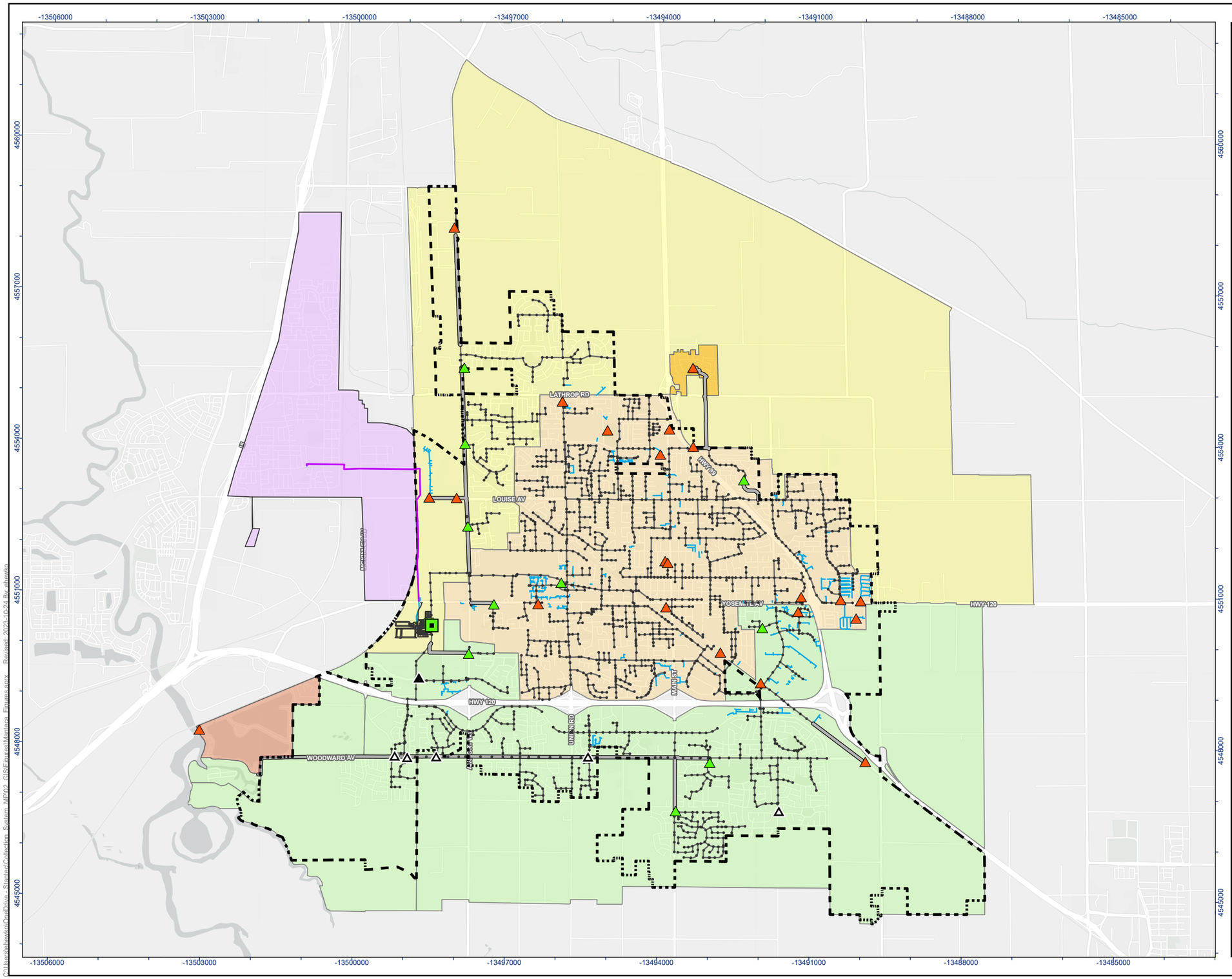
The existing collection system consists of approximately 250 miles of 4-inch to 60-inch diameter gravity sewers, 3- to 24-inch diameter force mains, and a number of lift and pump stations. Information regarding these conveyances and facilities, as reported by the City's GIS database and provided by City staff, is presented in the following sections. It is understood that these GIS databases may be subject to revision and confirmation, additional information regarding the City's GIS database is provided in **Section 3.2**. All pipeline quantities discussed exclude lines indicated as either inactive or abandoned in the City's GIS database.

2.1.1 Service Areas

The City's Wastewater Quality Control Facility (WQCF) serves the City of Manteca, City of Lathrop, Oakwood Shores, and Raymus Village in San Joaquin County. According to the 2020 SSMP the City provided service through approximately 19,500 connections to a population of approximately 81,345. The City's sewer service area is contiguous with city limits and is divided into North, South, and Central service sewershed areas. The North Shed contributes 10 percent, the South Shed contributes 30 percent, and the Central Shed contributes 60 percent of the total flow.

Figure 2-1 shows the boundaries of the different service areas.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain

Lift Station Status

- Active
- Unmodeled
- Inactive
- Abandoned

- Modeled Sanitary Sewer
- Private Sanitary Network
- Water Quality Control Facility Structures
- City of Lathrop Discharge
- Oakwood Shores Collection Boundary
- Raymus Village Collection Boundary
- City of Lathrop Collection Boundary

Service Area

- Central Shed
- North Shed
- South Shed
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/24/2023
TR by MA on 10/24/2023
IR Review by MVD on 10/24/2023

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Wastewater Servicing Master Plan

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Figure No.
2-1

Title
Sewer Collection System and Service Area

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2.1.1.1 Central Service Area

The majority of the collection system serves the core of the City (Central Shed), approximately bounded by SR-120 to the south, Austin Road to the east, Airport Way to the west, and Lathrop Road to the north. Subdivisions located on the perimeter of the Central Shed have installed temporary pump stations, which have or will be decommissioned upon connection to gravity trunk sewers. Within the Central Shed, the majority of the collection system flows by gravity to the Union Road Pump Station (URPS). Downstream of the URPS, wastewater flows to the WQCF by gravity.

2.1.1.2 North Service Area

The North Shed includes the City planning area north of SR120 and Yosemite Avenue outside of the Central Shed. Much of the predicted development is within the North Shed which is largely undeveloped and lacking infrastructure needed to serve the area. Primary infrastructure in the North Shed includes the North Trunk gravity sewer which receives flow from the Central Shed as well as discharge flow from lift stations that exist within the North Shed. These lift stations include Centerpoint, Woodbridge Park, Chadwick, Villa Ticino, and private lift stations on E. Louise Avenue. A private lift station at Raymus Village Park also exists within the North Shed but discharges to a manhole in the Central Shed at Southland Road along with another private lift station serving a small subdivision on S. Frontage Road.

2.1.1.3 South Service Area

The South Shed includes the City planning area south of SR120 and Yosemite Avenue outside of the Central Shed. Like the North Shed, much of the South Shed remains undeveloped, though many subdivisions have been constructed and expanded along the Woodward Avenue corridor in the last 10 to 15 years. The Oakwood Shores subdivision recently decommissioned its onsite treatment system and started pumping wastewater to the South Shed. Primary infrastructure in the South Shed includes the South Trunk gravity sewer and smaller gravity sewers, force mains, and lift stations along Woodward Avenue. Many of these lift stations were considered temporary and have been taken out of service. A 36-inch gravity sewer in Woodward Avenue has allowed for many of the temporary pump stations to be decommissioned, including Airport Road, Tara Park, Belle Vista, and Antigua. The primary active pump stations in the South Shed include the Woodward Park and Evans Estates pump stations. Several subdivisions are currently being constructed in the western portion of the service area along with a new regional lift station.

The total acreages of the north, central, and south service areas including developed and undeveloped portions are summarized in **Table 2-1** from City GIS data.

Table 2-1. Collection System Service Areas

Service Area	Developed (Acres)	Undeveloped (Acres)	Total (Acres)
North	1,166	9,136	10,302
Central	3,365	717	4,082
South	1,990	7,927	9,917
Total:	**6,521**	**17,780**	**24,301**

2.1.2 Gravity Sewers

The City's existing wastewater collection system comprises approximately 250 miles of gravity sewers ranging from 4-inch diameter to 60-inch diameter. **Table 2-2** provides a summary of gravity sewers by diameter. As shown in **Table 2-2**, the majority of existing gravity system is comprised of 6-inch and 8-inch diameter sewers (77%). Approximately 2% of the sewers are of unknown diameter or have a reported diameter that is shown as non-standard and could therefore possibly have been misreported. Pipe diameters within the collection system are shown graphically in **Figure 2-2**.

Table 2-2. Gravity Mains by Diameter[1]

Pipe Diameter (in)	Length (ft)	Portion of Total Length (%)
4	1,330	0.1
6	719,713	54.6
8	293,358	22.3
10	78,243	5.9
12	58,893	4.5
15	32,953	2.5
18	19,609	1.5
21	9,239	0.7
24	13,211	1.0
27	1,100	0.1
30	17,772	1.3
36	37,073	2.8
42	5,777	0.4
48	5,119	0.4
54	1,614	0.1
60	2,670	0.2
Unknown/Non-Standard	20,121	1.5
Total	**1,317,795**	**100**

Note:
[1] Data summarized from the City of Manteca's GIS sanitary sewer line shapefile (wwConveyance.shp), March 2022. Excludes pipes designated as inactive or abandoned.

The gravity sewer materials are summarized in **Table 2-3** and shown in **Figure 2-3**. The most common sewer pipe materials are polyvinyl chloride (PVC) and vitrified clay pipe (VCP), which combined account for almost 88% of the system by pipe length. Roughly 4% of the system consists of reinforced concrete pipe (RCP), less than 2% is of unidentified material, and the remaining 6% is of various other pipe materials.

Table 2-3. Gravity Mains by Pipe Material [1]

Pipe Material	Length (ft)	Portion of Total Length (%)
Polyvinyl Chloride (PVC)	707,620	53.7
Vitrified Clay (VCP)	450,453	34.2
Reinforced Concrete (RCP)	57,000	4.3
Steel Pipe (SP)	35,732	2.7
Asbestos Cement Pipe (ACP)	11,907	0.9
Acrylonitrile Butadiene Styrene (ABS)	8,009	0.6
Ductile Iron Pipe (DIP)	7,324	0.6
Cast Iron Pipe (CIP)	6,280	0.5
Unknown Material	22,149	1.7
Other / Unknown	11,321	0.9
Total	**1,317,795**	**100**

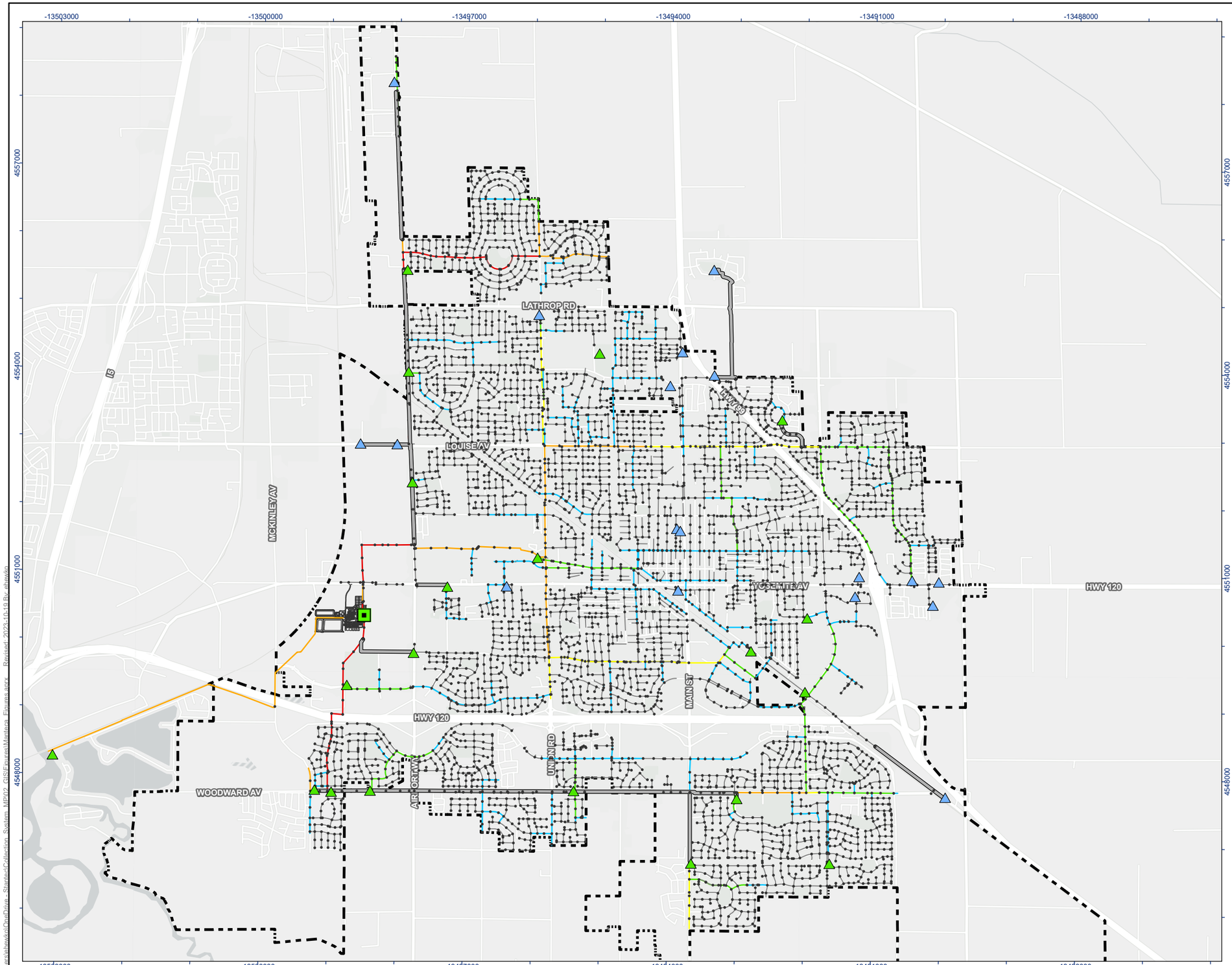
Note:
[1] Data summarized from the City of Manteca's GIS sanitary sewer line shapefile (wwConveyance.shp), March 2022. Excludes pipes designated as inactive or abandoned.

The installation years of gravity mains are summarized in **Table 2-4** and presented on **Figure 2-4**. According to the GIS database, approximately 14% of the system was constructed between 1951 and 1975, 29% was constructed between 1976 to 2000, and 40% of the system was constructed after the year 2000 or within the last 22 years. Data on installation year is limited for sewers constructed prior to 1951, the earliest installation year listed as 1906. Less than 1% of the system is identified as being constructed between 1906 and 1925 and approximately 17% of the system has an unknown installation year.

Table 2-4. Gravity Mains by Installation Year [1]

Installation Year	Age (Years)	Length (ft)	Portion of Total Length (%)
1906 to 1925	117 – 98	6,829	0.5
1926 to 1950	97 – 73	0	0.0
1951 to 1975	72 – 48	185,417	14.1
1976 to 2000	47 – 23	377,714	28.7
2001 to present	22 – 0	530,002	40.2
Unknown	Unknown	217,833	16.5
Total		**1,317,795**	**100**

Note:
[1] Data summarized from the City of Manteca's GIS sanitary sewer line shapefile (wwConveyance.shp), March 2022. Excludes pipes designated as inactive or abandoned.



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MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain

Lift Station

- City Owned
- Privately Owned
- Water Quality Control Facility Structures

Wastewater Sewer Diameter (inches)

- 0" - 8"
- 9" - 12"
- 13" - 18"
- 19" - 24"
- 25" - 36"
- 37" - 60"
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

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2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

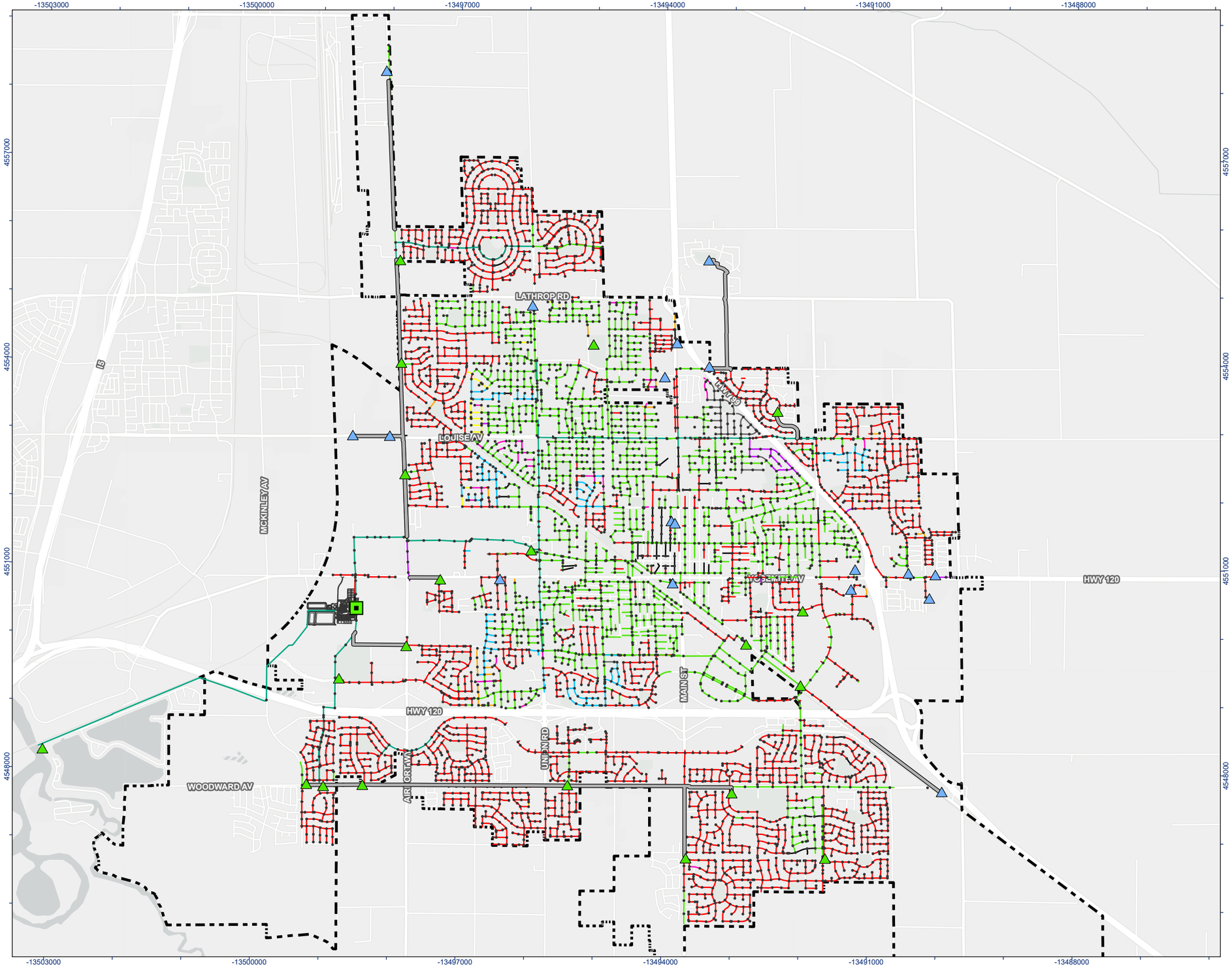
Figure No.
2-2

Title
Existing Sewer Collection System Pipe Size

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain

Lift Station

- City Owned
- Privately Owned
- Water Quality Control Facility Structures

Waterwater Sewer Material

- Polyvinyl Chloride (PVC)
- Vitrified Clay (VCP)
- Reinforced Concrete (RCP)
- Steel Pipe (SP)
- Asbestos Cement Pipe (ACP)
- Acrylonitrile Butadiene Styrene (ABS)
- Ductile Iron Pipe (DIP)
- Cast Iron Pipe (CIP)
- Other Materials
- Unknown
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

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Project Location
Manteca,
California

Prepared by EH on 10/17/2023
TR by MA on 10/17/2023
IR Review by MVD on 10/17/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

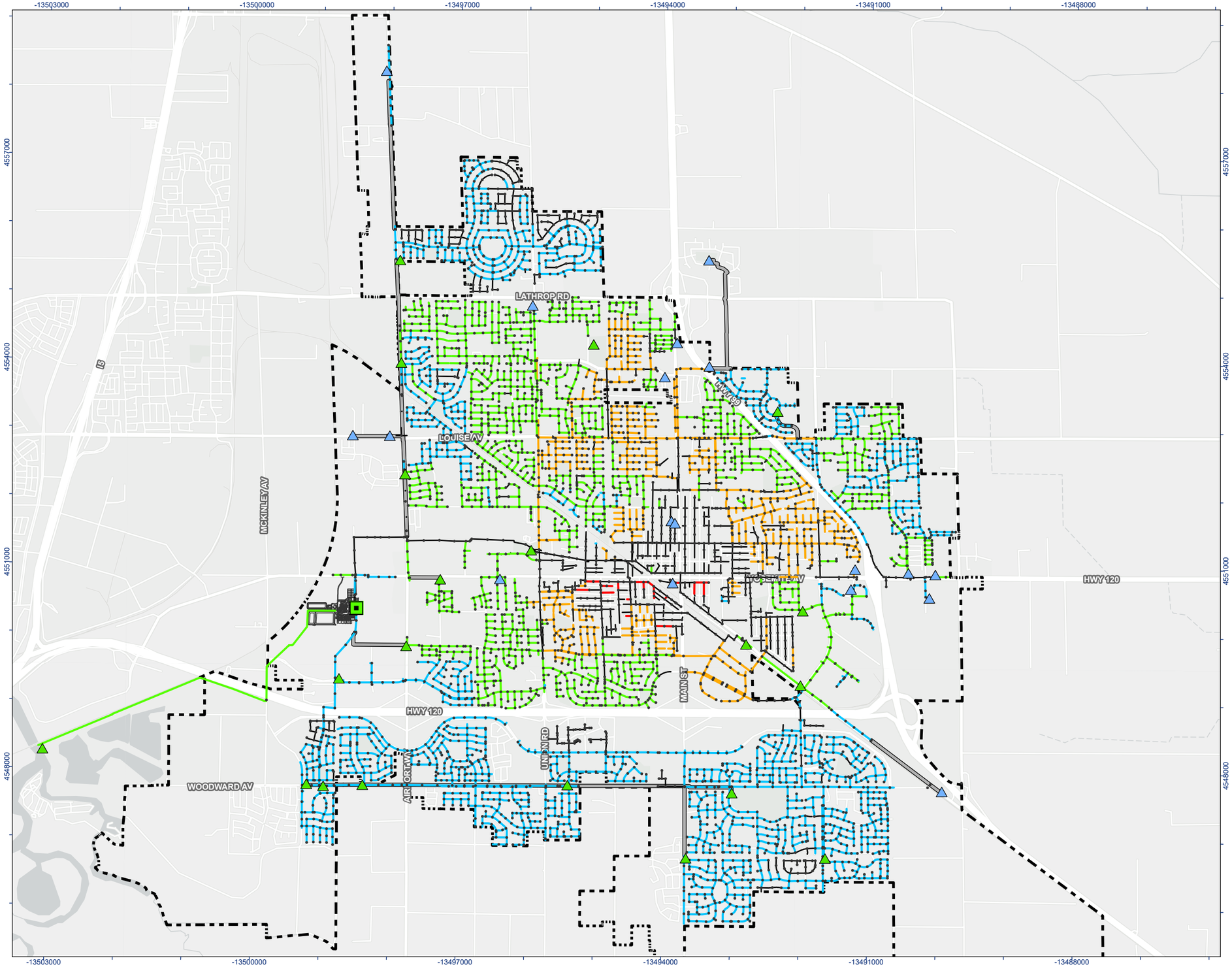
Figure No.
2-3

Title
Existing Sewer Collection System Pipe Material

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain

Lift Station

- City Owned
- Privately Owned
- Water Quality Control Facility Structures

Wastewater Sewer Installation Year*

- Unknown
- 1906 - 1925
- 1951 - 1975
- 1976 - 2000
- 2001 - 2020
- City of Manteca Limit

*No wastewater sewers were installed during 1926 to 1950.

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

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Project Location
Manteca,
California

Prepared by EH on 2/7/2024
TR by MA on 2/7/2024
IR Review by MVD on 2/7/2024

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City of Manteca
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Figure No.
2-4

Title
Existing Sewer Collection System Installation Year

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2.1.3 Force Mains

The existing collection system contains approximately 22 miles of active force mains ranging from 3-inch diameter to 24-inch diameter. Force main pipe diameters by pipe length are summarized in **Table 2-5**. Approximately 50% of force mains in the system are 12-inches in diameter, and 26% are 6-inches in diameter.

Table 2-5. Force Mains by Diameter [1]

Pipe Diameter (in)	Length (ft)	Portion of Total Length (%)
3	563	0.5
4	993	0.9
6	30,226	26.3
8	8,440	7.4
12	57,817	50.4
18	5,467	4.8
24	10,848	9.4
Unknown	450	0.4
Total	**114,804**	**100**

Note:
[1] Data summarized from the City of Manteca's GIS sanitary sewer line shapefile (wwConveyance.shp), March 2022. Excludes pipes designated as inactive or abandoned.

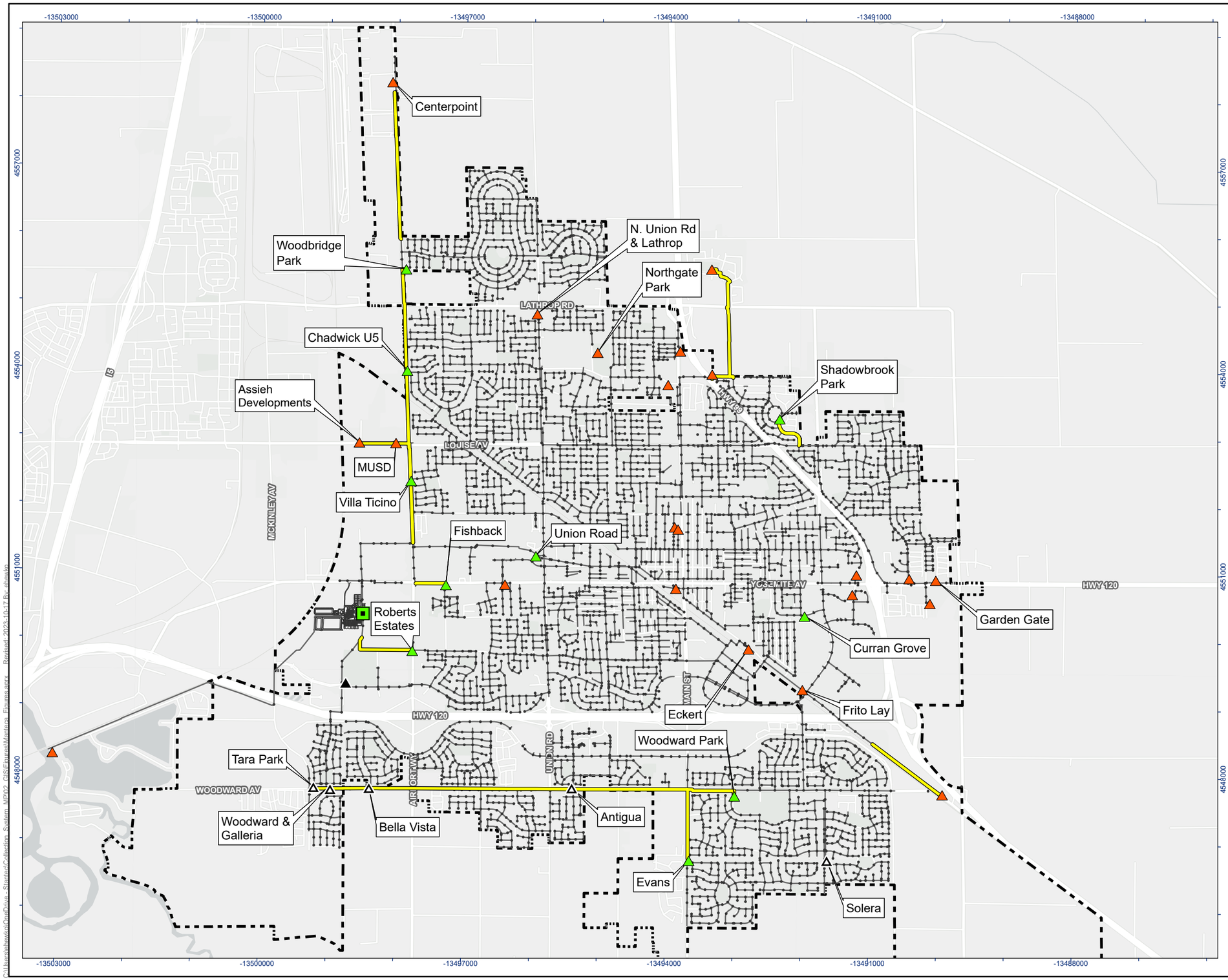
Approximately 83% of force mains are listed as having PVC pipe material by length, 4% are asbestos-cement pipe (ACP) material, 3% are high-density polyethylene (HDPE) pipe material, and 10% are of unknown material.

The installation year of collection system force mains are largely unknown based on the City's GIS data. Only 5% of force mains listed has being installed between 2016 and 2018, one pipe segment is listed as being installed in 2003, and the remaining 95% of active force mains have unknown installation years.

Sewer system force mains are shown on **Figure 2-5** in addition to pump stations and lift stations in the collection system.

2.1.4 Pump and Lift Stations

Pump stations and force mains in the collection system from the City's GIS database are shown on **Figure 2-5** and the service area of each station is shown in **Figure 2-6**. The City's GIS database includes 18 private and 21 city owned stations. One station was listed as abandoned and one was listed as being a wastewater flushing station. Limited data was available in the database. Therefore, key pump station information was taken from the City's SSMP, record drawings, discussions with City staff, and other available resources. A summary of data collected for the 18 major wastewater pump and lift stations is shown as **Table 2-6**.



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain
- Sanitary Network
- Water Quality Control Facility Structures

Lift Station Status

- Active
- Unmodeled
- Inactive
- Abandoned
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

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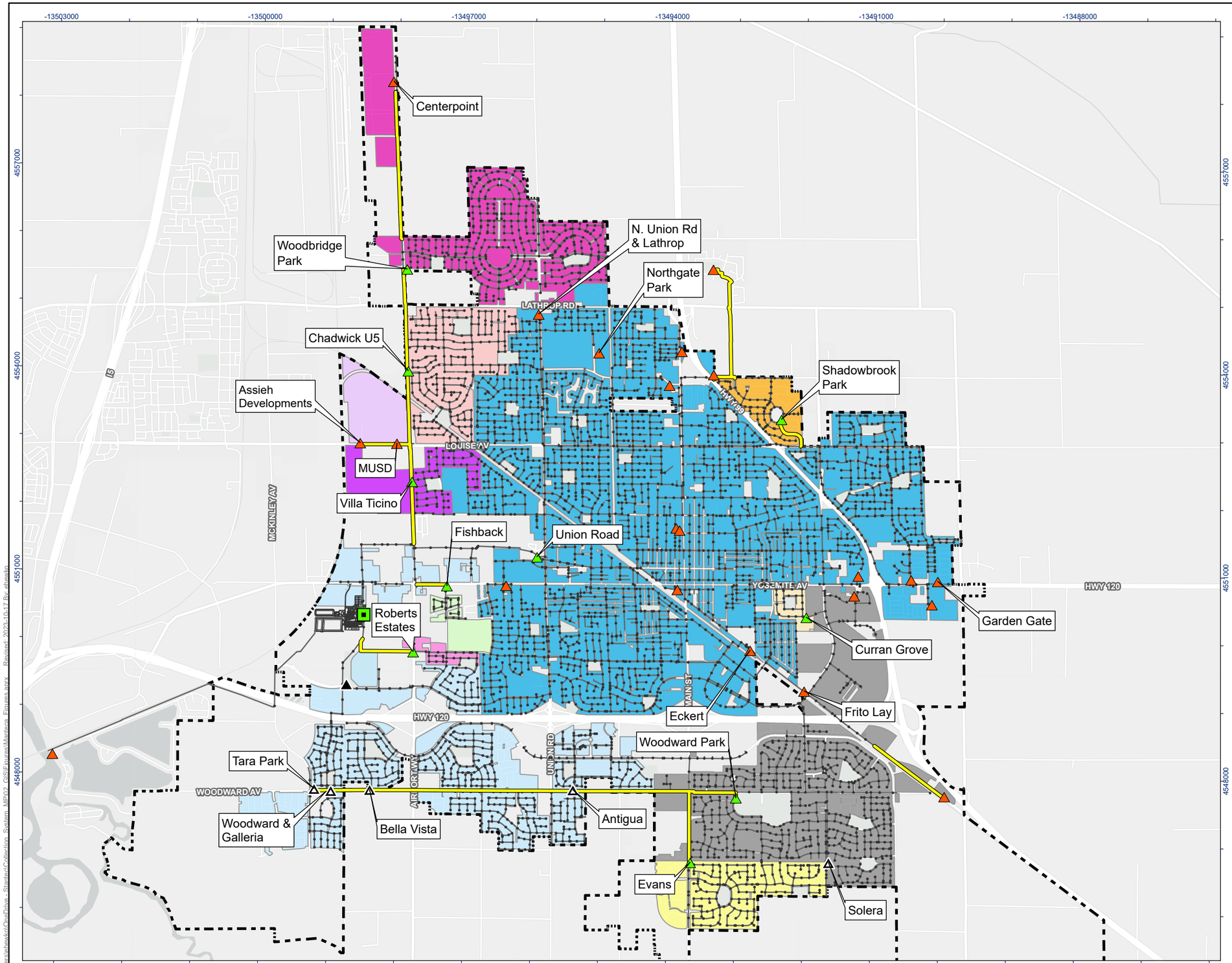
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Figure No.
2-5

Title
Existing Sewer Collection System Pump Stations,Lift Stations, & Forcemains

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MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain
- Sanitary Network
- Water Quality Control Facility Structures

Lift Station Status

- Active
- Unmodeled
- Inactive
- Abandoned
- City of Manteca Limit

Lift Station Basin

- Chadwick U5
- Curran Grove
- Evans
- Fishback
- Gravity
- Private
- Roberts Estates
- Shadowbrook Park
- Union Road
- Villa Ticino
- Woodbridge Park
- Woodward Park

N

0 0.5 1 Miles

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Notes

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Wastewater Servicing Master Plan

184031535

Figure No.
2-6

Title
Lift Stations Service Areas

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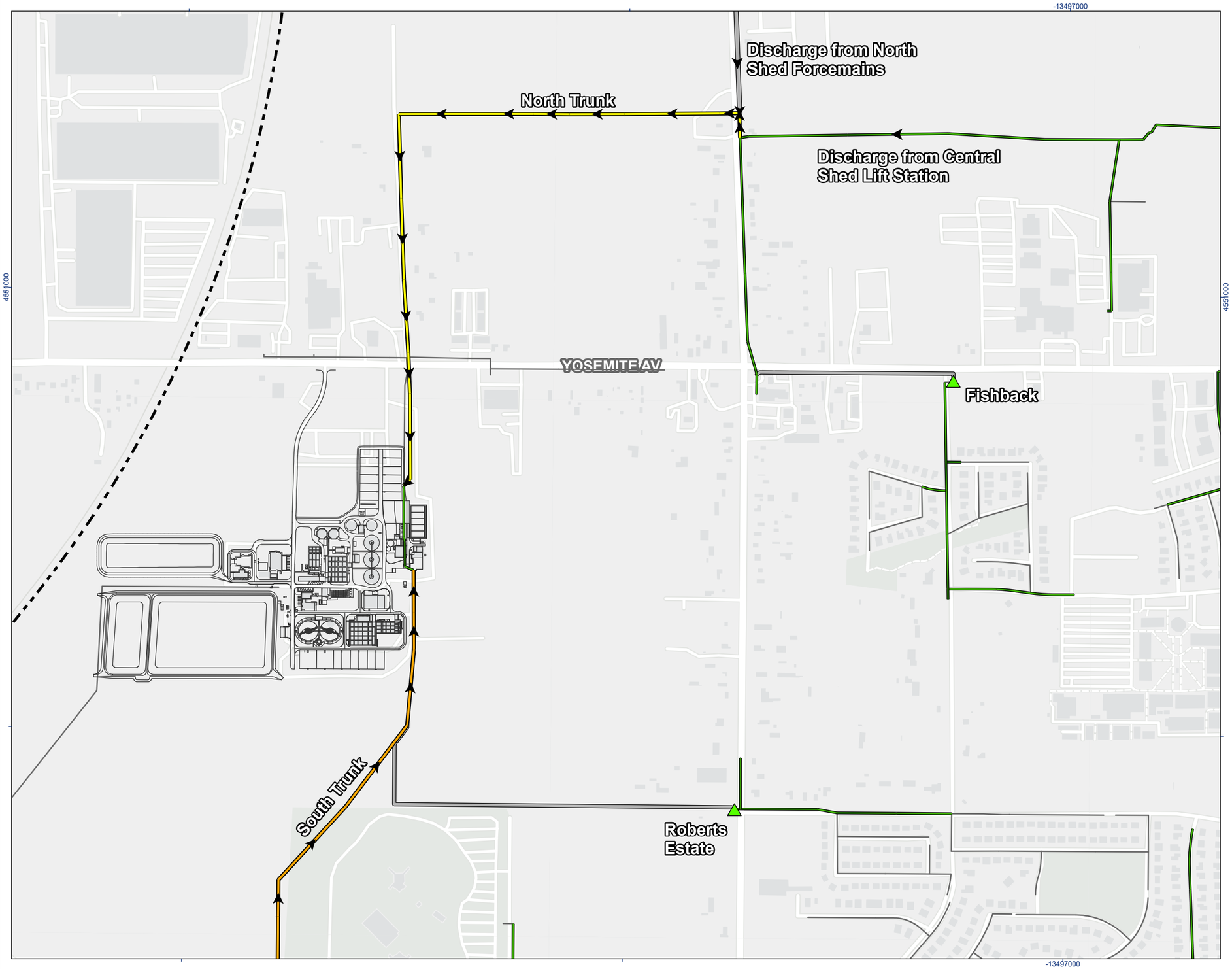
Table 2-6. Wastewater Pump and Lift Stations

Lift Station	Asset ID	No. of Pumps	Horsepower	Design Flow	Design Head	Firm Capacity (2)	Activity Status
		QTY	HP	Gpm	ft	Mgal/d	
Woodbridge Park	WWC-WW01	2, (4 future)	30.00	1,450	50.00	2.09	Active
Chadwick Unit 5	WWC-WW02	2	10.00	875	24.00	1.26	Active
Northgate Park (1)	WWC-WW03	1	*Small sump pump and septic tank*				Active
Villa Ticino	WWC-WW04	2	7.50	510	23.00	0.73	Active
Fishback	WWC-WW05	2	3.00	100 - 203	14.00	0.29	Active
Union Road	WWC-WW06	3	50 hp x 2 25 hp x1	7,000 x 2 3,500	19 19	15.12	Active
Curran Grove	WWC-WW09	2	3.00	140	18.00	0.20	Active
Roberts Estates	WWC-WW11	2	3.00	200	13.00	0.29	Active
Eckert Cold Storage (1)	WWC-WW12	2	20.00	750	51.00	1.08	Active/ Industrial Discharge Line
Frito Lay	WWC-WW13	2	3.00	200	48.00	0.29	Inactive
Shadowbrook Park	WWC-WW21	2	10.00	812	32.90	1.17	Active
Bella Vista	WWC-WW14	2	20.00	600	58.00	0.86	Inactive
Tara Park	WWC-WW15	2, (3 future)	25.00	*Temporary Lift Station*			Inactive
Antigua	WWC-WW16	2	10.00	193	53.00	0.28	Inactive
Woodward & Galleria	WWC-WW18	1	10.00	500	15.00	0.72	Inactive
Evans Estates	WWC-WW19	2	25.00	729	87.10	1.05	Active
Solera	WWC-WW20	2	10.00	220.00	66.00	0.32	Inactive
Woodward Park	WWC-WW17	2	10.00	590.00	38.00	0.85	Active

Notes:
[1] Lift station, collection system, and/or service area is too small to be included in the hydraulic model.
[2] Reliable capacity is defined as the maximum pumping capacity of the lift or pump station with the largest pump out of service.

2.1.5 WQCF Headworks and Influent Structure

Understanding how flow is discharged from the collection system to the WQCF is important for correctly modeling the outfall conditions of collection system. There are two main trunks that collect flow from the upstream collection system. The North Trunk Sewer collects flow discharged from the North Shed and the Central Shed with most of the flow from both sheds being discharged through connecting force mains and lift stations. The South Trunk Sewer collects flows conveyed from the South Shed, which also primarily accepted flow from connecting force mains and lift stations although many have been taken offline with recent trunk extensions and improvements. The main collection system trunks are shown in **Figure 2-7**.



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MANTECA CALIFORNIA

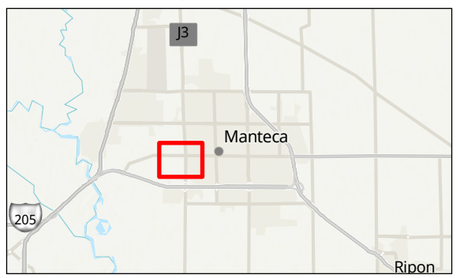
Legend
- Active Lift Station
- Sanitary Network
- Modeled Forcemain
- Modeled Sewer
- Water Quality Control Facility Structures
- North Trunk
- South Trunk
- City of Manteca Limit

N

0 500 1,000 Feet

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1:7,000

Notes
1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri Community Maps Contributors, San Joaquin County GIS/Planning, San Joaquin County Public Works, California State Parks, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, Esri, CGIAR, USGS, San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS



Project Location
Manteca,
California

Prepared by EH on 10/17/2023
TR by MA on 10/17/2023
IR Review by MVD on 10/17/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
2-7

Title
Existing Sewer Collection System Main Trunks and WQCF Discharge

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These two 60-inch trunk sewers discharge directly into the WQCF Influent Pump Station (IPS), which is responsible for screening and pumping all wastewater entering the WQCF. A bottom plan and section of the WQCF Influent Pump Station are shown in **Chapter 9.0** on **Figure 9-2** and **Figure 9-3**.

Flows enter the IPS and combine in the influent room from two 60-inch trunk sewers, one from the west (North Trunk Sewer) and one from the south (South Trunk Sewer). Both influent trunk sewers enter the influent room at an elevation of -4.14 ft. Leaving the influent room, the combined flow passes through bar screens and into the IPS wet well. The influent room is separated from bar screens and the IPS wet well by a concrete wall that extends across the top of the flow channels.

2.2 EXISTING SEWER FLOWS

For this WWMP, a flow monitoring study was conducted in the collection system during the period of March 18, 2022, to May 19, 2022. The flow monitoring study provided data used to perform an assessment of dry and wet weather flow conditions throughout the City's collection system. The flow monitoring study recorded flows using open channel flow monitors at 18 locations throughout the collection system. Historical influent flow data was used in conjunction with population data to establish the flow per capita wastewater statistics.

2.2.1 Wastewater Flow Characterization Definitions

This section describes definitions of the flow components used to characterize wastewater flow in this WWMP. Wastewater collection systems are designed to convey peak wet weather flows (PWWFs). PWWFs are generally comprised of four elements: base sanitary wastewater flow (BWWF), inflow, groundwater infiltration (GWI), and rainfall dependent infiltration (RDI). Each component is described in more detail below.

2.2.1.1 Base Wastewater Flow (BWWF)

Sanitary flow or base flow is the component of wastewater generated directly by public, residential, commercial, and industrial users. BWWF can also be equated to the average dry weather flow (ADWF) which is the average of total flows measured during typically dry months between July and September of each year.

2.2.1.2 Inflow

Inflow is storm water that is discharged into the sewer system from direct connections. These connections could include private sewer laterals, roof downspouts, yard and area drains, holes in manhole covers, cross-connections from storm drains, or catch basins.

2.2.1.3 Groundwater Infiltration (GWI)

GWI is groundwater that enters the collection system through cracks in sewer pipes and manholes, leaky joints, and damaged sewer lateral connections. GWI tends to vary seasonally depending on groundwater depth in relation to the depth of sewer pipelines. GWI is more significant during the wet season when

groundwater elevations are higher. GWI is also more significant in sewers built-in low-lying areas near creeks and drainage courses where groundwater elevations may be high due to surface water conditions.

2.2.1.4 Rainfall Dependent Infiltration (RDI)

RDI is stormwater flow that enters the collection system due to precipitation events. Infiltration is an indirect introduction of rainfall into the collection system through cracked sewer pipes, joints, and manhole walls.

2.2.1.5 Diurnal Patterns

A diurnal flow pattern describes the variation in wastewater flow occurring over the course of a full day. In a 24-hour period, wastewater flow varies significantly with maximum flow typically occurring in the morning and early evening. During the flow monitoring study conducted by the City flow was recorded every 15 minutes. This monitoring provided detailed data allowing the City to evaluate these daily patterns throughout its service area. Each area of the City has its own unique pattern, which also varies between weekdays and weekends.

2.2.2 Flow Monitoring Study

Open channel flow monitoring was conducted at eighteen sites from March 18, 2022, to May 19, 2022. This work was conducted by V&A Consulting Engineers (V&A) and is summarized in a technical report dated August 2022. The flow monitoring report and inflow and infiltration study provided by V&A is included in **Appendix B** *(City of Manteca Sanitary Sewer Flow Monitoring and Inflow/Infiltration Study, August 2022, V&A Consulting Engineers)*.

The goals of the flow monitoring study included the following:

- Establish the baseline sanitary sewer flows.
- Establish the peak flow condition during rainfall events and estimate the available sewer capacity.
- Quantify inflow and infiltration (I/I) at the applicable flow monitoring sites and develop synthetic I/I hydrographs for a design storm event.

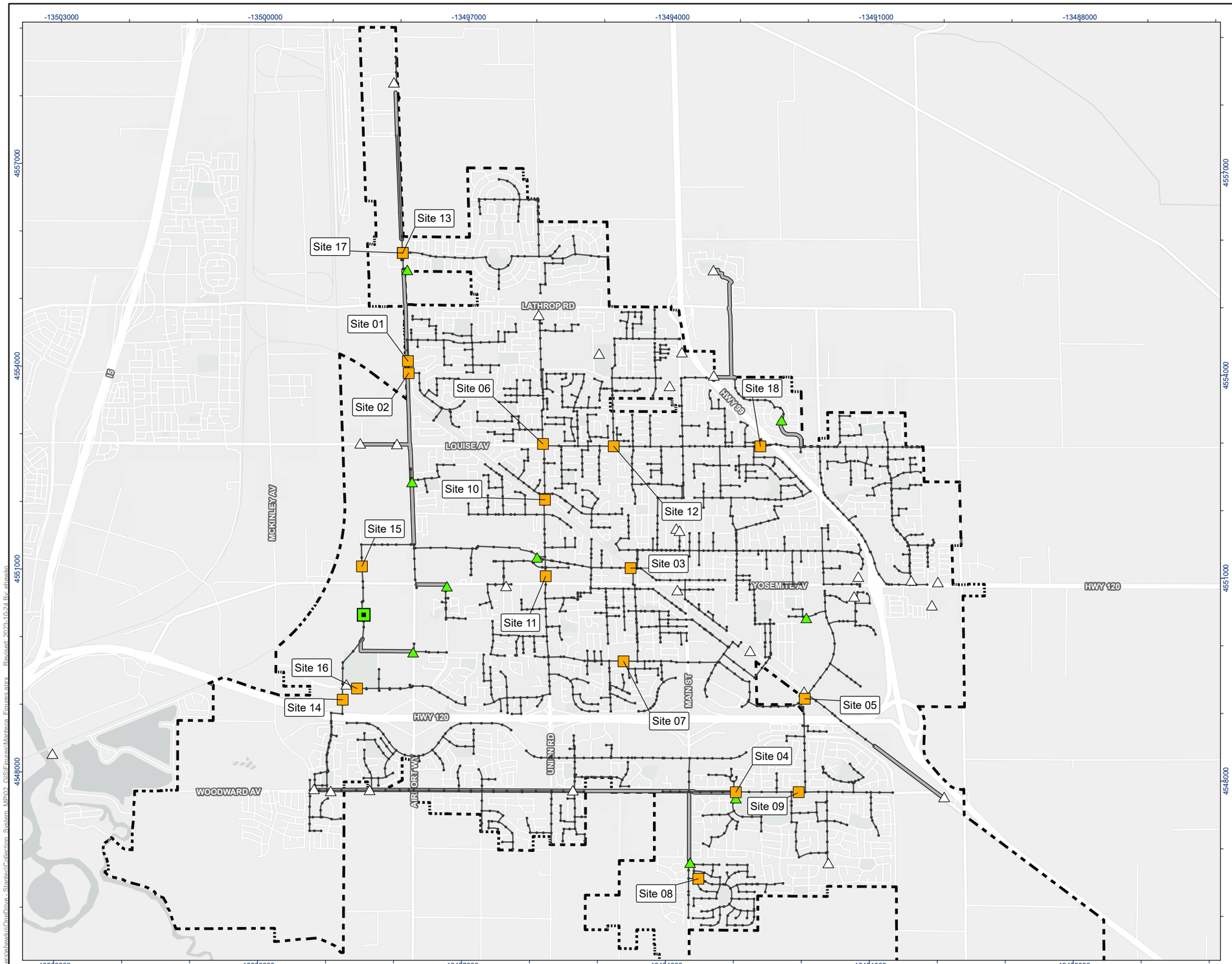
2.2.2.1 Flow Monitoring Sites

A total of 18 flow monitoring sites were used for model development and calibration. To distribute flow within the hydraulic model, flows from flow monitoring sheds in series are estimated by subtracting flow from upstream flow monitoring basins. There are inherent errors introduced when subtracting flow monitors in series due to variations in data quality, and travel time between monitors.

Table 2-7 summarizes the characteristics of the 18 sewer-sheds established for use in this WWMP and the sewer-shed isolation equations used to isolate flow. The locations of these flow monitors are shown on **Figure 2-8** and the associated monitoring basins or sewer-sheds are shown on **Figure 2-9**.

Table 2-7. Flow Monitoring Shed Characteristics

Monitoring Site/ Sewer-shed	Manhole ID	Pipe Diameter (in)	Existing Area (Acres)	Service Area	Flow Isolation Equation
1	WWMH1266	12	207	North	= Q_1
2	WWMH2281	15	150	North	= Q_2
3	WWMH0348	15	892	Central	= Q_3
4	WWMH2372	18	646	South	= $Q_4 – Q_9$
5	WWMH3748	18	427	South	= Q_5
6	WWMH0389	21	416	Central	= Q_6
7	WWMH3097	24	426	Central	= Q_7
8	WWMH5029	17.5	228	South	= Q_8
9	WWMH2650	27	290	South	= Q_9
10	WWMH0551	30	968	Central	= $Q_{10} – (Q_6 + Q_{12} + Q_{18})$
11	WWMH3166	30	533	Central	= $Q_{11} – Q_7$
12	WWMH3102	12	228	Central	= Q_{12}
13	WWMH3346	30	209	North	= Q_{13}
14	WWMH5147	48	992	South	= $Q_{14} – (Q_8 + Q_4)$
15	WWMH1227	54	1020	North	= $Q_{15} – (Q_1 + Q_2 + Q_3 + Q_{17} + Q_{13} + Q_{10} + Q_{11})$
16	WWMH3117	15	162	South	= Q_{16}
17	WWMH3346	40	517	North	= Q_{17}
18	WWMH0383	21	749	Central	= Q_{18}



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MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Other Lift Station
- Flow Monitor
- Modeled Forcemain
- Modeled Sanitary Sewer
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/24/2023
TR by MA on 10/24/2023
IR Review by MVD on 10/24/2023

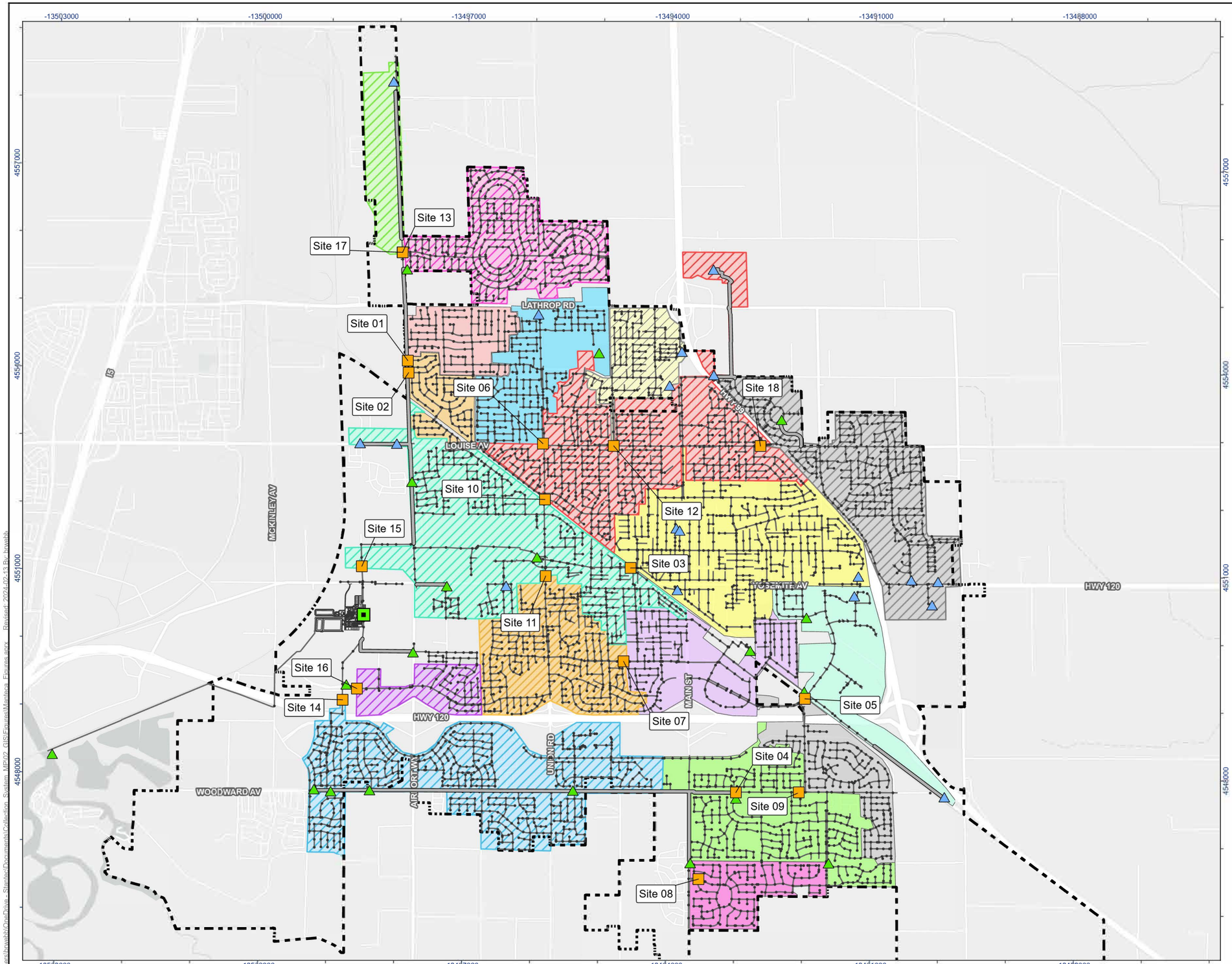
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Figure No.
2-8

Title
Flow Monitoring Locations and Modeled Facilities

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MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain
- Sanitary Network
- Water Quality Control Facility Structures

Lift Station

- City Owned
- Privately Owned
- Flow Monitor
- City of Manteca Limit

Flow Monitoring Basin

- Basin 1
- Basin 2
- Basin 3
- Basin 4
- Basin 5
- Basin 6
- Basin 7
- Basin 8
- Basin 9
- Basin 10
- Basin 11
- Basin 12
- Basin 13
- Basin 14
- Basin 15
- Basin 16
- Basin 17
- Basin 18

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
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Project Location
Manteca,
California

Prepared by EH on 2/13/2024
TR by MA on 2/13/2024
IR Review by MVD on 2/13/2024

Client/Project
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184031535

Figure No.
2-9

Title
Flow Monitoring Basins & Sewersheds

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2.2.2.2 Rainfall Data

V&A analyzed rainfall data from five publicly available weather stations which provided sufficient coverage over the collection system. The cumulative precipitation for the average of the rain gauges was 1.03 inches, equating to approximately 40% of the historical long-term average precipitation over the duration of the study period. There was only one primary rainfall event that occurred over the flow monitoring period (March 27, 2022 – March 28, 2022) which produced 0.72 inches of rain when averaged over the five gauges. A summary of the rainfall data recorded over the flow monitoring period is shown in **Table 2-8**.

Table 2-8. Summary of Rainfall Data

Rain Gauge	Primary Rainfall Event Precipitation Total (in)	Flow Monitoring Period Precipitation Total (in)
NW	0.71	1.17
EAST	0.61	0.94
SW	0.55	0.98
SOUTH	0.77	1.06
SE	0.76	1.06

This primary rainfall event was classified as a 1-year to less than 1-year storm event based on the National Oceanic and Atmospheric Association (NOAA) Rainfall Event Classifications.

2.2.2.3 Flow Monitoring Summary and I/I Analysis

V&A provided an analysis of I/I within the collection system. A summary of the results is provided in **Table 2-9**. V&A differentiated I/I flow from ADWFs to determine which components of I/I were more prevalent in each sewer-shed. After separating flow components, the I/I analysis metrics were normalized for an “apples-to-apples” comparison of each flow monitoring shed. Flows were normalized per-ADWF and per-acre).

Based on the data collected during the study, four of the flow monitoring sites were significantly impacted by upstream and downstream lift stations in the collection system, these sites included:

Site 4 (Woodward Park), Site 5 (Frito Lay & Curran Grove), Site 13 (Centerpoint & Woodbridge Park), and Site 14 (Evans & Woodward Park). These sites, as well as Site 15 were excluded from I/I analysis. Site 15 was found to show very little I/I response because most of the peak I/I response originated from upstream basins.

Basins 1, 2, 8, 12, 16, and 17 showed a negligible amount of combined I/I and were ranked lowest for combined I/I. Basins 6, 7, and 18 had the highest weighted, normalized peak I/I rates which is an indicator of high inflow, with 7 being the highest.

Basins 7, 10, and 9 had the highest weighted, normalized combined I/I rates, indicating high combined I/I. No evidence of GWI was found in any basin.

Table 2-9. V&A Flow Monitoring and I/I Analysis Summary

Monitoring Basin	ADWF (Mgal/d)	Peak Inflow Rate (Mgal/d)	Combined I/I (gallons)	Overall Inflow Rank	Overall Combined I/I Rank
1	0.124	0.041	Negligible	9	8
2	0.093	0.033	Negligible	8	8
3	0.253	0.262	30,500	5	5
4	0.241	n/a	n/a	n/a	n/a
5	0.048	n/a	n/a	n/a	n/a
6	0.145	0.223	34,700	2	4
7	0.155	0.476	58,900	1	1
8	0.094	0.028	Negligible	12	8
9	0.326	0.187	49,400	4	3
10	0.849	0.297	138,500	6	2
11	0.372	0.053	11,700	13	7
12	0.110	0.036	Negligible	10	8
13	0.002	n/a	n/a	n/a	n/a
14	0.599	n/a	n/a	n/a	n/a
15	0.563	n/a	n/a	n/a	n/a
16	0.092	0.029	Negligible	10	8
17	0.232	0.143	Negligible	6	8
18	0.396	0.365	34,700	3	6

Note:
[1] Highlighted cells indicate where data exceeds typical values or high normalized GWI, inflow, RDI, and total I/I flows were identified, (i.e., Inflow/RDI/Total I/I Rankings = 1, 2, or 3). Additional information can be found in the V&A report (**Appendix B)**.

Key:
I/I = inflow and infiltration
Mgal/d = million gallons per day
n/a = not applicable
V&A = V&A Consulting Engineers, Inc.

2.2.3 Dry Weather Flows

Average dry weather flows were established from the flow monitoring study during dry days when I/I had the least impact on the baseline flow. **Table 2-10** summarizes dry weather flow data measured during the study as well as the observed sedimentation during the site visit. The flow metering sites use area-velocity technology that measures flow depth, flow velocity, and flow rate in 15-minute intervals. The measurement of both depth and velocity allows for an assessment of whether the sewer is flowing unimpeded, or whether backwater conditions exist.

Table 2-10. V&A ADWF Summary

Monitored Site	Sediment (in)	Average d/D Ratio [1]	Mon-Thu ADWF (Mgal/d)	Friday ADWF (Mgal/d)	Saturday ADWF (Mgal/d)	Sunday ADWF (Mgal/d)	Overall ADWF (Mgal/d)
Site 1	none	0.09	0.121	0.124	0.126	0.137	0.124
Site 2	none	0.10	0.091	0.089	0.095	0.100	0.093
Site 3	none	0.05	0.253	0.251	0.255	0.251	0.253
Site 4	none	0.04	0.606	0.606	0.624	0.651	0.615
Site 5	none	0.05	0.049	0.051	0.044	0.044	0.048
Site 6	none	0.06	0.136	0.154	0.159	0.160	0.145
Site 7	none	0.05	0.157	0.154	0.151	0.153	0.155
Site 8	none	0.06	0.092	0.091	0.097	0.107	0.094
Site 9	*0.5*	0.03	0.377	0.364	0.353	0.391	0.374
Site 10	none	0.07	1.481	1.466	1.521	1.593	1.501
Site 11	*5*	0.02	0.524	0.511	0.532	0.552	0.527
Site 12	none	0.12	0.109	0.106	0.109	0.117	0.110
Site 13	none	0.00	0.003	0.002	0.002	0.002	0.002
Site 14	none	0.02	1.286	1.264	1.335	1.413	1.308
Site 15	none	0.02	3.291	3.221	3.386	3.290	3.294
Site 16	none	0.04	0.087	0.088	0.105	0.105	0.092
Site 17	none	0.03	0.229	0.235	0.238	0.238	0.232
Site 18	none	0.05	0.388	0.387	0.407	0.425	0.396
System	n/a	n/a	4.664	4.574	4.826	4.807	4.695

Note:
[1] The d/D ratio is the measured depth of flow (d) divided by the pipe diameter (D).
Key:
ADWF = average dry weather flow
d/D = depth over diameter ratio
Mgal/d = million gallons per day
V&A = V&A Consulting Engineers, Inc.

2.2.4 Wet-Weather Flows

Peak measured flows and flow depth can indicate the capacity limitations of a pipeline. While standards for peaking factors (calculated as ratio of peak flow to ADWF) vary, the Water Environment Federation Manual of Practice FD-6 and American Society of Civil engineers Manual No. 62 suggest typical peaking factor ratios range between 3.0 and 4.0, with higher values possibly indicating pronounced I/I flows. **Table 2-11** summarizes the peak recorded flows, levels, d/D ratios, peaking factors, and surcharge depth per site during the flow monitoring period. For the purposes of this WWMP, peaking factors over 5.0 are highlighted orange, respectively, as shown in **Table 2-11**.

Table 2-11. V&A PWWF Summary

Monitoring Site	ADWF (Mgal/d)	Peak Measured Flow (Mgal/d)	Peaking Factor	Pipe Diameter, D (in)	Peak Measured Depth, d (in)	Max d/D Ratio	Surcharge Above Pipe Crown (ft)
Site 1	0.12	0.31	2.5	12	18.1	*1.51*	*0.51*
Site 2	0.09	0.33	3.5	15	18.2	*1.21*	*0.27*
Site 3	0.25	0.48	1.9	15	9.2	0.62	-
Site 4	0.61	2.60	4.2	18	32.6	*1.81*	*1.22*
Site 5	0.05	0.17	3.7	18	3.0	0.17	-
Site 6	0.15	2.06	*14.2*	21	8.1	0.39	-
Site 7	0.16	0.58	3.7	24	4.6	0.19	-
Site 8	0.09	0.21	2.2	17.5	3.4	0.19	-
Site 9	0.37	0.97	2.6	27	9.3	0.34	-
Site 10	1.50	5.33	3.6	30	42.7	*1.42*	*1.06*
Site 11	0.53	2.33	4.4	30	80.1	*2.67*	*4.17*
Site 12	0.11	0.44	4.0	12	4.4	0.37	-
Site 13	0.002	0.20	*84.2*	30	2.9	0.10	-
Site 14	1.31	2.24	1.7	48	18.2	0.38	-
Site 15	3.29	6.11	1.9	54	30.6	0.57	-
Site 16	0.09	0.31	3.3	15	5.6	0.37	-
Site 17	0.23	1.03	4.5	40	10.1	0.25	-
Site 18	0.40	0.79	2.0	21	8.2	0.39	-

Key:
ADWF = average dry weather flow
d/D = depth over Diameter Ratio
Mgal/d = million gallons per day
PWWF = peak wet weather flow
V&A = V&A Consulting Engineers, Inc.

The following capacity analysis results are noted:

- Sites 6 and 13 had peaking factors over 5.
    - Site 6 peak level, velocity, and flow occurred prior to a rainfall event, perhaps due to an industrial sewer release. It occurred only once during the flow monitoring period of over 2 months, and probably does not need further investigation. Flow, velocity, and depth graphs of the event are shown in the V&A Report as Figure 3-10.
    - The peaking factor of Site 13 may be skewed high due to low ADWF numbers. The peak flow event did not occur during a period of rainfall and therefore, isn't attributed to inflow or infiltration. Site 13 is located downstream of the Centerpoint lift station which conveys mainly industrial discharge. This pump station influence is likely the cause of the large differential between average and peak recorded flows. During the calibration process, further discussed in Chapter 3.0, it was determined that the data collected from Site 13 is unsuitable for model

calibration. The erratic flow patterns and spikes in the data make it impossible to replicate within the model.

- d/D ratios of sites upstream of lift stations were surcharged during the study.
    - Sites 1 and 2 are immediately upstream of the Chadwick lift station.
    - Site 4 is immediately upstream of the Woodward Park lift station.
    - Sites 10 and 11 are upstream of the Union Road lift station, further upstream than sites referred to above. Site 10 is 2,490 LF upstream of the lift station and Site 11 is 1,040 LF upstream, with the others being less than 400 LF upstream of the respective lift stations.
    - Site 11 reached a peak surcharge depth of 4.17 ft above the pipe crown. Velocity data for a portion of the period was lost due to sediment covering the sensor and the site was noted as having 5-inches of sediment upon initial flow meter installation. The site was shown to surcharge regularly on nearly a daily basis. This in combination with data collected at Site 10 indicates that the Union Road lift station uses a significant portion of the upstream collection system as part of its operating volume.

2.2.5 Per-Capita Flow Assessment

The City of Manteca has two permanently installed flow meters at the WQCF, one measuring flow from Lathrop and one measuring the total flow discharged from the IPS. Average daily influent flow at the City's WQCF from January 2016 to January 2023 is presented in **Figure 2-10**. Flows at the WQCF are further described in **Chapter 8.0** of this WWMP.

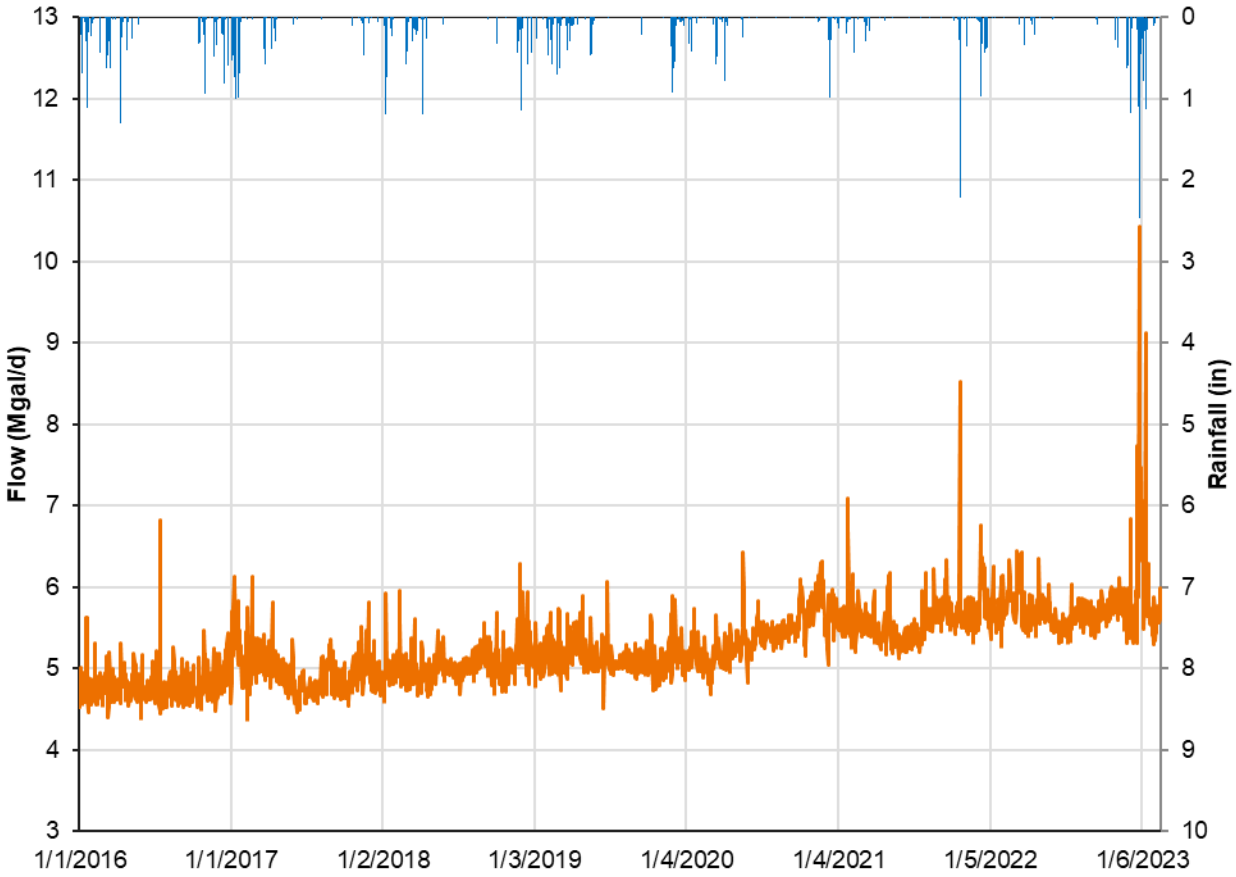


Figure 2-10. City of Manteca Influent Flow Data

The historical wastewater flows combined with United States Census Bureau population data were used to calculate the annual average flow (AAF) per capita for the service area, as tabulated in **Table 2-12**. The average per capita AAF discharged to the WQCF is 61 gallons per person per day (gpcd). Note that per capita flow in California typically ranges from 60-85 gpcd. The United States Census Bureau identifies an average household density of approximately 3.19 persons per household, or persons per equivalent dwelling unit (EDU) within the City of Manteca and was used to translate the per capita flow into the unit rate of 195 gpd/EDU.

Table 2-12. Historical Per-Capita Wastewater Generation

	Population Data [1]	Flow (Mgal/d)	Unit Rate (gpcd)
Year		**AAF [2]**	**AAF/capita**
2016	76,752	4.73	61.6
2017	78,784	4.77	60.6
2018	80,762	4.97	61.5
2019	83,323	5.01	60.1
2020	84,842	5.29	62.4
Averages		**4.95**	**61.2**
Calculated Unit Rate Per EDU @ 3.19 people/edu (gpd/EDU)			**195**

Notes:
[1] Population data obtained from the United States Census Bureau.
[2] AAF = Average Annual Flow;
Key:
AAF = Average Annual Flow
EDU = Equivalent Dwelling Unit
gpcd = Gallons per Capita Day
gpd/EDU = Gallons per Day per EDU
Mgal/d = million gallons per day

3.0 HYDRAULIC MODEL DEVELOPMENT AND CALIBRATION

The purpose of this chapter is to outline details of the sewer collection system model development and calibration. The collection system model only considers the City of Manteca's collection system. Although the City's WQCF accepts flows from neighboring jurisdictions, the hydraulic model only simulates the City's collection system and flows.

This chapter is divided into the following sections:

- Hydraulic Model Approach and Software
- Model Inputs
- Model Structure
- Flow Allocation
- Dry Weather Calibration
- Wet Weather Calibration
- Model Calibration Summary

3.1 HYDRAULIC MODEL APPROACH AND SOFTWARE

The City of Manteca's hydraulic modeling needs were assessed to help define the software and approach needed in the development of the hydraulic model. The preferred approach was to develop a dynamic model that includes all sewers greater than or equal to 8-inches in diameter within the existing collection system. Smaller diameter force mains and 6-inch diameter gravity mains were also included where necessary to account for flow splits or overflows within the system.

The approach in development of a new hydraulic model included the following:

- Review available hydraulic model software and select a suitable option for this study and future updates to the WWMP.
- Develop the model using the existing GIS data, supplemented with new survey data to update the invert levels and rim elevations of the manholes.
- Assign parcel-based sanitary sewer flows to model manholes based on georeferenced average monthly water meter data, normalized to specific sewer shed flow monitoring data.
- Identify dry and wet weather events to use for calibration.
- Undertake rainfall dependent inflow and infiltration (RDII) analysis for each of the meter subcatchments.
- Calibrate the model using the collected flow monitoring data.

3.1.1 Modeling Software

Commercially available open-channel flow hydraulic modeling software platforms were reviewed for the purpose of efficiently executing the collection system components of this WWMP. This included a high-level comparative review of the potential software candidate capabilities, licensing requirements, training needs, and costs to select a software best fit for Manteca's needs. This effort is summarized in *Technical Memorandum (TM) No. 1: Hydraulic Model Software Selection*, which is included in **Appendix C**.

Based on the City's needs, the hydraulic model of the collection system was developed using PCSWMM software by Computational Hydraulics Inc. PCSWMM is a fully dynamic model software package using the EPA SWMM5 engine as its basis.

3.2 MODEL INPUTS

The City maintains a GIS database of its collection system facilities, as described in **Chapter 2.0** of this report. During model development, the physical network of sewers, manholes, pump stations, and structures were established based on the City's GIS database, specifically the physical information contained therein for the existing collection system. This physical network becomes the underlying framework for the model. Therefore, it is crucial that the infrastructure is reviewed for completeness and proper connectivity.

A review of the existing collection system in the GIS database was completed prior to model development which provides quality enhancements to the sanitary GIS data. The data review was undertaken in GIS in both ESRI ArcMap and hydraulic modeling software utilizing built-in PCSWMM analysis tools. Missing and inconsistent data identified in the physical network included manhole inverts and rim elevations, sewer diameters, and slopes. In addition, a review was conducted of the hydraulic continuity and suitability of physical sewer data in terms of profile connectivity.

Pipe and manhole invert elevations from the City's GIS database do not specify what vertical datum is being used. The City uses the National Geodetic Vertical Datum of 1929 (NGVD 29), although a number of manholes had the following comment attribute field: 'RIM elev. based on 1988 vertical datum'. These rim elevations were assumed to use the National Geodetic Vertical Datum of 1988 (NAVD 88). It was assumed that all other elevations listed in the GIS database are listed in the City's standard datum. Comparisons between surveyed rim elevations (NGVD 29) and those indicated as being in the NAVD 88 in City GIS data show a difference of approximately 2.31 feet above the NGVD 29 datum. This correlates well with a conversion rate of -2.37 feet when going from NAVD 88 to NGVD 29 provided by the NOAA Online Vertical Datum Transformation website.

Laser imaging detection and ranging (LIDAR) data was used to fill gaps where rim elevations were missing from the database. A comparison of LIDAR results with those of rim elevation surveys indicates that LIDAR data generally provide a reasonable approximation of actual rim elevations.

A data verification program was developed to obtain missing or inconsistent data in an efficient manner, through the use of drawing review, survey, field verification, and inference. As a final resort data was inferred based on the surrounding network.

3.2.1 Geodatabases

The following primary physical asset data was received from the City:

- Manholes – wwManholes.shp
- Pipes – wwConveyance.shp
- Pump Stations – wwStation.shp
- Structures – wwStructures.shp

3.2.1.1 Manholes

The City's manhole shapefile contains a number of attribute fields used to define physical parameters and provide additional relevant information. Based on the data provided there are 4,672 manholes in the City's sanitary geodatabase. A summary of the relevant attribute fields for manholes and initial gap assessment is provided in **Table 3-1**.

Table 3-1. Manhole Data Gap Assessment

Field Name	Description	Gap Assessment	Percent of Total (%)
AssetID	Unique Identifier	No duplicate or blank fields	0
Status	Activity Status	31 abandoned, inactive, or other	1
RIM_Elev	Rim Elevation	180 blanks	4
Invert_1	Invert Elevation	687 blanks	15
Invert_2	Invert Elevation	1,707 blanks	37
Invert_3	Invert Elevation	3,379 blanks	72
Invert_4	Invert Elevation	4,461 blanks	95
All Invert Fields	Invert Elevations	634 blanks	14
Inst_Year	Installation Year	401 blanks	9

3.2.1.2 Sewers

The City's sewer line shapefile contains a number of attribute fields used to define physical parameters and provide additional relevant information. Based on the data provided there are 5,545 sewer pipes in the City's sanitary geodatabase. A summary of the relevant attribute fields for manholes and initial gap assessment is provided in **Table 3-2**.

Table 3-2. Pipeline Data Gap Assessment

Field Name	Description	Gap Assessment	Percent of Total (%)
AssetID	Unique Identifier	31 duplicate or blank fields	1
MATERIAL	Pipe Material	183 blanks	3
Status	Activity Status	82 abandoned or inactive	1
Slope1	Pipe Slope	3,353 blanks	60
DownElev	Downstream Elevation	975 blanks	18
UpElev	Upstream Elevation	1,026 blanks	19
PipeSize	Pipe Size	161 blanks	3
Inst_Year	Installation Year	797 blanks	14

3.2.1.3 Lift Stations

There are 39 lift stations in the City's GIS database. The database is limited to providing the assets physical location, activity status, and ID. It does not include pump station capacity, force main information, or other information necessary for building the model, a summary of additional lift station information is provided in **Chapter 2.0**. The database also indicates that there are 21 city owned lift stations and 18 private lift stations. One lift station is listed as a flushing station and one is listed as abandoned, although discussions with operators indicated many other lift stations have been abandoned or taken offline.

3.2.1.4 Structures

The structures database includes a total of 580 sewer valves, lamp holes, clean-outs, and plugs. These elements were added to the model as needed to complete the systems physical layout (i.e., added to the end of a line where no manhole existed). In addition to categorizing these elements into type, the structures shapefile also includes the attributes shown in **Table 3-3**.

Table 3-3. Structures Gap Data Assessment

Structure Type	Quantity	Number of Blank GIS Attribute Fields			
		RIM_Elev	Invert_1	Inst_Year	PipeSize
Air Release Valve	67	66	65	16	56
Gate Valve	18	18	18	1	0
Plug	33	33	33	33	33
Lamp Hole	412	44	412	147	402
Cleanout Vertical	35	13	16	12	13
Cleanout Horizontal	6	2	6	1	6
Cleanout	9	2	1	0	0

Key:
GIS = Geographic Information Systems

3.2.1.5 GIS Database Summary

Stantec reviewed the City's GIS database to import upstream, downstream, rim, and invert elevations available in the data set. The majority of invert and rim elevations were available for manholes, where a

single manhole invert elevation was missing in an alignment, the missing invert was interpolated between the available data upstream and downstream. The remaining gaps in the dataset primarily existed north and south of Yosemite Ave. in what is assumed to be the oldest part of the system. Manhole survey needs within the system were divided into three categories including:

- Primary Survey Needs: Missing manhole invert elevations along primary trunk sewers, those 10-inches and larger. [Total Manholes: 111]
- Secondary Survey Needs: Missing manhole invert elevations in the remaining trunks, along sewers 8-inches in diameter. [Total Manholes: 105]
- Remaining Data Gaps: Missing manhole invert elevations in the remaining system, along sewers less than 8-inches in diameter. [Total Manholes: 257]

An overview of the initial manhole data needs is shown in **Figure 3-1**, along with where manhole invert elevations that were interpolated. The primary survey needs were those necessary to build and use the hydraulic model, elevations needed to simulate the City's main trunk network. The primary survey needs existed along the main northern influent trunk, having an alignment running from the WQCF and the Union Road Lift Station as well as the upstream trunks. After providing this information to the City for review, additional record drawings for primary and secondary survey needs were provided. After importing these invert elevations and interpolating additional invert elevations based on the new information, the remaining gaps were limited to 50 manholes that needed to be surveyed.

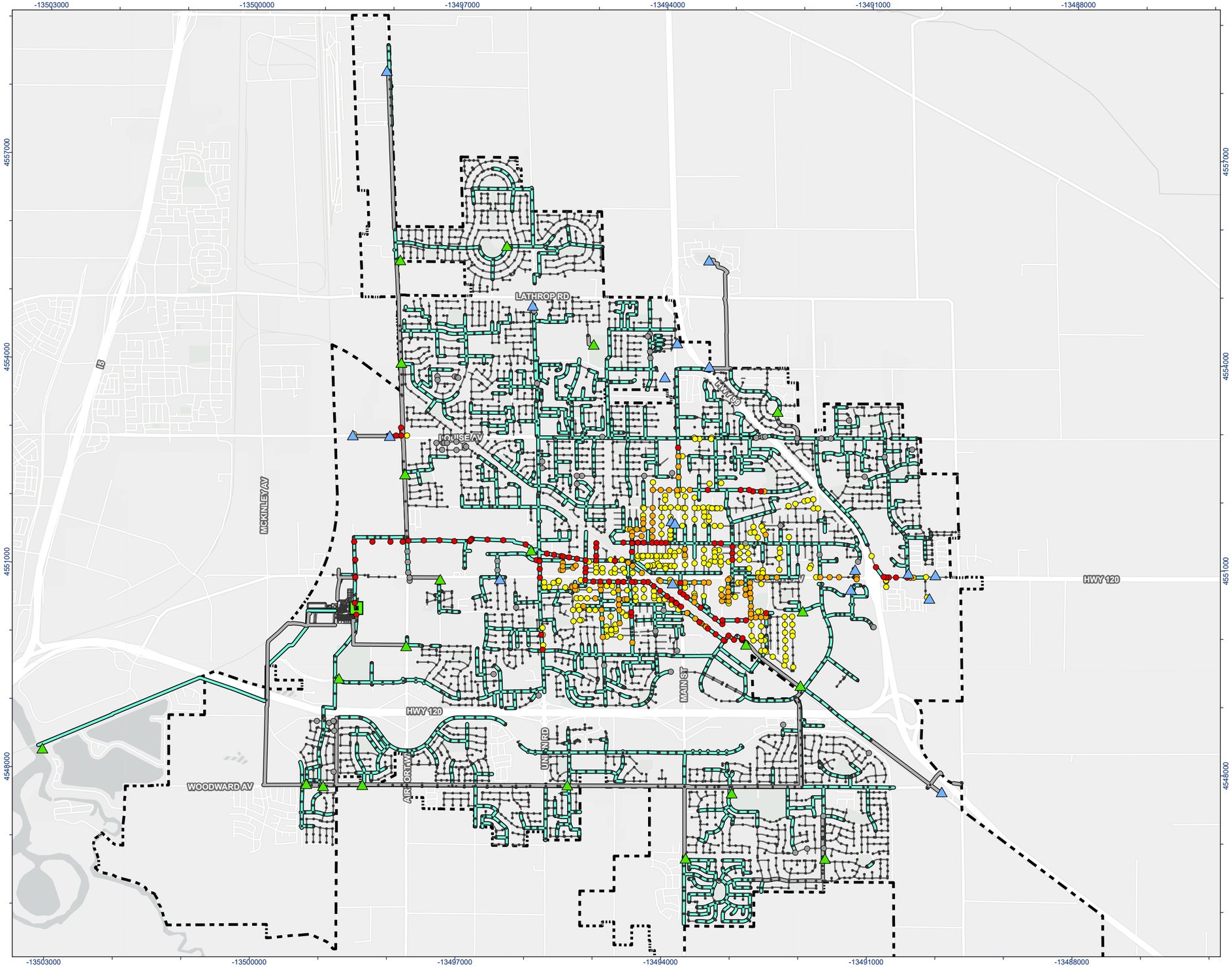
3.2.2 Record Drawings

Record drawings provided by the City were reviewed to fill in gaps in the GIS database and define physical lift station parameters. Lift station record drawings were provided for the majority of public and private lift stations in the collection system. These drawings were used to identify force main size, discharge elevation, wet-well size, invert and rim elevations, as well as any available pump information including horsepower (HP), pumping capacity, number of pumps, and operating levels. Although a number of lift station drawings were provided, generally the force main records were not included. Record drawings were provided, as noted above, for manholes identified as having missing invert elevations in the City's GIS database. Record drawings were provided for 96 manholes, resulting in approximately 85 invert elevation gaps filled. In addition to these records the City also provided drawings for the North Manteca Trunk Sewer Project from November 2019. The trunk's alignment, diameter, and elevations were updated in the GIS database.

3.2.3 Manhole Survey

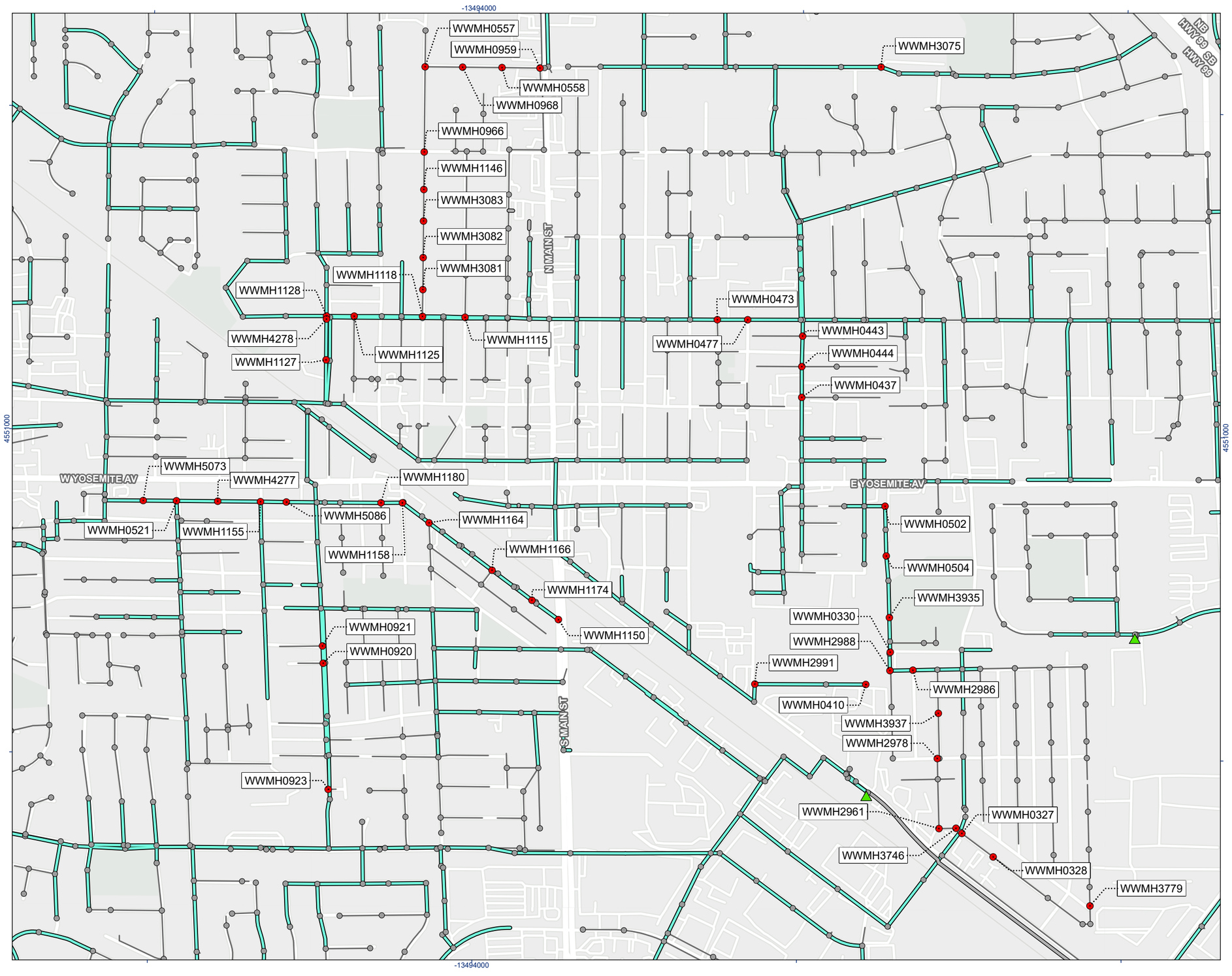
Stantec subcontracted with F3 & Associates (F3) to conduct a manhole survey of the remaining gaps in the City's GIS database. Survey is based on North American Datum of 1983 (NAD83)/ California Coordinate System of 1983 (CCS83) horizontal datum and City of Manteca vertical datum (NGVD 29) with ties to physical City of Manteca benchmarks. Of the 50 requested manholes for survey, 11 inverts could not be determined. The City was able to provide rim to invert depth information for surcharged and inaccessible manholes. Surveyed manholes are shown on **Figure 3-2** and a complete list of manholes surveyed is included in **Appendix D** along with the information provided by F3.

ATTACHMENT 2



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Stantec

MANTECA CALIFORNIA

Legend

- Forcemain
- City Owned Lift Station
- Surveyed Manhole
- Manhole
- Sanitary Sewer (< 6")
- Sanitary Trunk (> 6")

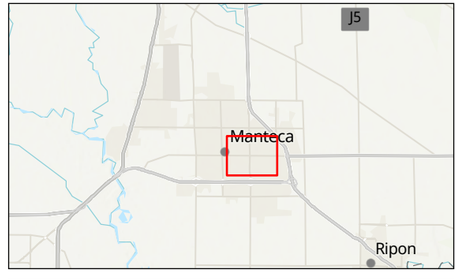
N

0 500 1,000 Feet

(At original document size of 11x17)
1:9,500

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, CGIAR, USGS, Esri Community Maps Contributors, San Joaquin County GIS/Planning, San Joaquin County Public Works, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS



Project Location
Manteca,
California

Prepared by EH on 10/17/2023
TR by MA on 10/17/2023
IR Review by MVD on 10/17/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
3-2

Title
Surveyed Manholes

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3.3 MODEL STRUCTURE

3.3.1 Manholes

There are a total of 2,132 manholes modeled in the wastewater collection system. This includes some nodes to reflect elevation changes along force mains. **Table 3-4** below provides a summary of the node inputs in the model.

Table 3-4. Modeled Manholes Summary

Nodes	
Count	2,132
Manhole Invert Range	-4.18 feet – 40.43 feet
Manhole Rim Range	15.6 feet – 49.91 feet
Manhole Depth Range	0.93 feet – 31.45 feet
Surcharge Depth (Gravity)	0 feet
Surcharge Depth (Force main)	1,000 feet

Note:
The "Surcharge Depth (Force main)" is an arbitrary model parameter required by the SWMM engine that is applied to the nodes along force mains, to allow the computation of the hydraulic gradeline to rise above the manhole rims in a pressurized system.

3.3.2 Sewers

In general, only sewers 8-inch or larger have been modeled with some exceptions of 6-inch sewers where needed to account for connectivity. There are a total of 2,103 gravity sewer segments included in the model, with diameters ranging from 6-inch to 60-inch. **Table 3-5** below provides a summary of the gravity sewer input in the model.

Table 3-5. Modeled Sewers Summary

Diameter (in)	Material (ft)																	
	ABS	ACP	CI	CIP	DIP	PVC	PVC LINED	PVS	RCP	S	SP	SP/CIP	SS	VCP	VCP/ABS	VCP/CIP	Unknown	Total (ft)
6	2,041					8,171								4,377			1,764	**16,353**
8	3,598	4,990	212	1,156	1,834	139,218		403	165		17,482	142	714	108,638	220	912	1,867	**281,551**
10	994	1,444	172			38,844			750		219			34,975			28	**77,413**
12						29,953			1,122	419	1,504			27,422			414	**60,834**
15		80				16,598			1,556					13,568			769	**32,571**
18						6,272			227					11,006			8	**17,513**
21						400			3,338		751		266	4,222				**8,977**
24						1,751			2,570					8,818				**13,139**
27														1,100				**1,100**
30						481			12,215					4,587				**17,283**
36									4,601					13,687			260	**18,548**
42							364		5,413									**5,777**
48									5,119									**5,119**
54									142								4,092	**4,234**
60									2,670								988	**3,658**
Total (ft)	**6,633**	**6,514**	**384**	**1,156**	**1,834**	**241,688**	**364**	**403**	**39,888**	**419**	**19,956**	**142**	**980**	**232,400**	**220**	**912**	**10,189**	**564,082**

As shown, 564,000 feet of gravity sewers are included in the model (approximately 43% of all sewers). After importing the City's GIS layers into the model, the geometry was evaluated for connectivity and continuity errors. Flow tracing tools were used to verify and correct network connectivity and flow direction. The sewer profile tool was used to inspect continuity of sewers and manholes attributes such as diameters, inverts, and rim elevations. Interpolation had to be used to fill gaps in known invert elevations, but generally will provide an adequate representation of the system.

3.3.3 Lift Stations & Force Mains

There is a total of 10 City owned lift stations included in the model. Seven private lift stations are modeled however the capacities are unknown and therefore are included for connectivity purposes only. Any inflows to the private lift stations are passed directly to the gravity system and will need to be confirmed.

Table 3-6 below provides a summary of the force mains included in the model.

Table 3-6. Modeled Force Mains Summary

Diameter (in)	Material			
	AC	PVC	Unknown	Grand Total (ft)
6		12,349		12,349
8	4,643	3,644		8,287
12		18,788	2,959	21,747
24			10,693	10,693
Total (ft)	**4,643**	**34,781**	**13,652**	**53,076**

Key:
AC = Asbestos Cement
PVC = Polyvinyl Chloride

3.3.4 Boundary Conditions

No external boundary conditions have been included in the model. Flow data available at the WQCF includes additional inflows from Lathrop as well as recycle flows from the WQCF internal processes. These flows must be subtracted from the metered flows at the WQCF to provide flows from the upstream collection system only. The true influent flow was determined by subtracting the in plant recycle flows from the WQCF flow data provided. In plant recycle flows were calculated as approximately 12 percent of the WQCF flow provided. To get the true City of Manteca flow, flow from Lathrop was subtracted from the calculated true influent flow. Flow from Lathrop was estimated as 16 percent of the true influent flow. Additional discussion of plant influent flows is included in **Chapter 8.0** of this report.

3.4 FLOW ALLOCATION

Flow monitoring was performed to provide data from specific locations within the collection system for use in calibration of the hydraulic model. Using a flow data from throughout the collection system for calibration allows the actual distribution of dry weather flows (DWF) to be assessed and provides information needed to develop a system specific distribution of wet-weather flow.

This section describes how flows are assigned to the appropriate nodes within the collection system model. Flow inputs are assumed to originate at a parcel level. Parcels were assigned to modeled manholes based on proximity and associated water meter billing records.

3.4.1 Sanitary Loading

Average sanitary load for all property connections, or water meter connections within each sub-sewershed were aggregated and loaded to the closest modeled manhole associated with the upstream connected properties. The manholes or sanitary load points for each sub-sewershed are identified based on the manhole location and engineering judgement. The upstream sub-sewersheds are loaded to the most upstream sanitary manhole to avoid empty pipes in the model. Each manhole within a sub-sewershed upstream of a flow meter was assigned the same diurnal pattern generated using the observed flow meter data.

Sanitary flow loadings for base wastewater flow (BWWF) were developed based on 2021 winter water meter billing records and flow recorded during the flow monitoring study. The City provided water usage data from 2016 to 2021 for address points within the City of Manteca. The total water use of parcels assigned to the same strategic manhole node in the model were determined. These totals were used to distribute the percentage of sewer flow recorded at each of the sewer system flow monitoring locations. This formed the initial sanitary BWWF for each property connection. This approach was selected over monitored collection system flow meter allocation by area as it kept the difference in water use observed between users correlating it to sewer system discharge.

The dry weather flow analysis also includes determination of the individual groundwater infiltration (GWI) component for assessing the impact of GWI on the system conveyance capacity. This is accomplished by identifying the minimum nightly monitored flow for a day, usually occurring during the early morning hours. In residential areas, the experience indicates that about 10 to 20 percent of this minimum nightly flow is attributable to wastewater, with the remaining flow to GWI. GWI was estimated as 80 percent of the minimum nighttime flow and was distributed to manholes proportionally based on contributing area. A number of sanitary sewer hydraulic modeling resources cite GWI as approximately 80 to 90 percent of minimum nighttime flows.

3.5 DRY WEATHER CALIBRATION

One of the most important steps of the hydraulic modeling effort is the calibration of the model. Adequate calibration establishes the level of confidence in the predictive capabilities of a hydraulic model. Model calibration is the adjustment of parameters in a hydraulic model so that modeled flows correlate with observed (metered) flows within an acceptable range.

3.5.1 Criteria for Dry Weather Flow Calibration

The criteria used for assessing the accuracy of the dry weather flow calibration are taken from the Chartered Institution of Water and Environmental Management (CIWEM) guidelines, which are summarized below:

- The volume of the modeled verses metered flow should be in the range of ±10%.
- The modeled versus metered peak flow rate should be in the range of ±10%.
- The modeled versus metered peak flow depth should be in the range of ±0.5 feet.

In general, for this analysis, the above criteria are viewed as objectives rather than as inviolable standards. If one or more of these criteria are not met, any such deviation is viewed in terms of whether the model maintains acceptable accuracy while remaining adequately conservative in its predictive capabilities using engineering judgement. Velocity data is also considered during the calibration process.

3.5.2 Diurnal Pattern Development

Data recorded from rain gauges were used to identify dry weather days suitable for calibration. If rainfall was not recorded at all rain gauges during and for 48 hours prior to that day, it was identified as a dry weather day. Dry weather flow periods observed in the data were identified for the eighteen flow meters in the service area. The average flow per timestep for all weekdays and weekends in each of these dry weather periods was calculated to generate hydrographs for weekday and weekend flow.

Diurnal patterns for weekdays and weekend days were generated for each flow monitoring basin using the observed flow meter data corresponding to DWF periods observed during the study. These derived patterns were further adjusted to account for travel time during the dry weather flow calibration process. If the resultant model diurnal curve has a time lag (due to the effect of long travel times), a time offset is applied to the input curve to achieve better agreement between the meter and modeled diurnal flow patterns. Similarly, if the resultant model diurnal curve is flattened (due to the effect of flow attenuation), an exponential “amplification factor” is applied to the input curve to achieve better agreement between the metered and modeled results.

Note that each diurnal pattern represents the characteristics of the contributing service area i.e., residential, or commercial or industrial flow patterns. The contributing area for most of the Manteca meters was predominantly residential and the diurnal pattern behavior reflected the service area as shown in **Figure 3-3**.

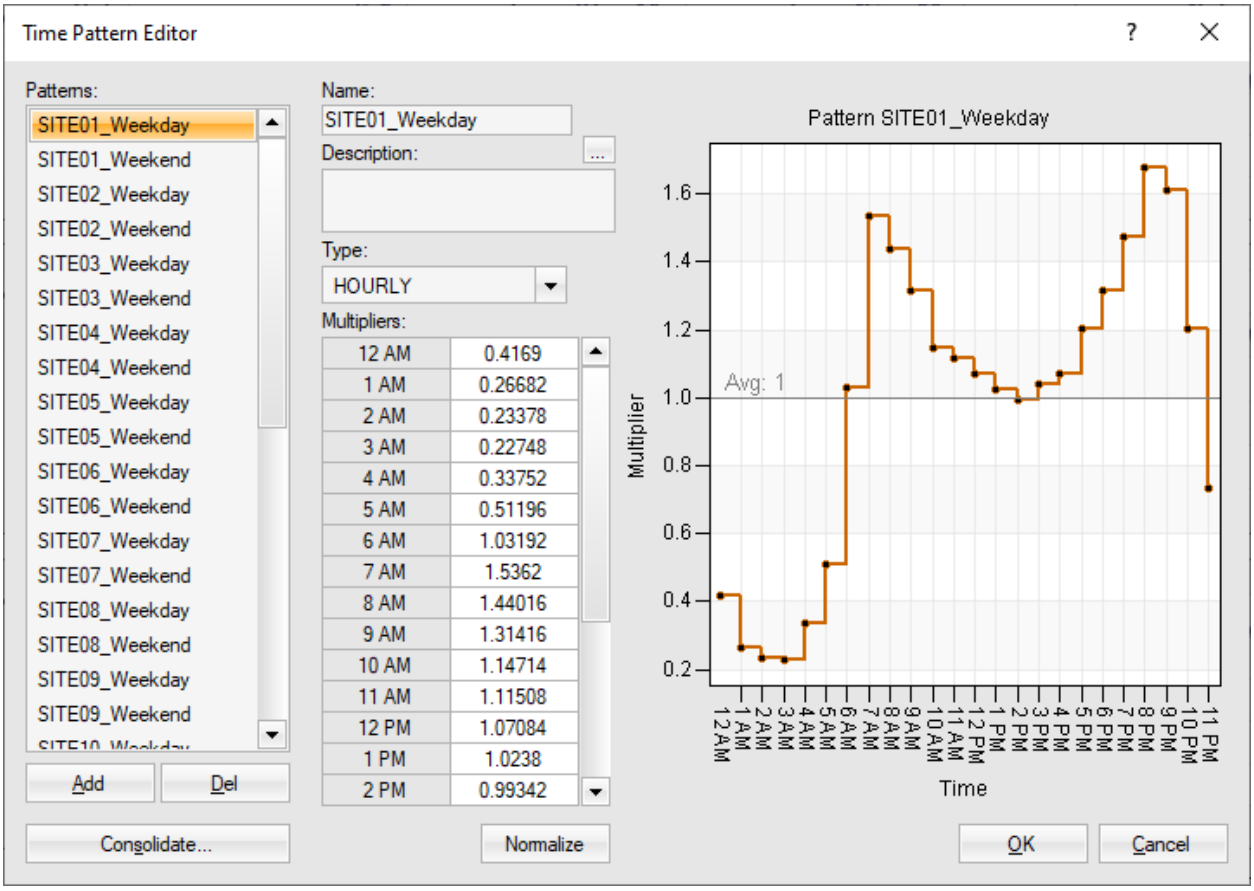


Figure 3-3. Residential – Diurnal Flow Pattern at Flow Meter Site 1

Exceptions were made for flow metering areas in which the observed diurnal flow pattern was significantly distorted by upstream or downstream pump operations (specifically meters 4, 5, 13, and 14). Based on the observed data, flow spikes due to pump operations (pump failure, wet-well back-ups, etc.) were omitted by through the review of graphed meter data over time and the diurnal curve was smoothed out to match the predominate pattern in the data observed. An example of flow spikes and pump station influence and the resulting diurnal pattern is shown in **Figure 3-4**.

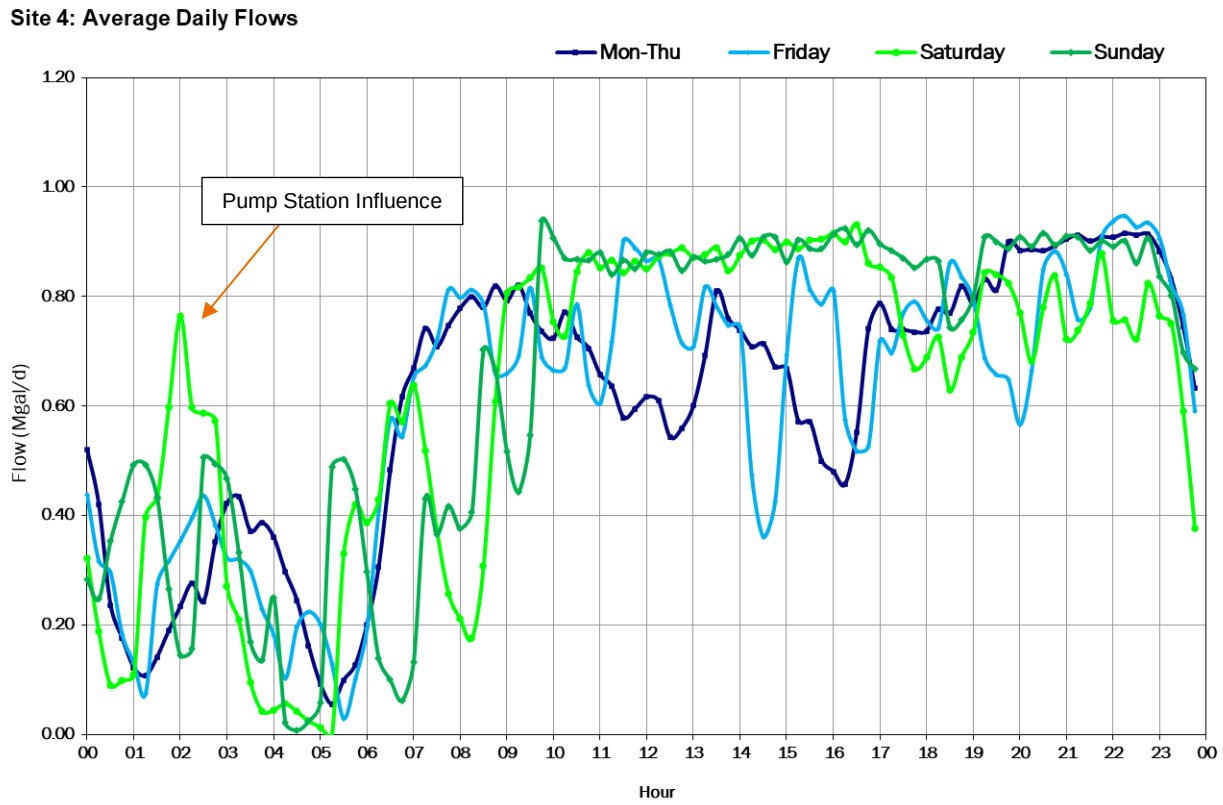


Figure 3-4. Pump Station Influence – Diurnal Flow Pattern at Flow Meter Site 4

The metered versus modeled diurnal flow patterns for all 18 flow monitoring sites and for the WQCF are presented in **Appendix F**. In general, very close agreement was achieved between the modeled and metered diurnal patterns. Notable disparities include the following:

- Site 4 as shown above.
- Site 5 shows significant pump station influence that is not replicated in the model. This results in significant flattening of the diurnal pattern.
- Site 11 shows significant pump station influence. It appears that the Union Road PS downstream of Site 11 experiences temporary flow disruption resulting in variability in the DWF pattern. This was verified through discussion with City staff.
- Site 13 show significant pump station influence that is not replicated in the model. This results in significant flattening of the inconsistent diurnal pattern. As previously discussed, data from Site 13 was considered unsuitable for model calibration purposes.
- Additional pump station influence is observed in other flow meter sites however not to the same degree as those listed above.

3.5.3 Flow Calibration

The flow monitoring study positioned one flow meter along each of the City's primary influent trunk sewers, the north trunk (Site 15), and the south trunk (Site 14). The sum of these meters and Site 16 provides a more accurate measure of to the true influent flow from the City of Manteca alone than data collected from the WQCF influent flow meter, which includes flow from the City of Lathrop and recycled flows from treatment operations. Therefore, the flow monitoring study data was used as the primary data for dry weather calibration.

The model calibration process began by calibrating the most upstream flow meters in the collection system and working downstream. Base flow data and sewer attributes were modified, within reasonable ranges, until there was less than a 10% difference between modeled average flow and measured average flow at each flow monitoring location. The adjustment process continued downstream and was repeated until the model reached an acceptable level of calibration with respect to the recorded ADWFs. The model was calibrated to two 7-dry weather day periods (Event 1: April 1, 2022 – April 8, 2022 and Event 2: May 2, 2022 – May 8, 2022).

Modeled versus metered flows are compared to assess the accuracy of the dry weather calibration and to determine where unexplained disparities exist. The 1-hour rolling average of observed data was used for the comparison of peak flows. Modeled versus metered flows for all 18 metering sites are compared for Event 1 in **Table 3-7** and Event 2 in **Table 3-8**.

Table 3-7. Flow Calibration Results – Dry Weather Period #1 (4/1/2022 - 4/8/2022)

	Volume			Peak Flow		
	Goal: -10% to +10% of observed values			Goal: -10% to +10% of observed values		
	Observed (Mgal/d)	Simulated (Mgal/d)	Error (%)	Observed (Mgal/d)	Simulated (Mgal/d)	Error (%)
SITE 01	0.13	0.13	1.5	0.22	0.20	-6.9
SITE 02	0.09	0.09	-2.4	0.19	0.16	-15.7
SITE 03	0.24	0.24	4.1	0.41	0.37	-9.6
SITE 04	0.61	0.61	0.4	1.00	0.89	-10.3
SITE 05	0.05	0.05	-0.9	0.11	0.09	-15.3
SITE 06	0.15	0.15	0.1	0.27	0.25	-8.8
SITE 07	0.16	0.16	-0.6	0.26	0.24	-8.4
SITE 08	0.09	0.10	2.9	0.19	0.16	-14.0
SITE 09	0.39	0.38	-1.4	0.64	0.59	-8.4
SITE 10	1.50	1.52	0.9	2.39	2.36	-1.3
SITE 11	0.53	0.53	-1.2	1.05	0.73	-31.0
SITE 12	0.12	0.11	-5.4	0.22	0.18	-18.0
SITE 13	*Data from Site 13 could not be used for calibration*					
SITE 14	1.29	1.31	1.0	2.09	1.82	-12.9
SITE 15	3.37	3.39	0.6	5.20	5.07	-2.4
SITE 16	0.10	0.10	-3.0	0.20	0.18	-12.8
SITE 17	0.23	0.23	0.8	0.40	0.40	-0.5
SITE 18	0.40	0.40	0.4	0.65	0.65	0.6

Key:
Mgal/d = Million Gallons per Day

Table 3-8. Flow Calibration Results – Dry Weather Period #2 (5/2/2022 - 5/9/2022)

	Volume			Peak Flow		
	Goal: -10% to +10% of observed values			Goal: -10% to +10% of observed values		
	Observed (Mgal/d)	Simulated (Mgal/d)	Error (%)	Observed (Mgal/d)	Simulated (Mgal/d)	Error (%)
SITE 01	0.13	0.13	-2.8	0.23	0.20	-10.8
SITE 02	0.09	0.09	-3.6	0.21	0.16	-25.6
SITE 03	0.26	0.24	-4.7	0.45	0.37	-18.2
SITE 04	0.60	0.61	2.2	1.05	0.89	-15.0
SITE 05	0.05	0.05	-1.7	0.10	0.09	-9.0
SITE 06	0.15	0.15	-3.7	0.27	0.25	-10.1
SITE 07	0.16	0.16	-0.8	0.26	0.24	-10.0
SITE 08	0.09	0.10	5.3	0.17	0.16	-2.1
SITE 09	0.38	0.38	0.1	0.64	0.58	-9.6
SITE 10	1.49	1.52	1.9	2.42	2.35	-3.0
SITE 11	0.53	0.53	-0.7	1.25	0.73	-42.1
SITE 12	0.11	0.11	2.5	0.20	0.18	-11.2
SITE 13	*Data from Site 13 could not be used for calibration*					
SITE 14	1.29	1.31	0.9	2.14	1.82	-14.9
SITE 15	3.40	3.39	-0.4	5.38	5.07	-5.9
SITE 16	0.10	0.10	0.5	0.18	0.18	-3.1
SITE 17	0.22	0.23	2.6	0.40	0.40	0.6
SITE 18	0.40	0.40	-1.3	0.68	0.65	-4.3

Key:
Mgal/d = Million Gallons per Day

As shown in the table, modeled versus metered dry weather flow volumes compare very well for all metering sites except Site 13. This demonstrates that the average DWF in the model matches very closely with the metered data. Modeled versus metered peak flows show a larger discrepancy. This is generally due to data outliers, or “flow spikes” that are observed in the data, and daily variation in flow patterns, an example this type of outlier or flow spike is shown in **Figure 3-5**. All modeled vs metered flow for each site can be found in **Appendix F**. The modeled flows will be identical for all weekdays (Mon – Fri) and weekends (Sat – Sun), where the metered flow is bound to see variations from day to day. This can also be a result of PS influence which cannot be duplicated in the model. An example of metered versus modeled flow for Site 1 can be seen below in **Figure 3-5**.

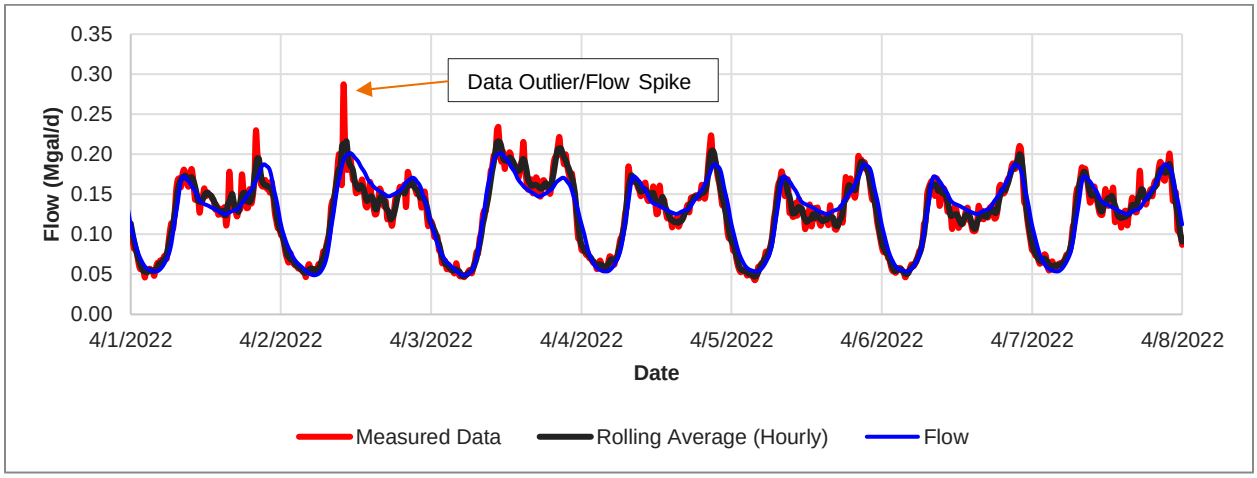


Figure 3-5. Metered versus Modeled Flows at Site 1

As shown above, a flow spike on April 2, 2022 results in a peak observed flow of approximately 0.3 Mgal/d as compared to the modeled flow of 0.2 Mgal/d. Taking the hourly rolling average of the 15-minute observed data helps to smooth out these sporadic spikes in the raw data. As shown in the tables, the peak modeled flows are generally within 20 percent of the hourly rolling average of the observed data aside from Site 11 which experienced frequent flow interruption due to operating conditions of the Union Road Lift Station. Visually reviewing graphs of model results and metered data also demonstrates a very close match of the metered versus modeled flows.

3.5.4 Velocity and Depth Calibration

Modeled versus metered velocities and depths are also compared to assess the accuracy of the dry weather calibration and to determine where unexplained disparities exist. There are no CIWEM guidelines for velocity, but a goal of +/- 1.0 fps was established. Peak flow depth was evaluated using the CIWEM guideline of +/- 0.5 feet of observed values. Modeled versus metered velocities and depths for all 18 metering sites are compared for Event 1 in **Table 3-9** and Event 2 in **Table 3-10**.

Table 3-9. Depth and Velocity Calibration Results – Dry Weather Period #1 (4/1/2022 - 4/8/2022)

	Peak Velocity			Peak Depth		
	Goal: -1 fps to +1 fps of observed values			Goal: -0.5 ft to +0.5 ft of observed values		
	Observed (fps)	Simulated (fps)	Error (fps)	Observed (ft)	Simulated (ft)	Error (ft)
SITE 01	1.59	1.38	-0.21	0.38	0.33	-0.06
SITE 02	2.24	1.57	-0.67	0.22	0.23	0.01
SITE 03	1.02	1.40	0.38	0.74	0.46	-0.28
SITE 04	1.60	2.34	0.74	2.22	0.55	-1.66
SITE 05	1.27	0.46	-0.81	0.22	0.35	0.12
SITE 06	1.71	1.24	-0.47	0.30	0.32	0.03
SITE 07	1.74	1.26	-0.48	0.27	0.30	0.03
SITE 08	1.34	1.23	-0.11	0.28	0.26	-0.02
SITE 09	1.11	1.08	-0.03	0.67	0.56	-0.10
SITE 10	2.62	2.23	-0.39	0.98	0.92	-0.06
SITE 11	1.00	1.39	0.39	3.95	0.38	-3.57
SITE 12	1.82	1.31	-0.51	0.30	0.31	0.01
SITE 13	0.59	0.25	-0.34	0.12	0.03	-0.08
SITE 14	1.35	1.27	-0.08	1.03	0.93	-0.10
SITE 15	1.32	1.47	0.15	1.89	1.66	-0.23
SITE 16	1.14	1.02	-0.12	0.46	0.34	-0.13
SITE 17	1.88	1.11	-0.77	0.37	0.38	0.01
SITE 18	1.33	1.30	-0.03	0.64	0.63	-0.01

Key:
fps = feet per second

Table 3-10. Depth and Velocity Calibration Results – Dry Weather Period #2 (5/2/2022 - 5/9/2022)

	Peak Velocity			Peak Depth		
	Goal: -1 fps to +1 fps of observed values			Goal: -0.5 ft to +0.5 ft of observed values		
	Observed (fps)	Simulated (fps)	Error (fps)	Observed (ft)	Simulated (ft)	Error (ft)
SITE 01	1.66	1.38	-0.28	0.38	0.33	-0.06
SITE 02	2.54	1.57	-0.97	0.26	0.23	-0.03
SITE 03	1.22	1.40	0.18	0.62	0.46	-0.17
SITE 04	1.73	2.33	0.60	2.51	0.55	-1.95
SITE 05	1.44	0.46	-0.98	0.22	0.35	0.13
SITE 06	1.81	1.24	-0.57	0.30	0.32	0.02
SITE 07	1.70	1.26	-0.44	0.28	0.30	0.02
SITE 08	1.26	1.23	-0.03	0.28	0.26	-0.02
SITE 09	1.19	1.08	-0.11	0.65	0.56	-0.09
SITE 10	2.63	2.22	-0.41	0.86	0.92	0.05
SITE 11	0.93	1.39	0.46	3.57	0.38	-3.19
SITE 12	1.97	1.31	-0.66	0.27	0.31	0.04
SITE 13	1.30	0.25	-1.05	0.24	0.03	-0.21
SITE 14	1.36	1.27	-0.09	1.06	0.93	-0.13
SITE 15	1.32	1.47	0.15	1.91	1.66	-0.25
SITE 16	0.96	1.02	0.06	0.41	0.34	-0.08
SITE 17	1.83	1.11	-0.72	0.29	0.38	0.08
SITE 18	1.34	1.30	-0.04	0.66	0.63	-0.03

Key:
fps = feet per second

As shown in the tables, modeled versus metered depths and velocities vary significantly across the sites. Sites that fall outside of the calibration goals are heavily influenced by pump stations in the system that control velocity and flow depth in the metered sewers. Pump station influence creates spikes or noise in the data which will result in larger mismatch of metered vs modeled results. This is why the flows are used as the primary means of calibration for DWF. Based on the results of the metered vs modeled comparisons and CIWEM guidelines, the calibration was deemed sufficient for this analysis using best engineering judgement.

Of note, recorded data for Site 13 appears to be unsuitable for calibration. The data shows very high pump influence, and the modeled flow is very low for a 30-inch sewer therefore confidence in the precision of the measured values would be difficult to achieve. Site 13 shows significant pump station influence that cannot not be replicated in the model.

3.6 WET WEATHER CALIBRATION

As described in **Chapter 2.0** of this report, the most significant storm event that occurred during the flow monitoring period was on March 27, 2022 – March 28, 2022 and produced 0.72 inches of rain when averaged over the five gauges. This storm event provided the basis for initial wet weather flow (WWF) calibration of the collection system model. The results of this calibration were validated using influent flow data from the WQCF collected during larger more recent storm events.

Based on the results presented below, the model is calibrated to a degree adequate to provide basis for sound collection system capacity analysis and planning. It should be understood, however, that the collection system response to major storm events may be highly variable, based on factors such as total event rainfall, peak storm intensity, antecedent rainfall, and possibly other factors. It is therefore appropriate in collection system planning to use an adequately conservative design storm condition.

3.6.1 Methodology

The analysis makes use of the RTK method for wet-weather calibration of the PCSWMM model. The RTK parameters are defined as follows:

- R: The portion of total rainfall within the tributary area that enters the collection system in the form of I/I.
- T: The time from the onset of rainfall to the peak of the I/I response.
- K: The ratio of the time to recession to the time to peak of the hydrograph, where the time to recession is defined as the time from the peak to the point in time where there is no longer any appreciable I/I response.

The RTK parameters are derived for each flow monitoring basin identified in the flow monitoring study. The resultant RTK parameters established through calibration are then applied to the collection system model using the 10-year, 24-hour design storm for both existing and buildout development conditions. The 10-year, 24-hour design storm is further described in **Section 4.1**. RTK values for future development areas are conservatively approximated from those developed in the wet weather calibration process.

3.6.2 Criteria for Wet-Weather Flow Calibration

The criteria used for assessing the accuracy of the wet weather flow calibration are taken from CIWEM guidelines noted for dry weather calibration and are summarized below:

- The modeled versus metered peak flow rate should be in the range of -15% to +25%.
- The volume of the modeled versus metered flow during and following the calibration of the storm should be in the range of -10% to +20%.
- The modeled versus metered flow non-surcharged depth should be in the range of ± 0.5 feet.

- The modeled versus metered flow of surcharge should be in the range of -0.5 feet to +1.6 feet.

As with the dry weather calibration, these criteria should be viewed as objectives rather than as inviolable standards. If one or more of these criteria is not met, any such deviation should be viewed in terms of whether the model is adequately conservative in its predictive capabilities. Of the above criteria, agreement between modeled and metered peak flows and volumes are considered the most important criteria, given that peak flows and volumes are what define the sizing needs of the existing and future collection system and treatment facilities.

3.6.3 Rainfall Event Analysis

As previously discussed, only one primary rainfall event occurred during the flow monitoring period. This event is used as the primary event for model calibration. To validate the calibration, rainfall data from the California Irrigation Management Information System (CIMIS) was downloaded to evaluate more recent and severe rainfall events in conjunction with influent flow data from WQCF. Between December 2022 and January 2023, 12.11 inches of rain fell in Manteca based on data from CIMIS Station 70. This amount of rainfall over 60-days is considered to have a return frequency of between 1 in 25-years (11.5 inches) and 1 in 50-years (12.4-inches) based on the NOAA point precipitation frequency atlas. Several storm events during this period had a significant impact on influent flows observed at the WQCF. The hourly rainfall and influent flow data for this period is shown in **Figure 3-6**.

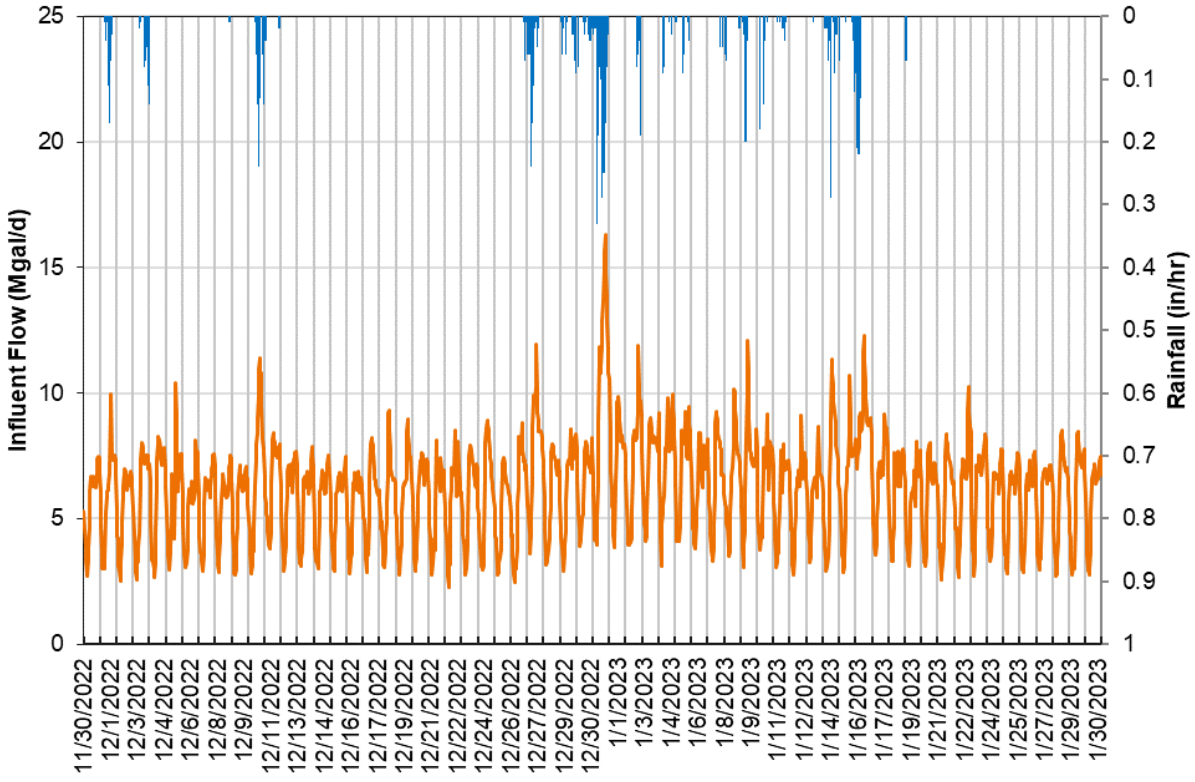


Figure 3-6. Rainfall and WQCF Influent Data

The most significant influent flow response and corresponding rainfall event occurred between December 29, 2022, and January 1, 2023, where 3.29-inches of rain was recorded at the CIMIS 70 station. During this event hourly influent flow peaked at approximately 16.3 Mgal/d. This event was classified as approximately 20-year, 3-day event, and a 20-year, 24-hour event based on the NOAA frequency atlas. The bulk of this rainfall fell during a 12-hour period starting at 6am on December 31, 2023, where 1.99 inches of rain was recorded. This was classified as a 30-year, 12-hour event based on NOAA frequency atlas.

Rainfall events used for model calibration and validation are summarized in **Table 3-11**.

Table 3-11. Rainfall Calibration and Validation Events

Rainfall Event	Duration	Total Rainfall (in)	24-hour Return Frequency	Peak Influent Flow (Mgal/d)	Data Source
1	Start: 3/27/2022 22:00 End: 3/28/2022 14:30 Duration: 16.5 hours	NW: 0.71 EAST: 0.61 SW: 0.55 SOUTH: 0.77 SE: 0.76 Overall: 0.72	<1-year	8.1	V&A Report
2	Start: 12/29/2022 1:00 End: 12/31/2022 22:00 Duration: 70 hours	12-hour: 1.99 24-hour: 2.49 Overall: 3.29	~20-year	16.3	CIMIS 70 - Manteca
3	Start: 01/14/2023 2:00 End: 01/16/2023 08:00 Duration: 54 hours	12-hour: 1.36 24-hour: 1.51 Overall: 2.24	~2-year	12.3	CIMIS 70 – Manteca

Key:
CIMIS = California Irrigation Management Information System
Mgal/d = Million Gallons per Day
NW = Northwest Rain Gauge
SE = Southeast Rain Gauge
SW = Southwest Rain Gauge
V&A = V&A Consulting Engineers, Inc.

3.6.4 Flow Calibration

Modeled versus metered flows are compared to assess the accuracy of wet weather flow calibration and to determine where unexplained disparities exist. As already noted, the March 2022 event was used to perform the initial calibration, which was then verified against the more significant rainfall events from December 2022 and January 2023. Upon review of the modeled response against the observed influent data at the WQCF, the calibration from the March 2022 event did not provide a representative response in the collection system as observed in the rainfall events in December and January. It was determined that the model should be recalibrated to using the more severe rainfall. This provided a challenge in terms of calibration as there is no flow meter data to use as a basis of comparison other than the influent data at the WQCF. However, our team felt it important to establish model parameters that would result in a similar response in the model at the WQCF as was observed in the influent data.

In order to calibrate the model with the lack of flow meter data during the same time period, the proportion of flows observed in the flow meters relative to the total flow at the WQCF during the initial calibration to the March 2022 rainfall, were used as a basis of comparison.

This ratio was calculated as follows:

Site Target Flow Proportion = Site Qmax / WQCF Qmax

The modeled peak flows for each meter site versus the modeled influent flow for the initial March 2022 calibration are compared in **Table 3-12**.

Graphical comparisons of modeled versus metered calibration data are presented in **Appendix F**.

Table 3-12. Flow Calibration Results – Wet Weather Period #1 (3/27/2022 - 3/28/2022)

	Peak Flow (Mgal/d)			
	Observed (Including Upstream Basins)	% of Total	Observed (Upstream Basins Removed)	% of Total
SITE 01	0.201	2.8%	0.201	2.8%
SITE 02	0.156	2.2%	0.156	2.2%
SITE 03	0.402	5.6%	0.402	5.6%
SITE 04	0.922	12.9%	0.345	4.8%
SITE 05	0.102	1.4%	0.102	1.4%
SITE 06	0.268	3.8%	0.268	3.8%
SITE 07	0.576	8.1%	0.576	8.1%
SITE 08	0.162	2.3%	0.162	2.3%
SITE 09	0.577	8.1%	0.577	8.1%
SITE 10	2.363	33.2%	1.271	17.9%
SITE 11	0.848	11.9%	0.272	3.8%
SITE 12	0.178	2.5%	0.178	2.5%
SITE 13	0.05	0.7%	0.05	0.7%
SITE 14	1.833	25.7%	0.749	10.5%
SITE 15	5.037	70.7%	0.615	8.6%
SITE 16	0.176	2.5%	0.176	2.5%
SITE 17	0.402	5.6%	0.402	5.6%
SITE 18	0.646	9.1%	0.646	9.1%
WQCF	**7.12**	**100.0%**	**7.12**	**100.0%**

The values presented above for the % of Total were the targets used to calibrate the model to the observed influent data for December 2022 and January 2023. The model parameters were adjusted until the modeled flows at the WQCF closely matched those observed in the influent data. The modeled peak

flows for each meter site versus the modeled influent flow for the December 2022 and January 2023 rainfall calibration are compared in **Table 3-13**.

Table 3-13. Flow Calibration Results – Wet Weather Period #2 (12/26/2022 - 1/16/2023)

	Peak Flow (Mgal/d)			
	Observed (Including Upstream Basins)	% of Total	Observed (Upstream Basins Removed)	% of Total
SITE 01	0.716	4.3%	0.716	4.3%
SITE 02	0.453	2.7%	0.453	2.7%
SITE 03	1.113	6.7%	1.113	6.7%
SITE 04	1.51	9.0%	-0.164	**-1.0%**
SITE 05	0.424	2.5%	0.424	2.5%
SITE 06	0.892	5.3%	0.892	5.3%
SITE 07	1.364	8.2%	1.364	8.2%
SITE 08	0.623	3.7%	0.623	3.7%
SITE 09	1.674	10.0%	1.674	10.0%
SITE 10	6.234	37.3%	3.092	18.5%
SITE 11	2.82	16.9%	1.456	8.7%
SITE 12	0.461	2.8%	0.461	2.8%
SITE 13	0.05	0.3%	0.05	0.3%
SITE 14	2.665	15.9%	0.532	3.2%
SITE 15	13.359	79.9%	0.77	4.6%
SITE 16	0.48	2.9%	0.48	2.9%
SITE 17	1.203	7.2%	1.203	7.2%
SITE 18	1.789	10.7%	1.789	10.7%
WQCF	16.721	100.0%	16.721	100.0%

A comparison of the modeled influent hydrograph versus the measured influent flow for the Wet Weather Period #2 is shown in **Figure 3-7**.

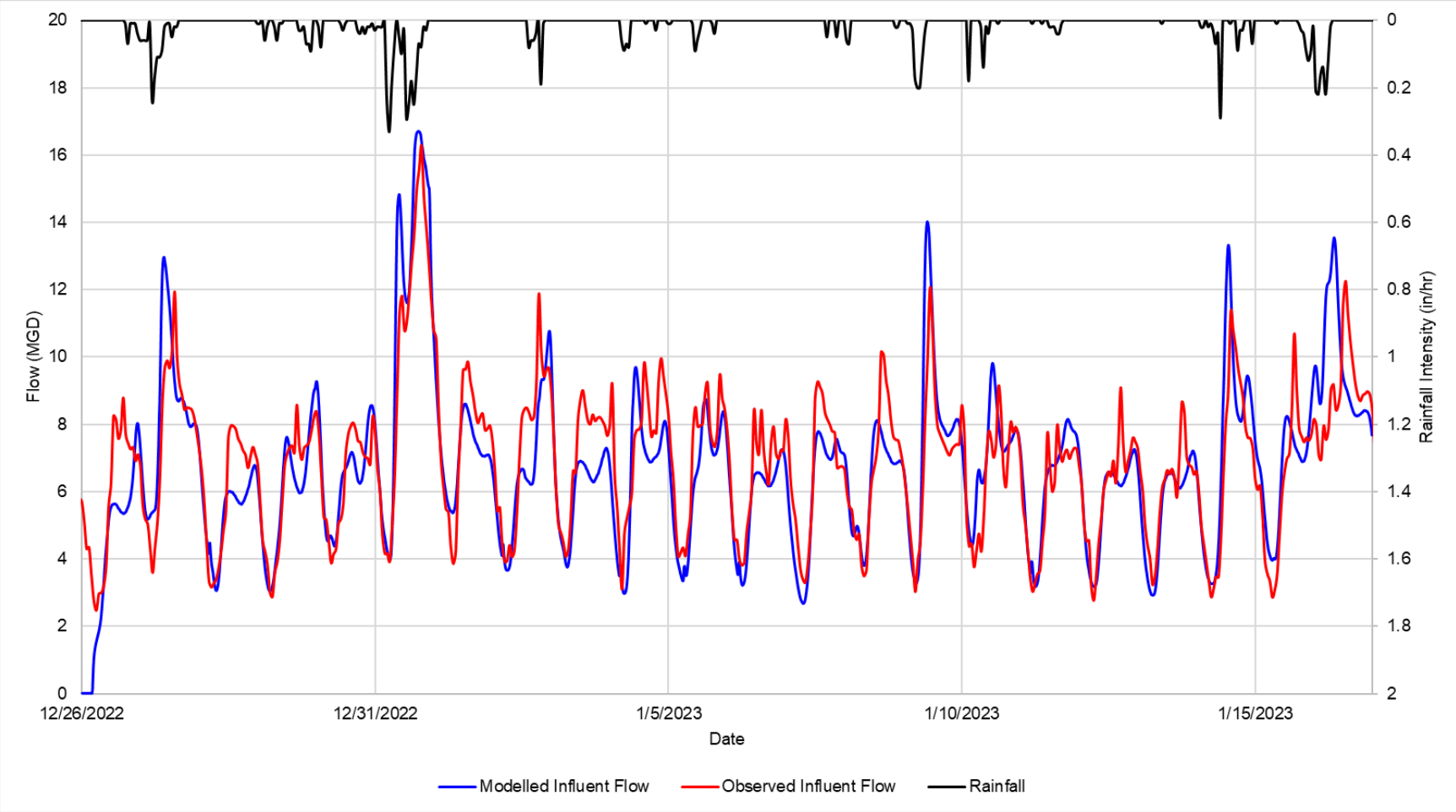


Figure 3-7. Modeled Versus Observed WQCF Influent Flow Data

As shown on **Table 3-12** and **Table 3-13**, the calibration leads to generally higher flow proportion than was observed with the initial calibration. It is preferrable to have a conservative result given the limited data available for calibration. As shown on **Figure 3-7** above, the modeled flows match the pattern and generally the timing of the peak flows observed at the WQCF. The model overestimates the peak flows, however this provides a conservative result and given the limited data with which to calibrate, it is preferrable to have a conservative result. A summary of the peak flows and volumes for the WWF period above is shown on **Table 3-14** below.

Table 3-14. WQCF Influent Flow Calibration Results – Wet Weather Period #2 (12/26/2022 - 1/16/2023)

Date	Peak Flow (Mgal/d)			Volume (Mgal)		
	Modeled	Observed	Error (%)	Modeled	Observed	Error (%)
12/26/2022 - 12/27/2022	13.15	11.95	10.0%	12.25	13.5	-9.3%
12/29/2022 - 12/31/2022	17.67	16.29	8.5%	23.92	22.74	5.2%
01/04/2023 - 01/05/2023	9.72	9.98	-2.6%	12.75	14.61	-12.7%
01/09/2023 - 01/12/2023	14.36	12.07	19.0%	20.82	19.68	5.8%
01/14/2023 - 01/17/2023	14.07	12.27	14.7%	23.6	22.3	5.8%
12/26/2022 - 01/17/2023	*17.67*	*16.29*	8.5%	*147.6*	*152.3*	-3.1%

As shown, the model peak flows are within the range of -15% to +25% and the volume is within the range of -10% to +20% noted in **Section 3.6.2**.

3.6.5 Velocity and Depth Calibration

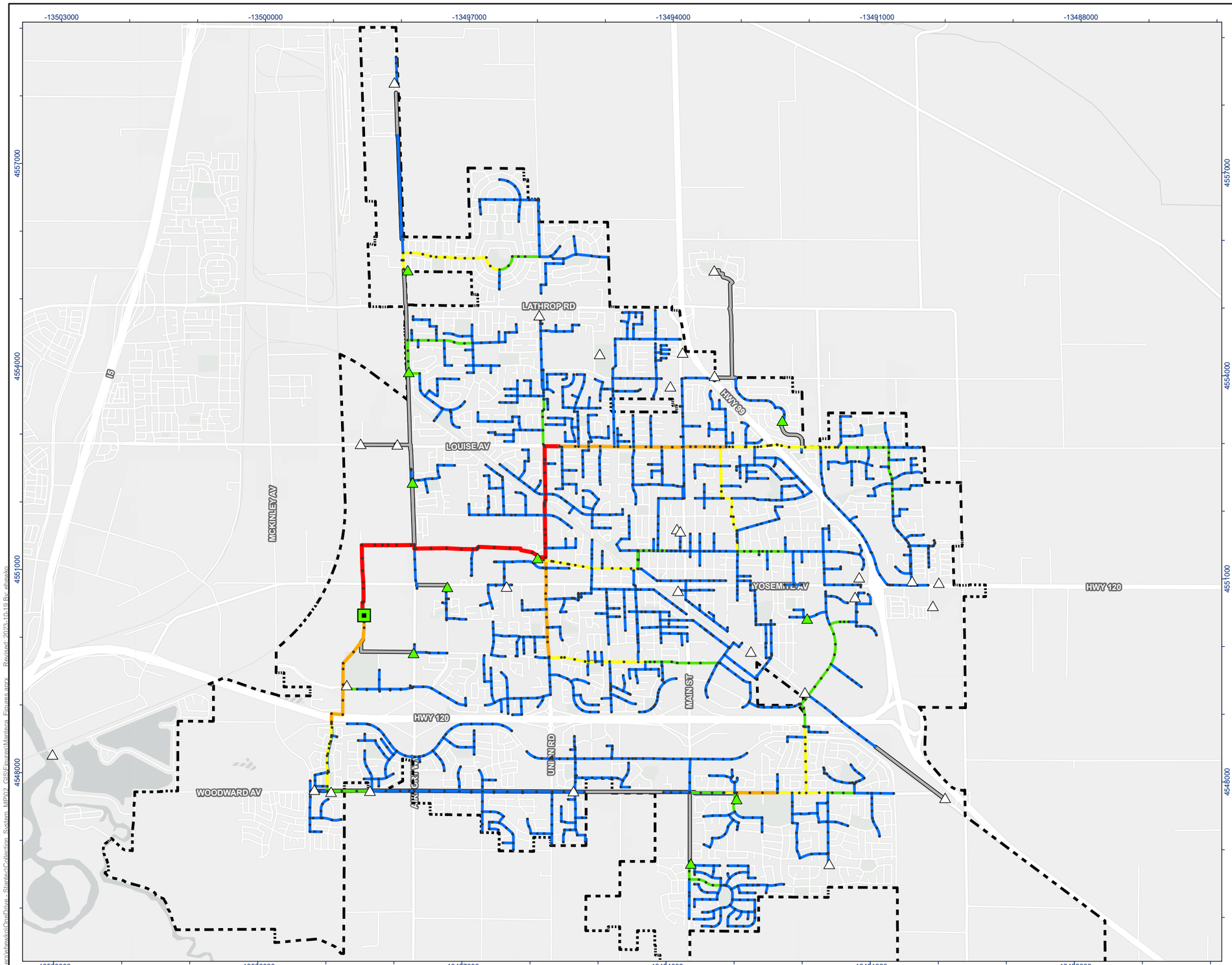
Modeled versus metered velocities and depths are also compared to assess the accuracy of the wet weather calibration and to determine where unexplained disparities exist. Modeled versus metered velocities and depths for all 18 metering sites are compared for Event 1, however since the model was recalibrated for the second wet weather period and velocity and depth data was unavailable for comparison, this step could not be carried out.

3.7 MODEL CALIBRATION SUMMARY

The model was calibrated for DWF and compared to metered results for two different periods: April 1, 2022 – April 8, 2022, and May 2, 2022 – May 9, 2022. The model results showed good correlation with the shape and timing of the flow observed at most metering sites, other than those impacted by strong pump station influence as discussed in section 3.5. The modeled volumes for DFW were all within 10% of the metered volumes. The modeled peak flows showed a larger variation from the metered flows however this is due to inconsistencies in the daily flows, and spikes in the data. The DWF calibration is deemed sufficient for the analysis.

The model was initially calibrated for WWF for a single event on March 27, 2022 – March 28, 2022. This calibration was verified against additional rainfall and influent flow data from December 1, 2022 –

February 1, 2023. It was determined that the model needed to be recalibrated for the larger rainfall events as the response in the model from the initial calibration was not within an acceptable error tolerance. Meter data was not available for the same time period for the recalibration; therefore an alternate approach was employed to attempt to match the proportion of flows observed at each meter site as compared to the influent flow at the WQCF. The calibrated model showed a strong correlation to the flows observed at the WQCF for the second WWF period of December 26, 2022 – January 16, 2023. The model generally over-estimates the peak flows observed, however the peak flows and volumes are within the error ranges noted in Section 3.6.2. The WWF calibration is deemed sufficient for the analysis. Level of service results for the calibrated WWF model can be seen on **Figure 3-8** through **3-11**.



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Other Lift Station
- Modeled Forcemain

Peak Flow (Mgal/d)

- <= 0.5 Mgal/d
- > 0.5 Mgal/d - 1.0 Mgal/d
- > 1.0 Mgal/d - 2.0 Mgal/d
- > 2.0 Mgal/d - 5.0 Mgal/d
- > 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

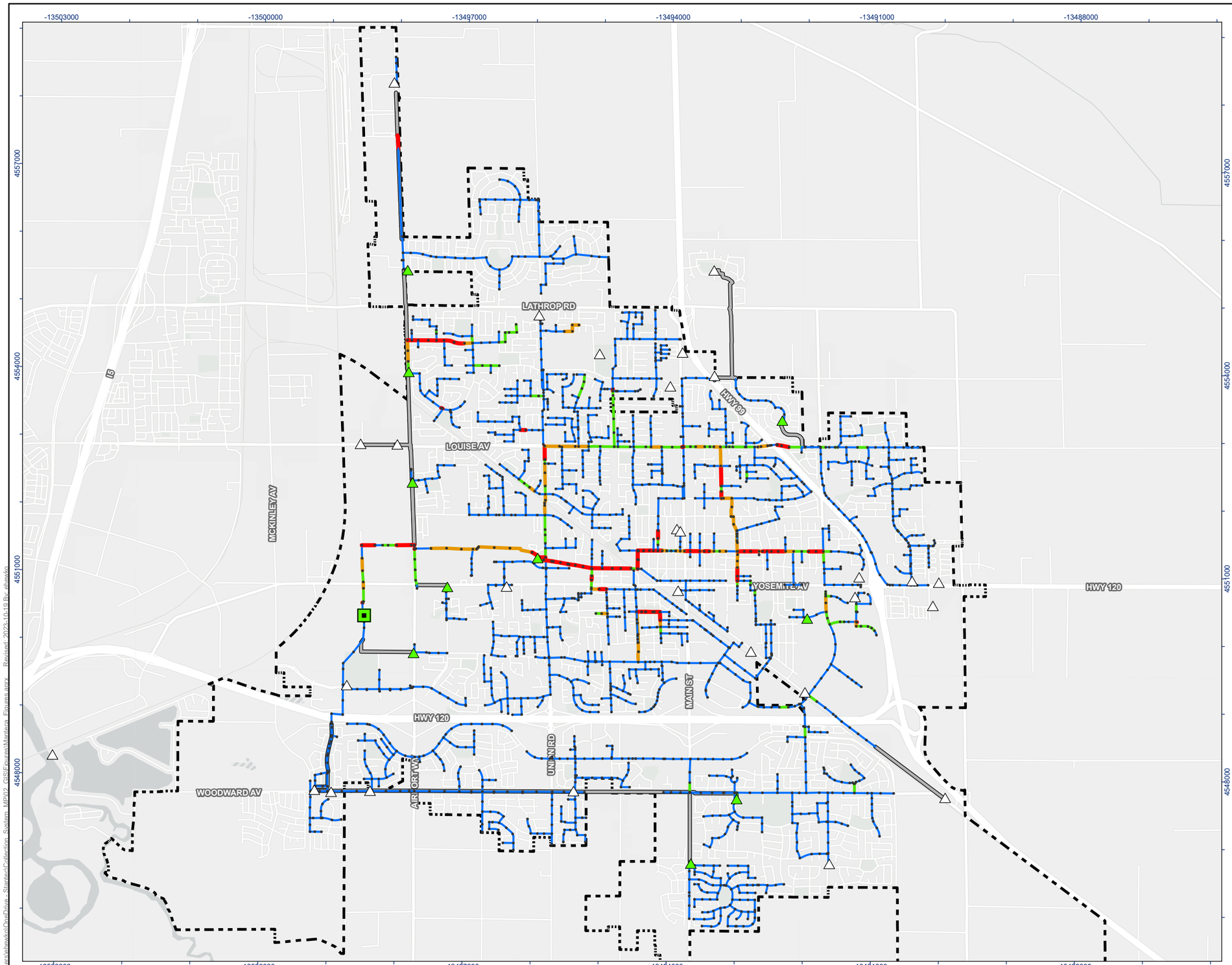
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Figure No.
3-8

Title
Calibration Event: WWF - Peak Sewer Flow

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Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Other Lift Station
- Modeled Forcemain

Peak Pipe Utilization (% of FPC)

- <= 50%
- > 50% - 75%
- > 75% - 50%
- > 100%
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
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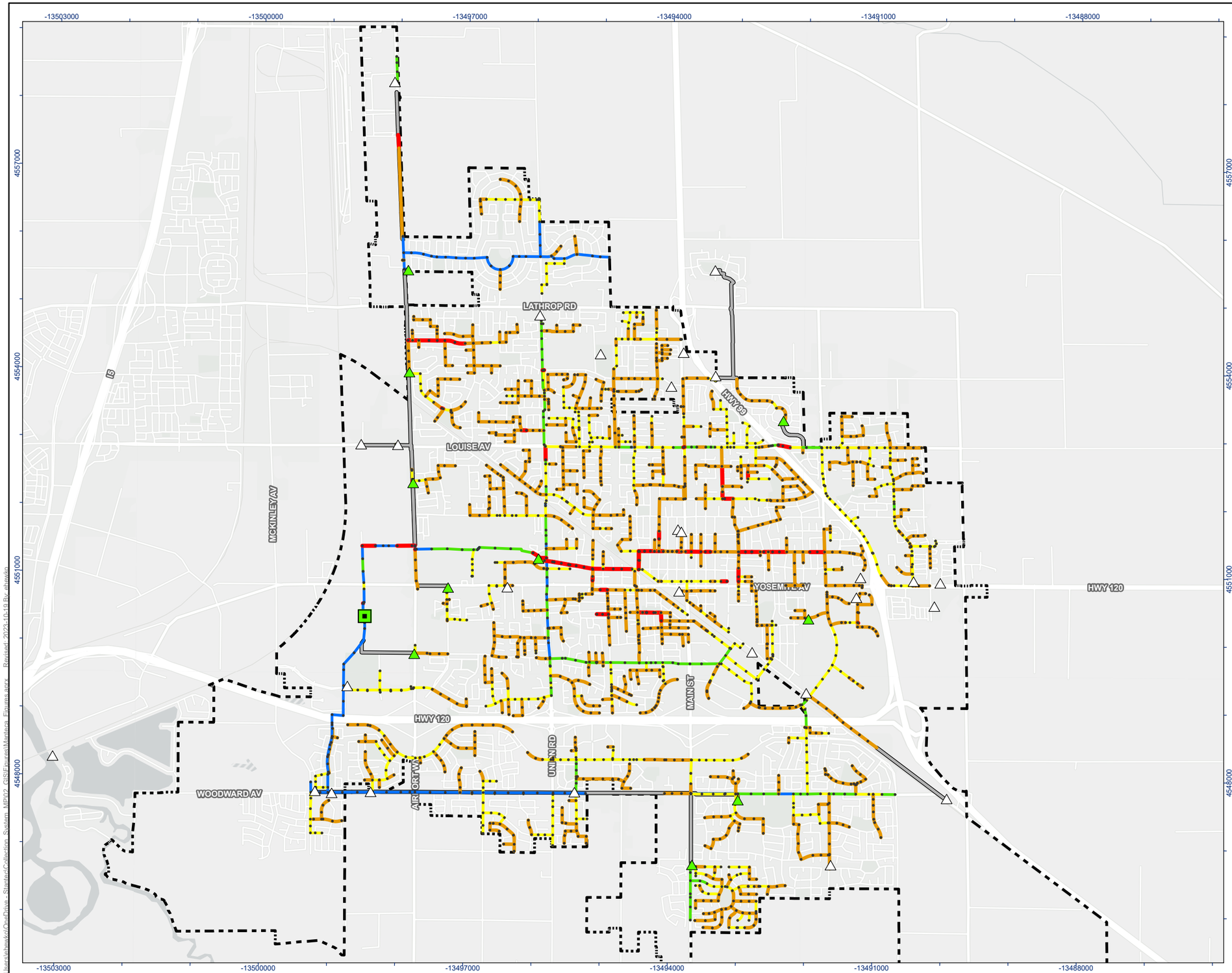
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Figure No.
3-9

Title
Calibration Event: WWF - Peak Pipe Utilization (% of FPC)

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Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Other Lift Station
- Modeled Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

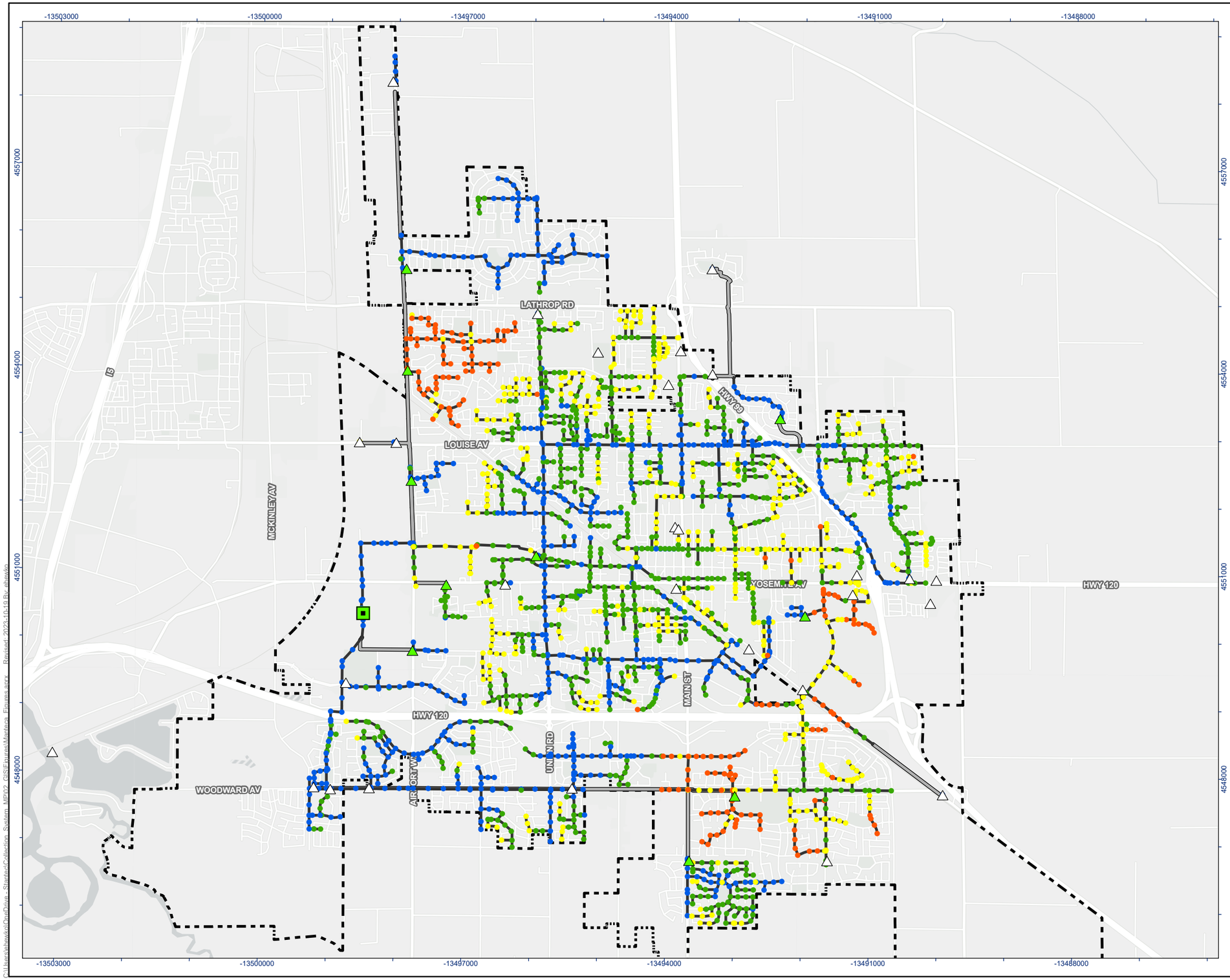
184031535

Figure No.
3-10

Title
Calibration Event: WWF - Residual Capacity

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Stantec

MANTECA CALIFORNIA

Legend

- Water Quality Control Facility
- Modeled Lift Station
- Other Lift Station
- Modeled Forcemain
- Modeled Sanitary Sewer

Manhole Freeboard (ft)

- <= 2 ft
- > 2 ft - 6 ft
- > 6 ft - 10 ft
- > 10 ft
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
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Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
3-11

Title
Calibration Event: WWF - Manhole Surcharging (Depth Below Rim)

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4.0 BASIS FOR COLLECTION SYSTEM ANALYSIS

The purpose of this chapter is to present planning, design, and performance criteria applicable to the City's wastewater collection system. These criteria are relevant to the analysis of the existing system, as well as the assessment of future capacity needs. Planning and growth assumptions for evaluation of the system at future levels of development is also presented. The criteria presented in this chapter serve as the basis for the recommended capital improvement program (CIP) presented later in this report.

This chapter is divided into the following sections:

- Design Criteria
- Future Growth Assumptions

4.1 DESIGN CRITERIA

The criteria presented in this chapter are considered adjunct to the existing City Standards and Specifications and are not intended to replace or supersede those standards unless specifically stated otherwise. The City should consider revising their peaking factor standards based on monitored flows. The City Standards exist as Standard Specifications and Drawings for the sewer, storm drain, water and street utilities and infrastructure. The City's Standards can be found in **Appendix E** of this report.

The Standard Specifications for sewers address pipe materials, maintenance holes, trenching and construction related topics. The Standards Drawings include various drawings related to pipe and maintenance hole construction, as well as system criteria such as pipe slope, diameter, velocity, and Manning's "n" for pipe sizing.

The City of Manteca design criteria require that wastewater sewer system design shall be in conformance with the City of Manteca's current Wastewater Sewer System Master Plan on Drawing No. S-2. This drawing presents sanitary sewer design data including the following various system criteria:

- Dry weather flow factors for various land use categories
- Calculations of flow peaking factors and I/I rates
- Design flow calculations

4.1.1 Wastewater Generation Factors for General Plan Land Use

As described in previous chapter, winter water meter demands, and data collected during the flow monitoring period serve as the basis for developing existing ADWF throughout the City. Land-use based wastewater generation factors (WGF) are used to establish ADWF estimates for future development. Based on review of existing development trends within Manteca and the City's General Plan, it was determined that approximately 80-percent of the gross area contributes to wastewater flow generation, leaving 20-percent for rights-of-way and open spaces. Therefore, the net area, equal to 80-pecent of the

gross total area, was used to estimate wastewater flow from future development areas using the WGFs presented below. This net to gross area ratio was determined by reviewing areas of the existing system that are already fully developed or considered built out.

Presented in **Chapter 2.0** is a per-capita flow assessment that identifies that the average per-capita flow in the existing system is approximately 61 gpcd. This unit rate was used to derive the WGFs by land use category by considering the City's average household density and the development densities presented in the General Plan for each land use designation. According to the US Census data from 2017 to 2021, the average household or equivalent dwelling unit (EDU) density in the City of Manteca is approximately 3.2 persons per EDU, resulting in an approximate wastewater unit rate of 195 gpd/EDU.

The land use-based WGFs presented in the City's 2012 Master Plan were reviewed and updated based on proposed changes to the City's General Plan and the updated WGFs presented above. The General Plan EDU densities presented in the 2012 Master Plan, and those in the 2023 General Plan are summarized in **Table 4-1**. The midpoint of each density range is used in both the 2012 Master Plan and this WWMP update, aside from very low density where 2 EDU/acre is used in the 2012 Master Plan.

Table 4-1. General Plan Residential Density Update

Residential Land Use Category	2012 General Plan Density (EDU/acre)	2023 General Plan Density (EDU/acre)
Very Low Density	0 to 2	0 to 2
Low Density	2.1 to 8	2.1 to 8
Medium Density	8.1 to 15	8.1 to 20
High Density	15.1 to 25	20.1 to 30

Key:
EDU = Equivalent Dwelling Unit

The 2012 Master Plan used lower WGFs for future development to reflect water conservation legislation that was upcoming at the time. Assumptions for existing development were 265 gpd/EDU for very low to low density residential and 189 gpd/EDU for medium and high density residential. Assumptions for future development were 160 gpd/EDU for very low to low density residential and 117 gpd/EDU for medium and high density residential. Unlike the 2012 Master Plan, this report uses the calculated historical per-capita unit rate (195 gpd/EDU) consistently for each future residential land use designation.

The results of the update to WGFs are presented in **Table 4-2**. The higher density ranges in the updated General Plan and a fixed data-based unit rate result in a higher WGF for low, medium, and high density residential land uses.

No adjustments were made to non-residential land use designation WGFs. Neighborhood commercial and urban reserve land use designations are no longer used in the updated General Plan, and downtown, agricultural industrial, and business professional were added. The WGF of downtown development was equated to that used for commercial mixed use. Agricultural industrial was equated to industrial land use and business professional was equated to general commercial land use. The WGF of parks was reduced from 400 gpd/acre to 100 gpd/acre to better reflect typically observed values. Parks typically have very

low to no wastewater generation component because they generally consist of open space and the majority of water use is attributed to irrigation. This is seen when comparing seasonal water use records.

Table 4-2. Wastewater Generation Factors (WGF)

Land Use	2012 Master Plan (gpd/acre)	2023 Master Plan (gpd/acre)
Residential – New Development		
Very Low Density Residential	320	195
Low Density Residential	808	985
Medium Density Residential	1,346	2,740
High Density Residential	2,337	4,885
Other – Existing and New Development		
Commercial Mixed Use	2,473	2,473
General Commercial	750	750
Heavy Industrial	1,000	1,000
Light Industrial	1,000	1,000
Public/Quasi-Public	425	425
Park	400	100
Agriculture	0	0
Open Space	0	0
Neighborhood Commercial	1,120	NA
Business Industrial Park	1,200	1,200
Urban Reserve	320	NA
Downtown	New Designations	2,473
Agricultural Industrial	New Designations	1,000
Business Professional	New Designations	750
Water	New Designations	0
ROW	New Designations	0

Note:
NA = not appliable, land use designation no longer included in General Plan.
Key:
gpd = gallons per day

4.1.2 Design Storm

The existing City Standards describe how to perform design flow calculations for collection system facilities. The design standards do not address flow modeling methodologies and assumptions related to the simulation of PWWFs in the collection system. After establishing ADWF conditions based on existing flow monitoring data and projecting future conditions with WGFs, the hydraulic model is used to apply a diurnal flow pattern to the ADWF and then the I/I resulting from a simulated severe storm event is superimposed on the dry weather flow pattern.

PWWFs simulated in the hydraulic model are used to evaluate the LOS of the collection system and provide recommendations for future servicing and improvement strategies. These computational models

use simulated design rainfall events representing a reasonable worst-case condition. For purposes of this WWMP, PWWFs in the collection system were evaluated using a 10-year, 24-hour design storm with a Huff distribution (distributing rainfall by hour) shown in **Figure 4-1**. According to the NOAA Rainfall Frequency Atlas a 10-year, 24-hour storm in the City of Manteca has a rainfall total of approximately 2.20 inches.

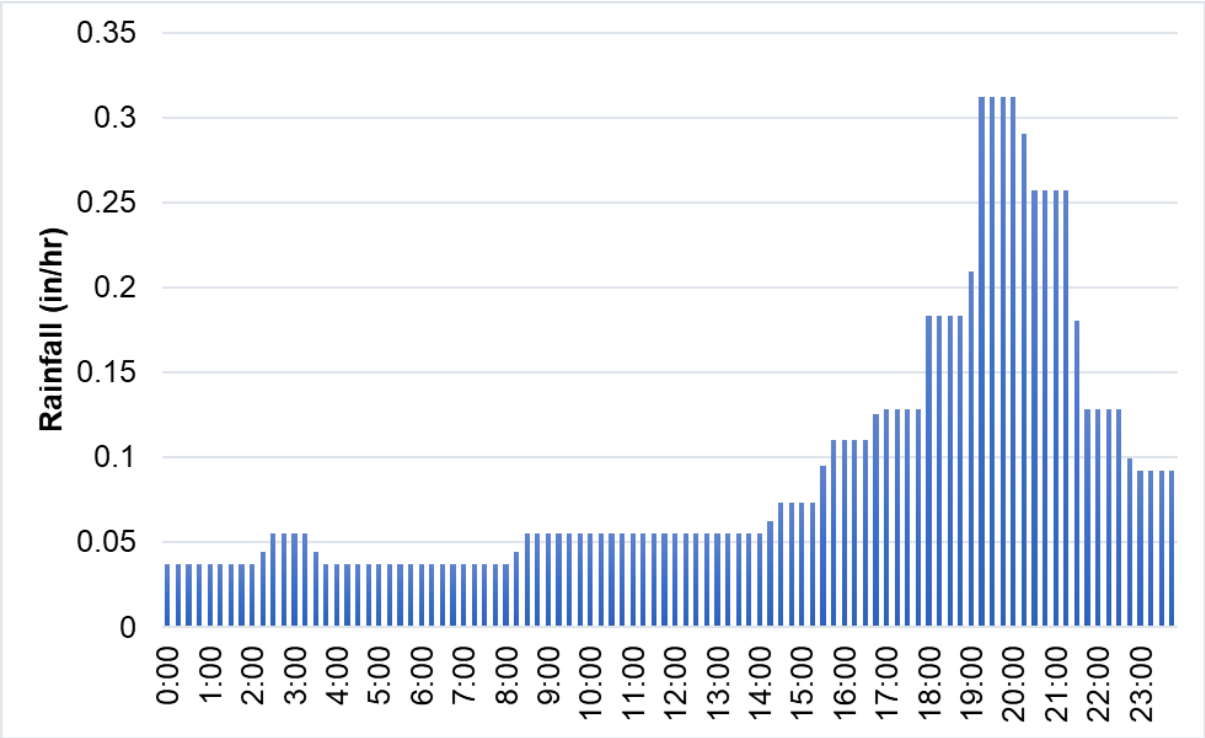


Figure 4-1. 10-year, 24-hour Design Storm

It is expected that for existing development conditions, the modeled 10-year, 24-hour design storm should produce peak flows at the WQCF that are consistent with historical results. Calibrated unit hydrographs from the existing system model were used to determine flows within the existing sewer service areas. The 18 calibrated unit hydrographs were averaged to create a single hydrograph which was used to simulate peak flows outside of the existing service area and within the future system planning areas.

4.1.3 Target Level of Service (LOS)

The level of service (LOS) is based on the capacity in the collection system and the risk of surcharging that may result in service connection flooding. Surcharging occurs when flow exceeds the open channel flow capacity of a gravity flow pipeline, which causes the water level in manholes to begin rising above the adjacent pipe crown elevation. Under surcharged conditions, the pipe flows under pressure and can carry additional flow. Gravity sewers are generally designed to flow partially or full without surcharging. However, short periods of surcharging can be accommodated within certain limits without justifying the cost of upsizing an existing pipeline. Such limits are described in **Table 4-3** which summarizes the criteria for dry and wet weather flow analyses.

Table 4-3. Allowable Surcharge Criteria

Criteria	Dry Weather Flow Analysis	Wet Weather Flow Analysis
Target Level of Service (LOS)	• Ratio of maximum depth • versus full depth (d/D) < 0.8	• When the rim elevation is less than or equal to 8-feet above the pipe crown: Ratio of maximum depth versus full depth (d/D) < 1.0, no surcharging allowed. • When the rim elevation is more than 8-feet above the pipe crown: Ratio of maximum depth versus full depth (d/D) = 1.0 is allowable, with a maximum surcharge depth of 1-foot above the pipe crown.

For dry weather flow (DWF) analysis, the ratio of maximum depth versus full depth (d/D) of the sewer shall be used to identify capacity constraints, as it is more representative of system capacity for a dynamic model. Based on industry best practices, any sewers with a d/D equal to or greater than 0.8 (80%) shall be identified as having capacity constraints under dry weather conditions.

For wet weather flow (WWF) events, surcharging (d/D of greater than 1) is considered acceptable provided the water level remains at least 8-feet below ground elevation. Freeboard in a manhole is defined as the distance between the rim elevation and the hydraulic grade line (HGL). Surcharging occurs when the HGL exceeds the pipe crown elevation. The maximum allowable surcharge in the gravity portion of the existing collection system is 1-foot. Manholes in the existing system must also maintain at least 8 feet of freeboard during a design storm event.

The following collection system capacity assessment criteria are used in this WWMP:

- Gravity mains are considered undersized if they do not meet the criteria presented in **Table 4-3.**
- Pump stations are considered undersized if the associated firm capacity (capacity with largest pump out of service) is not sufficient at modeled PWWF conditions.
- Force mains are considered under sized if the maximum velocity exceeds 8 feet per second (fps) at modeled PWWF conditions.

4.2 FUTURE GROWTH ASSUMPTIONS

The purpose of this section is to present the assumptions used in developing the future system model.

4.2.1 Future Study Area and Servicing Strategy

The study area considered in this WWMP encompasses the planning areas to which the City of Manteca will provide sewer service and ultimately be responsible for operating and maintaining under buildout development conditions. This is considered all areas covered by the City's General Plan. The 2012 Master Plan presents recommended improvements in the following categories the North Manteca Collection Strategy (NMCS), South Manteca Collection Strategy (SMCS), and Central Manteca Collection Strategy (CMCS). Like the 2012 Master Plan, this WWMP Update evaluates the collection system needs of these three major service areas or sewer-sheds described in **Chapter 2.0** of this report. A summary of

the areas of each service area within each boundary of the City's General Plan are summarized in **Table 4-4**. The boundaries of the Central Shed, North Shed, and South Shed are shown on **Figure 4-2**.

Table 4-4. Collection System Service Areas and General Plan Boundaries

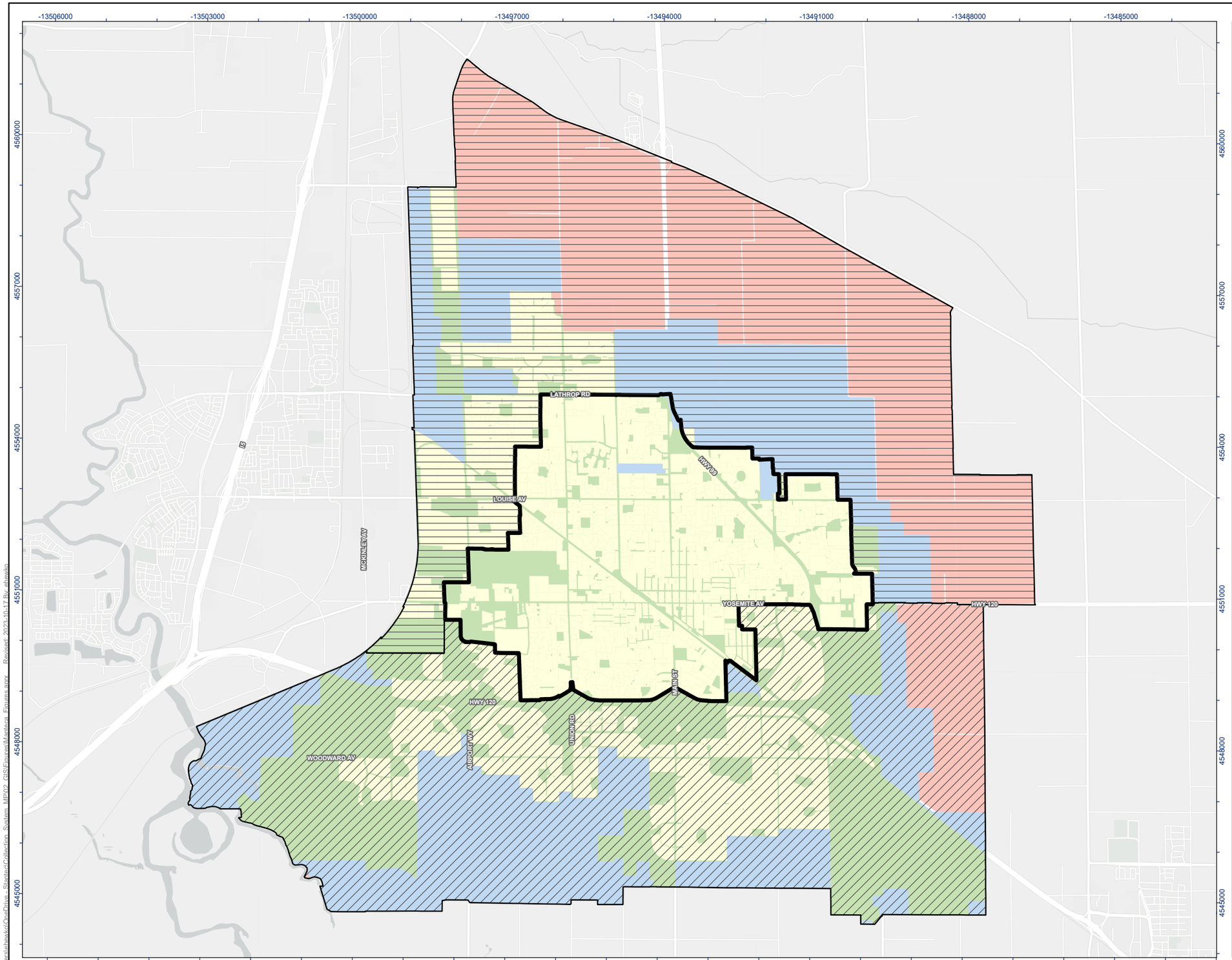
Service Area	Existing (Acres)	City Limits Infill (Acres)	SOI (Acres)	Remaining General Plan (Acres)	Total (Acres)
North Shed	1,166	773	2,783	5,580	10,302
Central Shed	3,365	681	36	0	4,083
South Shed	1,990	3,647	3,435	845	9,917
Total	**6,521**	**5,101**	**6,254**	**6,425**	**24,301**

This strategy assumes that future development flows outside of the existing City Limits boundary and sewer service area will be routed through their respective systems. For example, future flow originating from within the North Shed boundary should flow through the North Trunk system down Airport Way to the WQCF, while flows from within the Central Shed boundary should pass through the Union Road lift station and Central trunk network, and flow originating from the South Shed area should be routed through the South Trunk that follows Woodward Avenue.

The 2012 Master Plan recommended an overall trunk sewer strategy consisting of a combination trunk sewer gravity collection system with pump or lift stations located along the alignment to convey wastewater to an influent pump station located at the WQCF. Prior to development of the 2012 Master Plan, the 2006 Master Plan recommended three deep large diameter sewers to collect wastewater from the north, central, and south sections of the City for conveyance to an influent pump station located at the WQCF. This strategy of deep gravity trunk sewers was consistent with earlier master plans.

Based on the review of the existing collection system it appears that the City has alternated between these two collection system strategies: 1) The 2012 strategy including a shallower collection system with a number of interim and permanent lift or pump stations; and 2) The 2006 strategy including deeper trunk sewers minimizing the overall need lift or pump stations. This WWMP re-evaluates a deeper trunk strategy to eliminate pump and lift stations within the system using the new hydraulic model and high-resolution LIDAR surface elevation data. The development of the servicing strategy for future areas prioritized gravity sewers over lift stations and forcemains to the extent deemed feasible for this WWMP. Lift stations and forcemains were identified in recommended improvements when the depth of gravity sewers exceeded approximately 25-feet.

ATTACHMENT 2



Legend

Service Area

- Central Shed
- North Shed
- South Shed
- Existing Service Area
- City Limits
- Sphere of influence
- Remaining Planning Area

N

0 0.5 1 Miles

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1:60,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
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Project Location
Manteca,
California

Prepared by EH on 10/17/2023
TR by MA on 10/17/2023
IR Review by MVD on 10/17/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
4-2

Title
Service Area Collection Strategies

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4.2.2 Population Projections

The City of Manteca had a population of 85,792 people in 2021 according to US Census Bureau. Population projections from the City's General Plan indicate a build out population of 211,003 people. The City's Municipal Services Review (MSR) dated July 2022 cites the City's 2020 population estimated at 84,800 by the California Department of Finance and the latest population projections for Manteca are 134,248 people by 2035. The MSR projects an additional population of 64,773 people within City Limits at buildout. The MSR defines the SOI as the 10 and 30-year planning horizon providing population growth of up to 74,475 people. The remaining General Plan area, referred to as the Area of Interest (AOI) would provide population growth of an additional 12,415 people. A summary of the MSR population projections is shown in **Table 4-5**.

Table 4-5. MSR Population Projections

Area	Acres	Added Population	Total Population
2020 Existing City Area	11,583	-	84,800
Within City Limits		64,773	149,573
10-Year Planning Horizon	5,630	56,184	205,757
30-Year Planning Horizon	2,685	18,291	224,048
Area of Interest (Remaining General Plan)	4,506	12,415	236,463
Total	**24,404**		

Key:
MSR = Manteca Municipal Services Review (July 2022)

4.2.3 Design Horizons

This WWMP assessed system performance for existing level of development conditions as well as the following projected growth scenarios for the City of Manteca's wastewater collection system.

Scenario 1 – Existing Conditions Model

This modeled scenario simulates flow in the existing collection system during a 10-year, 24-hour design storm event. This model was constructed using the calibrated wet weather flow model and applying a 10-year, 24-hour rainfall event. The results of this simulation evaluate the existing collection system under ADWF and PWWF conditions.

Scenario 2 – Buildout of City Limits

This scenario simulates PWWF in the future collection system upon development of infill areas within the existing city limits. The majority of infill development is in the South Shed.

Scenario 3 – Buildout of the SOI Boundary

This scenario simulates PWWF in the future collection system upon development of the SOI that lies outside City Limits, as shown in **Figure 4-2**. The majority of SOI development is in the North Shed and South Shed.

Scenario 4 – Full General Plan Buildout

This scenario simulates PWWF in the future collection system upon development of the remaining general plan development area. The majority of the remaining general plan development area is in the North Shed.

General Plan land use information for future development areas serve as the basis to estimate future wastewater flow evaluated in this WWMP. A summary of the land use areas for each scenario is provided as **Table 4-6**.

Table 4-6. Design Horizon General Plan Land Use

General Plan Land Use	Gross Area (Acres)				
Planning Horizons	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Total
Description	Existing	Infill	SOI	Remaining GP	
Agricultural Industrial	0	0	0	232	232
Agriculture	0	118	724	3,162	4,004
Business Industrial Park	23	79	145	336	597
Business Professional	22	17	33	10	83
Commercial	501	452	192	58	1,202
Commercial Mixed Use	118	463	84	0	659
Downtown	157	3	0	0	160
High Density Residential	204	151	79	43	489
Industrial	581	444	399	1,719	2,956
Low Density Residential	4,016	1,718	2,794	238	9,004
Medium Density Residential	270	236	143	47	707
Open Space	0	370	97	8	475
Park	66	504	153	92	742
Public/Quasi-Public	526	450	332	67	1,375
Right of Way	8	82	75	14	179
Very Low Density Residential	28	15	823	400	1,267
Water	0	0	180	0	180
Total:	**6,520**	**5,102**	**6,253**	**6,426**	**24,301**

Key:
GP = General Plan
SOI = Sphere of Influence

The ADWF flow is calculated using the net area (80-percent of the gross area) and the WGFs from **Table 4-2**. Residential land uses use the mid-point of the general plan development densities to first calculate the projected number of EDUs for each parcel, rounding to the nearest EDU and a unit rate of 195 gpd/EDU to determine the projected ADWF. The resulting ADWF projections for each scenario are summarized in **Table 4-7**.

Table 4-7. Design Horizon Flow Projections

Scenario	Area (Acres)	ADWF (Mgal/d)	Total ADWF (Mgal/d)
1 – Existing	6,520	4.79	4.79
2 – City Limits	5,102	4.09	8.88
3 – SOI	6,253	3.84	12.72
4 – Full General Plan	6,426	2.47	15.19
Total:	**24,301**	**15.19**	

Key:
Mgal/d = Million Gallons per Day

5.0 COLLECTION SYSTEM CAPACITY EVALUATION

The purpose of this chapter is to present the results of the Manteca wastewater collection system model, evaluate the system's ability to meet the LOS performance criteria under existing and future development conditions, and present recommended system improvements to address existing deficiencies and serve future development.

The results of each level of development scenario are evaluated using the LOS performance criteria described in **Chapter 4.0**. The primary criterion used in the evaluation is surcharge depth, with a maximum allowable surcharge of 1-foot above the pipe crown in manholes with sufficient depth. Manholes in the existing system must maintain at least 8 feet of freeboard during a design storm event.

The model results are used to evaluate system capacity, hydraulic performance, identify system deficiencies, and develop recommended improvements. These recommended improvements are summarized in a prioritized CIP for the collection system which includes an estimate of probable costs.

This chapter is divided into the following sections:

- Modeled Design Horizon Scenarios
- Scenario 1 – Existing Development Results
- Scenarios 2 to 4 – Future Growth Analysis
- Phasing Strategies and Potential Alternatives
- Conceptual Opinion of Probable Cost
- Recommended Projects and Costs (**Table 5-12**)

5.1 MODELED DESIGN HORIZON SCENARIOS

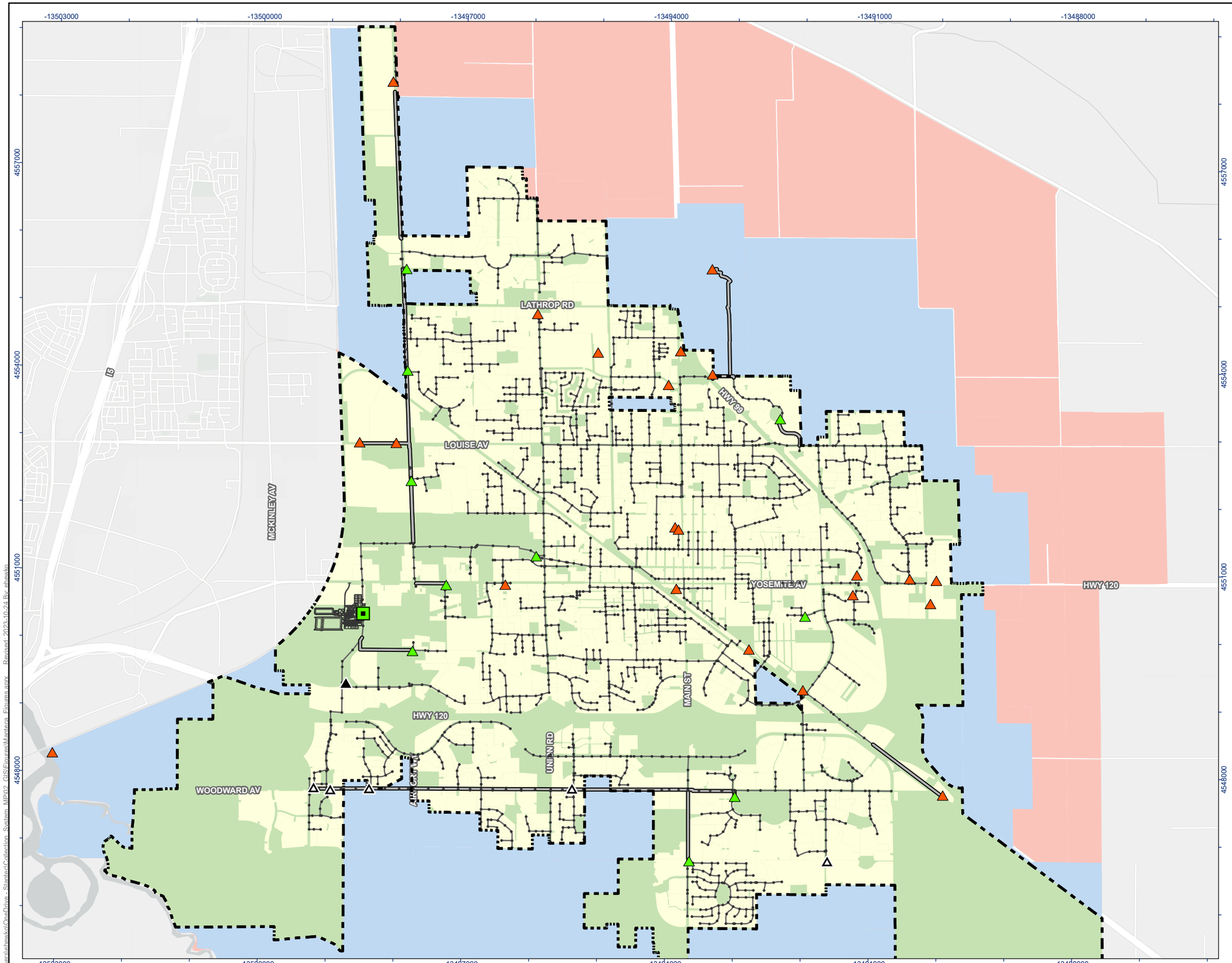
This Wastewater Master Plan (WWMP) assessed collection system level of service and capacity under four different scenarios described in **Section 4.2** of this report. Each scenario represents the cumulative development of growth areas within the General Plan. Simulated scenarios are summarized in **Table 5-1**. The results of Scenario 1 – Existing Conditions are detailed in **Section 5.2** and the results for Scenarios 2 to 4, which simulate future levels of development, are discussed in **Section 5.3** of this chapter. Future development areas and the associated scenario in which they are added is presented in **Figure 5-1**.

Table 5-1. Summary of Modeled Scenarios

Scenario	Description	Cumulative Planning Areas	ADWF (Mgal/d)	Simulated Peak Flow [1] (Mgal/d)
Scenario 1	Existing Conditions	• Existing Service Area	4.79	18.6
Scenario 2	Buildout of City Limits	• Vacant Areas within City Limits	8.88	31.0
Scenario 3	Buildout of SOI	• SOI Planning Areas	12.72	42.2
Scenario 4	Buildout of General Plan	• Remaining Planning Area	15.19	48.5

Note:
[1] Unattenuated flow, peak flow with recommended improvements.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes

Lift Station Status

- Active
- Unmodeled
- Inactive
- Abandoned
- Water Quality Control Facility
- City of Manteca Limit
- Modeled Sanitary Sewer
- Forcemain
- Water Quality Control Facility Structures
- Private Sanitary Network
- City of Manteca Limit
- Scenario 1 - Existing Service Area
- Scenario 2 - City Limits
- Scenario 3 - Sphere of Influence
- Scenario 4 - Remaining Planning Area

N

0 0.5 1 Miles

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Notes

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IR Review by MVD on 10/24/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-1

Title
Modeled Scenario Planning Areas

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5.2 SCENARIO 1 – EXISTING DEVELOPMENT RESULTS

Scenario 1 simulates flow in the existing collection system during a 10-year, 24-hour design storm event. The results of this simulation evaluate the existing collection system under ADWF and PWWF conditions. The results of the existing collection system model simulations and LOS evaluations are presented below.

5.2.1 Dry Weather Flows

The dry weather flow model simulates an ADWF of approximately 4.7 Mgal/d, with a diurnal peak flow of 7.1 Mgal/d. Dry weather flows simulated at each flow metering location are presented in **Section 3.5** of this report. Surcharging is not predicted to occur in the existing system under dry weather conditions as a result of gravity sewer capacity. As noted for the flow monitoring study, lift stations in the system cause surcharging to occur as a result of operating conditions.

For dry weather flow (DWF) analysis, the ratio of maximum depth versus full depth (d/D) of the sewer is used to identify capacity constraints, as it is more representative of system capacity for a dynamic model. Based on industry best practices, any sewers with a d/D equal to or greater than 0.8 (80%) shall be identified as having capacity constraints under dry weather conditions. The majority of sewers in the system have a d/D ratio of less than 0.8 under dry weather conditions, with the exception of sags and mismatched pipe crowns in the system.

5.2.2 Peak Flows and Residual Capacity

Model results for existing conditions at the WQCF and at the eighteen collection system flow monitoring sites are summarized in **Table 5-2**. The table shows:

- Modeled ADWF
- Modeled PWWF from the calibration storm event (December 2022),
- Modeled PWWF from the 10-year, 24-hour design storm described in **Chapter 3.0**.
- Peaking factors are shown in the last two columns for the calibration storm and 10-year, 24-hour design storm. The PWWF peaking factor is defined as the PWWF divided by the ADWF.

Table 5-2. Summary of Modeled Scenarios

	Modeled Flows (Mgal/d)			PWWF Peaking Factor	
	ADWF	Calibration PWWF	10-year, 24-hour PWWF	Calibration PWWF	10-year, 24-hour PWWF
Site 1	0.127	0.72	0.80	5.6	6.3
Site 2	0.091	0.45	0.49	5.0	5.4
Site 3	0.244	1.11	1.07	4.6	4.4
Site 4	0.616	1.51	1.85	2.5	3.0
Site 5	0.046	0.42	0.35	9.2	7.6
Site 6	0.149	0.89	0.84	6.0	5.6
Site 7	0.156	1.36	1.30	8.7	8.4
Site 8	0.096	0.62	0.60	6.5	6.2
Site 9	0.381	1.67	1.57	4.4	4.1
Site 10	1.519	6.23	6.14	4.1	4.0
Site 11	0.529	2.82	2.54	5.3	4.8
Site 12	0.110	0.46	0.44	4.2	4.0
Site 13	0.001	0.05	0.03	50.0	34.0
Site 14	1.301	2.67	3.35	2.0	2.6
Site 15	3.391	13.36	13.55	3.9	4.0
Site 16	0.097	0.48	0.47	4.9	4.8
Site 17	0.230	1.20	1.16	5.2	5.1
Site 18	0.399	1.79	1.75	4.5	4.4
WQCF	4.796	16.72	17.63	3.5	3.7

As shown in **Table 5-2**, the model predicts a peak flow of 17.6 Mgal/d at the WQCF for the 10-year, 24-hour design storm. The peaking factor associated with this result is 3.7. Sixteen of the flow metering locations indicate peaking factors above the overall WQCF peaking factor, and two meters indicate peaking factors below the WQCF value. In general, there is little variance between the peaking factors simulated in the calibration event and those simulated under the 10-year, 24-hour design storm.

Residual pipe capacity is defined as the remaining capacity in a sewer under peak flow conditions or the calculated full pipe capacity (FPC) subtracted by the peak simulated flow. The residual system capacity under 10-year, 24-hour design storm conditions is shown on **Figure 5-2**. The figure color codes pipeline capacity as follows:

- Red lines indicate that there is no residual capacity remaining. These lines are flowing either at or over their FPC. Those over capacity are further discussed in the following sections.
- Orange lines indicate that there is less than 0.5 Mgal/d of capacity available.
- Yellow lines indicate that there is 0.5 to 2.0 Mgal/d of capacity available.
- Green lines indicate that there is 2.0 to 5.0 Mgal/d of capacity available.

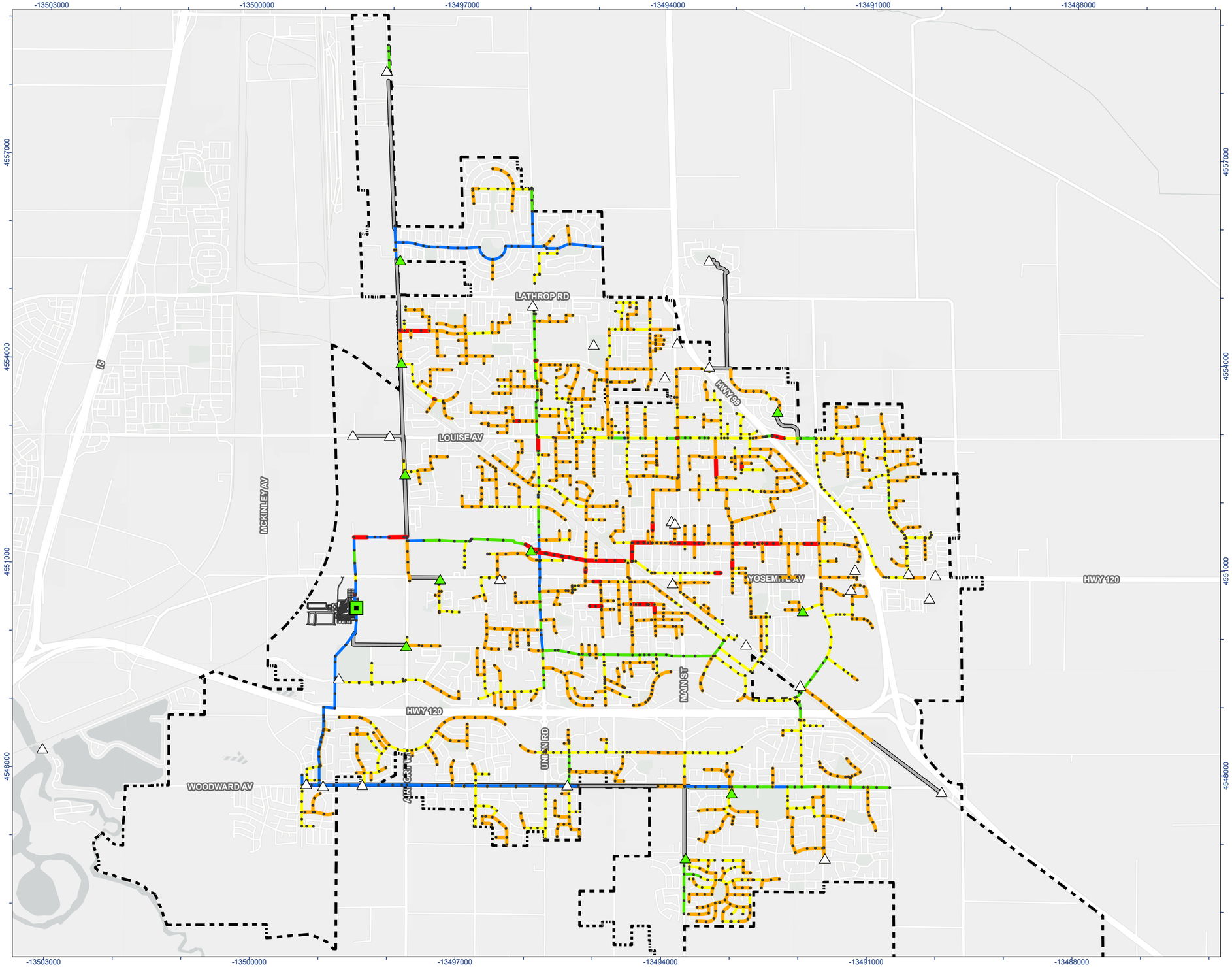
- Blue lines indicate that there is more than 5.0 Mgal/d of capacity available.

Below is a summary of residual capacity notes:

- Areas without any residual capacity (shown in red on **Figure 5-2**) primarily exist in the Central Shed, apart from:
    - the 12-inch sewer upstream of the Chadwick Unit 5 pump station in Hastings Drive between S. Airport Way and N. Landreth Lane which also does not have any residual capacity.
- Areas of the Central Shed without residual capacity include the pipelines described below. These pipelines are shown as red lines in **Figure 5-2**:
    - 15-inch sewer in Center Street from the Union Road lift station to Elm Avenue,
    - 10-inch sewer upstream in Elm Avenue and W. North Street,
    - 8-inch sewer in W. North Street between Charles and Cottage Avenue,
    - 15-inch sewer in Garden Gate Drive between Edison and Jason Street,
    - 8-inch sewer in Oregon Street between Sequoia and Park Avenue.

Other individual shallow sloped segments within the Central Shed also have no residual capacity as shown on **Figure 5-2**.

ATTACHMENT 2



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MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

Residual Capacity = Full Pipe Flow - Peak Flow

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/24/2023
TR by MA on 10/24/2023
IR Review by MVD on 10/24/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-2

Title
Residual System Capacity
10-year, 24-hour Design Storm

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5.2.3 Lift Station Performance

Peak flow results for the 10-year, 24-hour design storm at the 10 modeled pump stations are summarized in **Table 5-3**. The information in the table includes the pump station firm capacity and modeled maximum inflows to each station.

Table 5-3. Modeled Pump Station Results, 10-year, 24-hour Design Storm

Lift Station	Asset ID	Firm Capacity [(1)] (Mgal/d)	Max Station Inflow (Mgal/d)
Woodbridge Park	WWC-WW01	2.09	1.30
Chadwick Unit 5	WWC-WW02	1.26	1.29
Villa Ticino	WWC-WW04	0.73	0.60
Fishback	WWC-WW05	0.29	0.17
Union Road	WWC-WW06	15.12	10.99
Curran Grove	WWC-WW09	0.20	0.06
Roberts Estates	WWC-WW11	0.29	0.12
Shadowbrook Park	WWC-WW21	1.17	0.25
Evans Estates	WWC-WW19	1.05	0.64
Woodward Park	WWC-WW17	0.85	2.78

Note:
[1] Firm capacity represents the maximum pumping capacity of the lift station with the largest pump out of service.

The firm capacity is defined as the maximum pumping capacity of the lift station with the largest pump out of service. The total pumping capacity is defined as the total maximum capacity of the lift station with all pumps in operation. For purposes of evaluating the firm capacity of pump stations, the model treats pump stations as pumping all incoming flows regardless of station capacity to adequately represent peak inflow conditions.

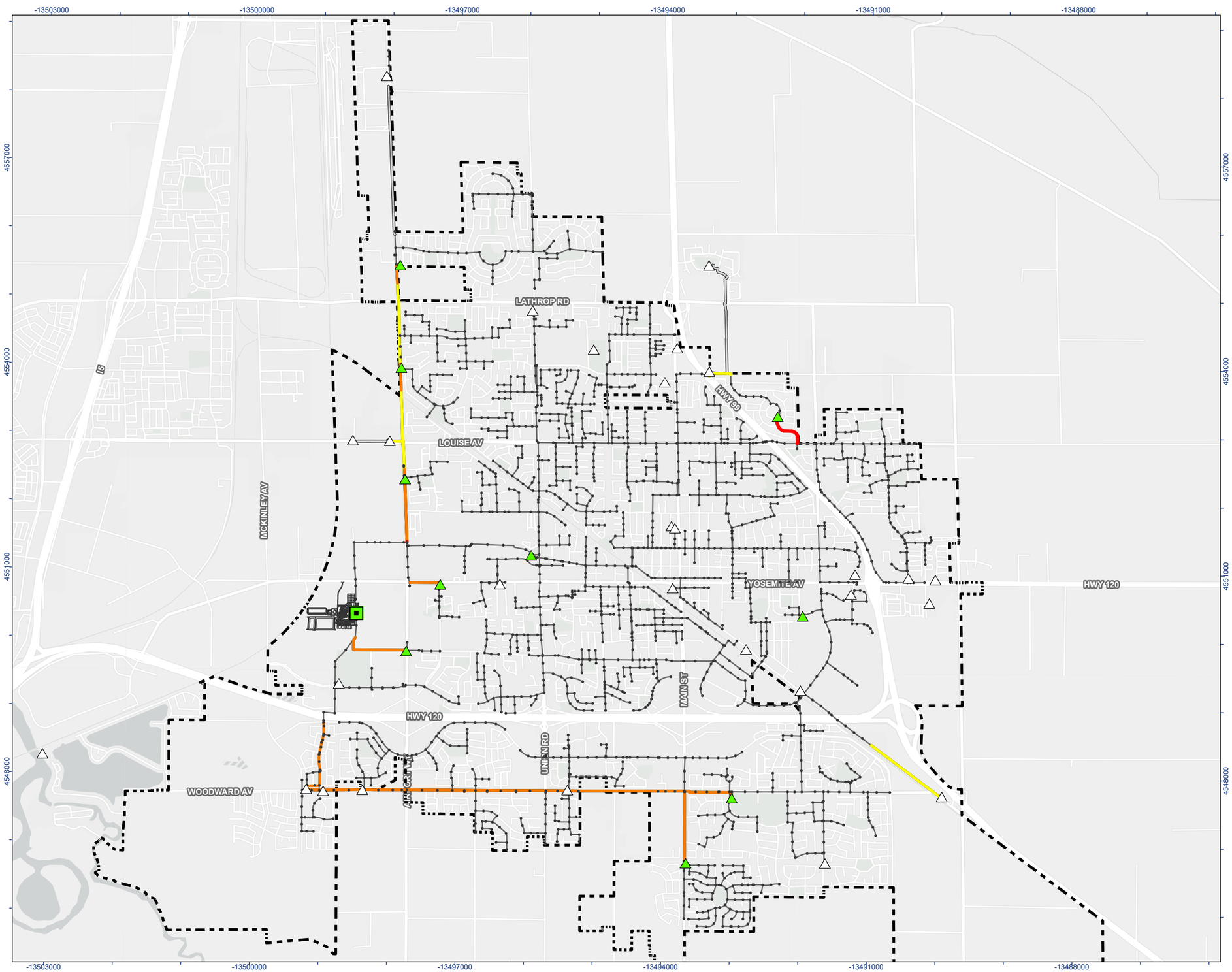
For the 10-year, 24-hour design storm condition, exceedances of the pump station firm capacity are indicated at two lift stations: Chadwick Unit 5 and Woodward Park. The largest exceedance occurs at the Woodward Park lift station, where flow exceeds the firm and total capacity of the station. Force main diameters and calculated maximum force main velocities are shown in **Table 5-4** and shown schematically on **Figure 5-3**.

Table 5-4. Modeled Force Main Results, 10-year, 24-hour Design Storm

Lift Station	Asset ID	Force Main Size (in)	Velocity (fps)	Flow (Mgal/d)
Woodbridge Park	WWC-WW01	24	1.03	2.09
Chadwick Unit 5	WWC-WW02	24	0.62	1.26
Villa Ticino	WWC-WW04	12	1.44	0.73
Fishback	WWC-WW05	6	2.29	0.14
Union Road	WWC-WW06	24	7.45	15.12
Curran Grove	WWC-WW09	4	3.55	0.20
Roberts Estates	WWC-WW11	6	2.29	0.29
Shadowbrook Park	WWC-WW21	6	9.22	1.17
Evans Estates	WWC-WW19	8	4.66	1.05
Woodward Park	WWC-WW17	12	1.68	0.85

The maximum force main velocity criterion of 8 fps is exceeded at the Shadowbrook lift station when operating at the firm capacity. Velocities of less than 2 fps are observed at lift stations that are part of force main systems with varying velocities that range between 0.0 – 2.0 fps and 2.0 – 8.0 fps as shown in **Figure 5-3**.

ATTACHMENT 2



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Legend

- Modeled Sanitary Manholes
- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Forcemain
- Sanitary Network

Force Main Velocity (fps)

- 0.0 fps - 2.0 fps
- 2.0 fps - 8.0 fps
- > 8.0 fps
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-3

Title
Modeled Forcemain Velocity
10-year, 24-hour Design Storm

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5.2.4 LOS Deficiencies

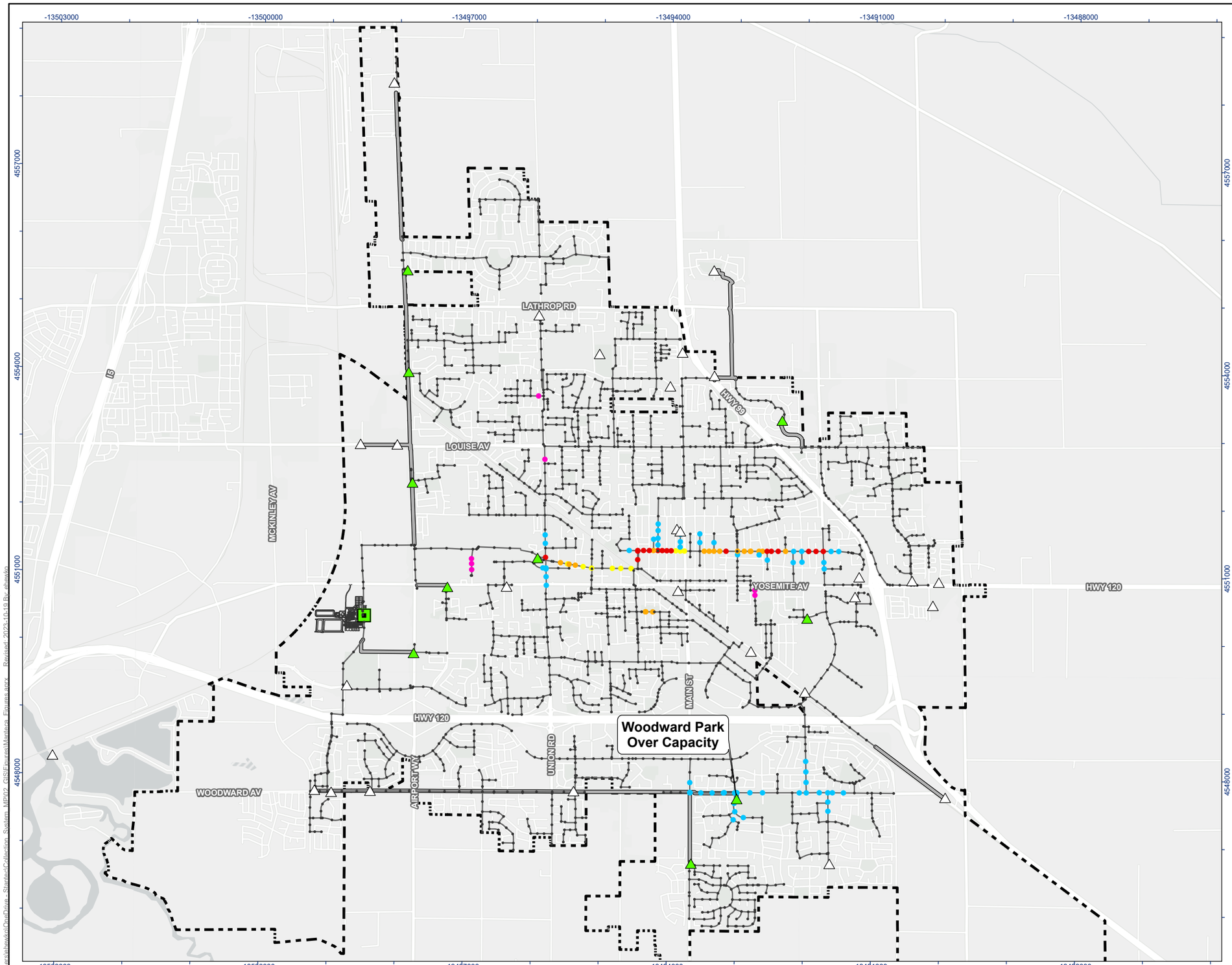
A schematic of modeled gravity sewer and pump station capacity deficiencies for the 10-year, 24-hour design storm conditions are presented in **Figure 5-4**. The highlighted gravity lines are shown as belonging to the following categories. The first two categories fail LOS criteria as presented in **Chapter 4.0** of this report.

- **LOS Failure 1:** Peak flow exceeds full pipe capacity (FPC), resulting in major surcharging (>1-foot depth).
- **LOS Failure 2:** Peak flow exceeds FPC, resulting in minor surcharging (<1-foot depth) without sufficient depth (<8-feet of available freeboard).
- **Minor Surcharging:** Peak Flow exceeds the FPC, resulting in minor surcharging (<1-foot depth) with sufficient depth (>8-feet of available freeboard).
- **Backwatered:** Peak flow does not exceed the FPC, but downstream capacity restrictions result in surcharging. Downstream restrictions include under capacity gravity sewers and/or lift station capacity or operation.
- **Design Issue:** Simulated surcharging resulting from a design issue, including things such as mismatched pipe crown elevations, individual negative or zero pipe slopes, and/or minor pipe sags.

The primary LOS deficiencies include the following portions of the system:

- 15-inch Center Street Trunk,
- 10-inch Elm/North Street Trunk, and
- Woodward Park pump station pumping capacity.

Recommended improvements for these portions of the system are included in the collection system CIP presented in this WWMP and are described in the following section.



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Legend

- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Forcemain
- Modeled Sanitary Sewer
- City of Manteca Limit

Manhole Issues

- LOS Failure 1
- LOS Failure 2
- Minor Surcharging
- Backwatered
- Design Issue
- Other Sanitary Manhole

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
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Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-4

Title
Scenario 1 – Modeled Capacity Deficiencies, 10-year 24-hour Design Storm

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5.2.5 Recommended Capacity Improvements

Theoretical pipe upsizing improvements to eliminate gravity sewer capacity deficiencies are listed in **Table 5-5** and are shown schematically in **Figure 5-5**. The improvements are sized to accommodate PWWF under buildout development conditions. As indicated in the table, the only recommended gravity sewer improvement is to the main branch of the trunk system in the Central Shed. The capacity constraint identified on Oregon Street is not recommended for improvements because surcharging is minor and predicted to remain under 0.22 feet above the pipe crown, monitoring is recommended under existing conditions.

Table 5-5. Theoretical Upsizing Improvements to Alleviate Existing Gravity Sewer Capacity Deficiencies – Scenario 1

ID	Description	Service Area	GIS Install Year	Upstream MH ID	Upstream MH Location	Downstream MH ID	Downstream MH Location	GIS Pipe Size (in)	Ave. Slope (ft/ft)	Upsized Pipe Size (in)	Total Length (LF)	Depth to Pipe Crown (ft)	Max Flow (Mgal/d)	Max Surcharge (ft)
1	W Center Street Trunk	Central Shed	Unknown	WWMH0349	W. Center Street and Elm Avenue	WWMH3125	Union Road Lift Station	15	0.0012	18	3,802	6.5 to 17.2	2.28	0.5
2	Elm/West North Street Trunk	Central Shed	Unknown	WWMH0883	E. North Street and Fremont Street	WWMH0349	W. Center Street and Elm Avenue	10	0.0013	15	4,510	5.1 to 14.1	1.43	3.44
3	10-inch East North Street Trunk	Central Shed	1951-1955	WWMH0901	E. North Street and Marie Avenue	WWMH0883	E. North and Fremont Street	10	0.0014	12	1,325	4.1 to 7.9	0.74	1.6
4	8-inch East North Street Trunk	Central Shed	1957	WWMH1432	E. North Street and Cottage Avenue	WWMH0896	E. North Street and Charles Avenue	8	0.0014	10	560	6.4 to 6.8	0.37	2.5

It should be noted that these theoretical improvements do not necessarily equate to a recommendation to proceed forward with design and construction of replacement sewers. While the model indicates potential for surcharging and/or SSOs in the indicated lines during peak flow conditions, most of the identified pipes were not directly flow metered, but rather the peak flows are inferred from downstream flow measurements based on the model calibration process described in **Chapter 3.0** of this report.

Moreover, the collection system geometry (especially pipe diameters, pipe invert elevations, and surface elevations) have not generally been confirmed by field surveys. In all cases, system geometry (including pipe depths, diameters, and rim elevations) should be confirmed by field surveys. In addition, it is recommended that the modeled capacity exceedances at the Woodward Park pump station be confirmed through flow metering and/or pump run time logging. The improvements in this section are included in the recommended CIP but are still subject to survey and field verification described above.

The alternative improvements considered for the Woodward Park pump station under existing conditions include: 1) increasing the firm pumping capacity to meet the simulated maximum inflow of approximately 2.8 Mgal/d by adding an additional pump to the station or swapping out the existing pumps for larger ones, or 2) installing 4,030 LF of 36-inch sewer to extend the existing South Trunk in Woodward Avenue to reach the unused existing 36-inch sewer at the intersection of Woodware Avenue and S. Main Street, additional discussion of this project is presented in **Section 5.3.1** of this report. Further improvements would be required beyond Project 5B under buildout conditions therefore, Project 5A is ultimately recommended. Alternative improvements for the Woodward Park Lift station under existing conditions are summarized in **Table 5-6**.

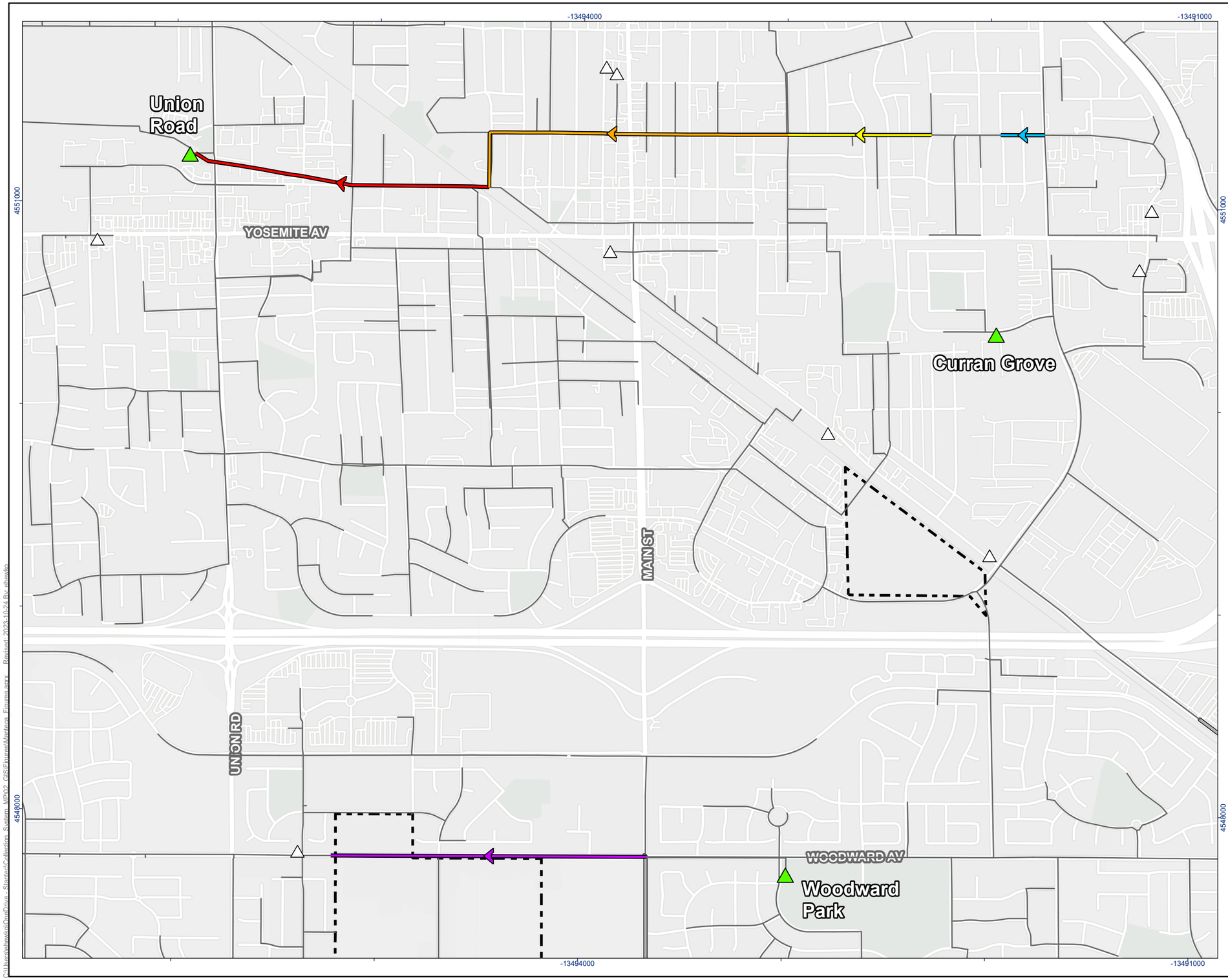
Table 5-6. Alternative Capacity Improvements for the Woodward Park Lift Station (Existing Conditions)

ID	Description	Service Area	GIS Install Year	Upstream MH ID	Upstream MH Location	Downstream MH ID	Downstream MH Location	Ave. Slope (ft/ft)	Upsized Pipe Size (in)	Total Length (LF)
5A	South Woodward Trunk Extension	South Shed	2001/ 2011	WWMH0481	Woodward Avenue and S. Main Street	WWMH4162	East of Pagola and Woodward Avenue	0.0006	36	4,030
ID	**Description**	**Service Area**	**GIS Install Year**	**Existing Firm Capacity (Mgal/d)**	**Expanded Firm Capacity (Mgal/d)**	**Existing No. Pumps**	**Design Flow (gpm)**	**Design Head (ft)**	**Existing Force Main Size (in)**	**New Force Main Velocity (fps)**
5B	Expand Woodward Park Pump Station Capacity	South Shed	2001	0.85	2.8	2	590	38	12	5.48

Additional lift station concerns include backwatered surcharging in the trunk lines north and south along Union Road due to the general operating configuration of the Union Road lift station, the firm capacity of Chadwick Unit 5, and high velocity in the Shadowbrook Park force main when pumping at firm capacity. Significant improvements to the Union Road lift station would be required to eliminate surcharge in the north and south Union Road gravity trunk lines. Surcharging is predicted to be around 1-foot with more than 12-feet of available freeboard. A future project to take the Union Road lift station offline has previously been identified by the City, which would eliminate this concern. Additional discussion of this project is also presented in **Section 5.3.1** of this report.

The Chadwick Unit 5 pump station is recommended for monitoring as firm capacity is only predicted to be exceeded by 0.03 Mgal/d. It's also recommended that the pumping capacity of the Shadowbrook Park pump station be verified. Firm capacity was taken from the original record drawings. It's possible that the drawings include an error or that a smaller pump has replaced the originally specified pump. No improvements are recommended for these stations in Scenario 1, under existing conditions.

ATTACHMENT 2



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MANTECA CALIFORNIA

Legend

- Modeled Lift Station
- Other Lift Station
- Forcemain
- Modeled Sanitary Sewer

Master Plan Project

- Project 1
- Project 2
- Project 3
- Project 4
- Project 5
- City of Manteca Limit

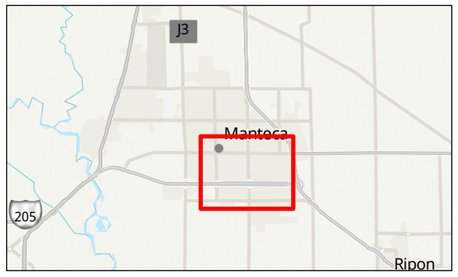
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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/24/2023
TR by MA on 10/24/2023
IR Review by MVD on 10/24/2023

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Wastewater Servicing Master Plan

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Figure No.
5-5

Title
Recommended Improvements to Address Existing Capacity Deficiencies

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5.3 SCENARIOS 2 TO 4 – FUTURE GROWTH ANALYSIS

The purpose of this section is to present the results of the hydraulic model of the wastewater collection system under future development conditions defined by the City's General Plan (Scenarios 2 to 4). Scenario 1 – Existing Development results are provided in **Section 5.2**. Modeled conditions for the ultimate planning area consist of flow for existing conditions, plus future flows from areas that do not discharge to the City's wastewater system. The following level of development scenarios were considered.

- Scenario 1 – Existing Development (refer to Section 5.2)
- Scenario 2 – Buildout of City Limits
- Scenario 3 – Buildout of the SOI
- Scenario 4 – Full General Plan Buildout

The hydraulic model of the existing collection system was adjusted to include flow from future development projects within the planning area at each level of development scenario. The land uses, WGFs, and other assumptions of the areas added to each scenario have been described in **Section 4.2** of this report. A summary of simulated flow conditions for each scenario is presented in **Section 5.1**.

5.3.1 Impacts of Growth on Existing Infrastructure

As discussed in **Chapter 4** the general approach to flow routing is that flows originating from future development will be routed through their respective service area or sewer shed. The majority of flow from infill developments within City Limits is routed through the existing system in Scenario 2. In Scenarios 3 and 4, flow originating from within the City's SOI and remaining planning area is primarily routed through new trunks in the North and South Sheds because the Central Shed exists within City Limits and is largely built out. After laying out the future system and evaluating future system results, this flow routing approach was slightly modified to minimize future improvement needs and take advantage of residual capacity within the existing system. The SOI area within the North Shed that exists immediately to the east of the Central Shed was ultimately routed through existing infrastructure in the Central Shed.

The modeled system deficiencies for future development conditions are only slightly more severe than those described for existing conditions. Key information is summarized below:

- The recommended improvements described under existing conditions also serve buildout flows, aside from Project 5B which expands the Woodward Park pumping capacity to existing flows.
- **Figure 5-6** shows areas of the existing system that fail LOS criteria under future conditions.
- The modeled results for the 10-year, 24-hour design storm, under each level of development scenario, are included in **Appendix F**.
- The impacts of future growth on existing pump stations are shown in **Table 5-7**.

- Pump and lift stations that would need improvements to expand the firm capacity at each level of development to meet future system flow conditions are highlighted in **Table 5-7**.

- An additional analysis was performed to consider if a parcel immediately outside city limits could be served through the existing collection system under the proposed land uses of the development. A summary of this assessment is provided below.

    - Parcel No. 197-020-270-000
      Street Address: 14851 South State Route 99 West Frontage Rd.

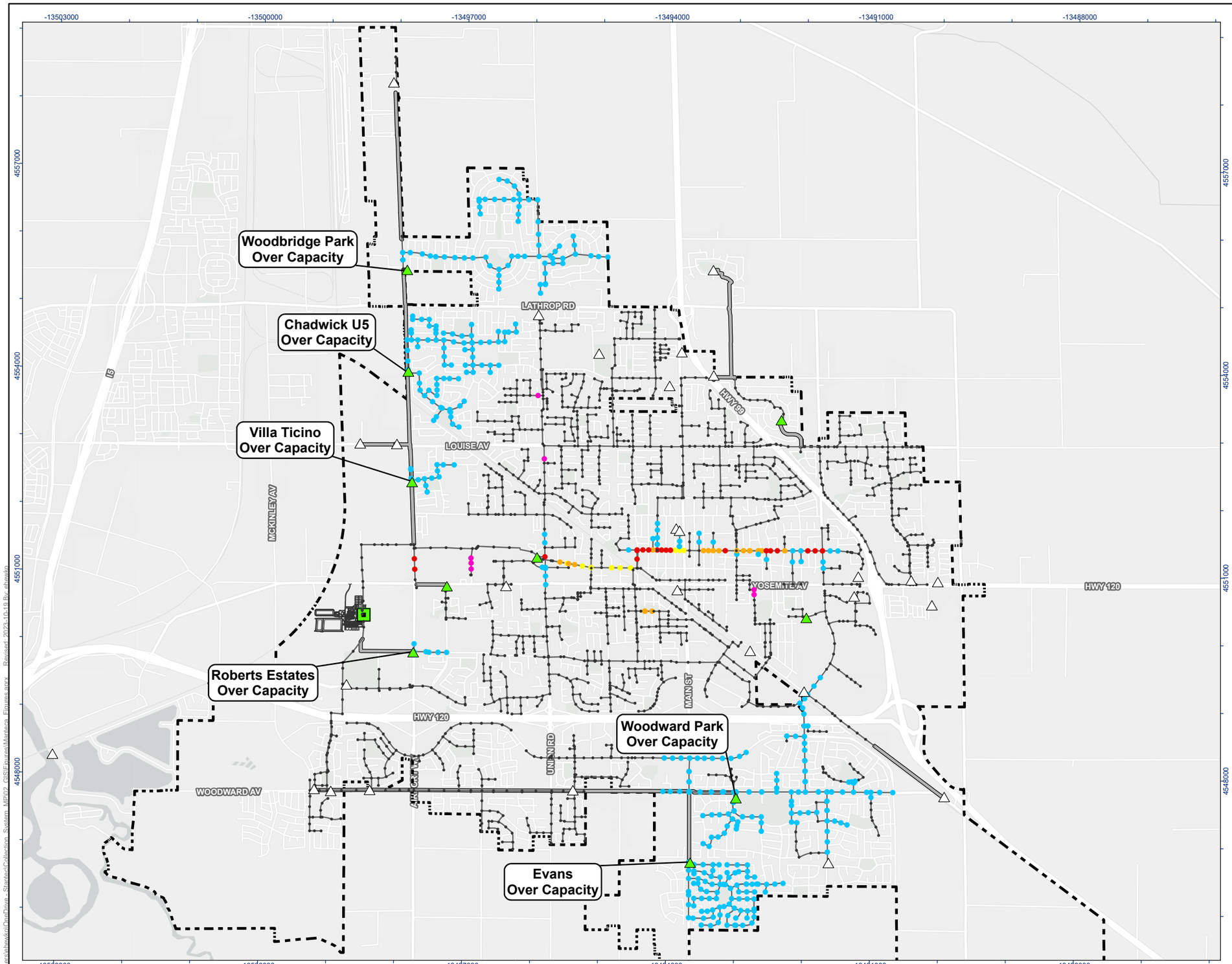
    - Description: The subject property is adjacent to and outside of the city limits of Manteca. The 28.8-acre parcel is bifurcated by the frontage road, 7.07 acres of the parcel lies east of the frontage road between the US 99 southbound offramp and the frontage road, and the remaining 20.80 acres lies west of the frontage road between the frontage road and property owned by San Joaquin Delta College.

    - Land Use: The General Plan shows the site as General Commercial, but it is proposed that the 7.07-acre portion of the parcel will consist of a gas station, hotel, and fast-food restaurant(s) and the 20.80-acre side will consist of a mixture of apartments and commercial uses along the frontages of Lathrop Road and the frontage road.

      Sewer Service: As part of the North Shed service area, this WWMP assumed that this parcel would be routed through new infrastructure under Scenario 3, which considers development of the General Plan SOI. Ultimately, this parcel is assumed to contribute flow to existing manhole WWMH3470, at the Tidewater Bike Path. The frontage road aligns with Crestwood Avenue at its intersection with Lathrop Road. The City has identified the sanitary sewer manhole in Crestwood Avenue, immediately south of the intersection, as the developments sanitary sewer point of connection. To determine if there is available sewer capacity, the estimated flow from the development area was modelled with the proposed planning information.

    - Flow projection: In this WWMP the ADWF was projected to be 17,382 gpd generated from the 28.9-acre commercial site. Discussions between the developer and the City projected an ADWF of 107,100 gpd, based on 350 EDUs, 150 hotel rooms assumed as EDUs, and 12.8 acres of commercial development on the site.

      Sewer System Impact: The impact of increased flows and redirecting them through the sewer in Crestwood Drive increases the HGL in the downstream system until it meets the 30-inch sewer in Louise Avenue where the impact becomes negligible. The 8 to 12-inch sewer between the point of connection and Louise Avenue appears to have sufficient capacity to serve the development site, reaching approximately full pipe capacity. Based on the results of the model the maximum peak flow from the development site that can be served through this point of connection is 345,000 gpd. Flow monitoring in the sewers between the proposed point of connection and Louise Avenue is recommended to confirm the existing sewer flows and residual system capacity.



Legend

- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Forcemain
- Modeled Sanitary Sewer
- City of Manteca Limit

Manhole Issues

- LOS Failure 1
- LOS Failure 2
- Minor Surcharging
- Backwatered
- Design Issue
- Other Sanitary Manhole

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/19/2023
TR by MA on 10/19/2023
IR Review by MVD on 10/19/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-6

Title
Scenarios 2-4 - Modeled Capacity Deficiencies, 10-year 24-hour Design Storm

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Table 5-7. Modeled Pump Station Results, 10-year, 24-hour Design Storm

		Maximum Modeled Inflow (Mgal/d)			
Lift Station	Firm Capacity (Mgal/d)	Scenario 1 - Existing	Scenario 2 - City Growth	Scenario 3 - SOI Growth	Scenario 4 - Buildout
Woodbridge Park	2.09	1.30	2.05	6.07	12.29
Chadwick Unit 5	1.26	1.29	1.33	2.31	2.31
Villa Ticino	0.73	0.60	0.90	0.90	0.90
Fishback	0.29	0.17	0.25	0.25	0.25
Union Road	15.12	10.99	12.44	13.50	13.56
Curran Grove	0.20	0.06	0.06	0.06	0.06
Roberts Estates	0.29	0.12	0.52	0.52	0.52
Shadowbrook Park	1.17	0.25	0.25	0.25	0.25
Evans Estates	1.05	0.64	3.44	4.52	4.52
Woodward Park	0.85	2.78	4.37	5.59	5.80

Based on the results presented in **Table 5-7**, the following lift stations will also require expansions or alternative improvements:

- Woodbridge Park – To support the addition of infill, SOI, and additional planning areas in the North Shed, the largest lift station improvements would be required at the Woodbridge Park pump station. The ultimate firm capacity would need to be expanded to over 12 Mgal/d.
- Chadwick Unit 5 – No improvements were recommended for this lift station under existing conditions because it was only predicted to be slightly over its existing firm capacity. Under future conditions improvements to expand firm capacity to 2.31 Mgal/d would be required to support infill development.
- Villa Ticino – To support infill development the firm capacity will need to be expanded to 0.90 Mgal/d.
- Roberts Estates – To support infill development the firm capacity will need to be expanded to 0.52 Mgal/d, roughly double the current capacity.
- Evans Estates – This lift station will require significant improvements to serve the Austin Road Industrial Area, as assumed in this WWMP. In addition to expanding the pumping capacity to 4.52 Mgal/d, the existing 8-inch force main would also require improvements. The velocity in the force main would be greater than 18 fps under the firm capacity needs predicted at buildout.
- Woodward Park – if not addressed by gravity improvement recommended in Project 5A for existing system improvements, firm capacity will need to be expanded to 5.8 Mgal/d. This scenario would also require improvements Woodward Park 12-inch force main as the velocity would exceed 11 fps, but also to the joint 12-inch force main of the Evans and Woodward Park

pump stations considering the velocity of the combined total flow contributions which is predicted to be 20 fps.

The following LOS deficiencies were identified in the gravity collection system under future development conditions:

Fishback Lift Station Tie-in (Scenarios 2 – 4): Surcharging was identified under all three future development scenarios. This deficiency is due to the large amount of infill added to the Fishback lift station collection shed. The City's GIS database indicates that the lift station discharges to a gravity line (8-inch) that is smaller than the gravity lines within the collection area (10-inch). Therefore, surcharging is predicted to occur in the gravity line downstream of the force main discharge location in North Airport Way, south of the North Trunk Sewer. An improvement project to take this lift station offline and upsize this sewer is recommended in the following sections (Project 9).

North Trunk Sewer (Scenario 4): Surcharging in the newly installed 36-inch North Trunk Sewer in Airport Way is predicted to exceed 1-foot in Scenario 4 with the addition of flow from the buildout service area and recommended improvements discussed in the following sections. Surcharge depth is predicted to reach 2.6 feet above the pipe crown between Crom Street and Geneva Way. No improvements are recommended to address this deficiency due to its recent installation and depth. Freeboard is expected to remain greater than 19 feet despite surcharging.

5.3.2 Previously Identified System Improvements

The City of Manteca has already made investments in their future collection system by preemptively installing oversized lines for future gravity sewers. Projects that would complete the construction of these gravity sewers are described below.

Project 5A: South Woodward Trunk Extension

This project was presented as an alternative to upgrading the Woodward Park lift station under existing conditions. The 36-inch South Trunk sewer in Woodward Avenue conveys wastewater flow to the treatment plant by gravity. It is currently missing a segment between Pagola Way and South Main Street. In the upstream, the City has already installed a 36-inch sewer to convey flows that currently conveyed through the Woodward Park pump station by gravity. Installing this remaining segment of sewer would allow the Woodward Park pump station to be taken offline and also allow the Evan's pump station to be taken offline through additional projects. This project would mitigate the need to expand both the Woodward Park and Evan's Pump Stations.

Project 6A: Central Union Road Trunk Extension

The City recently completed a project replacing the North Trunk Sewer as shown on **Figure 5-7**. The project replaced the 36-inch trunk sewer with a larger and deeper 54-inch sewer. Based on review of previous Master Plans and discussions with the City, this project was the first leg of an overall project intended to take the Union Road lift station offline. The Central Trunk could be extended from the upstream point of North Trunk project to bypass the lift station and allow flow from the Central Shed to

flow by gravity to the WQCF. City staff have noted many on-going issues with the lift station that were observed in the flow monitoring data collected as part of this WWMP. The station frequently experiences pump failure and uses the upstream collection system as part of its operating volume, which has contributed to catastrophic failures in the upstream trunk network. In addition to O&M issues the station is beyond its useful life, pumps currently installed in the station are from 1960. Although the capacity of the lift station appears to be sufficient, this project is recommended to eliminate surcharge experienced during operating conditions and O&M costs associated with the station.

Project 7A: North Trunk Extension on Airport Way

A 48-inch sewer exists at the upstream end of Airport Way, where flow is currently conveyed to the Woodbridge Park pump station. The upstream trunk in Daisywood Drive is also oversized to accommodate future flows from the North Shed. Based on review of prior Master Plans this trunk was planned to ultimately connect through an extension of the North Trunk sewer along Airport Way. The City recently installed approximately 2,900 LF of 36-inch sewer in Airport Way between the Manteca Park Golf Course and Louise Avenue.

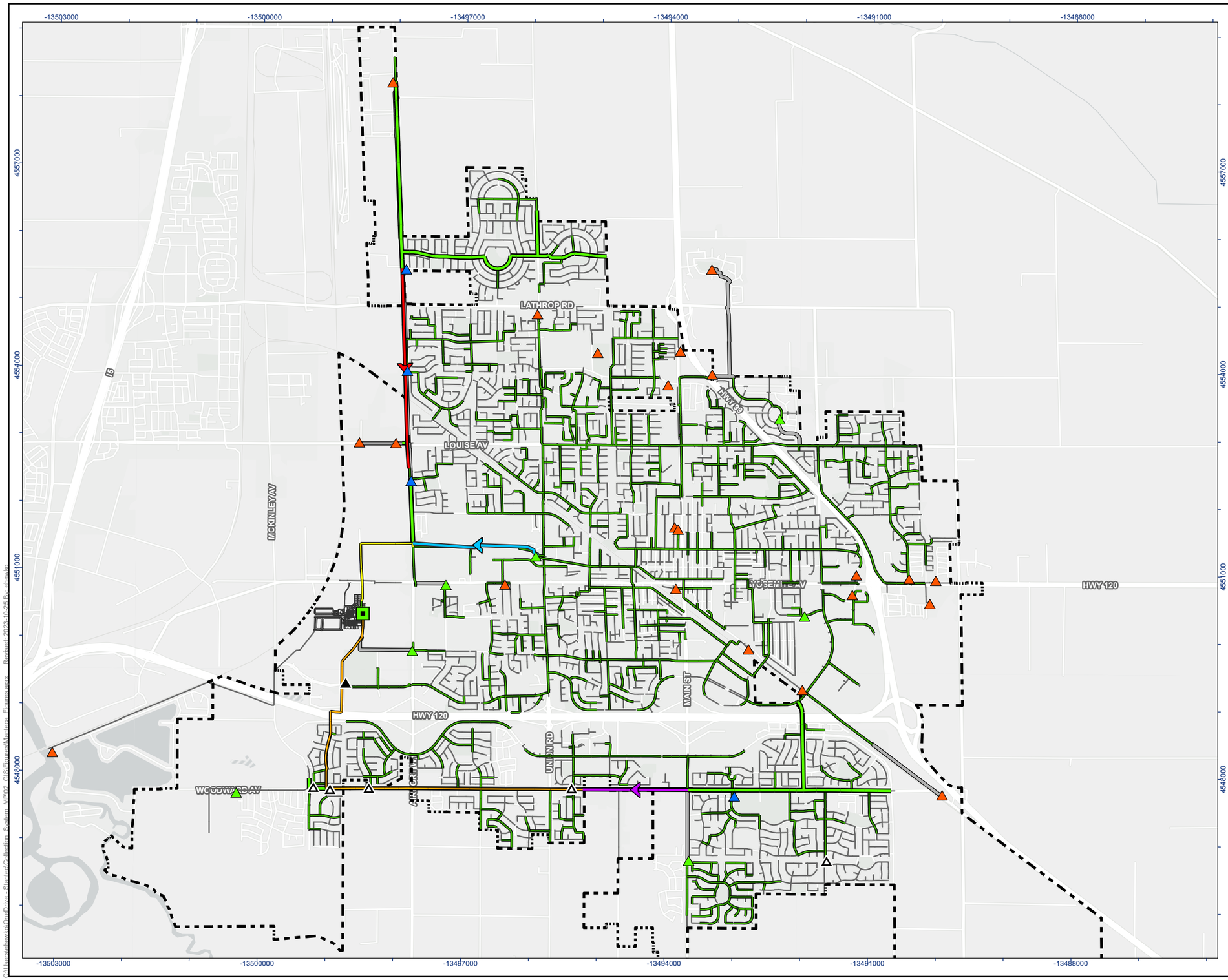
Continuing the North Trunk sewer along Airport Way to the Woodbridge Park pump station would allow the station to be taken offline in addition to those that lie within the project extents, including Chadwick Unit 5, Assieh Development, MUSD, and Villa Trinco. Another un-used existing oversized line exists to take the Centerpoint Pump Station offline and serve the northern planning area. Although the benefits of taking six lift stations offline and avoiding future expansions are high there are also constructability concerns with the potential project. The trunk extension would be over 20-feet deep in already crowded utility corridor. There are also surface features, such as water drainages, railroad crossings, and major intersections. The previously identified system improvement projects are summarized in **Table 5-8**. These projects and existing oversized portions of the system are shown in **Figure 5-7**.

Table 5-8. Previously Identified System Improvements

ID	Description	Service Area	GIS Install Year	Upstream MH ID	Upstream MH Location	Downstream MH ID	Downstream MH Location	Ave. Slope (ft/ft)	Pipe Size (in)	Total Length (LF)
5A [1]	South Woodward Trunk Extension	South Shed	2001/ 2011	WWMH0481	Woodward Avenue and S. Main Street	WWMH4162	East of Pagola and Woodward Avenue	0.0006	36	4,030
6A	Central Union Road Trunk Extension	Central Shed	1960	WWMH3125	Inlet to Union Rd PS	SSMH-13	Upstream End of North Trunk at Airport Way	0.0027	36	5,031
7A	North Trunk Extension on Airport Way	North Shed	2022/ 2006	WWMH3392	Inlet to Woodbridge Park PS	SSMH-12	Upstream End of the existing 36-inch sewer.	0.0006	48	7,670

Note:
1 Project 5A also listed under existing system improvements.

ATTACHMENT 2



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MANTECA CALIFORNIA

Legend

Lift Station Status
- Active
- Unmodeled
- Inactive
- Abandoned
- Removed with CIP
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Modeled Forcemain
- Sanitary Network
- North Trunk
- South Trunk
- Oversized Trunk
- Trunk

Assumed Projects
- Project 5
- Project 6
- Project 7
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes
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Project Location
Manteca,
California

Prepared by EH on 10/25/2023
TR by MA on 10/25/2023
IR Review by MVD on 10/25/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-7

Title
Previously Identified System Improvements

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5.3.3 Recommended Capacity Improvements

In addition to the previously identified system improvements, the following projects have been identified to address the predicted capacity constraints at each future level of development in the existing collection system.

Project 8: South Main Trunk to Evans (Evans)

Upon completion of Project 5A, it is recommended that the City install a new 27-inch sewer in South Main Street to allow the Evans pump station to be taken offline. Thereby avoiding future pump station expansions, force main improvements, and the O&M costs associated with the Evans pump station. This project is dependent on the completion of the South Woodward Trunk Extension project as it would tie into the upstream end of the project at South Main Street and Woodward Avenue.

Project 9: South Airport Way and Yosemite Avenue (Fishback)

Although capacity improvements were not identified for the Fishback lift station, the downstream collection system was identified as being undersized. As an alternative to upsizing the 8-inch gravity line in Airport Way, the City could install a new 10-inch gravity line all the way to the lift station and take it offline.

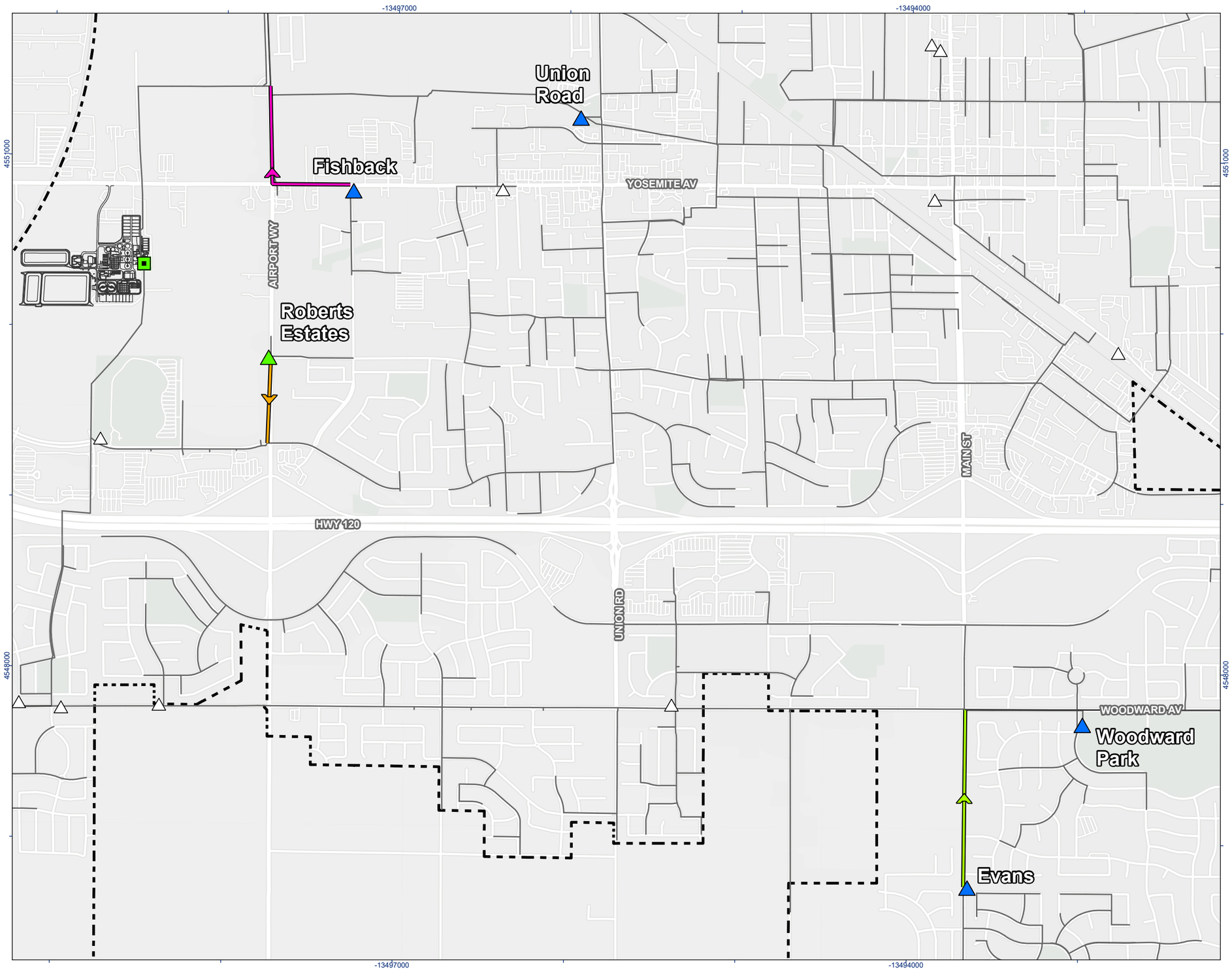
Project 10: South Airport Way Roberts Estates to Daniels (Roberts Estates)

The Roberts Estates lift station can be taken offline by extending a 10-inch sewer down Airport Way from the lift station at Wawona Street to the 12-inch sewer in Daniels Street. This eliminates O&M costs associated with the station as well as the need to almost double its firm capacity to support infill development.

These projects to address existing collection system capacity constraints under future conditions are summarized in **Table 5-9** and shown on **Figure 5-8**.

Table 5-9. Theoretical Upsizing Improvements to Alleviate Existing Sewer Capacity Deficiencies – Future Scenarios

ID	Description	Service Area	GIS Install Year	Upstream MH ID	Upstream MH Location	Downstream MH ID	Downstream MH Location	GIS Pipe Size (in)	Ave. Slope (ft/ft)	Upsized Pipe Size (in)	Total Length (LF)	Depth to Pipe Crown (ft)	Max Flow (Mgal/d)	Max Surcharge (ft)
Scenario 2 Improvements														
8	S. Main Trunk to Evans	South Shed	2016/ 2001	WWMH5022	Inlet to Evans PS	WWMH0481	Woodward Avenue and S. Main Street	8FM	0.0007	27	2,688	Mitigates lift station improvements. (Evans)		
9	S. Airport Way and Yosemite Ave. (Fishback)	South Shed	1978	WWMH2665	W Yosemite and Fishback, PS inlet	SSMH-13	Upstream End of North Trunk at Airport Way	8	0.0025	10	2,664	7.5 to 5.1	0.511	3.077
10	S. Airport Way Roberts Estates to Daniels	South Shed	1996	WWMH2754	S. Airport Way and Wawona Street	WWMH2321	S. Airport Way and Daniels Street	6FM	0.0047	10	1,317	Mitigates lift station improvements. (Roberts)		



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MANTECA CALIFORNIA

Legend

- Modeled Lift Station
- Other Lift Station
- Removed with CIP
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Modeled Sanitary Sewer

Master Plan Project

- Project 8
- Project 9
- Project 10
- City of Manteca Limit

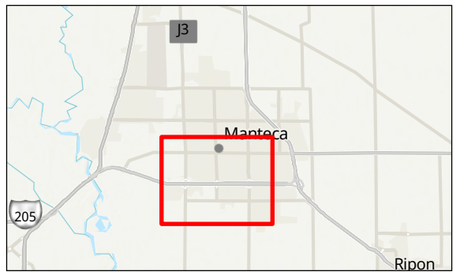
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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, CGIAR, USGS, Esri Community Maps Contributors, San Joaquin County GIS/Planning, San Joaquin County Public Works, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS



Project Location
Manteca,
California

Prepared by EH on 10/25/2023
TR by MA on 10/25/2023
IR Review by MVD on 10/25/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-8

Title
Recommended Improvements to Address Future Capacity Deficiencies

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5.3.4 System Infrastructure to Serve Future Development

Modeled future system infrastructure, including pump stations, force mains, and gravity sewers 10-inches in diameter and larger were considered in the development of this WWMP. The considered infrastructure layouts are based on an analysis of surface topography, critical surface features (such as highways, railroads, and surface water), and sewer pipe depths. The exact configuration of collection system facilities serving future areas is subject to change as development proceeds. For modeled future flow conditions, all existing infrastructure is assumed to remain unchanged aside from improvements identified for the existing system in **Section 5.2**. Moreover, the model treats pump stations as passing all incoming flows regardless of station capacity such that capacities of pump stations and downstream gravity lines can be properly evaluated.

5.3.4.1 Scenario 2 – Buildout of City Limits

There are approximately 4,962 acres of undeveloped area with the existing city limits boundary, 73 percent of which exists in the South Shed of the collection system. Much of this area is already planned for development or currently being developed.

Project 11: Yosemite Square Lift Station and Improvements

To serve the area north of the Austin Road Industrial Area, across Highway 99, referred to as Yosemite Square, a 2.4 Mgal/d lift station will be required to convey flow to the South Trunk in Woodward Avenue. The new 4,855 LF of 8-inch force main should be routed to an existing 18-inch sewer crossing at the intersection of Woodward Avenue and Moffat Boulevard. It is assumed that the existing 18-inch force main crossing is not being used and will be tied into a new 15-inch sewer in Woodward Avenue to be installed as part of an upcoming roadway realignment project. The cost of this 15-inch sewer in Woodward Avenue is included in this project in addition to approximately 3,230 LF of 15-inch sewer needed to serve the area upstream of the lift station. The 1,425 LF 15-inch sewer in Woodward Avenue should be installed with the highest slope possible, assumed to be 0.006 ft/ft.

Project 12: Austin Road Industrial Area Trunk

The largest planned development is the Austin Road Industrial area which is approximately 2,066 acres located in the southeast corner of city limits. A new trunk extending east from the existing 24-inch sewer in South Main Street to Austin Road is recommended to serve the Austin Road Industrial Area. This project assumes steeper than minimum slopes to follow the existing ground surface. The project assumes the following: 2,950 LF of 24-inch sewer at 0.0012 ft/ft, 5,300 LF of 21-inch sewer at 0.0012 ft/ft, and 2,350 LF of 18-inch sewer at 0.0015 ft/ft. It should be noted that larger pipe sizes may be required if these slopes are not achieved.

Project 13: South Austin Road - Industrial Area

A 15-inch sewer extending from the Austin Road Industrial Area Trunk in South Austin Road is recommended to serve the northern portion of the development.

5.3.4.2 Scenario 3 – Buildout of the SOI

The existing city SOI includes 6,393 acres of undeveloped land surrounding city limits. Approximately 1,076 acres of that land is designated as agriculture, ROW, water, or open space and are assumed to not contribute wastewater flow to the existing system. Approximately 2,859 acres are added to the North Shed, 3,473 acres are added to the South Shed, and the remaining 62 acres are within the central shed. As previously discussed, a portion of the eastern South and North Shed areas is directed through the Central Shed to utilize residual capacity in the existing system.

Project 14: Yosemite Square Service Area

The Yosemite Square lift station is proposed to be located centrally within its ultimate service area. To serve the portion of the service area outside of City Limits approximately 3,575 LF of 15-inch sewer in is proposed in Austin Road from Highway 99 to the lift station.

Project 15: Oleander Avenue Extension/ S. Airport Way Sewer

To serve the southern SOI area an extension of the existing 12-inch sewer in Oleander Avenue and a new sewer in S. Airport Road are recommended. This project includes approximately 2,250 LF of new 12-inch sewer in Oleander Avenue and 3,365 LF of new 10-inch sewer in S. Airport Road.

Project 16: Highway 99 Crossing at Northland Road

A new 24-inch trunk sewer crossing Highway 99 at Northland Road is recommended to serve the North Shed SOI area. This trunk ties into the existing 36-inch sewer stub that exists along the Manteca Tidewater Bikeway. This project assumes approximately 3,515 LF of 24-inch sewer. The depth at the highway crossing is estimated to be approximately 25-feet.

Project 17: East Lathrop Road Trunk

This project proposes a new 18-inch sewer in South Frontage Road extending from the Highway 99 Crossing at Northland Road (Project 16) to Lathrop Road and a 15-inch sewer continuing east to Cottage Avenue.

Project 18: Northland Road Trunk

An 18-inch sewer extending east down Northland Road from the proposed Highway 99 Crossing at Northland Road (Project 16).

Project 19: Northland Road Branches

Two 12-inch sewers are included to direct flow from the Northern SOI area to the Northland Road Trunk recommended in Project 18.

Project 20: Louise/Nehemiah Branches

This project includes two 12-inch sewer extensions from the existing system to Austin Road to serve development east of the Central Shed. One that ties into the 18-inch sewer in East Louise Avenue at Pestana Avenue and one that ties in to the 18-inch sewer in Pestana Avenue at Nehemiah Drive.

Project 21: South Union Road Extension

To serve the southern most portion of the SOI its recommended that the existing 12-inch sewer in South Union Road be extended by approximately 3,940 LF.

Project 22: Cottage Avenue

To serve the SOI area south of Lathrop Road a 12-inch sewer is recommended to extend in Cottage Avenue from the 15-inch East Lathrop Road Trunk (Project 17).

5.3.4.3 Scenario 4 – Full General Plan Buildout

The remaining planning area consists of 6,424 acres of land which primarily expands the North Shed service area. Approximately 50 percent of this area is designated with land uses that will contribute wastewater to the future service area. There are approximately 5,590 acres added to the North Shed and 845 acres added to the South Shed. The majority of the area added to the south shed will not contribute wastewater flow, therefore, no new infrastructure is included beyond that identified in Scenario 3 in the South Shed.

Project 23: North Shed Union Road Trunk

Extending the existing 30-inch sewer north along Union Road to Lovelace Road is recommended to serve the remaining planning area.

Project 24: Manteca Junction Trunk

This project recommends a 10-inch sewer extending further north along Union Road from Project 23.

Project 25: Lovelace Road Trunk - 99 Crossing

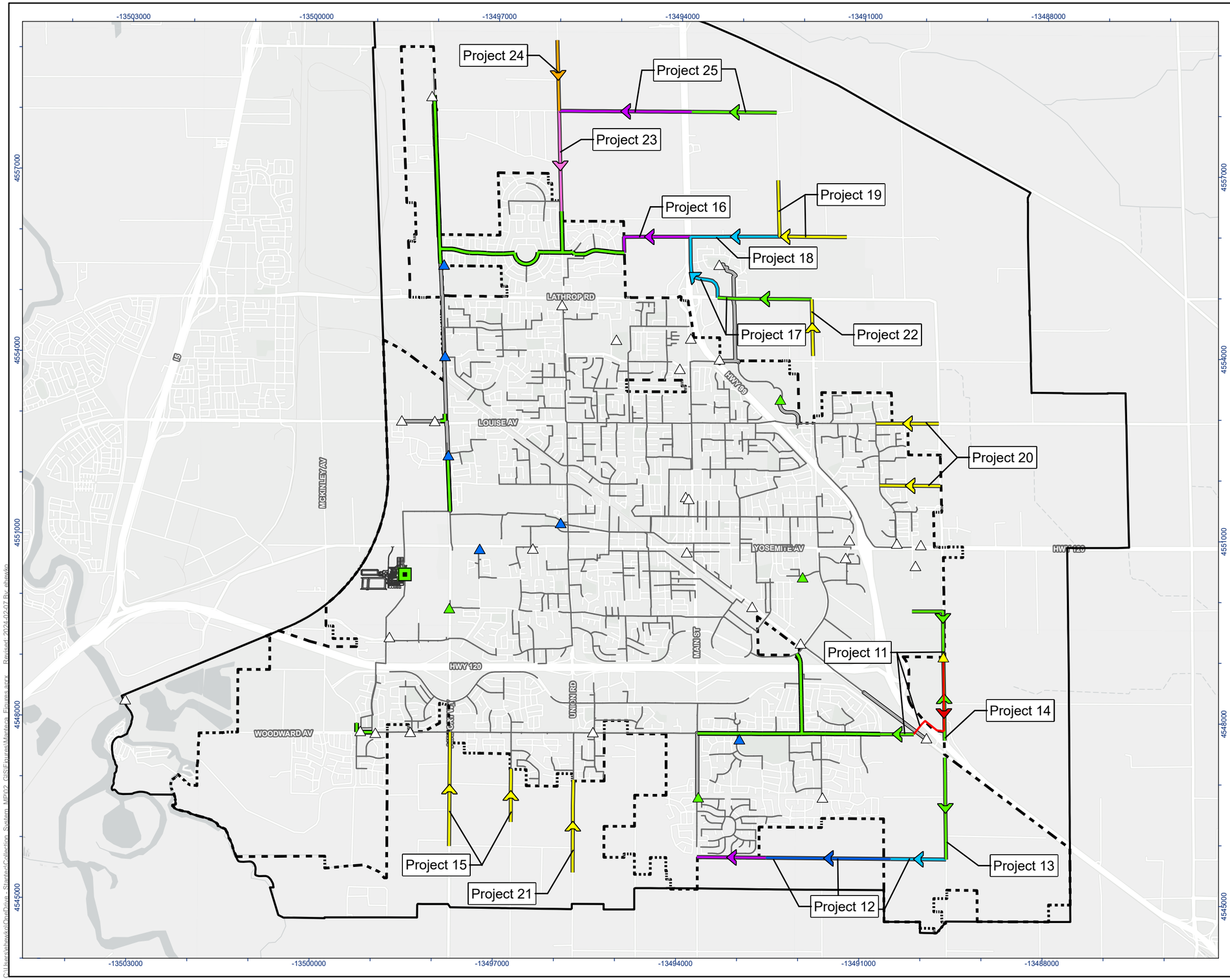
A 24-inch sewer extension east from Lovelace and Union Road crossing Highway 99 and a 15-inch sewer from Highway 99 to Castle Road.

The system infrastructure needed to serve future development at each level of development is summarized in **Table 5-10** and shown in **Figure 5-9**. The service area of each CIP is shown in **Figure 5-10**. A comparison of these recommended improvements and those presented in the 2012 Master Plan is presented in **Figure 5-11**.

Table 5-10. System Infrastructure to Serve Future Development

ID	Description	Service Area	Upstream MH ID	Upstream MH Location	Downstream MH ID	Downstream MH Location	Ave. Slope (ft/ft)	Pipe Size (in)	Total Length (LF)
Scenario 2 Improvements									
11	Yosemite Square Lift Station and Improvement	South Shed	BOSSMH41	Yosemite Square	WWMH3342	E. Woodward and Atherton Drive	0.006 0.0015	15 8FM	9,514
12	Austin Road Industrial Area Trunk	South Shed	BOSSMH6	Sedan Avenue and Austin Road	WWMH5167	S. Main Street and Sedan Avenue	0.0012 0.0015	24/21/ 18	10,598
13	South Austin Road - Industrial Area	South Shed	BOSSMH50	Moffat Blvd and Austin Road	BOSSMH6	Sedan Avenue and Austin Road	0.0015	15	4,333
Scenario 3 Improvements									
14	Yosemite Square Service Area	South Shed	BOSSMH49	South 99 Frontage Road	Yosemite Square LS	Yosemite Square	0.0015	15	3,575
15	Oleander Avenue Extension	South Shed	BOSSMH19	Oleander Avenue between Peach/Fig	WWMH4922	End of existing Oleander sewer	0.0015	15	2,250
16	Highway 99 Crossing at Northland Road	North Shed	BOSSMH020	Northland and Frontage Road	WWMH3470	Green Valley and Happy Valley Lane	0.0011	24	3,515
17	East Lathrop Road Trunk	North Shed	BOSSMH001 1	Lathrop and Cottage Avenue	BOSSMH020	Northland and Frontage Road	0.0015	18/15	7,335
18	Northland Road Trunk	North Shed	BOSSMH89	Northland and Castle Road	BOSSMH020	Northland and Frontage Road	0.0012	18	3,789
19	Northland Road Branches	North Shed	BOSSMH168/ BOSSMH178	North on Castle Road, East on Northland	BOSSMH89	Northland and Castle Road	0.002	12	5,255
20	Louise/ Nehemiah Branches	Central Shed	BOSSMH99	Austin Road and E. Louise Avenue	WWMH2114	E. Louise and Pestana Avenue	0.002	12	5,252
21	South Union Road Extension	South Shed	BOSSMH20	Union Road South of Fig	WWMH4954	Union Road and Lavender	0.002	12	3,940
22	Cottage Avenue	North Shed	BOMH00029	Cottage and Southland	BOSSMH001 1	Cottage and Lathrop	0.002	12	2,410
Scenario 4 Improvements									
23	North Shed Union Road Trunk	North Shed	BOSSMH18	Lovelace and S. Union Road	WWMH3782	S. Union Road at Abbey Mist Street	0.0006	30	4,692
24	Manteca Junction Trunk	North Shed	BOSSMH4	S. Union Road north of Coelho Road	BOSSMH18	Lovelace and S. Union Road	0.0025	10	3,008
25	Lovelace Road - 99 Crossing	North Shed	BOSSMH88	Castle Road Corner	BOSSMH18	Lovelace and S. Union Road	0.0008 0.0015	24/15	9,257

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Water Quality Control Facility Structures
- Forcemain
- Modeled Sanitary Sewer
- City of Manteca Limit
- General Plan Boundary
- Project 11 Lift Station

Master Plan Project Sewer Diameter (inches)

- 8" Forcemain
- 10"
- 12"
- 15"
- 18"
- 21"
- 24"
- 30"

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 2/7/2024
TR by MA on 2/7/2024
IR Review by MVD on 2/7/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

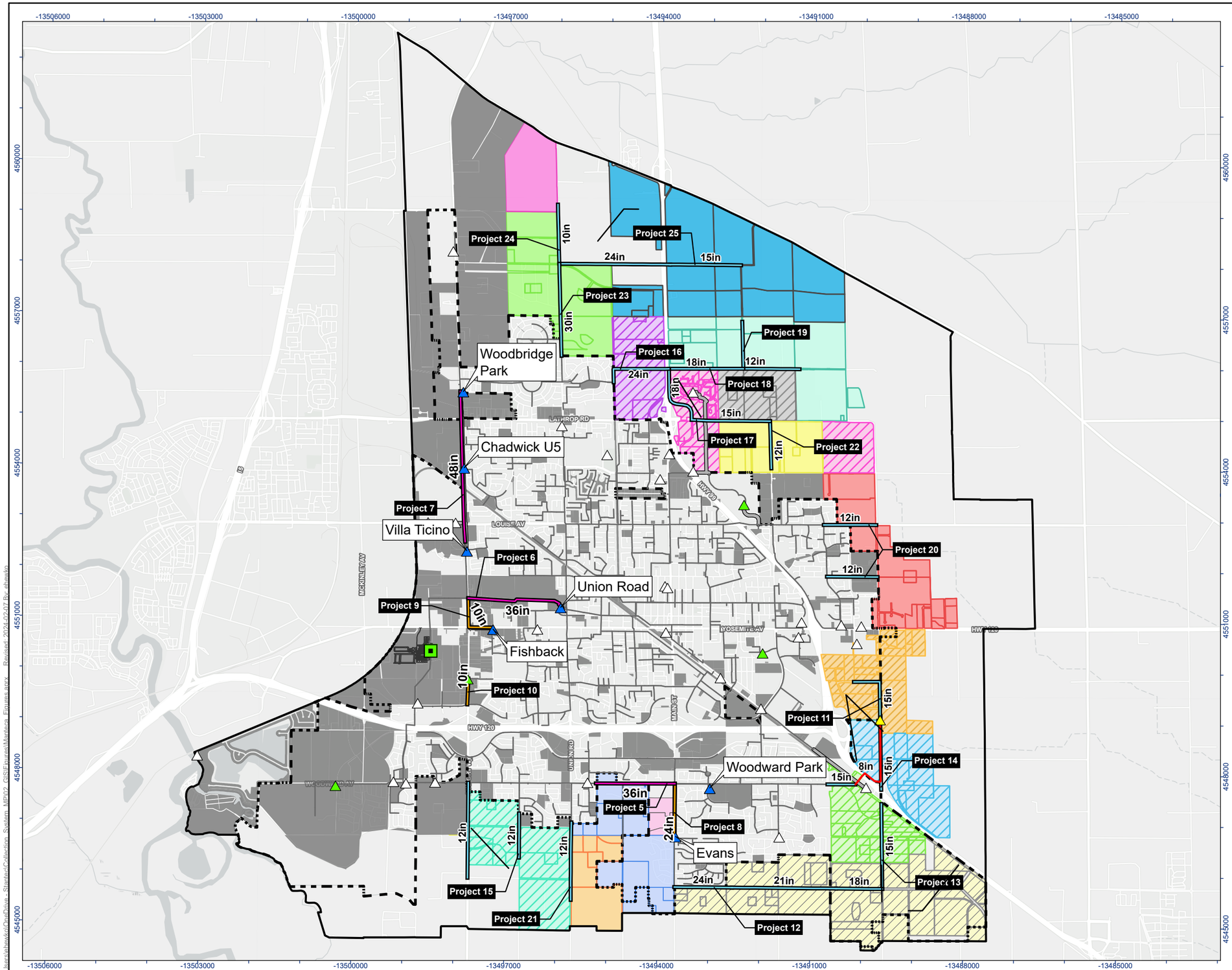
Figure No.
5-9

Title
System Infrastructure to Serve Future Development

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Lift Station
- Other Lift Station
- Removed with CIP
- Water Quality Control Facility
- Modeled Sanitary Sewer
- Water Quality Control Facility Structures
- Forcemain
- General Plan Boundary
- City of Manteca Limit

Master Plan Projects

- Assumed Projects
- Recommended Improvements to Address Future Capacity Deficiencies
- System Infrastructure to Serve Future Development
- Project 11 Lift Station
- Project 11 Forcemain

CIP Service Area

CIP 5	CIP 15	CIP 21
CIP 8	CIP 16	CIP 22
CIP 11	CIP 17	CIP 23
CIP 12	CIP 18	CIP 24
CIP 13	CIP 19	CIP 25
CIP 14	CIP 20	Tributary to the Existing System

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 2/7/2024
TR by MA on 2/7/2024
IR Review by MVD on 2/7/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

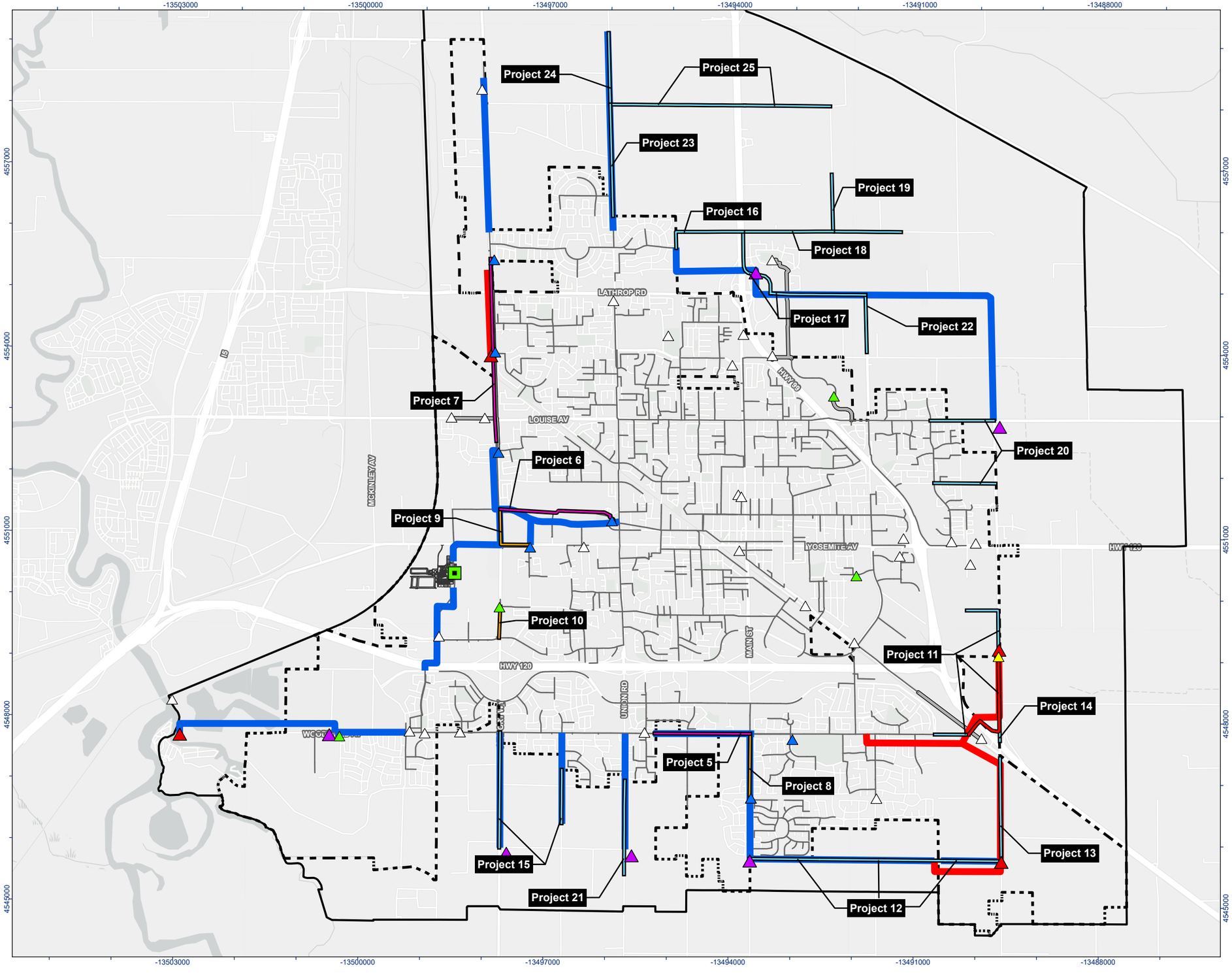
Figure No.
5-10

Title
Recommended Future System Improvements

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend
- Modeled Lift Station
- Other Lift Station
- Water Quality Control Facility
- Modeled Sanitary Sewer
- Water Quality Control Facility Structures
- Forcemain
- General Plan Boundary
- City of Manteca Limit

Master Plan Projects
- Assumed Projects
- Recommended Improvements to Address Future Capacity Deficiencies
- System Infrastructure to Serve Future Development
- Project 11 Lift Station

MP_PROJECT
- Project 11 Forcemain

2012 Master Plan
- Proposed Lift Station
- Proposed Pump Station

2012 Master Plan
- Proposed Force Main Link
- Proposed Trunk Sewer Link

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Notes
1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
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3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca, California

Prepared by EH on 2/7/2024
TR by MA on 2/7/2024
IR Review by MVD on 2/7/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
5-11

Title
Changes from 2012 Master Plan

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5.4 PHASING STRATEGIES AND POTENTIAL ALTERNATIVES

The growth rate of development within the City's planning area will dictate the time horizon for buildout of the ultimate service area. However, it is possible that full buildout may not occur within the time frame of the General Plan or in the order assumed in this Master Plan. This section presents the assumed project phasing strategy and presents alternative improvements to key CIP projects recommended for buildout.

The collection system CIP projects are generally presented in the order they should be completed based on the assumed order of development presented in model scenarios. Many of the future system improvement projects are dependent on the implementation of other recommended projects. Primarily the previously identified improvements discussed in **Section 5.3.2** of this report, including Project 5, and Project 7. **Table 5-11** presents the recommended collection system CIP projects and lists the dependent projects that need to be implemented prior to their construction.

Table 5-11. Dependent CIP Project Phasing

ID	Name	Dependent Projects
Scenario 1 Improvements		
1	W Center Street Trunk	Existing System Need
2	Elm/West North Street Trunk	Existing System Need
3	10-inch East North Street Trunk	Existing System Need
4	8-inch East North Street Trunk	Existing System Need
5A	South Woodward Trunk Extension	Existing System Need
6	Central Union Road Trunk Extension	Existing System Need
Scenario 2 Improvements		
7	North Trunk Extension on Airport Way	None
8	S. Main Trunk to Evans	5
9	S. Airport Way and Yosemite Ave. (Fishback)	None
10	S. Airport Way Roberts Estates to Daniels	None
11	Yosemite Square Lift Station and Improvements	None
12	Austin Road Industrial Area Trunk	5, 8
13	South Austin Road - Industrial Area	5, 8
Scenario 3 Improvements		
14	Yosemite Square Service Area	5
15	Oleander Avenue Extension/ S. Airport Way Sewer	None
16	Highway 99 Crossing at Northland Road	7
17	East Lathrop Road Trunk	7, 16
18	Northland Road Trunk	7, 16
19	Northland Road Branches	7, 16, 18
20	Louise/ Nehemiah Branches	None
21	South Union Road Extension	None
22	Cottage Avenue	None
Scenario 4 Improvements		
23	North Shed Union Road Trunk	7
24	Manteca Junction Trunk	7, 23
25	Lovelace Road - 99 Crossing	7, 23

As shown in **Table 5-11**, the greatest number of projects are dependent on the implementation of Project 5 and Project 7. As previously discussed, both of these projects consist of large, deep, gravity sewers that connect oversized portions of the existing system to the North and South Trunk sewers which flow by gravity to the WQCF, thereby allowing for the decommissioning of several lift stations. These projects also serve as the major conduit for future growth in the South Shed (Project 5) and North Shed (Project 7), making these projects a key component of the overall collection system CIP.

These previously identified system improvement projects pose construction challenges due to their depth, location in crowded utility corridors, and need for highway/railroad crossings, with the most significant challenges associated with Project 7. The following alternatives improvements to expand existing lift stations are presented for the previously identified improvement projects described in **Section 5.3.2**. Rebuilding the Union Road lift station as alternative to Project 6 is also discussed.

Project 5C: Expand Woodward Park and Evans Lift Stations

Project 5B was described in **Section 5.2** and included upgrading the Woodward Park lift station to meet capacity needs under existing conditions as an alternative to Project 5A which would extend the South Woodward Trunk and take the lift station offline. This alternative, Project 5C, also proposes an alternative to Project 5A with enough capacity to provide service under buildout conditions. As discussed, further improvements to the Woodward Park lift station would be needed to meet flows under buildout conditions. Additionally, without implementing Project 5A, Project 8 which would take the Evans lift station offline could not be implemented. Therefore, expanding both lift stations would be required under this alternative.

The projected buildout flow at the Woodward Park lift station is approximately 6.0 Mgal/d and the projected buildout flow at the Evans lift station is approximately 4.2 Mgal/d. The individual lift station force mains and combined force main system for these stations would also require improvements. The 12-inch Woodward Park lift station force main would need to be expanded to 16-inches in diameter, the 8-inch Evans lift station force main would need to be expanded to 14-inches in diameter, and the combined 12-inch force main would need to be expanded to 18-inches in diameter. The force main system could be shorted and tie into the upstream end of the existing 36-inch sewer in Woodward Avenue east of Pagola Avenue.

Implementing Project 5A, to extend the South Woodward Trunk and take the lift stations offline, is ultimately recommended for the following reasons:

- O&M costs of two major lift stations would be eliminated.
- Avoids expanding these lift stations to meet future capacity needs.
- The replacement of these forcemains would run a longer length than replacing them with gravity lines, due to the preemptively installed 36-inch gravity line that runs from S. Main Street to the Woodward Park Lift Station.
- Takes advantage of otherwise unused preemptively installed system capacity.

Project 6B: Rebuild the Union Road Lift Station

Project 6B is presented as an alternative to Project 6A, the Central Union Road Trunk Extension, which would replace the existing Union Road lift station force main and take the station offline. This alternative would rebuild the existing Union Road lift station at its current capacity, 15.2 Mgal/d, which is sufficient for buildout capacity needs. It would also require that the existing force main be rehabilitated or replaced as identified in **Chapter 6.0** of this report (North of Yosemite Avenue in Golf Course and Field). A new deeper wet-well would be required to eliminate surcharging in the collection system which occurs during general operation.

Replacing the Union Road lift station and discharge line with Project 6A, the Central Union Road Trunk Extension is ultimately recommended for the following reasons:

- Based on discussions with City staff, rebuilding the station in its existing location would pose challenges on such a confined site.
- The City has recently invested in constructing the North Trunk Sewer Project which extended the North Trunk sewer to meet the discharge location of the Union Road Lift Station at a depth that would allow the station to be taken offline.
- The lift station is beyond its useful life, has a high O&M impact, and consistently surcharges the upstream system. The upstream collection system will be left at risk of additional catastrophic failures if sufficient depth cannot be provided to allow the lift station to operate without surcharging the upstream system.
- The need to replace or rehabilitate discharge line that follows the same alignment as the proposed project. The alignment is generally open space with limited utility conflicts and crossings.
- Eliminates associated lift station improvement and O&M costs.

Project 7B: Expand North Shed Lift Stations

As an alternative to Project 7A, the North Trunk Extension on Airport Way, the lift stations in the North Shed could be expanded to provide sufficient capacity for buildout flows. This would require expanding Woodbridge Park, Villa Ticino, and Chadwick Unit 5. No improvements to the existing 24-inch force main would be required. The Woodbridge Park lift station would require the most extensive improvements to expand it from its current capacity of 2.1 Mgal/d to approximately 12.3 Mgal/d. Villa Ticino would need to be expanded to approximately 1.0 Mgal/d and Chadwick Unit 5 would need to be expanded to approximately 2.4 Mgal/d. The Villa Ticino and Chadwick Unit 5 lift stations are located in the sidewalk and do not have room to expand and with such a large expansion at Woodbridge Park it's likely that each of these lift station expansions would require land acquisition. The Villa Ticino lift station could currently be taken offline if flows were redirected to the existing 36-inch sewer in Airport Way.

Both Project 7A and Project 7B present their own unique challenges that warrant further investigation. Therefore, costs for both alternatives will be presented in the final section of this Chapter.

5.5 CONCEPTUAL OPINION OF PROBABLE COST

The purpose of this section is to present a conceptual opinion of probable construction cost (OPCC) for each of the recommended improvements to the City's wastewater collection system in development of the overall Capital Improvement Program (CIP) presented in **Chapter 12.0** of this WWMP. Cost estimates prepared for this WWMP are developed in accordance with the guidelines of the Association for the Advancement of Cost Engineering (AACE) International for a Class 5 Estimate. The AACE International defines a Class 5 Estimate as:

> *Class 5 Estimate: This estimate is prepared based on limited information, where little more than proposed plant type, its location, and the capacity are known. Strategic planning purposes include, but are not limited to, market studies, assessment of viability, evaluation of alternate schemes, project screening, location and evaluation of resource needs and budgeting, and long-range capital planning. Examples of estimating methods used would include cost/capacity curves and factors, scale-up factors, and parametric and modeling techniques. The expected accuracy ranges for this class estimate are -20 to -50 percent on the low side and +30 to +100 percent on the high side.*

5.5.1 Cost Estimating Assumptions

Construction and capital cost estimates are presented in March 2023 dollars corresponding to an Engineering News-Record Construction Cost Index (ENRCCI) of 13,176 (all Cities). The project cost estimates include base construction costs and soft costs. The engineering opinion of probable costs for the wastewater collection system falls under Classification Four (Class 5, as defined by Association for the Advancement of Cost Engineering, AACE) with an expected accuracy range of -50% to +100%.

Construction costs were developed based on a combination of equipment quotes supplied from manufacturers, bids on other City wastewater facilities projects, construction cost estimates by Stantec from similar type construction projects, and standard cost estimating guidelines.

Soft costs include a 30 percent mark-up for construction cost estimating and a 35 percent mark-up of the total construction cost for engineering, construction management and administration.

It is assumed that the recommended facilities will be developed in public ROW or on public property; therefore, land acquisition costs have not been included. Construction costs estimates do not include costs for annual O&M or any allowance for project financing costs.

The development of cost estimates for this recommended CIP involves the following cost estimation methods and assumptions:

1. All of the cost estimates presented in this chapter are expressed in current (March 2023) dollars. Escalation should be considered in the financial analysis for projects occurring in future years.
2. Where the basis for costs was previously estimated, those earlier estimates are escalated to the current ENRCCI value for March 2023.

3. For open-cut gravity sewer construction projects, Stantec's depth vs diameter unit cost table was used to estimate costs. Stantec's unit cost database was calibrated to match recent bid estimates provided by the City. These unit costs are included in **Appendix G** and are assumed to include manholes, excavation/backfill, sheeting and shoring, pipe construction, dewatering, lateral/sewer main connection, repaving, and mobilization/demobilization.

4. For future pump station facilities, construction costs are capacity-based estimates using cost curves, supplemented with cost information from pump station projects in California. The estimates are representative of average site conditions and normal difficulty of construction.

5. For pump station force main piping the assumed unit rates are also included in **Appendix G**. These costs are assumed to include excavation/backfill, sheeting and shoring, pipe construction, dewatering, repaving, and mobilization/demobilization.

5.6 RECOMMENDED PROJECTS AND COSTS

The recommended CIP list for the wastewater collection system is presented as **Table 5-12**. The alternative Project 7B to expand lift stations in the north shed presented in **Table 5-13**.

The information presented in the tables includes:

- An ID number assigned to the improvement
- Name of the improvement
- Service Area
- Description of the improvement
- Justification for the improvement
- Level of development scenario identified/needed
- Project quantities involved
- Project actions/notes
- Estimated capital cost

Table 5-12. Recommended Capital Improvement Plan – Wastewater Collection System

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
Scenario 1 Improvements							
1	W. Center Street Trunk	Central Shed	Upsize the existing 15-inch sewer to 18-inches	Existing system model shows surcharge failing LOS criteria.	~3,800 LF of 18-inch sewer pipe	Also included in Chapter 6 condition projects	$4,880,000
2	Elm/West North Street Trunk	Central Shed	Upsize existing 10-inch sewer to 15-inches	Existing system model shows surcharge failing LOS criteria.	~4,510 LF of 15-inch sewer pipe	Also included in Chapter 6 condition projects	$5,080,000
3	10-inch East North Street Trunk	Central Shed	Upsize existing 10-inch sewer to 12-inches	Existing system model shows surcharge failing LOS criteria.	~1,325 LF of 12-inch sewer pipe	Also included in Chapter 6 condition projects	$1,660,000
4	8-inch East North Street Trunk	Central Shed	Upsize existing 8-inch sewer to 10-inches	Existing system model shows surcharge failing LOS criteria.	~560 LF of 10-inch sewer pipe	This area could be monitored as projects 1-3 mitigate most surcharging identified in this portion of the system.	$510,000
5	South Woodward Trunk Extension	South Shed	Complete existing south trunk with new 36-inch sewer.	Existing system model shows insufficient capacity at Woodward Park pump station.	~4,030 LF of 36-inch sewer pipe	This is a previously identified project and completes previous south trunk planning.	$12,640,000
6	Central Union Road Trunk Extension	Central Shed	Replace existing 36-inch sewer, 24-inch force main, and Union Road LS with new deeper 36-inch trunk.	Existing Union Road lift station suffers from chronic mechanical failures, deterioration, and operational concerns.	~5,030 LF of 36-inch sewer pipe	Also included in Chapter 6 condition projects	$16,170,000

CITY OF MANTECA WASTEWATER MASTER PLAN

Collection System Capacity Evaluation
February 2024

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
Scenario 2 Improvements							
7	North Trunk Extension on Airport Way	North Shed	Replace existing force main system with 48-inch gravity sewer	Insufficient capacity at Woodbridge Park, Chadwick U5, and Villa Ticino pump stations.	~7,670 LF of 48-inch sewer pipe	Constructability of this project may be difficult in an already crowded utility corridor	$34,340,000
8	S. Main Trunk to Evans	South Shed	Replace existing 8-inch force main with 27-inch gravity sewer	Insufficient capacity at Evans pump station and force main system.	~2,690 LF 27-inch sewer pipe	This project may be combined with Project 5.	$7,180,000
9	S. Airport Way and Yosemite Ave. (Fishback)	South Shed	Replace existing 6-inch force main and 8-inch gravity sewer with 10-inch gravity sewer	Discharge from the Fishback lift station overwhelms downstream gravity sewer.	~2,665 LF 10-inch sewer pipe	Force main routing in model may be incorrect based on discussion with City staff, general service design of surrounding area should consider options to take lift station offline.	$3,100,000
10	S. Airport Way Roberts Estates to Daniels	South Shed	Replace existing 6-inch force main with 10-inch gravity sewer	Insufficient capacity at Roberts Estate pump station.	~1,320 LF of 10-inch sewer pipe	General service design of surrounding area should consider options to take lift station offline.	$1,750,000
11	Yosemite Square Lift Station and Improvements	South Shed	Construct new 2.4 Mgal/d lift station and 15-inch service area sewer. Extend 15-inch sewer downstream of new 8-inch forcemain.	Provide service to Yosemite Square and surrounding area.	~4,660 LF 15-inch sewer pipe, 2.4 Mgal/d pump station, and ~4,860 LF 8-inch force main	Force main should be routed to existing 18-inch highway crossing. The highway crossing should tie into the new 18-inch sewer in the realignment of Woodard Avenue.	$12,880,000

CITY OF MANTECA WASTEWATER MASTER PLAN

Collection System Capacity Evaluation
February 2024

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
12	Austin Road Industrial Area Trunk	South Shed	New 24 to 18-inch trunk sewer.	Provide service to the Austin Road Industrial Area	~2,355 LF of 18-inch sewer pipe, ~5,300 LF of 21-inch sewer pipe, and ~2,945 LF of 24-inch sewer pipe	Ties into existing 24-inch trunk upstream of Evans lift station.	$20,810,000
13	South Austin Road - Industrial Area	South Shed	Extend 15-inch sewer in Austin Road.	Provide service to the northern portion of the Industrial Area	~4,335 LF of 15-inch sewer pipe	Ties into Austin Road Industrial Area Trunk.	$5,780,000
Scenario 3 Improvements							
14	Yosemite Square Service Area	South Shed	New 15-inch trunk sewer.	Provide service to the southern portion of the Yosemite Square service area.	~3,575 LF of 15-inch sewer pipe	Ties into Yosemite Square lift station.	$4,240,000
15	Oleander Avenue Extension/ S. Airport Way Sewer	South Shed	Extend existing 12-inch sewer in Oleander Avenue into SOI. Install a new 10-inch sewer in Airport Way.	Provide service to southern SOI area.	~2,255 LF of 12-inch sewer pipe ~3,365 LF 10-inch sewer	Match existing 12-inch slope, 0.002 ft/ft. 10-inch at 0.0025 ft/ft or greater	$6,660,000
16	Highway 99 Crossing at Northland Road	North Shed	Construct new 24-inch sewer and highway crossing.	Provide service to northern SOI area.	~3,515 LF of 24-inch sewer pipe	Ties into existing system at Tidewater bike path. Includes highway crossing	$9,310,000
17	East Lathrop Road Trunk	North Shed	Construct new 18-inch and 15-inch sewer.	Provide service to northern SOI area.	~4,000 LF of 15-inch sewer pipe, ~3,340 LF of 18-inch sewer pipe.	Assumes slope of 0.0015 ft/ft	$12,060,000
18	Northland Road Trunk	North Shed	Construct new 18-inch sewer.	Provide service to northern SOI area.	~3,790 LF of 18-inch sewer pipe	Drop manhole recommended at downstream end to reduce depth.	$6,630,000

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
19	Northland Road Branches	North Shed	Construct new 12-inch sewers.	Provide service to northern SOI and planning area.	~5,255 LF of 12-inch sewer pipe	Variable routing and pipe sizing depending on actual development.	$6,350,000
20	Louise/ Nehemiah Branches	Central Shed	Construct new 12-inch sewers.	Provide service to eastern SOI area.	~5,250 LF of 12-inch sewer pipe	Ties into Louise and Pestana Avenue lines.	$5,160,000
21	South Union Road Extension	South Shed	Extend existing 12-inch sewer in South Union Road into SOI.	Provide service to southern SOI area.	~3,940 LF 12-inch sewer pipe	Match existing slope, 0.002 ft/ft.	$4,590,000
22	Cottage Avenue	North Shed	Construct new 12-inch sewer.	Provide service to northern SOI area.	~2,410 LF of 12-inch sewer,	Ties into East Lathrop Road Trunk.	$3,080,000
Scenario 4 Improvements							
23	North Shed Union Road Trunk	North Shed	Construct new 30-inch sewer.	Provide service to remaining planning area.	~4,695 LF of 30-inch sewer pipe	Requires upsizing of existing 18-inch section of Union Road sewer.	$13,130,000
24	Manteca Junction Trunk	North Shed	Construct new 10-inch sewer.	Provide service to remaining planning area.	~3,010 LF of 10-inch sewer pipe	Variable pipe size depending on actual flow routing and development conditions.	$3,730,000
25	Lovelace Road - 99 Crossing	North Shed	Construct new 24 to 15-inch sewer.	Provide service to remaining planning area.	~5,650 LF of 24-inch sewer pipe and ~3,605 LF of 15-inch sewer pipe	Includes highway crossing.	$18,090,000

Table 5-13. Alternative Project Costs – Project 7B: Expand North Shed Lift Stations

ID	Name	Service Area	Description	Justification	Quantities	Actions/Notes	Total Project Costs
Scenario 2 Improvements							
7B	Expand North Shed Lift Stations	North Shed	Alternative to Project 7 (North Trunk Extension on Airport Way) Expand Existing Lift Stations	Insufficient capacity at Woodbridge Park, Chadwick U5, and Villa Ticino.	Woodbridge Park (12.3 Mgal/d) Chadwick U5 (2.4 Mgal/d) Villa Ticino (1.0 Mgal/d)	Land acquisition required. No force main improvements. Note: costs exclude land acquisition	$29,530,000

6.0 WASTEWATER COLLECTION SYSTEM CONDITION ASSESSMENT

This chapter includes a summary of the sanitary sewer condition assessment conducted by Stantec Consulting Services Inc. (Stantec) in 2017. This assessment included 52,150 lineal feet sewer pipeline from 60-inches to 10-inches in diameter and inspection of 187 manholes. The assessment was summarized in a report titled City of Manteca Sewer Conditions Assessment dated August 2017 (MSCA). A summary of the MSCA is included to ensure that the recommendations of the assessment are carried through in the overall wastewater Capital Improvement Program (CIP) developed as part of this WWMP.

This chapter is divided into the following sections:

- Background
- Summary of Sewer Conditions Assessment
- Cost Summary of Recommended Projects

6.1 BACKGROUND

The City of Manteca currently operates and maintains approximately a 250 miles of sanitary sewer gravity pipeline including 4,672 sanitary sewer manholes. The City is required to have a Sewer System Management Plan (SSMP) in accordance with the State Water Resources Control Board (SWRCB) General Waste Discharge Requirement (WDR) provisions that requires all publicly owned wastewater dischargers with a collection system greater than one mile in length develop a SSMP. Under Section 6.8 (WDR Section D.13.iv.c) the SSMP is required to develop a rehabilitation and replacement program (Program) to identify and prioritize collection system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. This Program includes regular visual and television (TV) inspections of manholes and sewer pipes and a system of ranking the condition of the sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Also, the Program should include a capital improvement plan (CIP) that addresses proper maintenance and protection of the sewer collection system assets.

6.2 SUMMARY OF SEWER CONDITIONS ASSESSMENT

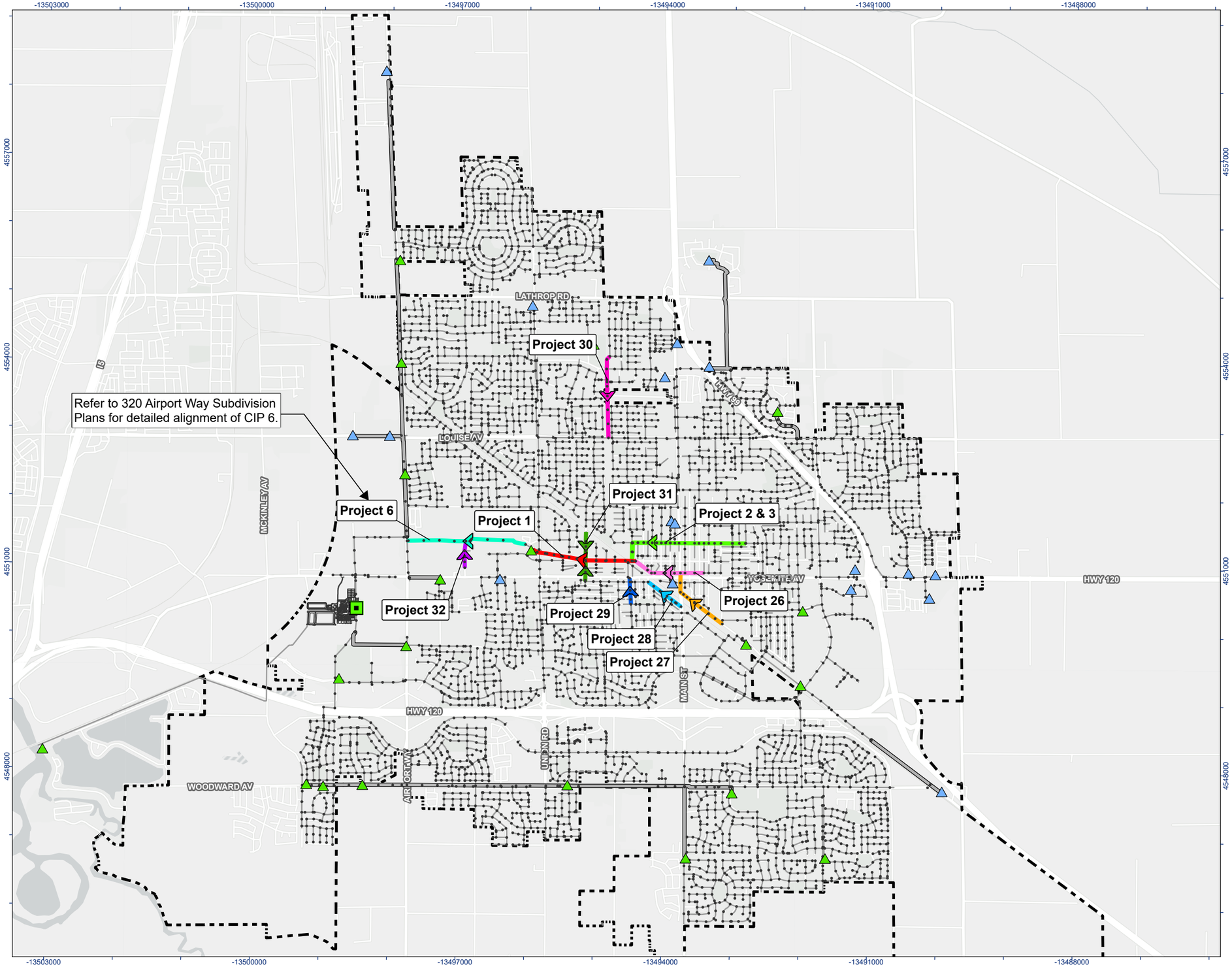
The MSCA used the National Association of Sewer Service Companies (NASSCO) rating system to classify sewer collection system defects by the following groups: structural, operation, construction, and miscellaneous. Each individual pipeline segments and manholes were then bundled into areas to develop projects that could be included in a CIP. The report identified the following 14 areas.

1. Heartsong Drive *(Project Completed)*
2. UPRR Right of Way and Ally Between Center Street and Yosemite Avenue
3. Alley Between Yosemite Avenue and Nevada Street *(Project Completed)*

4. West Center Street Trunk *(Addressed through capacity improvement Project 1, see **Chapter 5.0**)*
5. Moffat Boulevard and Main Street
6. Elm/West North Street Trunk and 10-inch East North Street Trunk *(Addressed through capacity improvement Projects 2 & 3, see **Chapter 5.0**)*
7. Oak Street from Main Street to Willow Avenue
8. Sequoia Avenue from Oregon Street to Alley north of Nevada Street
9. Tidewater Bike Path from Sandalwood Lane to Louis Avenue
10. Walnut Avenue from the alley north of Nevada Street to the UPRR
11. Central Union Road Trunk Extension *(Addressed through capacity improvement Project 6, see **Chapter 5.0**)*
12. Louise Avenue *(Project Completed)*
13. St. Dominic's Drive from North of Yosemite Avenue to Golf Course
14. Union Road *(Project Completed)*

Ongoing project work by the City since the MSCA has reduced this list to 10 projects. The projects are shown in **Figure 6-1**. The following sections provide summaries of each of the 10 remaining projects.

ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Sanitary Manhole
- Water Quality Control Facility
- Forcemain
- Sanitary Network
- Water Quality Control Facility Structures

Lift Station

- City Owned
- Privately Owned
- City of Manteca Limit

Improvement

- Project 1
- Project 2 & 3
- Project 6
- Project 26
- Project 27
- Project 28
- Project 29
- Project 30
- Project 31
- Project 32

Note: Refer to Appendix with CIP descriptions.

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 11/2/2023
TR by MA on 11/2/2023
IR Review by MVD on 11/2/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
6-1

Title
Condition Assessment (2017) Improvements

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6.2.1 Project Summaries

This section provides a brief description of the remaining projects being recommended as future CIPs. The location of each project area is shown on **Figure 6-1**.

Project No. 26: UPRR Right of Way and Alley Between Center Street and Yosemite Avenue

Location: Alley between Center Street and Yosemite Avenue from west of Sherman Avenue to the intersection of the UPRR right of way and Center Street.

Pipe Material: Vitrified Clay

Pipe Diameter: 12-inch

Approximate Length: 2,750 feet

Number of Manholes: 9

Manhole Material: Unlined Concrete and Brick

Recommendation: Point repair 4 segments of pipeline, dig and replace 3 segments of pipeline, and rehabilitate 9 manholes.

Project No. 1: West Center Street Trunk

Location: Center Street from the intersection of the UPRR right of way to just west of Union Road.

Pipeline Material: Vitrified Clay

Pipe Diameter: 12-inch and 15-inch

Approximate Length: 3,950 feet

Number of Manholes: 16

Manhole Material: Unlined Concrete and Brick

Recommendation: Replace entire alignment with new 18-inch gravity pipeline (See **Chapter 5**).

Project No. 27: Moffat Boulevard and Main Street

Location: Main Street from Garfield Avenue to Moffat Street then along Main Street to alley north of Yosemite Avenue.

Pipeline Material: Vitrified Clay and one segment of Truss Pipe

Pipe Diameter: 10-inch

Approximate Length: 2,900 feet

Number of Manholes: 10

Manhole Material: Unlined Concrete and Brick

Recommendation: Dig and replace 3 segments of pipeline, CIPP 5 segments of pipeline.

Project No. 2 and 3: Elm/West North Street Trunk and 10-inch East North Street Trunk

Location: North Street from Roosevelt Avenue to Elm Avenue then along Elm Avenue to Center Street.

Pipeline Material: Vitrified Clay

Pipe Diameter: 10-inch

Approximate Length: 7,150 feet

Number of Manholes: 34

Manhole Material: Unlined Concrete and Brick

Recommendation: Replace entire alignment with new 15-inch and 12-inch gravity pipeline (See **Chapter 5).**

Project No. 28: Oak Street from Main Street to Willow Avenue

Location: Oak Street from Main Street to Willow Avenue.

Pipeline Material: Vitrified Clay

Pipe Diameter: 10-inch

Approximate Length: 1,600 feet

Number of Manholes: 7

Manhole Material: Unlined Concrete and Brick

Recommendation: Point repair 4 segments of pipeline and rehabilitate 7 manholes.

Project No. 29: Sequoia Avenue from Oregon Street to Alley North of Nevada Street

Location: Sequoia Avenue from Oregon Street to the alley north of Nevada Street.

Pipeline Material: Vitrified Clay

Pipe Diameter: 10-inch

Approximate Length: 1,000 feet

Number of Manholes: 3

Manhole Material: Brick

Recommendation: Point repair 1 segment of pipeline, rehabilitate 1 manhole, and replace 2 manholes.

Project No. 30: Tidewater Bike Path from Sandalwood Lane to Louis Avenue

Location: Along Tidewater Bike Path from Sandalwood Lane to Louis Avenue.

Pipeline Material: Vitrified Clay

Pipe Diameter: 12-inch

Approximate Length: 3,150 feet

Number of Manholes: 9

Manhole Material: Unlined Concrete

Recommendation: Point repair 1 segment pipeline, dig and replace 2 segments of pipeline, and rehabilitate 9 manholes.

Project No. 31: Walnut Avenue from the alley north of Nevada Street to the UPRR

Location: Walnut Avenue from the alley north of Nevada Street to the UPRR right of way.

Pipeline Material: Vitrified Clay

Pipe Diameter: 10-inch

Approximate Length: 1,900 feet

Number of Manholes: 7 and 1 Lamphole

Manhole Material: Unlined Concrete and Brick

Recommendation: Point repair 3 segments of pipeline, dig and replace 1 segment of pipeline, CIPP 1 segment of pipeline, replace frame/cover on 2 manholes, and rehabilitate 7 manholes.

Project No. 6: Central Union Road Trunk Extension

Location: From the golf course maintenance yard located west of Union Road, north of Center Street to 1,300 feet north of Yosemite Avenue just west of Airport Way.

Pipeline Material: Reinforced Concrete and Spiral Wound Lined Pipe

Pipe Diameter: 30-inch and 36-inch

Approximate Length: 5,200 feet

Number of Manholes: 16

Manhole Material: Unlined Concrete

Recommendation: Replace with new gravity pipeline and decommission Union Road Pump Station (See **Chapter 5**).

Project No. 32: St. Dominic's Drive from North of Yosemite Avenue to Golf Course

Location: Saint Dominic's Drive from just north of Yosemite Avenue to just south of the golf course.

Pipeline Material: Polyvinyl Chloride

Pipe Diameter: 12-inch

Approximate Length: 900 feet

Number of Manholes: 4

Manhole Material: Unlined Concrete

Recommendation: Rehabilitate 4 manholes.

6.3 SUMMARY OF RECOMMENDATIONS

Table 6-1 summarizes the combined pipeline and manhole repair, rehabilitation, and replacement costs for each project area. Costs for projects that overlap with recommended capacity improvements are presented in **Chapter 5**. In addition to the improvements to the existing areas, the City should continue inspecting the remainder of their system. Recommendations from the SSMP should be implemented to continue cleaning and inspecting the pipelines (250 miles) and manholes (4,700 manholes) within the system at a rate of approximately 5% to 10% per year, respectively.

Table 6-1. Summary of Project Repair/Rehabilitation/Replacement Costs

ID	Description	Cost
26	UPRR Right of Way and Ally Between Center Street and Yosemite	$489,000
27	Moffat Boulevard and Main Street	$1,022,000
28	Oak Street from Main Street to Willow Avenue	$98,000
29	Sequoia Avenue from Oregon Street to Alley North of Nevada Street	$53,000
30	Tidewater Bike Path from Sandalwood Lane to Louis Avenue	$348,000
31	Walnut Avenue from the alley north of Nevada Street to the UPRR	$279,000
32	St. Dominic's Drive from North of Yosemite Avenue to Golf Course	$29,000
	Total	**$2,318,000**

7.0 WASTEWATER QUALITY CONTROL FACILITY (WQCF) BACKGROUND AND REGULATORY REQUIREMENTS

The Manteca Wastewater Quality Control Facility (WQCF) is located southwest of downtown Manteca at 2450 West Yosemite Avenue. The WQCF treats typical municipal wastewater generated in the City of Manteca (City), Raymus Village, Oakwood Shores, and the neighboring City of Lathrop. The plant also receives seasonal discharges from a local food processor (Eckert Cold Storage).

This chapter includes the following sections:

- WQCF Background
- Regulatory Requirements
- Thermal Plan Compliance

7.1 WQCF BACKGROUND

The Manteca WQCF began operation in 1959. The original facility was an oxidation pond that discharged effluent to the surrounding land for agricultural irrigation. In 1970, the facility was upgraded with preliminary and primary treatment facilities and aerobic sludge digestion. Effluent continued to be used for agricultural irrigation. In 1986-1988, as part of the Clean Water Grant Program, a major expansion to the facility was constructed. This Phase I Expansion Project included the construction of primary sedimentation basins, secondary treatment facilities (biological towers and aeration basins), secondary clarifiers, anaerobic sludge digesters, sludge drying beds, a chlorine disinfection system, and an outfall to the San Joaquin River. In 1992-1993 a Phase II Expansion Project added a primary sedimentation basin, secondary clarifier, and four sludge drying beds. Starting in 2001 the Phase III Expansion Project was constructed in a series of Schedules (A, B, C, and D) over a period of several years.

The Phase III Expansion Project separated the main treatment processes into the Northside and Southside Plants. Schedule A improvements included the construction of two new aeration basins, modifications to three existing secondary clarifier sludge collection mechanisms, and replacement of two existing centrifugal blowers with larger units within the Northside plant. As part of the Schedule A improvements, the City also procured a skid-mounted centrifugal dewatering system to dewater anaerobically digested primary and secondary sludges to augment the existing drying bed facilities. Schedule A improvements were completed in 2003.

Phase III Schedule B improvements included the construction of a new headworks and influent pump station, two aerated grit tanks, three primary sedimentation basins, five aeration basins, two secondary clarifiers, and an odor control biofilter for the Northside plant. Schedule B improvements also included the expansion of the existing Laboratory and Administration Building. Schedule B improvements were substantially completed in 2005.

Phase III Schedule C improvements included a mechanical dewatering facility. The skid-mounted centrifugal dewatering system acquired under Schedule A was relocated to a new dewatering building.

Other improvements included a Shop Maintenance Building and a paved biosolids stockpile area. Schedule C improvements were completed in 2008.

Phase III Schedule D improvements included the construction of a secondary effluent equalization pond, filter feed pump station, coagulation and flocculation facilities, tertiary filters, a chemical storage and handling facility, a UV disinfection system, an effluent pumping station, and two odor control biofilters. In addition to flow attenuation, the secondary effluent equalization pond was designed to store water during periods of reverse river flow due to tidal influence in the San Joaquin River. Schedule D improvements were completed in 2007. The biological towers completed during Phase 1 were taken out of service after the completion of the Phase II Schedule D improvements.

Under the Industrial Pipeline Project (IPP-3), the existing secondary effluent storage pond was modified to create a second lined pond for food processing wastewater from Eckert Cold Storage (Eckert). High strength Eckert wastewater had been co-mingled with domestic wastewater and processed through the WQCF prior to disposal. lPP-3 was the final component in a source separation program designed to allow independent treatment of Eckert wastewater prior to land application at the WQCF. The IPP-3 was completed in 2009.

In 2018, improvements were made to the Northside Plant aeration basins to improve energy efficiency and improve control of the aeration process to obtain additional denitrification capabilities. This included replacement of multistage blowers with high efficiency turbo blowers, replacement of the diffuser system with more reliable high efficiency fine bubble diffusers, and installation of control valves and DO controls to all basin zones. These improvements allowed influent flows to increase without violations of the NPDES permit. In 2020 these same improvements were made to the Southside Plant.

The WQCF Digester Improvements Phase I Project, completed in 2019, included new Digesters No. 3 and No.4 and a new Digester Control Building, rehabilitation of Digesters No. 1 and No. 2, replacement the existing gas flare, new FOG and food waste receiving stations. Also completed in 2019 was the Compressed Biogas Fueling Facilities Phase II Project, which included a new biogas renewable compressed natural gas (BioCNG) facility and fill station.

An aerial view of the Manteca Wastewater Quality Control Facility (WQCF) is shown in **Figure 7-1.** A process flow diagram of the WQCF is shown on **Figure 7-2**.

ATTACHMENT

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1. HEADWORKS/SCREENS
2. INFLUENT PUMP STATION
3. SEPTAGE RECEIVING STATION
4. FOG RECEIVING
5. FOOD WASTE RECEIVING
6. BIOGAS SULFATREAT SYSTEM
7. ODOR CONTROL BIOFILTER
8. CHLORINE BUILDING
9. NORTHSIDE AERATED GRIT TANKS
10. NORTHSIDE PRIMARY SEDIMENTATION BASINS
11. NORTHSIDE AERATION BASINS
12. SECONDARY CLARIFIER NO.1
13. SECONDARY CLARIFIER NO.2
14. SECONDARY CLARIFIER NO.3
15. NORTHSIDE RAS & N.S. WAS PUMP STATION
16. SOUTHSIDE AERATED GRIT TANKS
17. SOUTHSIDE PRIMARY SEDIMENTATION BASINS
18. SOUTHSIDE AERATION BASINS
19. SOUTHSIDE MCC BUILDING
20. SECONDARY CLARIFIER NO.4
21. SECONDARY CLARIFIER NO.5
22. SEC. CLARIFIERS NO.4 & NO.5 SPLITTER BOX
23. SOUTHSIDE RAS PUMP STATION
24. FILTER FEED PUMP STATION
25. CHEMICAL BUILDING 2
26. RAPID MIX AND FLOCCULATION TANKS
27. TERTIARY FILTERS
28. UV DISINFECTION
29. EFFLUENT PUMP STATION
30. EFFLUENT MCC/GENERATOR BUILDING
31. CHLORINE CONTACT TANK
32. IRRIGATION PUMP STATION
33. RECYCLE WATER PUMP STATION
34. SECONDARY EFFLUENT EQUALIZATION POND
35. SECONDARY EFFLUENT STORAGE POND
36. ECKERT POND
37. DISSOLVED AIR FLOTATION TANKS
38. COLLECTIONS STORAGE BUILDING
39. DIGESTER NO.1
40. DIGESTER NO.2
41. DIGESTER CONTROL BUILDING
42. DIGESTER NO.3
43. DIGESTER NO.4
44. SLUDGE BLENDING TANK
45. DEWATERING BUILDING
46. DEWATERED SLUDGE LOADING AREA
47. RCNG GAS STORAGE/CONDITIONING
48. BIOCNG
49. CNG/TRUCK LOADING
50. FLARE
51. NORTH SLUDGE DRYING BEDS
52. ADMIN BUILDING
53. LABORATORY
54. SHOP/MAINTENANCE BUILDING
55. TRAINING/LOCKER ROOM OPERATION BUILDING
56. BIOTOWERS
57. STAFF LOCKER ROOM

N

0 60 120 180 240 300 FEET

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Figure 7-1
WQCF Existing Site Layout

ATTACHMENT 1

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CENTRATE

SD

M

NORTHSIDE FACILITIES

PS

PS/SC

SC

GRIT TANK NO. 1

GRIT TANK NO. 2

PRIMARY SEDIMENTATION NO. 1

PRIMARY SEDIMENTATION NO. 2

PRIMARY SEDIMENTATION NO. 3

PE

AERATION BASIN NO. 4

AERATION BASIN NO. 3

AERATION BASIN NO. 2

AERATION BASIN NO. 1

AERATION BASIN NO. 5

RECYCLE

ML

SC NO. 1

SC NO. 2

SC NO. 3

RAS/WAS PUMP STATION

RAS

WAS

DAF NO. 1

DAF NO. 2

TSO

TS

PS/SC/TS

DIGEST. NO. 3

DIGEST. NO. 1

DIGEST. NO. 4

DIGEST. NO. 2

DSL

SLUDGE BLENDING TANK

DEWATERING BUILDING

DWS

LAND FILL

HYDROGRITTER

DUMPSTER

GRIT TO LANDFILL

SEPTAGE RECEIVING

SCREENING TO LANDFILL

WASHER COMPACTOR

INFLUENT PUMP STATION

SS

SE

FA

GAS CONDITIONING

DG

FLARE

BIOCNG

CNG/TRUCK LOADING

NORTH TRUNK SS

SOUTH TRUNK SS

MECH. SCREENS

WET WELL

ODOR CONTROL BIOFILTER

SOUTHSIDE FACILITIES

GRIT TANK NO. 3

GRIT TANK NO. 4

PRIMARY SEDIMENTATION NO. 4

PRIMARY SEDIMENTATION NO. 5

PRIMARY SEDIMENTATION NO. 6

CLASSIFIER

AERATION BASIN NO. 6

AERATION BASIN NO. 7

AERATION BASIN NO. 8

AERATION BASIN NO. 9

AERATION BASIN NO. 10

SC NO. 4

SC NO. 5

SPLIT BOX

BACKWASH

FILTER FEED PUMP STATION

RAPID MIX FLOCCULATION

TERTIARY FILTRATION

BFV

FEF

UV CHANNEL NO.1

UV CHANNEL NO.2

WIRG

FE

CHLORINE CONTACT

RECLAIMED FLOW

EFFLUENT PUMP STATION

OUTFALL TO RIVER

SECONDARY EFFLUENT EQUALIZATION POND

IRRIGATION PUMP STATION

SECONDARY EFFLUENT STORAGE POND

BILL VALVE

TO CITY-OWNED FIELDS

Legend

- Sanitary Sewer (SS)
- Primary Effluent (PE)
- Mixed Liquor (ML)
- Secondary Effluent (SE)
- Tertiary Effluent (TE)
- Final Effluent (FE)
- Return Activated Sludge (RAS)
- Waste Activated Sludge (WAS)
- Scum (SC)
- Primary Sludge (PS)
- Thickened Sludge (TS)
- Thickened Sludge Overflow (TSO)
- Digested Sludge (DS)
- Dewatered Sludge (DWS)
- Digester Gas (DG)
- Sanitary Drain (SD)/Backwash/Centrate
- Screenings/Grit
- Foul Air (FA)

Equipment

- Pump
- Butterfly Valve (BFV)
- Motorized Operator
- Gate
- or Valve
- Mag Meter
- Palmer Bowlus Flume

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Figure 7-2

Existing WQCF Process Flow Diagram

7.2 REGULATORY REQUIREMENTS

The purpose of this section is to provide an overview of the regulatory requirements for the WQCF and provide insight into potential changes that may be adopted with future regulations.

The City WQCF is currently regulated by National Pollutant Discharge Elimination System (NPDES) CA0081558 Order R5-2021-0003 (Order). The Order serves as Waste Discharge Requirements (WDR) pursuant to the California Water Code (Section 13260) and Federal Clean Water Act (Section 402). NPDES orders are renewed on a five-year cycle to reflect changes in policy interpretation, updates to regulation and policy regarding the disposal of wastewater, variations in effluent quality, and public input. The current Order became effective on April 1, 2021 and expires on March 31, 2026.

7.2.1 Order Limitations

7.2.1.1 Effluent Discharge Limitations to San Joaquin River

The Order describes explicit effluent limitations for discharge to the San Joaquin River. Some of the key effluent limitations are summarized in **Table 7-1**.

Table 7-1. Select Order Effluent Limitations for Discharge to San Joaquin River

Parameter	Concentration
BOD_5	
Average Monthly, mg/L	10
Average Weekly, mg/L	15
TSS	
Average Monthly, mg/L	10
Average Weekly, mg/L	15
Ammonia Nitrogen (as N) from April 1st to November 30th [1]	
Monthly Average, mg N/L	2.0
Weekly Average, mg N/L	4.2
Ammonia Nitrogen (as N) from December 1st to March 31st [1]	
Monthly Average, mg N/L	2.5
Weekly Average, mg N/L	6.2
Nitrate plus Nitrite as N	
Average Monthly, mg N/L	10
Average Weekly, mg N/L	15.3

Note:
[1] Loading limits for ammonia nitrogen are regulated based on the concentration (mg N/L) x average dry weather flow effluent limit (Mgal/d) x 8.34 conversion factor.
Key:
BOD_5 = Biochemical Oxygen Demand, 5-day at 20°C
mg/L = milligrams per liter
TSS = Total Suspended Solids

Additional effluent discharge limitations include:

- **pH**: The pH shall not be depressed below 6.5 nor raised above 8.5.
- **Percent Removal:** The average monthly percent removal of BOD_5 and TSS shall not be less than 85%.
- **Acute Whole Effluent Toxicity:** Survival of aquatic organisms in a 96-hour bioassay of effluent shall equal or exceed 70% in each assay and 90% as a median for any three consecutive assays.
- **Temperature:** The maximum temperature of the discharge shall not exceed the natural receiving water temperature by more than 20°F.
- **Total Coliform:** Total coliform organisms shall not exceed 2.2 most probable number per 100 mL (MPN/100mL) as a 7-day median, 23 MPN/100mL more than once in a 30-day period, or 240 MPN/100mL at any time.
- **Chlorpyrifos and Diazinon:** The sum of average monthly effluent limitation (Samel) shall be less than 1.0, and the sum of average weekly effluent limitation (Sawel) shall be less than 1.0 using the following equations:

$$\text{Samel} = \frac{\text{Average Monthly Diazinon (µg/L)}}{0.079} + \frac{\text{Average Monthly Chlorpyrifos (µg/L)}}{0.012} \leq 1.0$$

$$\text{Sawel} = \frac{\text{Average Weekly Diazinon (µg/L)}}{0.14} + \frac{\text{Average Weekly Chlorpyrifos (µg/L)}}{0.021} \leq 1.0$$

- **Electrical Conductivity (EC) at 25°C:** The effluent calendar year annual average EC shall not exceed 1,000 µmhos/cm.
- **Methylmercury:** Effective 31 December 2030, the effluent calendar year annual methylmercury load shall not exceed 0.38 grams, in accordance with the Delta Mercury Control Program.
- **Mercury, total:** Effective immediately and until 30 December 2030, for a calendar year, the total annual mass discharge of total mercury shall not exceed 90 grams/year. This interim effluent limitation shall apply in lieu of the final effluent limitation for methylmercury.

7.2.1.2 Receiving Water Limitations

Receiving water limitations have been implemented to prevent discharge of materials that cause or contribute to nuisance or to adverse impacts on beneficial uses of the San Joaquin River. There are also limitations to prevent detrimental responses in human, plant, animal, or aquatic life. Some of these limitations have specific and/or numerical limits and are presented below.

The discharge shall not cause the following in San Joaquin River:

- **Biostimulatory Substances:** Water to contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses.
- **Chemical Constituents:** Chemical constituents to be present in concentrations that adversely affect beneficial uses.
- **Color:** Discoloration that causes nuisance or adversely affects beneficial uses.
- **Dissolved Oxygen**: The dissolved oxygen concentration to be reduced below 5.0 mg/L at any time.
- **Floating Material:** Floating material to be present in amounts that cause nuisance or adversely affect beneficial uses.
- **Oil and Grease:** Oils, greases, waxes, or other materials to be present in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
- **pH**: The pH to be depressed below 6.5 nor raised above 8.5.
- **Pesticides:** Should not be present in water, sediments, or aquatic life in concentrations that affect beneficial uses. Total identifiable persistent chlorinated hydrocarbon pesticides should not be present in the water column at concentrations detectable within the accuracy of analytical methods approved by U.S. EPA or the Executive Officer. Pesticide concentrations should be the lowest technically and economically achievable and consistent with antidegradation policies. Pesticide concentrations should not exceed maximum contaminant levels (MCLs). Thiobencarb shall be 1.0 μg/L or less.
- **Radioactivity:** Radionuclides shall be below MCLs specified in Table 64442 of section 64442 and Table 64443 of section 64443 of Title 22 of the California Code of Regulations, and their concentration in water and the food web shall be below levels that are harmful to human, plant, animal, or aquatic life.
- **Suspended Sediments:** The suspended sediment load and suspended sediment discharge rate of surface waters to be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
- **Settleable Substances:** Substances to be present in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.
- **Suspended Material:** Suspended material to be present in concentrations that cause nuisance or adversely affect beneficial uses.

- **Taste and Odors:** Taste- or odor-producing substances to be present in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.
- **Temperature:** 1) The creation of a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25% of the cross-sectional area of the river channel at any point; and 2) a surface water temperature increase greater than 4°F above the natural temperature of the receiving water at any time or place.
- **Toxicity:** Toxic substances to be present, individually or in combination, in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.
- **Turbidity:** Shall not exceed 2 Nephelometric Turbidity Units (NTU) where natural turbidity is less than 1 NTU, nor the limits presented in **Table 7-2**.

Table 7-2. Maximum Turbidity Limits

Natural Turbidity (NTU)	1 - 5	5 - 50	50 – 100	>100
Increase limit	≤1 NTU	≤20%	≤10 NTU	≤10%

In addition to the above surface water limitations, the Order contains groundwater limitations. Release of waste constituents from any portion of the WQCF shall not cause groundwater to:

- Contain any of the below constituents in concentrations statistically greater than water quality objectives (WQO) or natural background quality, whichever is greater.
  - **Total Coliforms Organisms**
    - WQO: less than 2.2 MPN/100mL as a 7-day median
    - Ambient background quality: less than 2 MPN/100mL
  - **TDS**
    - WQO: 1,070 mg/L
    - Ambient background quality: 280 mg/L
  - **Total Nitrate Nitrogen (effective 1 April 2026)**
    - WQO: 10 mg/L
    - Ambient background quality: 15.3 mg/L
- Exhibit a pH less than 6.5 or greater than 8.4.
- Impart taste, odor, chemical constituents, toxicity, or color that creates nuisance or impairs any beneficial use.

7.2.1.3 Land Application Limitations

Recycled water applied to Land Application Areas (City owned agricultural fields) contains undisinfected secondary municipal wastewater and food processing wastewater from Eckert Cold Storage. In addition to complying with specifications detailed in the Order (e.g., setback requirements, use requirements, use area management requirements, etc.), the WQCF must also comply with the following loading limitations and triggers for the application of recycled water to the Land Application Areas. Section 9.10 describes the existing effluent handling and disposal facilities, including the existing land disposal system.

- **Hydraulic Loading**. The volume of recycled water and supplemental irrigation water (if any) applied to the use areas shall not exceed agronomic rates based on the vegetation grown, pre-discharge soil moisture conditions, and weather conditions.
- **Total Nitrogen**. Crops shall be grown on the use areas and cropping activities shall be managed to take up the nitrogen applied, including any fertilizers and manure. The total nitrogen mass loading to the land Application Areas shall not exceed the agronomic rate for the crop grown.
- **BOD_5 Loading.** The maximum daily mass of BOD_5 applied to the Land Application Areas shall not exceed 300 lbs/acre/day.
- **Total Dissolved Solids (TDS) Trigger.** If the calendar annual average TDS concentration exceeds 600 mg/L, this represents an increase over current performance-based discharge levels, and therefore the City must conduct an evaluation to determine the reason(s) for the increased TDS concentration. The evaluation shall include an explanation of the increased concentrations and the City's determination if it represents an increase in mass loading of TDS to the Land Application Areas that would require an Antidegradation Analysis update to demonstrate the increased mass loading is consistent with the Antidegradation Policy.

7.2.1.4 Recycled Water Limitations

The WQCF also produces Title 22 disinfected tertiary recycled water for construction purposes and dust control, sanitary sewer cleaning, and landscape irrigation. The use of the Title 22 disinfected tertiary recycled water is regulated under the State Water Resources Control Board Recycled Water General Order WQ 2016-0068-DDW. The use of the recycled water is beyond the scope of this report. The production of the recycled water is regulated under the NPDES permit. Regarding production, in addition NPDES permit effluent total coliform limitation, the NPDES permit includes the following limitation.

- **Turbidity**. The filter effluent turbidity shall not exceed 2 NTU as a daily average, 5 NTU more than 5% of the time within a 24-hour period, and 10 NTU at any time.

7.2.2 Competing Regulations

The State of California has adopted competing regulations that will impact the WQCF capacity and effluent quality, in particular:

- SB 606 and AB 1688, Water Management Planning (which limits indoor potable water use to 50 gpd/capita by 2030)
- SB 1383, Short-Lived Climate Pollutants Reduction Act (which limits methane emissions to 40% below 2013 levels and reducing disposal of organic waste by 75% from the 2014 levels by 2025)
- Basin Plan Amendments, including salt control programs

7.2.2.1 SB 606 and AB 1688, Water Management Planning

SB 606 and AB 1688 limit indoor potable water use to 50 gpcd by 2030. For the City of Manteca, this means the residents will have to reduce their current water use by approximately 22% (based on the current estimated usage of 61 gpcd). It is noted that when water is conserved, the mass of pollutants discharged by each person is then carried to the treatment plant in less water, resulting in higher pollutant concentrations. The complication of increasing wastewater influent concentrations is documented in the flows and loads section, **Section 7-2**, and described herein to note the important implications that water conservation has on the capacity of the WQCF.

This level of water conservation will cause the design organic loading of the plant to be reached before the hydraulic design flow. This further complicates compliance with pollutants that are not removed from the existing process facilities, because they are in such low concentrations or they are not currently permitted (such as salinity, PFAS, pharmaceuticals, pesticides, etc.). A discussion of appropriate treatment technologies for removal of these pollutants is provided in **Chapter 10**.

7.2.2.2 SB 1383, Short-Lived Climate Pollutants Reduction Act

SB 1383 limits methane emissions to 40-percent below 2013 levels and reduces disposal of organic waste by 75-percent from the 2014 levels by 2025. To achieve the goals of this regulation, a key strategy is to divert organic waste from landfills and send the food waste to municipal wastewater treatment facilities for co-digestion in anaerobic digesters, making beneficial use of biogas. However, the diverted organic waste will take up valuable volume in digesters and solids handling facilities that would otherwise be used for wastewater sludge. Further, food waste will increase salinity loading to the plant, as further discussed below. The impacts of food waste were considered when evaluating improvements options at the WQCF, as detailed in Chapters 9 and 10.

7.2.2.3 Salinity

The Regional Water Quality Control Board (Regional Board) amended its Basin Plan to implement a long-term program to control salinity and nitrate build-up in the Central Valley, with input from all stakeholders (agriculture, cities, industries, environmentalists, economists, etc.) and as recommended by the CV-SALTS Initiative. The Basin Plan amendments were approved by the EPA and Office of Administrative Law (OAL) on January 15, 2020, which became the effective date for the Basin Plan Amendments and policies identified therein. One of the major aspects of the amendments includes a Salt Control Program, described below.

Salt Control Program

The Salt Control Program established in the Basin Plan will be implemented in three phases, with each phase expected to take 10 to 15 years, according to the Basin Plan. The initial phase required the City to select either the "Conservative Salinity Permitting Approach" (which applies the Water Quality Objectives of 700 µS/cm, along with other requirements) or the "Alternative Salinity Permitting Approach" (which allows Agencies to join regional efforts to study salinity effects on the ecosystem). Since the City currently does not meet the water quality objectives, the WQCF is operating under the Alternative Approach. For more information and updates in the Salt Control Program (such as outcomes and recommendations from Phase 1 and plans for Phases 2 and 3), the City may visit the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) website.

Future Salinity Compliance

Increased water conservation in the City, including State mandated reclamation and water conservation requirements (SB 606 and AB1688, described above), will inhibit compliance with water quality objectives for salinity. Additionally, if the City decides to receive food waste at the WQCF (to comply with SB1383) the concentrated food slurry may further inhibit compliance with water quality objectives. These external compliance pressures are noted herein to highlight the complexity of competing State interests and help make informed decisions about expansion options. Notably, extreme water conservation has a direct effect on wastewater influent and will increase salinity concentrations entering the WQCF, as identified in **Table 7-3**. The mass of pollutants (salt) discharged by each person remains unchanged regardless of water use, but because the mass is conveyed with less water (during water conservation measures), it results in higher pollutant concentrations arriving at the WQCF.

Table 7-3. Water Conservation Effect on Salinity

Parameter [1]	Existing Conditions	Interim Conditions	Future Conditions
Flow (Mgal/d) [2]	7.13	9.23	19.6
Indoor Water Usage (gpcpd)	61	50	50
Potable Water Source EC (µS/cm) [3]	505	505	505
EC added after Potable Water Use (µS/cm) [4]	597	730	730
Influent EC (µS/cm) [2]	1102	1236	1236
Effluent EC (µS/cm) [5]	789	884	884
Maximum Permitted EC	1000	700	700
Required Salinity Reduction	No	Yes	Yes
Fraction of Salinity to be Removed	0%	21%	21%
Required Reverse Osmosis (Mgal/d) [6]	--	2.4	5.0

Notes:
[1] Does not include impacts from food waste or FOG, as quantity and quality of food/FOG receiving is currently unknown.
[2] Includes in-plant recycle flows.
[3] Increasing EC from any source (potable water or downstream water uses) will further exacerbate permit compliance.
[4] Salinity is added to potable water concentrations through people's diets, cleaning products, agricultural runoff, etc.
[5] Assumes current treatment plant EC removal efficiency will remain (28.4% based on the average influent and effluent EC concentrations from 2010-2022.
[6] Assumes brine flow is negligible. Based on an RO EC removal efficiency of 90% and a safety factor of 1.1.
Key:
Mgal/d = million gallons per day
gpcpd = gallons per capita per day
EC = electrical conductivity
µS/cm = microsiemens per centimeter

As shown in **Table 7-3,** the wastewater effluent salinity concentration (as estimated with EC) would be expected to increase to 884 µS/cm with the mandated water conservation. This exceeds the anticipated future permit limits (700 µS/cm). The other items that may increase salinity materially are described below:

- The salinity of the City's potable water supply increases, such as by deterioration of existing sources and/or by acquisition of new, more saline sources.
- The City permits commercial/industrial salt loads and/or concentrations to increase, such as by new "salt" industries, increased water conservation by existing industries, salt-impacting changes in processes used by existing industries, etc.
- The introduction of food waste and/or fats, oil, and grease (FOG).

To ensure long-term compliance with the permit, it appears that the City should plan for some future salinity reduction. In this case (and considering the limits of current salt removal technologies), the City would likely install a reverse osmosis (RO) treatment system for only a portion of the total plant flow to remove just the amount of salt needed to comply with regulations, as indicated in **Table 7-3**.

To reduce salt at the WQCF, RO would be used most likely because other salinity reduction technologies such as nanofiltration (NF), electrodialysis reversal (EDR), and ion exchange tend to leave the more problematic ions, such as sodium and chloride, in the water. However, in 30 years there may be a

completely new salt removal technology based on current world-wide research and development of new salt removal technologies, including those identified through the Department of Energy's Water Security Grand Challenge. For now, the City should plan on possible future implementation of RO but can remain flexible to adapt to other technologies that may become available before salinity removal is implemented.

As the City moves forward with expanding the capacity of the WQCF, a reasonable question is whether the expansion should be "in kind" with the existing process, or should be with a newer technology, specifically an MBR (membrane bioreactor). In developing an answer, many factors will be considered including near-term and long-term costs, best professional judgement by the design and operations team, and the Basin Plan amendments, **Chapter 10** incorporates these issues into the detailed evaluation. It must be noted that an MBR would not remove any salinity but can act as a pretreatment step in conjunction with a salinity removal system. This is illustrated in **Table 7-4**, which shows treatment steps needed to facilitate RO based on plant expansion in-kind versus plant expansion with MBR.

Table 7-4. Stepwise Unit Processes to Achieve RO Treatment

1. In-Kind Treatment	**1. MBR-Based Treatment**
a. Headworks	a. New Headworks for MBR Train
b. Primary Clarifiers	b. Primary Clarifiers
c. "Large" Reactor Basins (including anoxic basins for denitrification)	c. "Small" Reactor Basins (including anoxic basins for denitrification)
d. Clarifiers	d. MBR basins
e. Disc filters	
2. Side-Stream RO Pretreatment	**2. Side-Stream RO Pretreatment**
a. Microfiltration/ultrafiltration (MF/UF)	a. Cartridge filters
b. Cartridge filters	b. Chemical conditioning (acid, biocide, chloramine, etc.)
c. Chemical conditioning (acid, biocide, chloramine, etc.)	
3. Side-Stream RO treatment	**3. Side-Stream RO treatment**
4. Full Stream Disinfection	**4. Full Stream Disinfection**

As shown above, in order to reduce salinity at the WQCF, side-stream treatment (i.e., reverse osmosis) is required, which requires a pre-treatment step that includes membrane filtration, cartridge filters, and chemical conditioning. A potential benefit of installing an MBR in the next expansion project is that it would serve the dual purposes of providing the City with additional capacity and a pre-treatment step for a possible future RO salinity reduction process. This potential benefit and the likelihood of needing to implement RO in the foreseeable future is recognized in the overall treatment system alternative analysis detailed in **Chapter 10**.

7.2.3 Future Compliance Considerations

Long-term compliance is also dependent on future permit requirements, which may include more stringent or added provisions for salinity (described above), biological interferences, pesticides, and contaminants of emerging concern (CEC). These constituent considerations are discussed below.

7.2.3.1 Pesticides

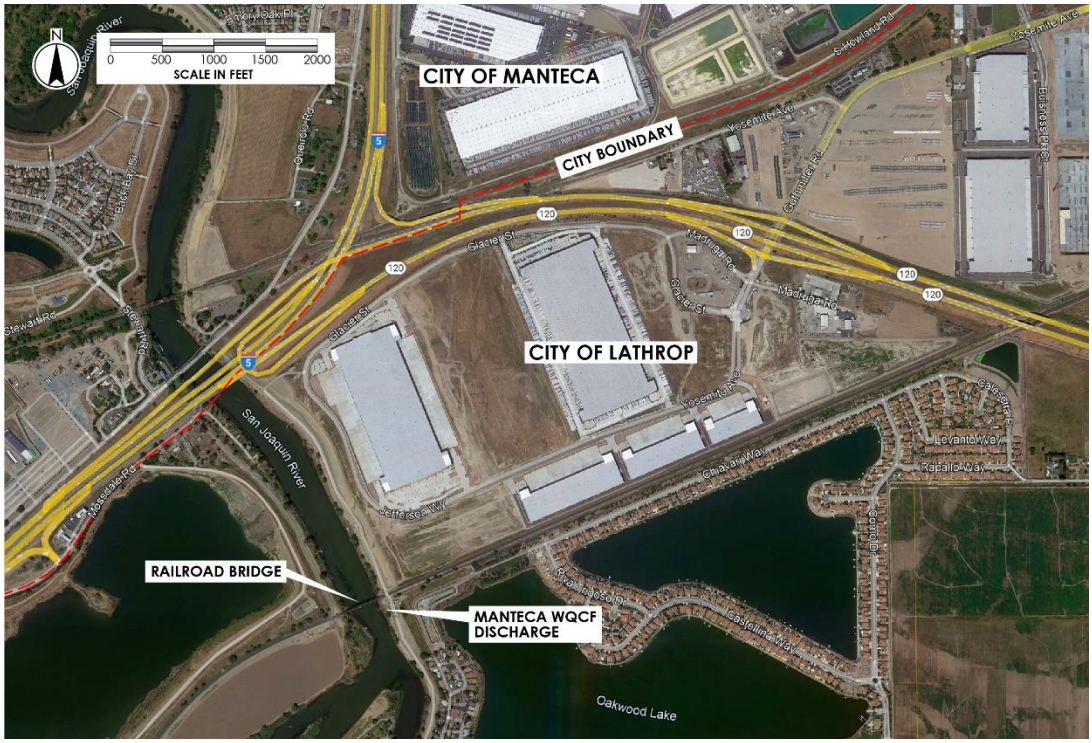
The impacts of pesticides, including insecticides, herbicides, and fungicides, on water quality and aquatic habitats will continue to drive implementation of control programs and development of discharge limits. This has resulted in the inclusion of chlorpyrifos and diazinon limits in the WDR, even when there is no reasonable potential for impacts. Discharge limits for pyrethroid pesticides were adopted in the San Joaquin River Basin Plan and became effective in December 2006, but numerical limits are not specified in the WDR. The Basin is also listed as impaired by Group A pesticides, including organochlorine pesticides, but a TMDL has not been developed and numerical limits are not included in the permit. Future developments in these types of chemicals will require additional analysis of effluent chemistry and potentially require additional treatment to comply.

7.2.3.2 Constituents of Emerging Concern (CEC)

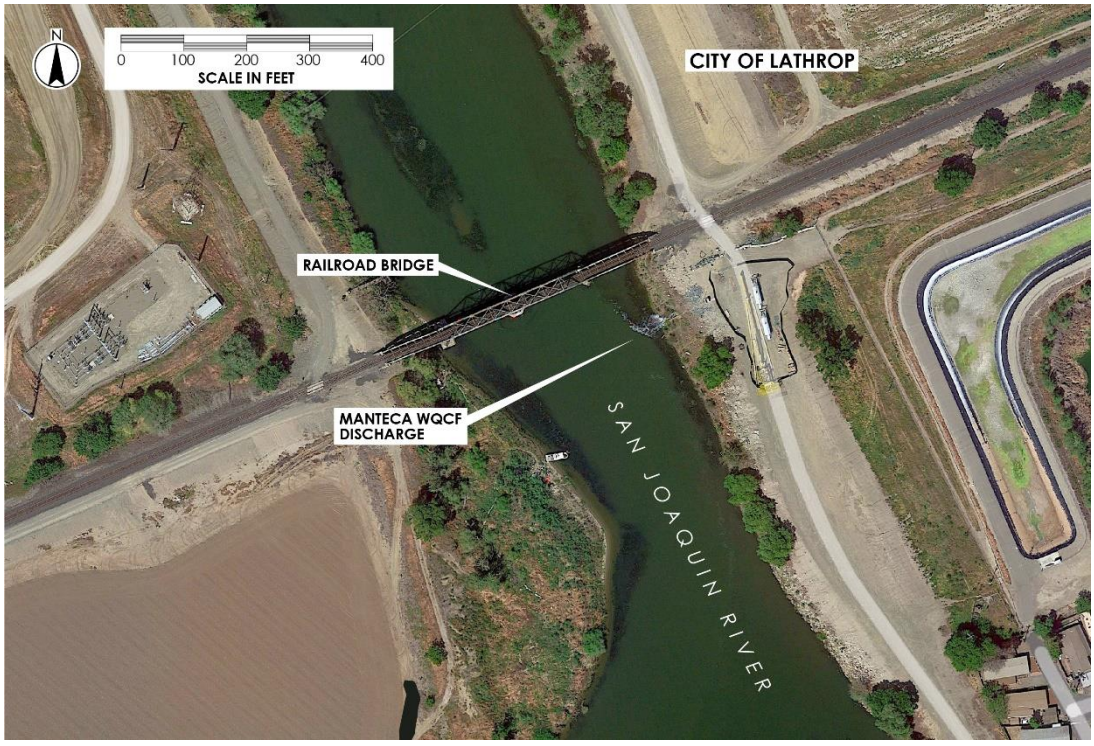
CEC, including pharmaceuticals and endocrine disrupting compounds, such as hormones, at variable concentrations have been detected in treated effluent from conventional wastewater treatment plants. However, numeric requirements for removal of CEC appear to be unlikely for the foreseeable future. If CEC removal becomes an issue with the current surface water discharge, use of advanced oxidation processes, such as ozonation, combined with biological activated carbon filtration can be considered.

7.3 THERMAL PLAN COMPLIANCE

The WQCF currently disposes of final effluent (the portion not delivered to reclamation) via a 36-inch diameter pipe discharging to the San Joaquin River just south of the railroad bridge upstream of the I-5 bridge at the I-5/CA-120 interchange. There is no diffuser and the pipe discharges on the side of the bank with a concrete apron. The discharge location is shown on **Figures 7-3**.



Manteca WQCF Outfall Discharge Location



Manteca WQCF Discharge into San Joaquin River

Figure 7-3. WQCF Outfall Discharge Location

The existing NPDES permit currently limits the maximum flow capacity of the WQCF to 9.87 Mgal/d ADWF. However, it should be noted that what is missing from the permit's capacity definition is that the secondary treatment processes are limited by biological loading rates (not hydraulic loading). Based on the report titled, City of Manteca WQCF 2021 Capacity Assessment, prepared by HERWIT Engineering and Stantec in March 2022 (hereafter referred to as the WQCF 2021 Capacity Assessment), the actual capacity of the existing secondary treatment system with interim improvements is 8.23 Mgal/d ADWF (excluding in-plant recycle flows), as discussed in **Chapter 8**. The NPDES permit allows for a ADWF increase up to 17.5 Mdal/d. In order to increase the permitted ADWF to 17.5 Mgal/d (and subsequently increase the allowable flow to be discharged to the San Joaquin River), the City is required by permit complete the following actions 1) complete construction of the Phase IV Upgrade and Expansion Project (as described in the Discharger's April 2014 NPDES Permit Renewal); 2) submit a request to the Central Valley Water Board to increase the permitted discharge flow rate; and 3) demonstrate compliance with the effluent limitations and the receiving water limitations. The increase in the permitted discharge flow rate shall not be effective until the Executive Officer verifies the Phase IV Upgrade and Expansion Project was completed as described and approves the City's request.

In compliance with the California Environmental Quality Act (CEQA), the City prepared and submitted for public review a Draft Environmental Impact Report (DEIR) that addressed the future Phase IV Upgrade and Expansion Project. Since the City determined that it is impracticable to acquire additional agricultural fields (though they are seeking to expand their Title 22 recycled water program through uses such as baseball fields and parks), the increased discharge will be primarily for effluent discharges to the San Joaquin River. The City performed extensive hydrodynamic and thermal modeling as part of the DEIR to determine the effects of the increased effluent discharge flow to the San Joaquin River and to the Sacramento-San Joaquin Delta downstream of the discharge. This modeling is detailed in the following reports.

- Technical Memorandum (TM) – CORMIX Investigation of Cooling Facilities Operations (DRAFT), Larry Walker Associates, February 2008.
- Thermal Plan Exception Analysis Final Report, Larry Walker Associates, Resource Management Associates, Hanson Environmental, Inc. February 2006.

The models showed that 9.87 Mgal/d discharge at times could violate the "Thermal Plan" provisions without special operation of the effluent discharge pumping system when low river flows and high effluent temperatures were encountered. The referenced "Thermal Plan" is the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California". The models also showed that the 17.5 Mgal/d discharge would violate the Thermal Plan limits. The purpose of these two reports were to analyze the impact of the effluent discharge on the San Joaquin River aquatic species, including salmon runs. Based on these reports, an exception to the Thermal Plan was requested by Manteca from the RWQCB. This request was denied and the permitted flow expansion to 17.5 Mgal/d is only allowed under the existing NPDES permit if compliance with the Thermal Plan limits is achieved. Construction of cooling towers was therefore included in the Phase IV Upgrade and Expansion Project description to the Regional Water Board. The cooling facilities would be designed to reduce temperature of the treated effluent such that the effluent discharge and associated size of the

thermal plume will comply with Thermal Plan provisions as necessary to protect sensitive aquatic life. The cooling towers are described in more detail in **Chapter 10.**

Measurement of final effluent temperature, and the river temperature upstream and downstream of the discharge location is also a requirement under the current NPDES permit. A comparison of recent effluent discharge and river temperatures from 2016 through 2021 has shown an increase in the temperature difference between the effluent and the river of 2°F to 5°F over what was used for all previous modeling. Therefore, a new river modelling study is recommended before proceeding with the design and construction of cooling towers, or other methods of cooling, to validate compliance with the Thermal Plan. Thermal Plan compliance and possible options for compliance are further discussed in **Chapter 10.**

8.0 WQCF WASTEWATER FLOWS AND LOADS

8.1 HISTORICAL AND DESIGN FLOWS AND LOADS

Historical influent flows from January 2016 through February 2021 are shown in **Figure 8-1**. The 365-day average flow values are centered averages based on available data extending one-half the averaging period before and after the date indicated (i.e., the 365-day average flow on the date indicated includes data beginning 182 days prior to the indicated date and data ending 182 days after the indicated date). The 365-day average flow (annual average flow or AAF) has exhibited a mostly steady increasing trend over the period of record considered, however, the rate of increase accelerated in the final year. The AAF at the end of the study period was 7.13 Mgal/d. The ratio of the average dry weather flow to the annual average flow for each year was calculated. The average of this ratio from 2016 through 2021 is 0.992, which indicates that the ADWF is essentially equal to the AAF. For the intended purpose of this this Master Plan, the flow will be presented in terms of ADWF. The annual average BOD load was steadily increasing over the same period. The most recent annual average BOD load determined was 22,121 lb/d as shown in **Figure 8-2**.

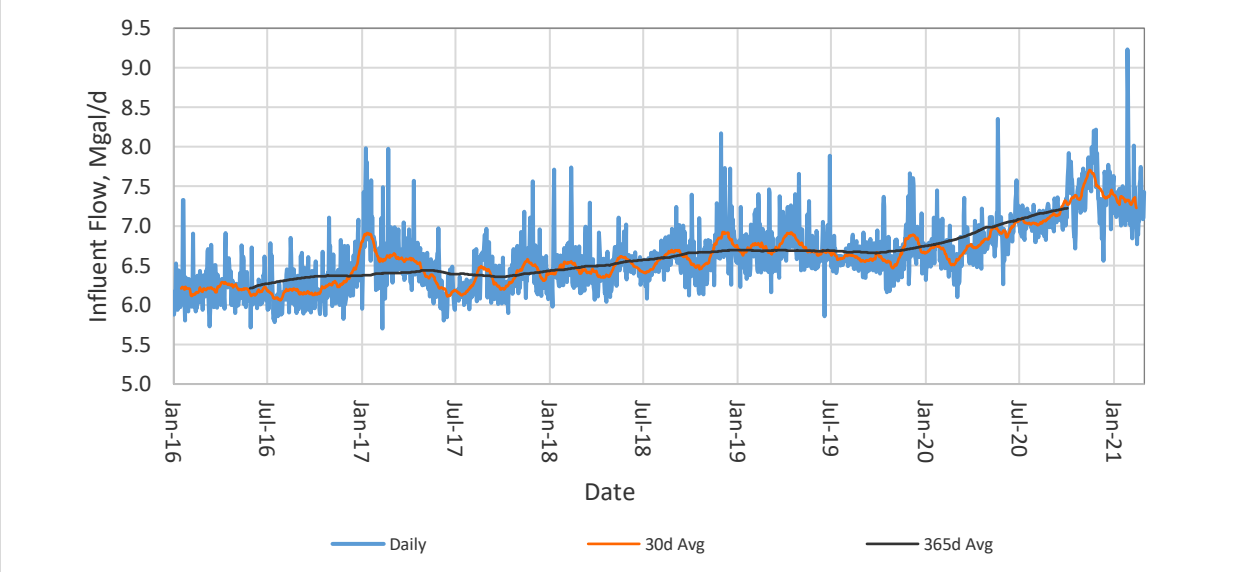


Figure 8-1. Historical Influent Flow

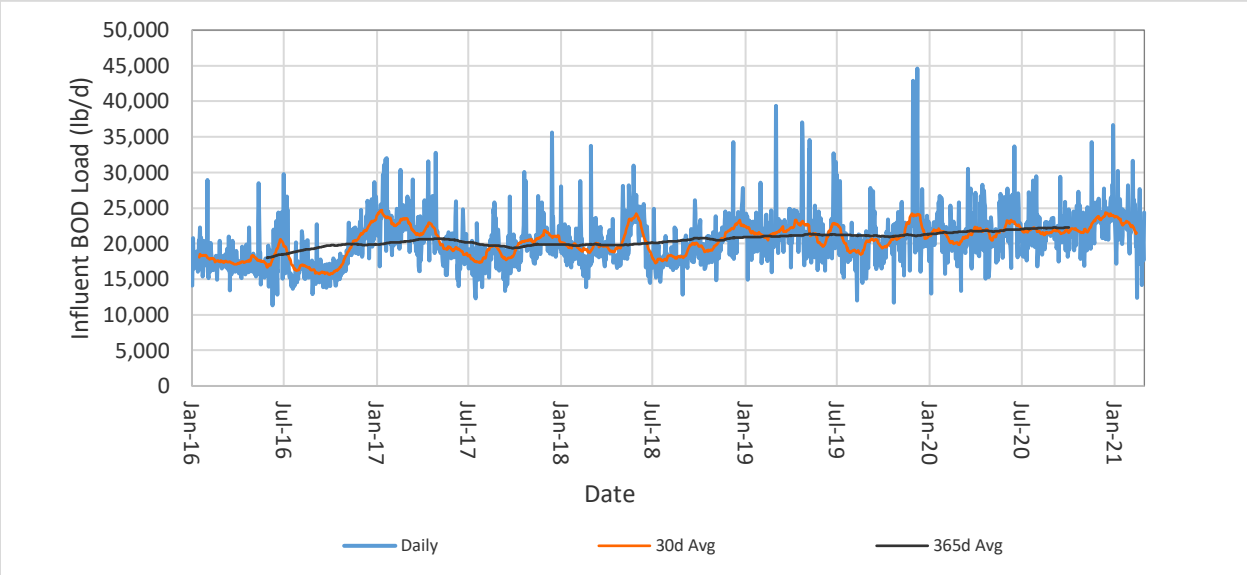


Figure 8-2. Historical Influent BOD Load

The Phase III Expansion Basis of Design Report prepared by Nolte and Associates in July 2001 rated the existing WQCF at an average flow capacity of 9.87 Mgal/d. Of this capacity, 14.7% (1.45 Mgal/d) is contracted to the City of Lathrop. There have been several changed conditions at the WQCF since 2001 that affect the capacity of the WQCF, including the following:

- Drought conditions and water conservation in recent years have resulted in increased wastewater strength as the pollutants contributed by a given population are carried in less water to the WQCF.
- An effluent limit on Nitrate + Nitrite Nitrogen (10 mg/L monthly average) was added to the National Pollution Discharge Elimination System (NPDES) Permit for the WQCF. The Phase III design did not consider or provide adequate facilities to meet this requirement at the original 9.87 Mgal/d design flow.
- The biotowers in the Northside Plant, which provided a portion of the treatment capacity established in the Phase III Basis of Design Report, were removed from service because they remove the carbon source needed for denitrification. Therefore, they were incompatible with meeting the new nitrogen permit limit.
- A portion of the previous aeration basin volume in each plant (Zone B in each aeration basin) was converted to operate at low dissolved oxygen environment needed for nitrogen removal by cycling the dissolved oxygen on and off (part of the aeration efficiency improvements in 2015 and 2018).
- To improve process control, an automated solids retention time (SRT) controller was installed for both plants in 2020. This allows the WQCF to reliably operate at a lower SRT than previously possible, thereby increasing process capacity.

Because of these changed conditions the WQCF has limited treatment capacity to support ongoing growth within the City. Current and projected future average influent characteristics, including flow, biochemical oxygen demand (BOD), total suspended solids (TSS), and total Kjeldahl nitrogen (TKN) are shown in **Table 8-1**. For comparison, corresponding values from the Phase III Basis of Design Report are also shown. The projected near-term future flow of 9.23 Mgal/d which includes the true influent flows from Manteca and Lathrop, as well as in-plant recycle streams from the WQCF corresponds to the likely achievable capacity with the Interim Improvements recommended in the WQCF 2021 Capacity Assessment which are described in **Chapter 9**.

Table 8-1. WQCF Existing and Near-Term Future Flows and Loads Compared to Phase III Basis of Design Report

Parameter	Current Condition [1]	Future Condition with Interim Improvements [2]	Phase III Design [3]
Annual Average Flow, Mgal/d [4]	7.13	9.23	9.87
Average Constituent Concentrations, mg/L [4]			
BOD	372	372	310
TSS	279	279	315
TKN	60	60	35
Annual Average Load, lb/d [4]			
BOD	22,121	28,636	25,500
TSS	16,591	21,477	25,900
TKN	3,568	4,619	2,900

Notes:
[1] Based on annual average conditions centered on August 30, 2020.
[2] Based on future likely achievable capacity (9.23 Mgal/d including recycle flow) with recommended improvements.
[3] Design criteria from Phase III Basis of Design Report, July 2001.
[4] All data for current and future conditions include the impacts of in-plant recycle steams.
[5] Phase III data are presumed to include the impacts of in-plant recycle streams, although not explicitly stated in the Phase III Basis of Design Report
Key:
BOD = Biochemical Oxygen Demand
lb/d = pounds per day
mg/L = milligram per liter
Mgal/d = million gallons per day
TKN = Total Kjeldahl Nitrogen
TSS = Total Suspended Solids
WQCF = Wastewater Quality Control Facility

8.2 RECYCLED FLOWS AND TRUE INFLUENT CHARACTERISTICS

The WQCF 2021 Capacity Assessment analyzed in-plant recycle flow stream data to quantify the total recycle flows to determine the true plant influent (without recycle streams) characteristics. The analysis is shown in **Table 8-2**. As indicated, the total in-plant recycle flow adds up to 0.772 Mgal/d out of the 7.13 Mgal/d measured at the headworks with a true influent flow of 6.358 Mgal/d (7.13-0.772). Therefore, the recycle streams account for approximately 12% of the true influent flow of 6.358 Mgal/d (0.772/6.358) or the true plant influent flow is about 89% (6.358 / 7.13) of the monitored and reported plant influent flow, which includes the plant recycle flows. Based on known and estimated return flow characteristics, the true

plant influent has a somewhat higher BOD and lower TKN than the monitored influent with recycles flows included.

Table 8-2. Recycle Flow Streams and True Influent Characteristics

Flow Component	2020 Typical Flow, Mgal/d	Ratio to True Influent Flow	BOD, mg/L	TSS, mg/L	TKN, mg/L	BOD, lb/d	TSS, lb/d	TKN, lb/d
DAFT Subnatant [1]	0.21	0.033	114	114	11	200	200	20
North Scum + Other [2]	0.21	0.033	150	150	10	263	263	18
Filter BW + South Scum + Other [3]	0.16	0.025	223	223	22	297	297	30
South Grit Wash Water [4]	0.13	0.020	372	279	60	403	302	65
Centrate [5]	0.062	0.010	75	250	1,000	39	129	517
Total Return	0.772	0.121	187	185	101	1,202	1,191	649
Total Influent Flow with Recycles [6]	7.13	1.121	372	279	60	22,121	16,591	3,568
True Influent Flow w/o Recycles	6.358	1.000	395	290	55	20,919	15,399	2,919
Load with Recycles Ratio to True Influent						1.057	1.077	1.222

Notes:
[1] Presume 98% TSS capture in TWAS at 12.5% of WAS flow. Subnatant contains 2% of WAS TSS load in 87.5% of WAS flow.
Presume WAS TSS = 5000 mg/L
Subnatant TSS = 5000*0.02/0.875 = 114 mg/L
Presume Subnatant BOD = Subnatant TSS = 114 mg/L
Presume Subnatant TKN = 0.1 x TSS = 11.4 mg/L
[2] Estimated characteristics as shown.
[3] Presume characteristics equal to estimated filter backwash characteristics. Presume filters remove equivalent of 5 mg/L BOD and TSS in total influent with recycles. Presume TKN = 0.1 x TSS.
[4] Presume grit wash characteristics same as total influent flow characteristics.
[5] Based on typical sampling data and BioWin evaluations, presume Centrate BOD=75 mg/L, TSS=250 mg/L, TKN=1,000 mg/L.
[6] Annual Average Flow Centered on August 30, 2020.
Key:
BOD = Biochemical Oxygen Demand
DAFT = Dissolved Air Flotation Thickener
lb/d = pounds per day
mg/L = milligram per liter
Mgal/d = million gallons per day
TKN = Total Kjeldahl Nitrogen
TSS = Total Suspended Solids
TWAS = Thickened Waste Activated Sludge
WAS = Waste Activated Sludge

8.3 CITY OF LATHROP FLOW IMPACTS

As previously noted, the City of Lathrop is contracted to 14.7% of the flow capacity for the Phase III Expansion. In this subsection, flows from Lathrop are evaluated and compared to Manteca and total flows, with and without allowances for in-plant recycle flows.

To understand how Lathrop flows can be compared to Manteca and total flows, it is helpful to consider the generalized flow diagram shown in **Figure 8-3**. As shown in the figure, the flow meter that is used to measure the WQCF influent flow is located downstream from the return of in-plant recycle streams. The flows thus measured are reported as the plant influent flows, but they do not represent the true influent flows, which would exclude in-plant recycle streams. The Lathrop flow, by contrast, is the true Lathrop

influent flow, excluding recycle impacts. Therefore, when determining the fraction of the total plant flow represented by Lathrop, it is not appropriate to divide the reported Lathrop flow by the reported WQCF influent flow. Instead, the reported WQCF influent flows must first be adjusted to eliminate the recycle flows before determining the Lathrop fraction. Alternatively, the Lathrop flows can be adjusted to include a proportional share of in-plant recycle flows before they are compared to the reported WQCF influent flows. This concept is developed further in **Table 8-3**, which is discussed below.

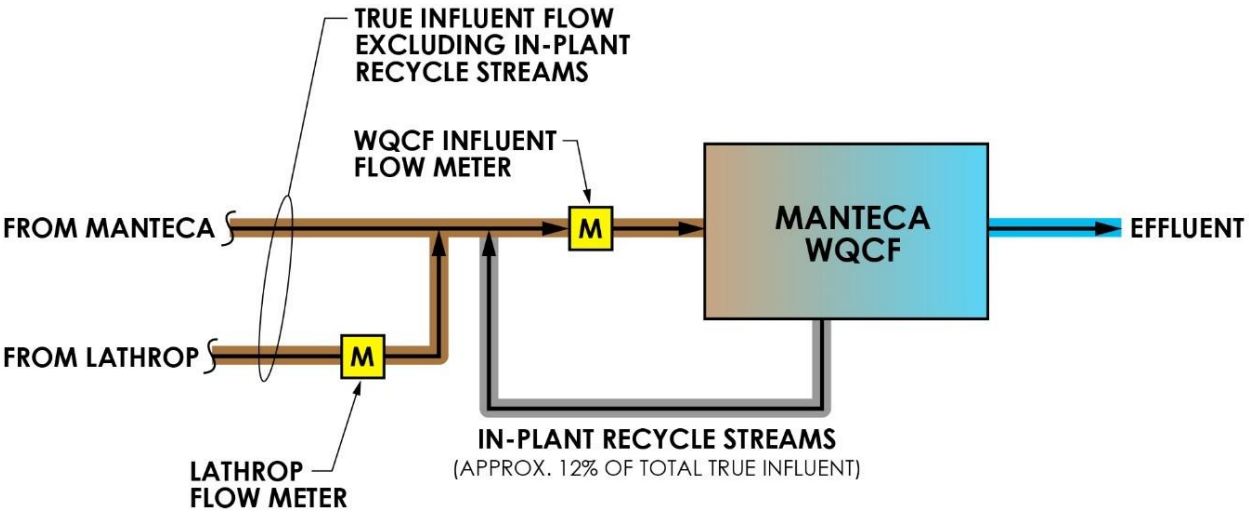


Figure 8-3. Existing Manteca WQCF Generalized Flow Diagram

Table 8-3 provides a breakdown of Lathrop, Manteca, and total flows under existing conditions (total flow of 7.13 Mgal/d) and under anticipated future conditions at the target capacity of 9.23 Mgal/d, assuming that Lathrop will represent 14.7% of the total flow in that future condition. As shown in **Table 8-2**, in-plant recycle flows are expected to add approximately 12% to base flows. As mentioned above, this recycle flow allowance must be added to metered Lathrop base flows to attain Lathrop's total contribution to metered WQCF influent flows, which include the recycle streams. As indicated in **Table 8-3**, Lathrop's current flow contribution represents 16.8% of the total WQCF flow. If it is assumed that Lathrop's flow contribution in the future condition will be at the contract amount of 14.7%, then Lathrop's metered flow (not including recycle allowance) would increase from the current value of 1.07 Mgal/d to 1.21 Mgal/d, an increase of 0.14 Mgal/d. During the same time, Manteca's base flow (without recycle allowance) would increase by 1.73 Mgal/d. Therefore, future flow increases would be allocated 7.5% to Lathrop and 92.5% to Manteca. The lower growth allowance for Lathrop is because the current Lathrop flow as a fraction of the total flow is substantially greater than 14.7% and is assumed to decrease to 14.7%.

Table 8-3. Breakdown of Existing and Projected Interim Flows

Condition and Flow Category	Annual Average Flow, Mgal/d		
	Lathrop	Manteca	Total
Existing			
Flow Excluding In-Plant Recycle Streams [1]	1.07	5.29	6.36
Flow Including In-Plant Recycle Streams [2]	1.20	5.93	7.13
Fraction of Total Flow	0.168	0.832	1.000
After Interim Improvements [3]			
Flow Excluding In-Plant Recycle Streams	1.21	7.02	8.23
Flow Including In-Plant Recycle Streams [2]	1.36	7.87	9.23
Fraction of Total Flow	0.147	0.853	1.000
Difference (Future - Existing)			
Flow Excluding In-Plant Recycle Streams	0.14	1.73	1.87
Flow Including In-Plant Recycle Streams [2]	0.16	1.94	2.10
Fraction of Total Flow	0.075	0.925	1.000

Notes:
[1] Existing Lathrop flow based on annual average from Dec 2019 through Nov 2020. Beginning Dec 2020 recorded Lathrop flows decreased and must be verified.
[2] Flow including in-plant recycle streams calculated as 1.121 x base flow.
[3] Future based on total flow with recycle streams = 9.23 Mgal/d. Assuming Lathrop will represent 14.7% of total flow in future.

8.4 SUMMARY OF EXISTING AND FUTURE WASTEWATER CHARACTERISTICS

Wastewater flows and characteristics from January 2016 through February 2021 (over five years of data) were analyzed. The current wastewater flows and loads presented in this section are summarized and used for projecting future flows and loads as shown in **Table 8-4**. It is presumed that future expansion will provide build-out capacity flows for Manteca plus the Lathrop flow contribution totaling 17.5 Mgal/d (ADWF without recycle). The future projections assume that all average wastewater influent constituent concentrations and flow and load peaking factors remain unchanged from existing conditions. Therefore, future increases in all sewage flows and loads are expected to be proportional to increases in the annual average flow, which should be roughly proportional population growth.

The assumption that future influent average constituent concentrations and flow and load peaking factors will remain the same as existing presumes that inside water use practices (mainly water conservation within homes) will remain the same as existing. If, due to drought, regulatory requirements, and/or other factors, inside water use practices within the community change, wastewater characteristics will also change, which could impact plant capacity.

Therefore, the analyses and findings in this WWMP should be reviewed if substantial changes in wastewater characteristics occur.

Table 8-4. Existing and Future Flows and Loads

Parameter [1]	Existing 6.37 Mgal/d [2, 3]	Interim 8.23 Mgal/d [2, 4]	Future 17.5 Mgal/d [2, 4]
ADWF (with Recycle)	7.13	9.23	19.6
ADWF (without Recycle)	6.37	8.23	17.5
Flow Ratios			
ADMMF/ADWF	1.04	1.04	1.04
PDF/ADWF	1.25	1.25	1.25
PHF/ADWF	2.10	2.10	2.10
Load Ratios			
ADMML/AAL	1.20	1.20	1.20
PDL/AAL	2.00	2.00	2.00
Flow, Mgal/d			
ADWF	7.13	9.23	19.6
ADMMF	7.42	9.60	20.38
PDF	8.91	11.54	24.50
PHF	14.97	19.38	41.16
Annual Average Load, lb/d			
BOD	22,121	28,636	60,809
TSS	16,591	21,477	45,608
TKN	3,568	4,619	9,808
Average Day Maximum Monthly Load, lb/d			
BOD	26,545	34,363	72,971
TSS	19,909	25,772	54,729
TKN	4,281	5,542	11,770
Average Constituent Concentrations, mg/L			
BOD	372	372	372
TSS	279	279	279
TKN	60	60	60
Constituent Concentrations with ADMMF and ADMML, mg/L			
BOD	429	429	429
TSS	322	322	322
TKN	69	69	69
Constituent Concentrations with ADWF and ADMML, mg/L			
BOD	446	446	446
TSS	335	335	335
TKN	72	72	72

Notes:
[1] ADWF = Average Dry Weather Flow, AAF = Annual Average Flow, ADMMF = Average Day Maximum Monthly Flow, PDF = Peak Day Flow, PHF = Peak Hour Flow, AAL = Annual Average Load, ADMML = Average Day Maximum Monthly Load, PDL = Peak Day Load
[2] All flows and loads include in-plant recycle streams. Future projections assume recycle flow and load fractions remain unchanged.
[3] Based on AAF = 7.13 Mgal/d as of August 30, 2020.
[4] The Future condition is based on likely achievable plant capacity with improvements as discussed in Chapter 10. Flow and load peaking factors assumed same as existing.
Key: mg/L = milligrams per liter
Mgal/d = million gallons per day
lb/d = pounds per day

8.5 SOLIDS MASS BALANCE

A solids balance diagram of the existing loading conditions at the WQCF is shown on **Figure 8-4**. Based on the existing and future flows and loads listed in **Table 8-4**, the estimated solids production was developed by preparing solids mass balances, including the in-plant recycle flows and loads, for the average annual and peak month loading conditions. The raw and digested sludge flows determined from the solids mass balance calculations were then used to determine the sizing requirements for the solids handling facilities. Solids mass balance calculations for the current and interim average annual plant influent flows are summarized in **Table 8-5** for the average day and average day maximum month (ADMM) loading conditions with and without imported food waste. Solids mass balance calculations for futures flows are summarized in **Table 8-6** when the average annual plant influent flows are at 12.89 Mgal/d and 17.5 Mgal/d, respectively. Solids mass balance diagrams for all loading conditions are provided in **Appendix H**.

ATTACHMENT 2

Stantec

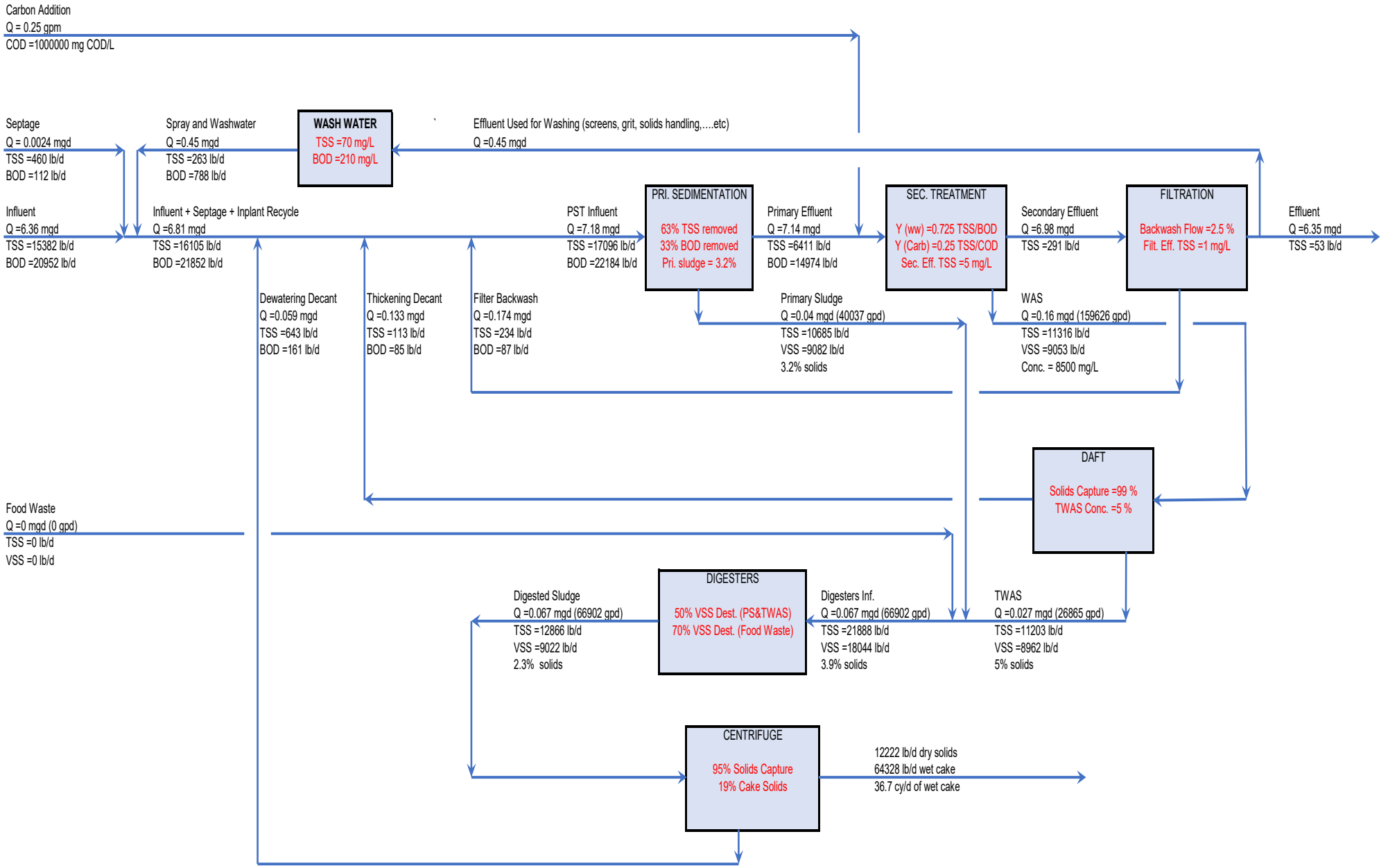


Figure 8-4

Solids Mass Balance Diagram of Existing Loading Conditions

Table 8-5. Solids Production Summary for Current and Interim Flows

Description	Existing 6.37 Mgal/d Average		Existing 6.37 Mgal/d Peak Month		Interim 8.23 Mgal/d Average		Interim 8.23 Mgal/d Peak Month	
	No Food Waste	With Food Waste	No Food Waste	With Food Waste	No Food Waste	With Food Waste	No Food Waste	With Food Waste
Annual Average Influent Flow, Mgal/d	6.36	6.36	6.36	6.36	8.23	8.23	8.23	8.23
Primary Influent Flow, Mgal/d	7.18	7.19	7.21	7.22	9.29	9.29	9.33	9.34
Primary Influent BOD, lb/d	22,184	22,207	26,420	26,443	28,704	28,727	34,185	34,208
Primary Sludge, gpd	40,037	40,251	47,569	47,784	51,789	52,003	61,536	61,750
Primary Sludge Solids, lb/d	10,685	10,742	12,695	12,753	13,821	13,879	16,423	16,480
TWAS, gpd	26,865	26,891	31,786	31,812	34,237	34,263	40,605	40,631
TWAS Solids, lb/d	11,203	11,214	13,255	13,266	14,277	14,288	16,932	16,943
Food Waste Flow, gpd	0	7,226	0	7,226	0	7,226	0	7,226
Food Waste TSS Mass, lb/d	0	4,821	0	4,821	0	4,821	0	4,821
Digested Sludge Flow, gpd	66,902	74,368	79,356	86,822	86,025	93,491	102,141	109,607
Digested Sludge Solids Dry Mass, lb/d	12,866	14,689	15,253	17,076	16,513	18,336	19,602	21,426

Key:
BOD = Biochemical Oxygen Demand
gpd = gal/d = gallons per day
lb/d = pounds per day
Mgal/d = million gallons per day
TWAS = Thickened Waste Activated Sludge

Table 8-6. Solids Production Summary for Future Flows

Description	Future 12.89 Mgal/d Average		Future 12.89 Mgal/d Peak Month		Future 17.5 Mgal/d Average		Future 17.5 Mgal/d Peak Month	
	No Food Waste	With Food Waste	No Food Waste	With Food Waste	No Food Waste	With Food Waste	No Food Waste	With Food Waste
Annual Average Influent Flow, Mgal/d	12.89	12.89	12.89	12.89	17.5	17.5	17.5	17.5
Primary Influent Flow, Mgal/d	14.51	14.52	14.58	14.59	19.37	19.37	19.46	19.47
Primary Influent BOD, lb/d	44,922	44,945	53,503	53,526	60,408	60,430	72,058	72,081
Primary Sludge, gpd	80,897	81,111	96,144	96,358	109,325	109,539	130,025	130,239
Primary Sludge Solids, lb/d	21,590	21,647	25,659	25,716	29,177	29,234	34,701	34,758
TWAS, gpd	48,271	48,296	57,761	57,785	64,927	64,951	77,810	77,834
TWAS Solids, lb/d	20,129	20,139	24,086	24,096	27,074	27,085	32,447	32,457
Food Waste Flow, gpd	0	7,226	0	7,226	0	7,226	0	7,226
Food Waste TSS Mass, lb/d	0	4,821	0	4,821	0	4,821	0	4,821
Digested Sludge Flow, gpd	129,168	136,633	153,905	161,369	174,251	181,716	207,835	215,299
Digested Sludge Solids Dry Mass, lb/d	24,492	26,314	29,206	31,028	33,021	34,844	39,421	41,244

Key:
BOD = Biochemical Oxygen Demand
gpd = gal/d = gallons per day
lb/d = pounds per day
Mgal/d = million gallons per day
TWAS = Thickened Waste Activated Sludge

8.6 EQUIVALENT POPULATION SERVED

Flows from a given population are subject to variation with water conservation (and infiltration and inflows into the sewage collection system, which is not a significant issue for Manteca). However, pollutant loads are generally proportional to population and do not vary with water conservation. Since design loads are the key criteria for sizing wastewater treatment facilities, it is useful to present plant capacities in terms of loading or equivalent population.

The average flow per capita was calculated using five years of plant data (January 2016 to February 2021) to calculate an average influent daily flow using the average BOD load (without in-plant recycle flows and Lathrop's contribution) for each year divided by the State of California Department of Finance population estimates for the City of Manteca. Averaging the five years of data calculates to a per capita wastewater flow of 61 gal/capita/day and a per capita BOD load of 0.203 lb BOD/capita/day. After the recommended Interim Projects are completed increasing the true influent flow capacity to 8.23 Mgal/d, the equivalent Manteca population the WQCF can serve is 111,800.

From 2017 through 2020 (fiscal year ending), the City approved an average of 553 single family home permits per year, while an average of 167 multi-family units per year were approved from 2018 through 2020 (2017 data not provided). Assuming 3.2 people per single family unit and 2.5 people per multi-family unit, the occupants of the new dwelling units would be expected to increase the City population by about 2.5% per year (based on a 2020 population of 84,842). This is substantially lower than the rate of increase in WQCF flows over roughly the same period that averaged around 3.4% per year, and the influent biological loading (based on BOD) that increased by an average of 4.1% annually. There are several possible explanations why the increase in reported influent flows and loads at the WQCF were higher than the expected increase in City population including:

- Occupancies for new dwelling units could be higher than assumed; however, reasonable increased occupancies in new residential units would have only a minor impact on the overall City population.
- Flows and loads could be increasing for existing residential units due to increased occupancy per unit.
- Non-residential (commercial, industrial, governmental, etc.) flows and loads could be increasing at a higher rate than residential flows and loads.
- Lathrop flows and loads could be increasing faster than Manteca residential flows and loads.

Over the longer time horizon of 20 plus years, the City is projecting an annual population growth rate of 2.8%**.** Using a population growth rate 2.8% for Manteca and subtracting 14.7% for Lathrop, the equivalent population for Manteca at the build-out ADWF would be approximately 236,000 people by fiscal year (FY) 2057/2058 as summarized in **Table 8-7**.

Table 8-7. Population Projections and Associated Flows and BOD Loads

Date	Manteca Population (capita)	Manteca BOD Load w/o Lathrop or In-Plant Recycle (lb/d)	Manteca Flow w/o Lathrop or In-Plant Recycle (Mgal/d)	BOD/capita (lb/d/capita)	Flow/Capita (gpcd)	Lathrop Contribution Population (capita)	Lathrop Flow (Mgal/d)	Total Flow w/o Recycle (Mgal/d)	Lathrop Population Contribution/ Total Population	Total Population
12/31/2016	76,752	15,673	4.73	0.204	62	15,616	0.95	5.68	16.9%	92,368
12/31/2017	78,784	15,648	4.77	0.199	61	15,591	0.96	5.74	16.5%	94,375
12/31/2018	80,762	16,449	4.97	0.204	61	16,389	1.00	5.97	16.9%	97,151
12/31/2019	83,323	16,797	5.01	0.202	60	16,735	1.01	6.02	16.7%	100,058
12/31/2020	84,842	17,412	5.29	0.205	62	17,349	1.07	6.36	17.0%	102,191
12/31/2021	87,218	17,676	5.34	0.203	61	15,030	1.08	6.42	14.7%	102,248
12/31/2022	89,660	18,171	5.49	0.203	61	15,451	1.11	6.60	14.7%	105,111
12/31/2023	92,170	18,679	5.64	0.203	61	15,884	1.14	6.78	14.7%	108,054
12/31/2024	94,758	19,204	5.80	0.203	61	16,330	1.17	6.97	14.7%	111,088
12/31/2025	97,411	19,741	5.96	0.203	61	16,787	1.20	7.17	14.7%	114,198
12/31/2026	100,139	20,294	6.13	0.203	61	17,257	1.24	7.37	14.7%	117,396
12/31/2027	102,943	20,862	6.30	0.203	61	17,740	1.27	7.57	14.7%	120,683
12/31/2028	105,833	21,448	6.48	0.203	61	18,239	1.31	7.79	14.7%	124,072
12/31/2029	108,796	22,049	6.66	0.203	61	18,749	1.34	8.00	14.7%	127,546
12/31/2030	111,843	22,666	6.85	0.203	61	19,274	1.38	8.23	14.7%	131,117
12/31/2031	114,974	23,301	7.04	0.203	61	19,814	1.42	8.46	14.7%	134,788
12/31/2032	118,203	23,955	7.24	0.203	61	20,370	1.46	8.70	14.7%	138,573
12/31/2033	121,512	24,626	7.44	0.203	61	20,941	1.50	8.94	14.7%	142,453
12/31/2034	124,915	25,315	7.65	0.203	61	21,527	1.54	9.19	14.7%	146,441
12/31/2035	128,412	26,024	7.86	0.203	61	22,130	1.59	9.45	14.7%	150,542
12/31/2036	132,018	26,755	8.08	0.203	61	22,751	1.63	9.71	14.7%	154,769
12/31/2037	135,714	27,504	8.31	0.203	61	23,388	1.68	9.98	14.7%	159,102
12/31/2038	139,514	28,274	8.54	0.203	61	24,043	1.72	10.26	14.7%	163,557
12/31/2039	143,421	29,066	8.78	0.203	61	24,716	1.77	10.55	14.7%	168,137
12/31/2040	147,448	29,882	9.03	0.203	61	25,410	1.82	10.85	14.7%	172,858
12/31/2041	151,576	30,719	9.28	0.203	61	26,122	1.87	11.15	14.7%	177,698
12/31/2042	155,820	31,579	9.54	0.203	61	26,853	1.93	11.46	14.7%	182,673
12/31/2043	160,183	32,463	9.80	0.203	61	27,605	1.98	11.78	14.7%	187,788
12/31/2044	164,681	33,374	10.08	0.203	61	28,380	2.04	12.12	14.7%	193,061
12/31/2045	169,292	34,309	10.36	0.203	61	29,175	2.09	12.45	14.7%	198,466
12/31/2046	174,032	35,269	10.65	0.203	61	29,991	2.15	12.80	14.7%	204,023
12/31/2047	178,905	36,257	10.95	0.203	61	30,831	2.21	13.16	14.7%	209,736
12/31/2048	183,928	37,275	11.26	0.203	61	31,697	2.27	13.53	14.7%	215,625
12/31/2049	189,078	38,319	11.57	0.203	61	32,584	2.34	13.91	14.7%	221,662
12/31/2050	194,372	39,392	11.90	0.203	61	33,497	2.40	14.30	14.7%	227,869
12/31/2051	199,815	40,495	12.23	0.203	61	34,435	2.47	14.70	14.7%	234,249
12/31/2052	205,425	41,632	12.57	0.203	61	35,402	2.54	15.11	14.7%	240,827
12/31/2053	211,177	42,797	12.93	0.203	61	36,393	2.61	15.54	14.7%	247,570
12/31/2054	217,090	43,996	13.29	0.203	61	37,412	2.68	15.97	14.7%	254,502
12/31/2055	223,168	45,228	13.66	0.203	61	38,459	2.76	16.42	14.7%	261,628
12/31/2056	229,435	46,497	14.04	0.203	61	39,539	2.84	16.88	14.7%	268,974
12/31/2057	235,859	47,799	14.44	0.203	61	40,646	2.92	17.35	14.7%	276,505
12/31/2058	242,463	49,138	14.84	0.203	61	41,784	3.00	17.84	14.7%	284,247

9.0 WQCF ASSESSMENT OF EXISTING FACILITIES AND RECOMMENDED INTERIM IMPROVEMENTS

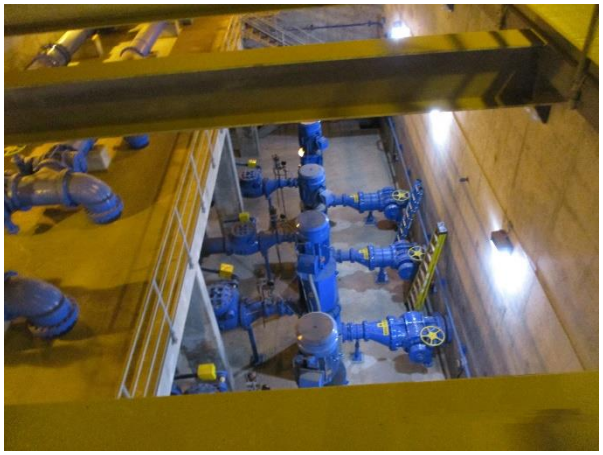
This chapter provides an overview of the City's existing Wastewater Quality Control Facility (WQCF). The information presented in this chapter is based on the review of previous studies, design reports, record drawings, operating records, and discussions with City staff. This chapter also presents an assessment of the performance of the existing treatment processes and recommendation for Interim Improvements to keep the plant in compliance with waste discharge requirements until the next major expansion project.

This chapter is divided into the following sections:

- Headworks and Influent Pump Station
- Aerated Grit Tanks
- Primary Sedimentation Basins
- Secondary Treatment Facilities
- Secondary Effluent Equalization Pond (SEEP)
- Filter Feed Pump Station
- Rapid Mix and Flocculation Tanks
- Tertiary Filters
- UV Disinfection System
- Effluent Handling and Disposal Facilities
- Biosolids Handling Facilities
- Biogas Utilization Facilities
- Electrical Supply and Distribution
- Instrumentation and Electrical Controls
- Auxiliary Systems
- Recommended Interim Improvements

9.1 HEADWORKS AND INFLUENT PUMP STATION

Photos of the Headworks and Influent Pump Station (IPS) are shown on **Figure 9-1**. The purpose of the Headworks and IPS is to provide flow control to the treatment plant and remove rags and other debris that would otherwise clog and prematurely wear out equipment used in downstream processes.



Influent Pump Station



Headworks Screens



Headworks Biofilter



Headworks Screenings Dumpsters

Figure 9-1. Headworks and Influent Pump Station

9.1.1 Influent Gravity Sewer Trunks

Raw wastewater from the City's sewer collection system enters an influent box structure at the WQCF from two gravity sewer trunks, the 60-inch North Manteca Sewer Trunk and 60-inch South Manteca Sewer Trunk. Each sewer trunk has an isolation gate at the influent box. Wastewater flows out of the influent box through three parallel channels into a common influent channel. The common influent channel is connected to the screen distribution channels for flow splitting to the headworks bar screens.

9.1.2 Influent Screening

Influent screening system consists of one manual bar rack and three mechanical bar screens. Slide gates upstream and downstream allow for isolation of each bar screen and bar rack. The mechanical bar screens are designed to remove coarse solids and non-biodegradable materials. Two of the recently replaced mechanical bar screens have 1/4-inch openings and the third older screen has 3/8-inch

openings. Solids caught on the screen are continuously transferred to the top of the screen for discharge to the screenings washer compactor system. The manual bar screen has 3/8-inch openings and permits shutdown and bypass of the mechanical bar screens during periods of equipment failure and maintenance.

9.1.3 Screenings Washer Compactor System

Collected screenings from the mechanical bar screens are discharged onto a shaftless screw conveyor and fed to the hopper of a screenings washer compactor. Screenings are sprayed and passed through a grinder for particle reduction to provide a greater exposed surface area during the washing process. Ground solids are passed through an auger, which washes and separates soft organics from undesirable solids. A reversing sequence causes the ground solids to be washed multiple times before being transferred to the compaction zone. The undesirable solids are compacted, dewatered, and finally discharged to the screenings dumpster.

9.1.4 Influent Pump Station

Bottom plan view and section of the Influent Pump Station (IPS) is shown on **Figure 9-2** and **Figure 9-3,** respectively. Screened wastewater collected in the IPS wet well is pumped by four pumps, two pumps to the Northside Plant, a dedicated pump to the Southside Plant, and a standby pump that can convey wastewater to both the Northside and Southside Plant. The IPS dry well has additional room for four future pumps. Pumped flow to the Southside Plant is measured with a magnetic flow meter located inside the IPS. Flows to the Northside Plant are measured at the Northside Plant aerated grit tanks.

N
0 2 4 6 8 10
SCALE IN FEET

NORTH TRUNK
60" SS

SOUTH TRUNK
60" SS

A
FIG 9-3

SLDG-03-07
SLDG-03-08
SLDG-03-09
SLDG-03-01
SLDG-03-02
SLDG-03-03
SLDG-03-10
SLDG-03-04
SLDG-03-05
SLDG-03-06

SLOPE
SLOPE

MECHANICAL BAR SCREEN
MBSN-03-03
MECHANICAL BAR SCREEN
MBSN-03-02
MECHANICAL BAR SCREEN
MBSN-03-01
MANUAL BAR SCREEN

EL. -0.86
EL. -0.86
EL. -0.86

EL. -9.04
EL. -9.04

SCREEN DISTRIBUTION CHANNEL

STLG-03-01

EL. -15.00

24" P.V. (TYP.)

24" WALL PIPE SPOOL W/ B.F. FOR FUTURE PUMPS (TYP. OF 4)

B.F. (TYP.)

A
FIG 9-3

2" SD

EL. -15.0
EL. -16.5

HOSE RACK

1/2" CAS

HOSE BID (TYP.)
1" 3W

20" P.V. (TYP.)
10" SS

20" SS
20" X 10" RED. (TYP.)

16" X 8" RED. (TYP.)
16" C.V. (TYP.)
16" P.V. (TYP.)
16" SS

NORTHSIDE PUMPS

FCA (TYP.)

SOUTHSIDE PUMPS

FCA (TYP.)
20" X 10" RED. (TYP.)
20" C.V. (TYP.)
20" P.V. (TYP.)
20" SS

24" X 12" RED. (TYP.)

FUTURE PUMP RC BASE (TYP. OF 4)

6" WIDE TRENCH DRAIN (TYP.)

1" 3W

HOSE BIB & RACK (TYP.)

INFP-03-01
INFP-03-02
INFP-03-03
INFP-03-04
INFP-03-05
INFP-03-06
INFP-03-07
INFP-03-08

(FUTURE)

90° ELBOW ANCHOR RC BASE FOR FUTURE PUMPS (TYP. OF 4)

MEZZANINE ABOVE

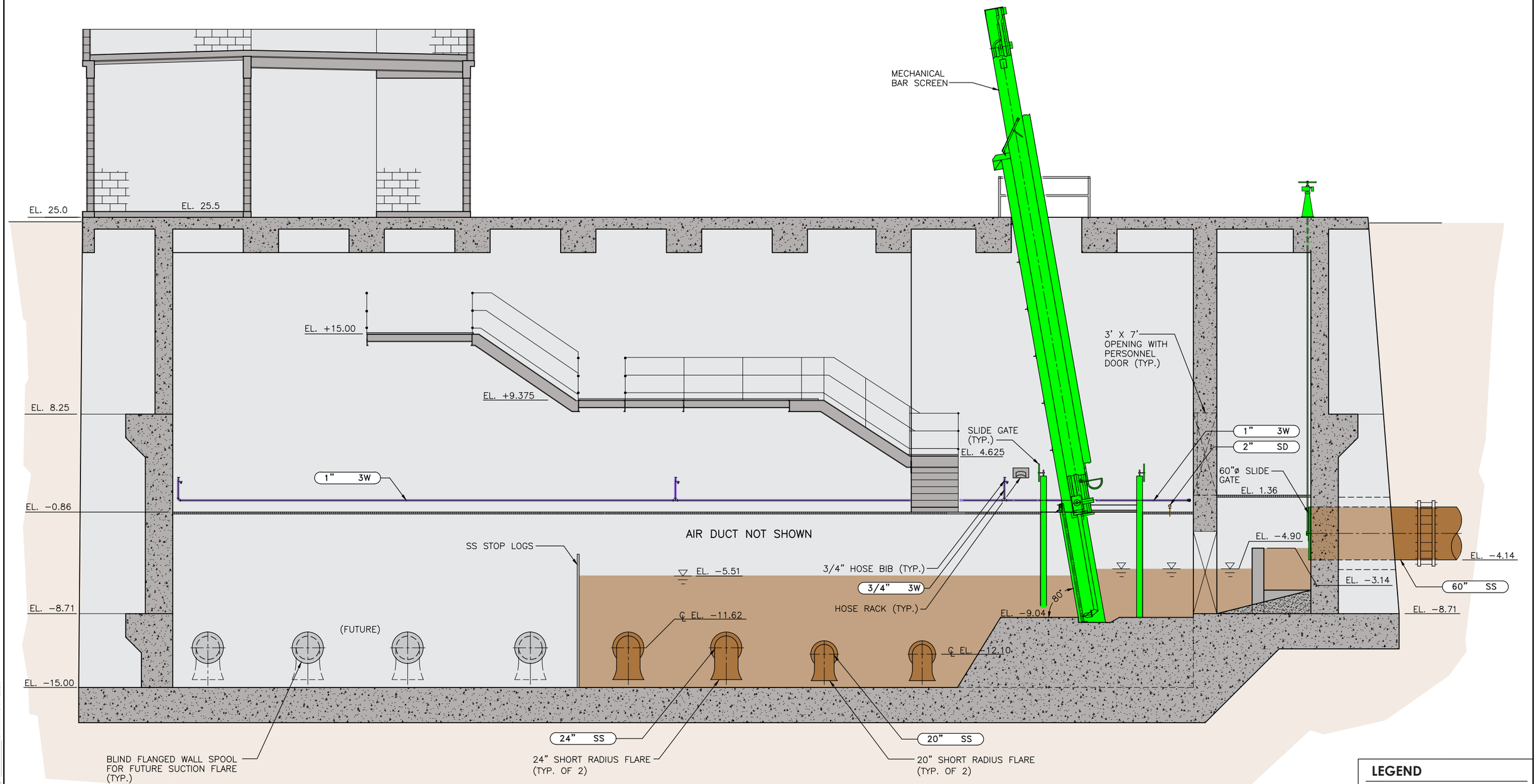
EL. -15.00

LEGEND

- SANITARY SEWER (SS)
- PLANT EFFLUENT (3W)
- DRAIN/VENT (D/V)
- CHEMICAL (CAS)
- PRIMARY EQUIPMENT
- FUTURE
- STRUCTURE

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Figure 9-2
WQCF Influent Pump Station Bottom Plan



SECTION A FIG 9-2

LEGEND

- SANITARY SEWER (SS)
- PLANT EFFLUENT (3W)
- DRAIN/VENT (SD/D/V)
- PRIMARY EQUIPMENT
- FUTURE
- STRUCTURE

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Figure 9-3
WQCF Influent Pump Station Section View

9.1.5 Headworks and IPS Biofilter

The Headworks and IPS uncovered biofilter was originally constructed to treat air from the Headworks and Influent Pump Station and was later also connected to the Dewatering Building. The biofilter is sized to treat an airflow of 33,000 cubic feet per minute (cfm) of air and is distributed to the following areas:

- Influent Junction Structure, Screen Room and IPS Wet Well
- Dewatering Building

Lava Rock media was selected due to longer media life potential compared to organic media. Media is installed to a depth of 4 feet and the unit provides an empty bed residence time of 100 seconds. The unit is provided with a single variable frequency drive (VFD) controlled odor control fan to remove air from the IPS and Dewatering Buildings for treatment. Airstream humidification is provided upstream of the biofilter using in-duct water spray nozzles and surface sprinklers are provided to irrigate the media bed. The biofilter and odor control system have not been operating at optimal conditions since 2015.

9.1.6 Assessment of Headworks, IPS and Biofilter

Currently, the IPS is designed with three duty pumps and one standby pump (the standby pump can convey screened wastewater to either the Northside Plant or the Southside Plant). The operators have noted that during recent severe storm events, all four pumps were needed to convey the high influent flows. There are currently four empty pump bays to facilitate expanding the capacity of the IPS. For pumping to the Southside Plant, there are two 200 hp pumps (one duty and one standby), each with a design capacity of 10 Mgal/d. The peak hour flow to the Southside Plant for the Interim Improvement Projects is 10.82 Mgal/d, which is greater than the capacity of the one duty pump for the Southside Plant. Therefore, to ensure the IPS has firm capacity, it is recommended to install a fifth pump in one of the empty pump bays to serve as the second duty pump dedicated to the Southside Plant. The fifth Influent Pump Station pump is included with the Interim Improvement Projects listed in **Table 9-3.**

In 2022, two new headworks screens were installed to replace the older screens. The third mechanical screen is at the end of its useful life and will need replacing. The third mechanical screen replacement is included with the Interim Improvement Projects listed in **Table 9-3**.

The Headworks screening channel and wet well are covered by aluminum grating. Water in the ducting from the wet well flooding has mixed with the sulfides in the air ventilation system producing sulfuric acid. The acid in the ducting has leaked onto the grating requiring replacement of the grating in 2022. On February 6, 2015, a study of headworks ventilation system and biofilter was prepared by HERWIT and Stantec. According to plant staff the biofilter operated effectively for approximately 5 years before exhibiting operational problems, primarily attributed to excessive head loss across the filter associated with media fouling. The biofilter has not been functioning properly since that time. Air is being exhausted from the Headworks, IPS and Dewatering Building with the odor control fan and discharged without odor treatment. The study made the following recommendation to improve ventilation and bring the biofilter back into service:

- Provide a new ventilation where foul air from the junction structure, covered channels and room air will be exhausted to the biofilter for treatment. Exhausting 10,000 cfm of air from the junction structure, 3,000 cfm of air from the channels, and 5,500 cfm from the operating space, results in 18,500 cfm of air treated in the biofilter.

- Ventilate the operating space at 5,500 cfm (12 air changes per hour) to the upgraded biofilter for treatment. Supply air will only be provided to the operating space (5,500 cfm at 12 ach), so air exhausted from the channels will come from the room thereby creating a pressure differential between the two spaces. This will contain odors in the channels and junction structure and improve indoor air quality.

- Replace existing exhaust ductwork in the Influent Junction Structure, Screen Room and Wet Well to accommodate revised airflows and distribution. In addition, a new exhaust ductwork system should be provided for the operating space. All ductwork should be provided with air balancing/isolation dampers for all pickup points.

- The existing odor control fan should be replaced with a spark and corrosion resistant, FRP unit that is sized for the planned odor control capacity of the system (i.e. 18,500 cfm, as discussed above). This will prolong the useful life of the unit, better match the revised airflow scheme, and reduce the overall horsepower of the unit ultimately saving on power costs.

- The lava rock media in the biofilter should be replaced by inorganic media provided by Biorem©, ECS or equivalent. Three (3) feet of media should be replaced in two (2) cells to provide an EBRT of 55 seconds.

- The biofilter media cells (2 total) should be provided with a cover system. The cover will help prevent the migration of dust, soil and other particulates to the biofilter, and will also help to provide better climatic controls of the media bed.

- The exhaust duct from the odor control fan should be reconfigured downstream of the existing grease/particulate filter. Specifically, the ductwork should be routed above grade to feed the two biofilter cells that will be refurbished and provided with an accessible balancing isolation damper.

Improvements to the headworks ventilation system and biofilter are included with the recommended Interim Improvement Projects listed in **Table 9-3**.

9.2 AERATED GRIT TANKS

There are four total aerated grit tanks: two at the Northside Plant and two at the Southside Plant. All aerated grit tanks are similar in operation. The purpose of the aerated grit tanks is to remove relatively high-density inorganic particles (e.g., sand) from the wastewater stream. This reduces wear on downstream mechanical equipment and minimizes the accumulation of inorganic materials in the digesters. Aeration of the tanks improves the treatability of the wastewater, grease separation, and removal of biochemical oxygen demand (BOD) in the primary sedimentation basins.

Screened sewage from the Headworks is conveyed to the aerated grit tanks by the Influent Pump Station (IPS). Each grit removal tank consists of two parallel aerated grit chambers. Slide or stop gates located at the entrance to each grit tank allows for shutdown and isolation of an individual tank.

Grit is separated from the influent flow as it passes through the sloped chambers with heavier sand and grit particles settling to the bottom and lighter organic materials remain in suspension. Coarse bubble air diffusers are located near to the bottom of the tanks, which induces a circulation pattern in the liquid stream. The rising air produces a spiral motion of flow through the tank that helps grit settle and collect at the grit collection sump (hopper). Grit classifiers separate the grit from the organics and water. The North Plant grit classifier was replaced in 2022. The south plant grit classifier is still the original unit.

Settled grit in the bottom of the hopper is conveyed to a grit classifier by grit pumps at the Northside Plant and by gravity at the Southside Plant. The grit classifier separates the heavier grit particles and lighter organic particles from the liquid. The grit classifier washes, dewaters, and conveys the grit to a dumpster.

Effluent from the grit tanks flows into a common distribution channel leading to the primary sedimentation basins.

Photos of the Aerated Grit Tanks are shown on **Figure 9-4**.



Southside Plant Grit Basins



Southside Plant Grit Collection Hopper



Northside Plant Grit Classifier



Southside Plant Aerated Grit Basin Blower

Figure 9-4. Aerated Grit Tanks

9.2.1 Assessment of Aerated Grit Tanks

The existing Aerated Grit Tanks are performing satisfactorily as designed and will not require major upgrades until the next expansion project. However, the covers for the aerated grit tanks are too heavy for the operators to lift for operation and maintenance so they are left open, and therefore, the biofilters are not in operation.

The current aerated grit tank covers are the Enduro XL6 fiberglass reinforced plastic (FRP) covers, which the operators have noted are too heavy. The existing covers are recommended to be replaced with Evoqua's Geomembrane Technologies brand tank covers, which are retractable arch-supported covers made of high-performance UV-protected membranes. The covers are supported on a low-profile aluminum arch frame so they can be quickly detached and re-attached to provide easy access for operators. Since the Phase III Expansion Project (when the current covers were installed), Enduro has started to manufacturer the XL3 FRP covers, which can also be considered during preliminary design.

The individual spans of the XL3 cover are lighter than the XL6 cover because the XL3 cover spans a maximum distance of approximately 10 ft while the XL6 cover spans a maximum distance of approximately 20 ft. A possible, less expensive alternative to replacing all existing covers that could be investigated during preliminary design is to only replace some of the panels with XL6 panels with larger hatches for access. The cost of replacing the XL6 covers with Evoqua's Geomembrane Technologies brand tank covers is included in the Interim Improvements Project.

New covers for the aerated grit tanks are included with the recommended Interim Improvement Projects listed in **Table 9-3**.

9.3 PRIMARY SEDIMENTATION BASINS

There are six total primary sedimentation basins: three at the Northside Plant and three at the Southside Plant. All primary sedimentation basins are similar in operation. The purpose of the primary sedimentation basins is to remove readily settleable solids and floatable materials, such as oil and grease, to reduce the wastewater suspended solids content for downstream treatment processes.

Screened and de-gritted wastewater enters the primary sedimentation basins through a common influent channel. Flumes located at the entrance of each basin provide even flow distribution into each train from the influent channel. Basins are designed to present low velocity, idle flow conditions, and have baffles to disperse flow and prevent short circuiting. This allows suspended solids and floatable material, such as oil and grease, to gradually separate from the wastewater. Suspended solids settle to the bottom of the of the basin where they form a semi-solid sludge. Settled sludge is pushed by a collector mechanism into a channel or hopper located at the inlet of each basin. Primary sludge pumps periodically withdraw and convey collected sludge to the anaerobic digesters for treatment.

Floatable materials such as oil and grease rise to the surface where they form a scum layer. Mechanical skimmers and telescopic valves collect the scum and convey it to a common collection box. Primary scum pumps periodically withdraw and convey collected scum to the anaerobic digesters for treatment.

Clarified primary effluent overflows a series of v-notch weirs located at the outlet end of each basin into an effluent launder. Flow from the effluent launders collect in a common primary effluent channel from which wastewater is conveyed downstream to the aeration basins for further treatment.

Photos of the Primary Sedimentation Basins are shown on **Figure 9-5**.



Southside Plant Primary Sedimentation Basin



Southside Plant Primary Sedimentation Basin Launders



Southside Plant Aerated Grit Pumps



Southside Plant Primary Sludge Pumps

Figure 9-5. Primary Sedimentation Basins

9.3.1.1 Assessment of Primary Sedimentation Basins

The existing Primary Sedimentation Basins are performing satisfactorily as designed. Recently the chain and flight collectors at the Northside Plant were replaced. The covers for the sedimentation basins are too heavy for the operators to lift for operation and maintenance so they are left open, and therefore, the biofilters are not in operation.

The current primary sedimentation basin covers are the Enduro XL6 FRP covers, which the operators have noted are too heavy. The existing covers are recommended to be replaced with Evoqua's Geomembrane Technologies brand tank covers (same as the aerated grit tanks), which are retractable arch-supported covers made of high-performance UV-protected membranes. The covers are supported on a low-profile aluminum arch frame so they can be quickly detached and re-attached to provide easy access for operators. Similar to the aerated grit tanks, alternative solutions that could be investigated during preliminary design include the Enduro XL3 covers or only replacing some of the panels with XL6

panels with larger hatches for access. New covers for the primary sedimentation basins are included with the recommended Interim Improvement Projects listed in **Table 9-3**.

9.4 SECONDARY TREATMENT FACILITIES

Photos of the Secondary Treatment Facilities are shown on **Figures 9-6, 9-7** and **9-8**. The Secondary Treatment Facilities include the Aeration Basins, Secondary Clarifiers, and RAS/WAS Pumps Stations. There are ten aeration basins (all similar in configuration and operation): Five at the Northside Plant (Aeration Basin Nos. 1-5) and five at the Southside Plant (Aeration Basin Nos. 6-10). There are five secondary clarifiers (all similar in configuration and operation): Three at the Northside Plant and two at the Southside Plant. There are two Return Activated Sludge (RAS) Pump Stations and one Waste Activated Sludge (WAS) Pump Station. The primary components of the existing secondary treatment systems for both the Northside and Southside Plants are indicated in **Table 9-1**.

Table 9-1. Existing Secondary Treatment Facilities

Item	North Plant	South Plant
Number of Aeration Basins	5	5
Zone Volumes in Each Reactor Basin, Mgal		
Zone A (Anoxic)	0.054	0.074
Zone B (Aerobic/Anoxic)	0.054	0.103
Zone C (Aerobic)	0.054	0.087
Zone D (Aerobic)	0.067	0.071
Zone E (Aerobic)	0.067	0.071
Total	**0.296**	**0.406**
IMLR Pumps		
Number of IMLR Pumps per Reactor	1	1
Approximate Capacity of Each IMLR Pump, Mgal/d	2	2
Secondary Clarifiers		
Number of Secondary Clarifiers	3	2
Diameter of Each Clarifier, feet	85	110
RAS Pumps		
Number of Duty RAS Pumps per Clarifier	1	1
Capacity of Each RAS Pump, gpm	2,250	3,400
RAS Underflow Rate, gpd/ft^2	571	515

Key:
gpd/ft^2 = gallons per day per square foot
gpm = gallons per minute
IMLR = Internal Mixed Liquor Recycle
Mgal = million gallons
Mgal/d = million gallons per day
RAS = Return Activated Sludge



Southside Plant Aeration Basin Fine Bubble Diffusers



Southside Plant Aeration Zone E



Southside Plant Aeration Basin Aerobic Zones



Southside Plant Aeration Basin Blowers

Figure 9-6. Aeration Basins



Northside Plant Secondary Clarifiers



Southside Plant Secondary Clarifier



Southside Plant Secondary Clarifier Effluent Launder



Southside Plant Secondary Clarifier Launder Covers

Figure 9-7. Secondary Clarifiers



Northside Plant RAS Pump Station



Northside and Southside Plants WAS Pump Station



Southside Plant RAS Pump Station



Southside Plant RAS Pump Station

Figure 9-8. RAS Pump Stations

The purpose of the secondary treatment facilities is to complete the biological treatment of the wastewater (carbonaceous oxidation, nitrification, and energy saving denitrification). Effective operation of the secondary treatment process is critical for the WQCF to produce effluent that complies with BOD, total suspended solids (TSS), and nitrogen requirements of the NPDES permit.

9.4.1 Secondary Treatment Aeration Basins

The aeration basins (also referred to as Reactor Basins) are one component of the secondary treatment process. Other major systems include the Secondary Clarifiers and RAS/WAS Pump Stations.

The primary function of the aeration basins is to provide the optimum environment required to produce and maintain an adequate biomass of selected biologically active microorganisms. This biomass is commonly termed “Activated Sludge.” The activated sludge microorganisms feed and grow on soluble carbonaceous and nitrogenous compounds. In so doing, they convert the soluble compounds into

settleable particulate that can be removed in the secondary clarifiers. This mass of activated sludge solids in the aeration basin is commonly called the mixed liquor suspended solids (MLSS).

A mixture of screened raw sewage and return activated sludge (RAS) flows to the aeration basins. To optimize the capacity of the aeration basins, attain an effluent nitrate-nitrogen concentration of 10 mg/L, and to control sludge bulking and to save energy, the process is run to allow cyclic aeration to promote simultaneous nitrification and denitrification (SND) in this zone. Oxygen is required for microorganisms to respire and to allow for nitrification to take place. Dissolved oxygen (DO) probes monitor the DO concentration and are used to control the blowers that provide air to the diffusers. Substantial denitrification will occur in the aerobic zones that has low dissolved oxygen concentration or operating with cyclical (High/Low) DO concentrations. By so doing, a dual zone phenomenon occurs within the activated sludge floc itself. The outer zone, where oxygen is available, is nitrifying while the inner zone, where oxygen is absent, is denitrifying.

The most important species of the organisms in the MLSS are the heterotrophic bacteria and the nitrifiers which are responsible for BOD, ammonia, and nitrate removal. Nitrification (conversion of influent ammonia to nitrite and nitrate) generally occurs in the aeration basins when and where oxygen is present, while denitrification (conversion of nitrate to nitrogen gas) occurs when and where oxygen is absent. If the bulk liquid dissolved oxygen concentration in the aeration basins is maintained above 2 mg/L, nitrification is optimized, but very little denitrification will occur. If the dissolved oxygen concentration is lowered to less than 0.3 mg/L, nitrification will be slowed somewhat, but significant denitrification will likely be promoted. This is because the low bulk liquid dissolved oxygen concentration would not penetrate completely into bacterial flocs, and this would create anoxic (oxygen absent, but nitrate present) areas in the interior of flocs where denitrification can occur. Another method to promote denitrification is to cycle DO concentrations up and down, for example, between 0.1 and 2 mg/L. In this case, nitrification would be promoted during times with high DO and denitrification would be promoted at low or zero DO.

9.4.2 Secondary Clarifiers

The purpose of the secondary clarifiers is to separate settleable solids from aeration basin effluent, also known as mixed liquor, leaving a high-quality secondary effluent. Suspended solids in the mixed liquor settle to the bottom while the clarified effluent overtops a weir into a collection trough for conveyance to downstream processes. Effective operation of the secondary clarifiers is critical for the WQCF to produce effluent that complies with BOD, TSS, and nitrogen requirements of the NPDES permit.

The secondary clarifiers are circular concrete tanks with a center drive mechanism supported on a stationary center-feed influent column. Mixed liquor influent from the aeration basins enters the secondary clarifiers through the influent column in the center of each unit where energy dissipation occurs. Suspended solids in the mixed liquor settle to the bottom while the clarified effluent overtops a peripheral weir into an effluent launder for conveyance downstream. Sludge and scum collection systems remove settable and floatable solids.

9.4.3 RAS/WAS Pump Stations

The purpose of the Return Activated Sludge (RAS) pump station is to recycle settled sludge from the bottom of the secondary clarifiers back to the aeration basins. By controlling the amount of recycled RAS, a desirable mixed liquor suspended solids (MLSS) concentration is achieved in the aeration basins and the sludge blanket is maintained at the appropriate level in the secondary clarifiers.

The purpose of the Waste Activated Sludge (WAS) pump station is to waste solids from the RAS system to maintain the desired Solids Retention Time (SRT). The WAS system is controlled by a HACH controller with automatic SRT control. The RAS/WAS Pump Stations need higher capacity pumps as described in the WQCF 2021 Capacity Assessment Study.

The Northside Plant RAS pump station and the WAS pump station are in the RAS/WAS Building between the Northside Plant aeration basins (Aeration Basin Nos. 1-5) and the secondary clarifiers (Secondary Clarifier Nos. 1-3). The Southside Plant RAS pump station is located outdoors adjacent to the South Plant secondary clarifiers (Secondary Clarifier Nos. 4-5).

The RAS pump stations return settled solids in the secondary clarifiers back to the aeration basin influent channels. They are only capable of conveying return sludge within the same facility (e.g. the Northside Plant RAS pump station cannot return sludge to the Southside Plant aeration basins or vice versa). A 4-inch reseeding line is being incorporated into the Interim Improvement Projects to allow seeding of sludge back and forth between the North and South Plants.

The WAS Pump Station is responsible for pumping WAS from the Northside Plant and Southside Plant secondary clarifiers to the sludge thickening facilities.

9.4.4 Assessment of Secondary Treatment Facilities

The existing Northside and Southside Plants are challenged to meet the effluent nitrate + nitrite (10 mg/L as nitrogen monthly average). As discussed in the WQCF 2021 Capacity Assessment, improvements are needed to the secondary treatment facilities to improve nitrogen removal performance and are a pre-requisite to handle increased flows and loads. Improvements to the secondary treatment aeration basins are currently under design by Pacific Advanced Civil Engineering, Inc. (PACE) and improvements to the RAS/WAS pumping systems are currently under design by HERWIT Engineering.

The proposed Northside Plant improvements include increasing the volume of the aeration basins 22 percent by raising the water depth and reconfiguring the biological treatment zones so the first and fourth zones are anoxic. Cyclic aeration has been difficult to operate and therefore will be removed in the second zone so that there are three zones out of five with constant aerobic biological treatment. Exterior improvements will include installation of a new Internal Recycle Pump Station (IRPS) to replace the undersized existing internal mixed liquor recycle pumps, installation of a new Primary Effluent Pump Station (PEPS) to lift the hydraulic profile, and modifications to the existing Influent Channel to accommodate a two-train operation to replace the existing five parallel trains.

For the Southside Plant improvements, the aeration basins will be reconfigured so that the first and fourth biological treatment zones are anoxic. Cyclic aeration will be removed in the second zone so that there are three zones out of five with constant aerobic biological treatment. Exterior improvements will include installation of a new Internal Recycle Pump Station (IRPS) to replace the undersized mixed liquor recycle pumps.

Glycerin feed systems have been added to both the Northside and Southside Plants ahead of the first zone anoxic basins to improve denitrification performance.

To maximize the capacity of the existing secondary clarifiers, it is essential that return activated sludge (RAS) pumping capacity be adequate. Generally, the pumping capacity divided by the clarifier area should give an underflow rate greater than 500 gpd/ft^2. The maximum underflow rates for the Northside and Southside clarifiers are 571 gpd/ft2 and 258 gpd/ft^2, respectively, indicating a severe deficiency in the Southside Plant. The proposed improvements to the Secondary Clarifiers include the following:

- Replace the RAS pumps in the Southside Plant to obtain a reliable capacity of at least 4.8 Mgal/d per secondary clarifier (existing capacity is 1,700 gpm = 2.4 Mgal/d).
- Replace the waste activated sludge (WAS) pumps in both the Northside and Southside Plants to provide reliable wasting as required under future design conditions.
- Also noted by plant operations staff, the secondary clarifier ducking skimmers work poorly and require replacement with a more traditional skimmer rack arm design.
- There are hydraulic issues at the Southside Plant clarifiers with large periodic flow surges. The effluent launder at the Southside Plant aeration basins traps air and then suddenly releases it, modifications are required to avoid pipe damage.

Finally, as noted in the WQCF 2021 Capacity Assessment, sidestream treatment would greatly reduce the recycle TKN load from the solids handling system and would provide major benefits to assist in compliance with the effluent nitrate + nitrite limit, whether the plant accepts food waste or not into the anaerobic digesters. Food waste should not be accepted without providing sidestream treatment.

Secondary treatment improvements described above are included with the recommended Interim Improvement Projects listed in **Table 9-3.**

9.5 SECONDARY EFFLUENT EQUALIZATION POND (SEEP)

Photos of the Secondary Effluent Equalization Pond (SEEP) are shown on **Figure 9-9**. The Secondary Effluent Equalization Pond (SEEP) is a 5.9-million-gallon (Mgal) storage pond. The SEEP is used to dampen diurnal peak and low flow conditions to the tertiary filters and UV disinfection system, and to store secondary effluent when discharge to the San Joaquin River is unavailable due to temperature conditions.

The SEEP is a lined and covered earthen storage pond that is sized based on the following design criteria:

- Diurnal flow equalization (approximately 1.9 Mgal of storage).
- Low flow conditions in the San Joaquin River at times of high tidal influence when discharge is restricted (approximately 3.7 Mgal of storage).



Secondary Effluent Storage Pond



Electrical Transformer & Switchgear for Irrigation Pump Station



Irrigation Pumps



Secondary Effluent Equalization Pond

Figure 9-9. Secondary Effluent Storage and Equalization Ponds

9.5.1 Performance Assessment of SEEP

The SEEP liner is in poor condition. When there is a puncture or tear in the liner it is difficult to repair because of the deteriorated condition of the liner material. Also, it is difficult to clean the pond or remove sludge underneath the liner, so it is currently full of sludge. Plant operations staff report that last time the pond was out of service 6 to 12 inches of sludge had accumulated in the bottom of pond.

Replacement of the liner is included with the recommended Interim Improvement Projects listed in **Table 9-3**.

9.6 FILTER FEED PUMP STATION

Photos of the Filter Feed Pump Station are shown on **Figure 9-10**. Secondary effluent is pumped to the tertiary filters and UV disinfection system through the Filter Feed Pump Station (FFPS). The FFPS is comprised of four vertical mixed flow impeller pumps housed within individual pump barrels. The pumps tee off of a common 36-inch manifold. A magnetic flow meter and VFD units are used to control the pumps to obtain the filter flow desired by the operator. When needed, coagulant and polymer are added to secondary effluent immediately following the FFPS through a chemical injection line at the pump station.



Filter Feed Pumps



Filter Feed Pump Station



Filter Feed Pumps

Figure 9-10. Filter Feed Pump Station

9.6.1 Performance Assessment of Filter Feed Pump Station

The existing FFPS is performing satisfactorily as designed and will not require major upgrades until flows reach a peak hourly flow of approximately 25.1 Mgal/d (one low flow pump with a maximum design

capacity of approximately 5.0 Mgal/d and three high flow pumps in a two duty plus one standby pump configuration, each with a maximum design capacity of approximately 10.0 Mgal/d).

9.7 RAPID MIX AND FLOCCULATION TANKS

Photos of the Rapid Mix and Flocculation Tanks are shown on **Figure 9-11**. Following the FFPS, secondary effluent can be routed to a rapid mix tank and/or three flocculation tanks prior to tertiary filtration and UV disinfection. The purpose of the rapid mix and flocculation tanks is to provide coagulation and flocculation to condition or pre-treat secondary effluent for enhanced tertiary filtration. Coagulation and flocculation are particularly important when secondary effluent quality deteriorates as evidenced by increasing turbidities. The use of chemicals for pre-treatment is required by State Board when filter influent turbidity exceeds 5 NTU for more than 15 minutes. The flocculation process should generate strong pin-point floc that are easily and efficiently removed by the tertiary filters.



Flocculation Tanks



Rapid Mix and Flocculation Tanks and Filter Structure

Figure 9-11. Rapid Mix and Flocculation Tanks

9.7.1 Performance Assessment of Rapid Mix and Flocculation Tanks

The existing Rapid Mix and Flocculation Tanks are performing satisfactorily as designed. The Rapid Mix Tanks were designed for an average flow of 9.87 Mgal/d and a peak flow of 19.15 Mgal/d, which provides hydraulic residence times of 40 seconds and 20 seconds, respectively. The Flocculation Tanks were also designed for an average flow of 9.87 Mgal/d and a peak flow of 19.15 Mgal/d, which provides hydraulic residence times of 45 minutes and 23 minutes, respectively.

9.8 TERTIARY FILTERS

Photos of the Tertiary Filters are shown on **Figure 9-12**. The purpose of the tertiary filters is to reduce suspended solids and organic loading to the San Joaquin River and increase the reliability of the UV disinfection system. Filtration followed by UV disinfection allows the WQCF to achieve NPDES effluent quality requirements and comply with Title 22 requirements for producing disinfected tertiary recycled water (DTRW). The Tertiary Filters consists of six cloth disk filters enclosed in concrete basins. A five foot wide filter inlet channel allows flow to be directed to any combination of filters. Each filter is equipped with a drive assembly, center tube assembly, filter cloth disk assembly, backwash/sludge discharge assembly, level switches and sensors, and filter controls. The filter backwash pumps, turbidity equipment and other associated piping and appurtenances are contained in three pump galleries. Following tertiary filtration, filtered effluent can be routed to the UV disinfection system or directed to the Secondary Effluent Storage Pond (SESP) for storage and/or re-treatment under abnormal conditions.



Cloth Media Filters



Filter Feed Trough



Tertiary Filters Control Panel



Tertiary Filter Concrete Tank

Figure 9-12. Tertiary Filters

9.8.1 Performance Assessment of Tertiary Filters

The PLCs for the filters were replaced with Modicon M340s, since this upgrade the Tertiary Filters are performing satisfactorily and will not require expansion until flows reach the design capacity of 9.87 Mgal/d as an average flow and 19.15 Mgal/d as a maximum flow.

9.9 UV DISINFECTION SYSTEM

The purpose of UV disinfection (photos shown in **Figure 9-13**) is to disinfect the tertiary treated effluent and produce DTRW. The UV light inactivates pathogens in the filtered wastewater by damaging the genetic material. Tertiary filtration along with UV disinfection allows the WCQF to achieve NPDES effluent quality and Title 22 requirements. The UV disinfection system consists of three components: 1) disinfection channels (currently two concrete channels), 2) electrical system (lamps, wiring/cabling, power distribution, and control system, which includes the UV detection system, on-line UV transmittance

monitor, and ballasts), and 3) mechanical system (quartz sleeves, frames, UV modules, automatic wiping system, motorized inlet/outlet gates, and reactor configuration).



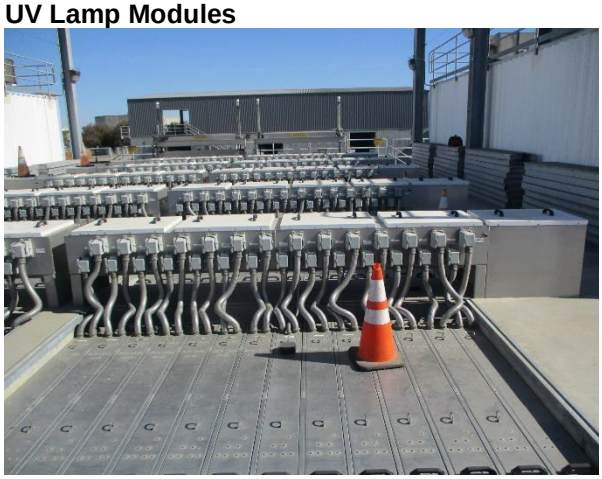
UV Disinfection Facility Influent Gates



UV Lamp Modules



UV Disinfection Facility Effluent Gates



UV Lamp Modules

Figure 9-13. UV Disinfection

9.9.1 Performance Assessment of UV Disinfection System

In the last two years (January 2021-March 2023), there has been one total coliform violation in June 2022 (prior to 2021, there was one exceedance in 2020, one in 2019, and several in 2018). From January 2018 through March 2023, the daily average UV dose has averaged 206 mJ/cm2, which is significantly greater than the permit required minimum UV dose of 100 mJ/cm2. The width of the existing channels (10-feet 11.5-inches) with no added means of access, makes it difficult to get access to the lamps and channels for maintenance and cleaning.

Stantec recently coordinated with Wedeco (the UV lamp manufacturer) to determine the proposed UV system upgrade for the Interim Improvement Projects. While it is recommended to complete the UV system improvements during the Interim Improvement Projects to facilitate maintenance and improve treatment (reduce the likelihood that a coliform violation could occur), the proposed UV system is

recommended to be designed to handle future build-out flows. The 2012 Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (third edition) published by the National Water Research Institute (NWRI) in collaboration with Water Research Foundation (WRF) (hereafter referred to as the 2012 NWRI UV Guidelines) specifies that a different minimum design UV transmittance (UVT) value is appropriate when using media filtration compared to membrane filtration upstream of the UV system. Therefore, assuming the secondary treatment system at the WQCF will be expanded with MBRs (discussed further in **Chapter 10**), the UV system influent flow for the expanded WQCF will be a combined flow from both the existing filters and the new MBR system, and it is appropriate to use combined peak flow and UVT design values. The required peak build-out flow for the new UV system is 31.08 Mgal/d at a minimum design UVT of 61.3-percent based on the estimated peak flows noted below from the existing filters and new MBR system.

- 11.54 Mgal/d from the existing filtration system (peak day flow due to available equalization) at a minimum design UVT of 55-percent (per the 2012 NWRI UV Guidelines)
- 19.54 Mgal/d from the new MBR system (peak hour flow as no equalization will be available for the MBR system flow) at a minimum design UVT of 65-percent (per the 2012 NWRI UV Guidelines)

9.9.1.1 UV Disinfection System Alternative Analysis

Three UV system alternatives were analyzed to achieve a UV dose of 100 mJ/cm2 based on a peak design flow of 31.08 Mgal/d at a minimum design UVT of 61.3-percent. The three Wedeco UV systems analyzed include the LBX 1500e (closed vessel), Duron 6 (open channel), and Duron 8 (open channel). Manufacturer proposals were obtained for all three systems.

LBX 1500e (Closed Vessel)

The LBX 1500e system is a closed vessel, in-pipe system. In-pipe UV disinfection systems use lamps submerged in closed-chamber reactors. The reactor train is placed within a piping manifold, which provides a disinfection system with minimal footprint. The reactor trains can be isolated by two associated butterfly valves, and all reactor trains are integrated by means of a common inlet and outlet piping manifold. The Wedeco LBX 1500e system uses low-pressure lamps. Low pressure bulbs emit a narrower range of UV radiation (compared to medium pressure bulbs) but have a lower probability of breakage (which releases mercury and glass into the system) because they operate at low temperatures.

To achieve the required minimum UV dose at the peak flow and minimum design UVT, 25 LBX 1500e reactor vessels are needed (24 duty plus 1 standby vessel), with each vessel having 60 lamps for a total of 1,500 lamps.

The equipment cost alone for the system (not including installation/labor, other modifications needed such as demolition of the existing infrastructure and constructing a canopy, or soft cost markups) is approximately $719,000 more than the Duron 6 system and $1,655,000 more than the Duron 8 system. Considering the higher capital cost and the City’s investment in the existing infrastructure, the closed

vessel system was not considered further. The UV disinfection system alternative analysis was focused on the Duron 6 versus the Duron 8.

Duron 6 vs Duron 8

Since both the Duron 6 and Duron 8 are open channel systems and the existing two channels are difficult to maintain due to the 10-ft 11.5-inch width, it is proposed for both systems to split the two existing channels into four channels (three duty plus one standby channel). This will facilitate cleaning as the channels will be approximately half the existing width and will also make it easier to take a channel offline for maintenance as only a quarter of the available channels will be offline as compared to half being offline during maintenance activities in the existing system.

Some of the main differences between the Duron 6 and the Duron 8 system are shown in **Table 9-2**.

Table 9-2. UV Disinfection System Duron 6 vs Duron 8 Comparison

Item	Duron 6	Duron 8
Watts per Lamp	600	800
UVC Output, watts	210	270
Vertical Incline	45°	65°
Minimum Channel Depth Needed with Bridge Mounting System, inches	51	79
Minimum Channel Depth Needed without Bridge Mounting System, inches	74.75	106.3
Proposed System	4 channels (3 duty + 1 standby) with 24 lamps per bank, 11 banks per channel	4 channels (3 duty + 1 standby) with 24 lamps per bank, 7 banks per channel
Proposed Total Number of Lamps	1,056	672
Total Project Cost Estimate	$17,879,000	$15,583,000

Key:
Mgal/d = million gallons per day

One of the key construction differences is that the depth of the existing channels (currently approximately 53 inches) will need to be increased to install the Duron 8 equipment while the existing channels with the bridge mounting system can be used with the Duron 6 equipment. However, the Duron 8 system offers several advantages over the Duron 6 system, such as requiring significantly less lamps. In addition to having a lower capital cost, the Duron 8 offers the following enhancements over the Duron 6 system:

- **Lamp Power:** The Duron 8 uses higher wattage lamps that produces a higher UVC output, as shown in **Table 9-2**, which allows for less lamps required to achieve the same dose.
- **Bank Size:** The Duron 8 allows for a more efficient, fine-tuned design due to the bank sizing being expandable in two lamp increments (compared to the Duron 6 which is expandable in four lamp increments). The Duron 8 bank size range was expanded to 8 to 72 lamps per bank compared to the Duron 6 which has a bank size range of 12 to 48 lamps per bank.

- **Installation Flexibility:** The Duron 8 utilizes integrated channel walls that allow for greater channel width tolerance and improved flow distribution and dose delivery. Also, the ballast enclosure configurations were expanded, thereby reducing the total number of enclosures and footprint.
- **Enhanced Intensity Monitoring:** The Duron 8 UV sensor window was reconfigured to allow monitoring of both lamp rows (the Duron 6 sensor window only captured one lamp row).
- **Wiper Improvement:** The Duron 8 wiper rings are in a "stacked" position, which allows for easier access for replacement.
- **Maintenance:** The Duron 8 module lift motor was relocated to the top of the module for easier access (compared to the Duron 6 module lift motor that sits within the module frame and requires removal of the lamp/sleeve assemblies for access).
- **Less Equipment:** The Duron 8 wiping and lifting enclosures were combined into one common enclosure to simplify installation and operation.

Recommended UV Disinfection System

The proposed UV system upgrade is the Wedeco Duron 8 (800W), which includes 24 lamps per bank, 7 banks per channel (i.e., 168 lamps per channel and 672 lamps total), and four total channels (three duty plus one standby channel) to achieve a UV dose of 100 mJ/cm2 based on a peak design flow of 31.08 Mgal/d at a minimum design UVT of 61.3-percent. The proposed project includes 1) splitting the two existing channels into four channels, 2) increasing the depth of the existing channels, 3) installing the Duron 8 equipment, 4) replacing the existing shipping containers and the enclosures inside them with freestanding Type 4X stainless steel ballast enclosures each with a side mounted AC unit for internal cooling, and 5) constructing a wall on the south side to block sun exposure to the ballast panels.

Improvements to the UV Disinfection System are included with the recommended Interim Improvement Projects listed in **Table 9-3.**

9.10 EFFLUENT HANDLING AND DISPOSAL FACILITIES

Treated effluent from the WQCF is disposed of by three methods: 1) On-site land application; 2) Recycled; and 3) Discharge to the San Joaquin River. The disposal facilities consist of the following:

- Irrigation Pump Station and Secondary Effluent Storage Pond (SESP) for on-site land application of undisinfected secondary effluent.
- Recycled Water Transfer Pump Station, Recycled Water Pump Station, and Truck Fill Station for urban landscape irrigation (including the Great Wolf Lodge) and use of recycled water for construction purposes.
- Two effluent pumps and a 36-inch outfall for discharge to the San Joaquin River.

9.10.1 Irrigation Pump Station and Secondary Effluent Storage Pond (SESP)

The Irrigation Pump Station is a reinforced concrete structure with four constant-speed, vertical mixed-flow propeller pumps. Undisinfected secondary effluent can flow by gravity into the influent channel or stilling well of the pump station or overflow into the SESP.

The SESP is a 9-acre, 15-Mgal storage pond. The excess flow which cannot reach the irrigation fields by gravity will automatically be diverted to the SESP. When the pond is full, the pond level control system will sound an alarm. Generally, the operator will isolate the pond, after which the excess secondary effluent will back up into the line to the Secondary Effluent Equalization Pond, unless one or more of the irrigation pumps are manually started to direct undisinfected secondary effluent to the surrounding fields.

9.10.2 Onsite Land Disposal System

The on-site land disposal system is composed of piping and irrigation structures arranged to gravity feed approximately 117 net usable acres of City-owned property. Each field is equipped for overland irrigation (flood irrigation) via the irrigation header and 36-inch reinforced concrete feeder pipes with discharge structures strategically located along the fields. Each structure has an inlet irrigation-type “alfalfa” valve located directly atop the 36-inch pipe and an outlet weir.

9.10.3 Outfall

Disinfected effluent from the UV Disinfection facility flows into the effluent pump station wet well then through an inlet flap gate leading to a 42-inch final effluent pipe. The final effluent pipe is connected to the 36-inch outfall leading to the San Joaquin River and a 42-inch plant effluent bypass line which discharges into the SESP. The outfall is approximately 14,300 feet long. The plant effluent bypass line is used when the final effluent does not comply with the NPDES permit requirements. Under average flow conditions and low water levels in the San Joaquin River, discharge through the outfall can occur by gravity.

9.10.4 Recycled Water System

The recycled water system delivers disinfected tertiary recycled water (DTRW) to City urban water recycling projects, such as the truck fill station and the Great Wolf Lodge south of the WQCF.

The plant recycled water system includes: 1) two recycled water transfer pumps; 2) a recycled water chlorine contact basin and pump station; and 3) a truck fill station. The two recycled water transfer pumps are in the effluent channel of the UV disinfection system. The pumps transfer DTRW from the UV disinfection system to the recycled chlorine contact basin and water pump station. The transfer pumps are vertical turbine type with one pumping stage and a product lubricated open lineshaft. Each pump has a rated capacity of 2,000 gpm at a total dynamic head (TDH) of 17 ft and is driven by a constant speed 15 hp electric motor. These pumps operate to maintain level in the chlorine contact basin. Hypochlorite is injected into the water as it enters the chlorine contact tank.

The recycled water chlorine contact basin and pump station consists of a wet well, two high pressure low flow pumps for plant process water and two low head high flow pumps at the same location for process water and a sodium hypochlorite handling facility. The wet well was previously the chlorine contact tank. During Schedule D of the Phase III Expansion Project, modifications were constructed at the chlorine contact tank to convert the tank to also act as a wet well for the recycled water pump station. Because of intertie piping with Great Wolf Lodge, only the higher-pressure low flow pumps are used now. The Great Wolf facility needs high pressure all of the time per their contract. The plant can't use low pressure high flow pumps even for plant water needs because there is a common piping system for both plant water and Great Wolf Lodge.

The low head and high head recycled water pumps are vertical turbine type with product lubricated open line shafts. The large flow low head pumps each have a rated capacity of 2,000 gpm at a TDH of 81 ft and is driven by a constant speed 50 hp electric motor. The low flow high head pumps each have a rated capacity of 400 gpm at 250 feet of head.

The pumps discharge into a 12-inch recycled water pipeline. A second injection point for sodium hypochlorite solution, static in-line mixer, and flowmeter are located downstream of all four recycled water pumps. The 12-inch recycled water pipeline delivers DTRW to the in-plant water system, trunk fill station and the Great wolf Lodge. The truck fill station is located at the entrance to the WQCF and services construction trucks and the general public.

The recycled water system uses the chlorine contact basin to help equalize water usage as well to chlorinate the water. However, the facility is uncovered and attractive to birds. This results in problems with fecal coliform testing even though the water is chlorinated. It is recommended that the basin be covered with Evoqua's Geomembrane Technologies brand tank covers (same as the aerated grit tanks and primary sedimentation basins), which are retractable arch-supported covers made of high-performance UV-protected membranes. The covers are supported on a low-profile aluminum arch frame so they can be quickly detached and re-attached to provide easy access for operators. It is also recommended that the in-plant water system piping be separated from the pipeline going off site to allow use of the low-head pumps for the in-plant water system and the high pressure pumps for off-site uses including the Great Wolf Lodge.

9.10.5 Effluent Pump Station

Photos of the Effluent Pump Station are shown on **Figure 9-14**. When the water surface elevation in the San Joaquin River is high, peak flows occur at the plant, or a combination of the two, effluent pumping is required. The liquid level in the effluent pump wet well will rise, triggering an effluent pump to start. The two effluent pumps are close coupled, single stage, vertical turbine pumps. The pumps are equipped with 100 hp motors and each have a capacity of 6,700 gpm at 45 ft of TDH.



Figure 9-14. Effluent Pump Station

9.10.6 Performance Assessment of Effluent Handling and Disposal Facilities

The effluent handling and disposal facilities will not require major upgrades until the recycled water system is expanded or cooling towers are added for NPDES permit compliance (as described under the permit requirements section in this chapter). Future recycled water use is described in the Reclaimed Water Facilities Master Plan (Woodard & Curran, January 2023).

9.11 BIOSOLIDS HANDLING FACILITIES

The biosolids handling facilities consist of the following:

- Waste activated sludge thickening with dissolved air floatation thickening (DAFT)
- Anaerobic digestion of primary and thickened WAS
- Anaerobic digester control building with associated equipment
- FOG and food waste receiving stations
- Biosolids dewatering facilities
- Biosolids drying with open asphalt lined drying beds

9.11.1 Waste Activated Sludge Thickening

Sludge thickening facilities are comprised of two dissolved air floatation thickeners (DAFT). The sludge thickening facilities are responsible for thickening WAS to reduce the anaerobic digester heating

requirements, minimize required digester capacity; and maximize solids retention time in the anaerobic digesters. The DAFT units were designed to thicken WAS to an approximate concentration of 3%, without using polymer, and 5% with polymer, and capture 85 to 95% of the input solids. Polymer is currently used at the DAFTS.

The sludge thickening facilities are composed of two DAFT tanks. Each DAFT is rectangular above ground concrete tank. Each DAFT includes the following components:

- A float removal system.
- A bottom sludge removal system.
- A subnatant wet well with an overflow pipe to the plant drain and a suction pipe from the pressure recycle pump.
- An effluent weir plate to control the penetration depth of the float skimmer blades in the wastewater.
- A sludge box that receives float and bottom sludge from both tanks and functions as a wet well for the thickened sludge pumps.
- An inlet distribution system to provide uniform distribution of the influent flow in the tank.
- Thickened waste activated sludge pump to pump thickened sludge to the digesters.

9.11.2 Anaerobic Digesters

Photos of the Digesters are shown on **Figure 9-15**. The anaerobic digesters are responsible for stabilizing primary sludge and thickened WAS from the North Plant and South Plant. The purpose of the anaerobic digesters is to stabilize the organic solids in the primary sludge and thickened WAS prior to dewatering. Stabilizing the organic solids has the following benefits:

- Reduces the solids that must be dewatered and disposed
- Reduces pathogens
- Eliminates offensive odors
- Improves the ability to dewater the sludge
- Enables compliance with Federal regulations governing the treatment and handling of biosolids (40 CFR Part 503).



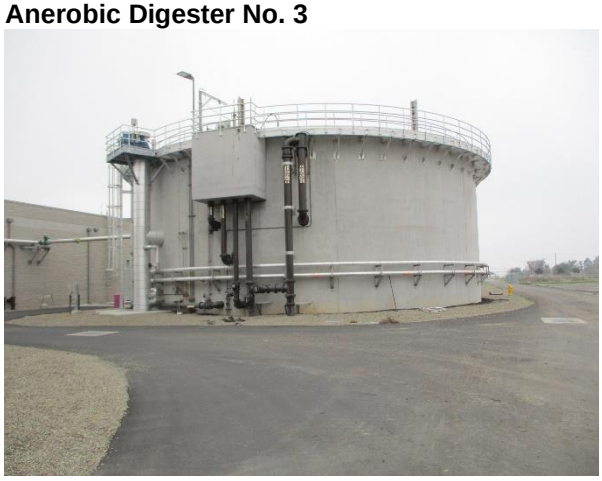
Anerobic Digester No.1



Anerobic Digester No. 3



Anerobic Digester No. 4



Anerobic Digester No. 4

Figure 9-15. Digesters

The anaerobic digesters are designed to attain volatile solids destruction in the range of 55 to 70% on a weight basis (resulting in an approximate volatile fraction in the digested sludge solids of 50-60%). A digester gas production in the range of 12 to 17 cubic feet per pound of volatile solids destroyed is anticipated as part of the process. Digesters No. 1 and 2 are 60 feet in diameter with fixed steel covers and hold 523,00 gallons each. Digesters No. 3 and 4 are 65 feet in diameter with floating steel covers and hold 662,00 gallons of sludge and 16,500 cubic feet of digester gas each. Each digester is mixed with two 15 hp draft tube mixers pumping 10,000 gpm.

The primary sludge and scum, and thickened WAS are pumped to the Sludge Control Building. From the Sludge Control Building, the combined sludge is routed to one of the four anaerobic digesters by two pneumatically operated valves through the heated sludge/sludge mixing discharge piping. Primary sludge and thickened WAS are each metered to provide equal amounts of sludge to all operating digesters. To maintain a suitable environment for the microorganisms that decompose the sludge, the digesting sludge is maintained at 95°F by continuous sludge circulation through external heat exchangers. The digester gas produced because of the sludge decomposition is collected and piped to the two hot water boilers,

the BioCNG system, or to the waste gas burner. The boilers provide the hot water needed for heating of the digesting sludge. The waste gas burner ignites and burns the excess (unused) digester gas in a controlled manner. The BioCNG system separates the CO_2 from the CH_4 in the biogas. The CH_4 is then compressed into compressed natural gas (CNG) and sent to the truck loading facilities. CO_2 along with waste CH_4 is sent to a specialized boiler that burns this gas and recovers heat to the digesters. The digesting sludge is displaced by the incoming sludge through a telescoping valve into an overflow box on the top side of each digester. From the digester overflow boxes, the sludge flows by gravity to the sludge drying beds or routed to the solids holding tank at the sludge dewatering facility.

9.11.3 Anaerobic Digester Control Building

The digester control building controls sludge into each digester including separate metering and control of primary sludge, TWAS, and FOG and food waste. There are also sludge transfer pumps to recirculate sludge from any digester to pick up FOG or food waste at the food waste receiving facilities. The sludge transfer pumps can also transfer sludge between digesters, or to the solids holding tank or sludge drying beds. The building also controls the boilers and heating system to heat and maintain temperature of each in service digester. This includes recovery of heat from the waste gas boiler to the digesters. The building also controls the biogas management system including biogas storage by controlling cover level in Digester No. 3 and No. 4, the production of BioCNG, usage of the boilers, waste gas flaring, and overall usage of biogas and natural gas for the facility.

The air compressors for the plant air system are also located in this building.

Photos of the Digester Control Building are shown on **Figure 9-16**.



Digester Control Building Exterior



Digester Control Building Interior



Digester Boilers



Digester Boilers

Figure 9-16. Digester Control Building

9.11.4 FOG and Food Waste Receiving Stations

Photos of the FOG and Food Waste Receiving Stations are shown on **Figure 9-17**. The FOG receiving station consists of the following:

- 10,000 gallon receiving tank that is heat traced and insulated.
- A Rock trap with manual basket strainer to screen FOG.
- Two Wemco chopper pumps rated at 475 gpm at 15 feet to unload trucks and mix the contents of the receiving tank.
- Two Bredel 50 hose pumps rated at 20 gpm at 125 psig to meter the fog into the digesters.
- An automated diver control station that controls and logs loads from each driver.



Food Waste Receiving Station



Food Waste Receiving Station



FOG Receiving Station



FOG Receiving Station

Figure 9-17. FOG and Food Waste Receiving Stations

The FOG station is not currently operating because the FOG trucks making deliveries were found to have a lot of rags and other debris that were not captured by the rock trap and basket strainer. This led to excessive plugging of the chopper pumps. The system needs a second screen or macerator in addition to the rock trap to function reliably.

The Food Waste Receiving station consists of the following:

- Two Bredel 50 hose pumps rated at 20 gpm at 125 psig to meter the food waste into the digesters.
- Concrete slab.
- Water service with solenoid valves.

Food waste is intended to be screened and turned into a slurry at the Lovelace waste transfer facility. The slurry will then be trucked in a container to the WQCF. The transportation container will act as the holding tank and remain at the WQCF and be pumped out over time with the hose pumps. Water connections with solenoid valves can add water to the food waste as needed. This facility has yet to operate as the food waste processing equipment is only now being installed at the Lovelace transfer station.

9.11.5 Biosolids Dewatering Facilities

Photos of the dewatering facilities are shown on **Figure 9-18**. The mechanical dewatering facility reduces the liquid content in the anaerobically digested sludge generated from the primary and secondary treatment facilities. The mechanical dewatering facility produces dewatered cake with an average dry solids concentration of 19%. Centrate is returned directly to the headworks for treatment.

The mechanical dewatering facility includes the following components:

- 112,000-gallon solids holding tank that receives digested sludge flow from the digesters.
- One centrifugal mixing pumps for the solids holding tank.
- Two Centrisys centrifuges rated at 185 gpm and 1,540 lbs/hr capacity each.
- Sludge holding tank and inline grinder.
- Two centrifuge feed pumps.
- Two polymer dilution units, systems.
- One conveyor that transports the sludge cake to an outdoor covered loading facility where sludge is manually loaded into roll off containers.



Solids Holding Tank



Dewatered Cake Loading Facility



Centrifuge Feed Pumps



Centrifuges

Figure 9-18. Solids Dewatering Facilities

The dewatering facility operates properly. However, the WQCF does have a serious struvite problem and this struvite has impacted maintenance costs on the centrifuges, making them expensive to maintain. The centrate return from the dewatering facilities also drastically impacts the nitrogen treatment ability of the secondary treatment process.

9.11.6 Biosolids Drying Facilities

The sludge drying beds were used to dry biosolids prior to the construction of the dewatering building. The south beds have been abandoned and are now used for equipment storage. The north drying beds are now used only as a place to periodically empty the digester contents for cleaning, and occasionally for storage of dewatered biosolids when disposal is not available.

9.11.7 Performance and Capacity Assessment of Biosolids Facilities

The existing biosolids handling facilities are functioning satisfactorily with the following exceptions:

- Digesters No. 1 and 2 need an overflow box that discharges to the solids holding tank similar to Digesters No. 3 and 4.
- New grating and handrailing at the digester gas relief valves is needed for all four digesters.
- The existing waste heat radiator is undersized and needs to be replaced with a larger radiator.
- The existing FOG receiving station basket screen does not work very well. A replacement screening system is recommended for the FOG Receiving Station.

The impact of the centrate return on the nitrogen treatment capabilities of the main process is very significant. The main treatment process is currently overloaded on nitrogen treatment capacity. As a result of this, only one centrifuge can be run at a time with a flow limit of 115 gpm. This is well below the centrifuge capacity of 185 gpm. Side stream treatment of the centrate is needed to reduce the impacts of the dewatering return on the main plant process and allow full use of the dewatering facility, Side stream treatment of the centrate is recommended and included with the Interim Improvement Projects list in **Table 9-3.**

Even with side stream treatment, the centrifuge facility will be required to run both centrifuges with the increased loadings from the Interim Projects and will not have a redundant centrifuge. A third centrifuge, or equivalent dewatering equipment, new sludge feed pump, and new polymer blending unit are recommended and included in the Interim Improvement Projects. Considering future dewatering capacity needs for the Phase IV Expansion Project (discussed further in Section 7.9), it is recommended to install a larger centrifuge than the existing equipment. The new centrifuge is recommended to have a minimum capacity of 260 gpm and 3,000 dry lb/hr.

Currently, the plant is required to run both DAFT units continuously to keep up with WAS loading. This will become more critical when the WAS system is expanded. A redundant DAFT is required to allow maintenance on the DAFT system. A new DAFT is recommended and included in the Interim Improvement Projects.

Recommended improvements to the Biosolids Handling Facilities are included with the Interim Improvement Projects listed in **Table 9-3.**

9.12 BIOGAS UTILIZATION FACILITIES

The biogas utilization facilities consist of the following:

- Floating steel covers on Digester No. 3 and No. 4 for low pressure gas storage.

- Biogas H2S removal system consisting of ferric chloride chemical feed system to each digester followed by H2S removal vessel and media.
- Biogas booster blowers to pull biogas through the H2S media and provide pressure for the biogas users.
- Hot water boilers to heat the anaerobic digesters
- Biogas Compressed Natural Gas (Bio-CNG) System
- Waste gas boiler to burn waste gas from the Bio-CNG process
- Waste Gas Flare to burn excess biogas
- CNG Fueling Station
- 400 kilowatt (kW) electrical generator (currently abandoned)

9.12.1 Floating Steel Gas Covers

Digester No. 3 and No. 4 have floating steel covers that allow storage of low-pressure digester gas. Each cover can hold up to 16,500 cf of biogas. The covers float on the gas and the cover level is used by the SCADA system to control biogas usage at the facility.

9.12.2 Biogas H2S Removal System

Hydrogen sulfide (H_2S) has to be removed from the biogas to protect combustion equipment and eliminate sulfur dioxide generation. This is a two-step process at the WQCF. Step one is to inject ferric chloride into each digester. This system consists of two 1,500-gallon chemical tanks and a dedicated chemical metering pump for each digester. Ferric Chloride is dosed to reduce the H_2S in the biogas from 2,000 ppm to approximately 300 ppm. Approximately 160 gallons per day of ferric is dosed in the digesters. The biogas is then sent to the H_2S media vessel which uses absorption media such as Sulfatreat to reduce the H_2S to less than 5 ppm. The H_2S removal system works well. However, the two 1,500-gallon chemical tanks are too small for a full bulk chemical delivery, thereby increasing the chemical cost on a per gallon basis and preventing some vendors from servicing the WQCF.

9.12.3 Biogas Booster Blowers

Four hermetically sealed multi-stage biogas booster blowers are used to pull biogas through the H2S media vessel and provide pressure to the gas flare, boilers, or BioCNG equipment. Each booster blower is rated at 130 scfm at 2 psig discharge pressure and 5 hp. The blowers are staged on and off by SCADA based on the biogas equipment operating.

9.12.4 Hot Water Boilers

There are two hot water boilers with an output heat rating of 3.34 million BTU/hr each dedicated to heating the digesters with hot water. The boilers can fire biogas or natural gas. There are no operational issues with the boilers.

9.12.5 Bio-CNG System

Photos of the Bio-CNG system are shown on **Figure 9-19**. The BioCNG system from Unison uses membrane technology to separate CO_2 from CH_4 in the biogas. Siloxanes are also removed from the biogas as part this process. The CO_2 along with a small amount of leak through CH_4 (Off Gas) is burned in a waste gas boiler and used to heat the digesters. The purified CH_4 is compressed into CNG and sent to the truck loading facility for use in City garbage trucks. The BioCNG system produces 500 diesel gallon equivalents (DGE) of CNG for City use.



Compressed Biogas Fueling Facility



H2S Removal and BioCNG Generation Equipment



FOG Storage Tank and Off Gas Equalization Tank



H2S Removal and BioCNG Generation Equipment

Figure 9-19. Bio CNG System

9.12.6 Waste Gas Boiler

A 1 million BTU/hr waste gas boiler burns the off gas from the BioCNG system. This boiler incorporates a fuel blending system to use additional natural gas to achieve combustion in the boiler. All heat is recovered to heat the digesters. Excess heat is sent to an exterior radiator.

A waste gas flare rated at a maximum flow of 300 SCFM and 10 million BTU/hr is used to burn excess biogas when not needed for heating or CNG production. The flare is an enclosed type with a blower and motorized louvers that controls the combustion temperature to 1,600F meeting air board regulations. The flare turns on and off by SCADA based on cover levels in Digester No. 3 and 4.

9.12.7 CNG Fueling Station

Photos of the CNG Fueling Station are shown on **Figure 9-20**. The CNG fueling system utilizes the following equipment.

- Two low pressure CNG storage vessels each storing 12,400 scf of CNG at 80 PSIG maximum pressure
- Fifteen high pressure storage cylinders each storing 11,430 scf of CNG at 4,500 psig maximum pressure
- Two 200 hp gas compressors each rated at 450 scfn of CNG at a discharge pressure of 4,500 psig. The compressors are used on both BioCNG gas and natural gas as if there is not enough BioCNG to keep up with fuel demands.
- A gas dryer to dry the BioCNG and natural gas prior to compression.
- Two hydraulic compressors (HY-C) to pump CNG from the high-pressure storage vessels to the fuel dispensers.
- One fast fill and 32-time fill fuel dispensers.
- SCADA control of the system.

The CNG fueling station is used daily by the truck fleet and is functioning properly without issues.



CNG Fueling Station



CNG Fueling Station Pump



BioCNG Compressor



BioCNG Storage Tanks

Figure 9-20. CNG Fueling Station

9.12.8 400 kW Generator

A 400-kW generator was installed as part of the phase III expansion. At the time of installation the generator was unable to pass air permit requirements and has not been operated since installed. The generator has been out of service for more than 10 years and is abandoned.

9.12.9 Performance Assessment of Biogas Utilization Facilities

The existing biogas utilization facilities are performing satisfactorily and are not planned to be expanded with the Phase IV Project Expansion Project.

Digester heat demand is less than anticipated and the waste gas boiler radiator is too small to handle the excess heat and a larger replacement radiator is recommended for system stability. Plant staff at times are forced to dump heat into the out of service digester which is not a desired long-term solution.

The H_2S removal system works well. However, the two 1,500-gallon chemical tanks (ferric chloride) are too small for a full bulk chemical delivery, preventing some vendors from servicing the WQCF. The smaller tanks also increase the cost of the chemical as the freight charge on a per gallon basis is higher. It is recommended to replace the two 1,500-gallon chemical tanks with two 2,700-gallon chemical tanks (ferric chloride) so a full bulk chemical delivery can be received, thereby reducing the per gallon cost of the chemical and making it possible for other vendors to service the WQCF.

9.13 ELECTRICAL SUPPLY AND DISTRIBUTION

The electrical power system for the WQCF includes the following components: 1) 17kV switchgear; 2) 17 kV cabling system; and 3) Power distribution equipment to loads.

9.13.1 Normal Electrical Power System

The WQCF receives power from Pacific Gas & Electric (PG&E) at 17kV from overhead distribution lines via a PG&E-owned 17kV above ground distribution cable serving the site that undergrounds right before the 17kV switchgear. The site 17kV switchgear consists of a lineup of outdoor-rated enclosures containing the incoming cable termination section, utility revenue metering equipment, a main vacuum circuit breaker, and two feeder vacuum circuit breakers (A and B). Auxiliary compartments in the switchgear contain voltage transformers, protective relays and controls, a control power transformer and switchgear batteries used for close and tripping power for the circuit breakers.

The 17kV cabling system distributes power from the site 17kV switchgear to each of the 17kV:480-volt pad mounted transformers located at the various process areas. Two sets of 17kV feeder cables are routed from the switchgear (one set from each of the two feeder circuit breakers (A and B)) to each of the pad mounted transformers to provide a redundant path for the distribution of 17kV power in the event of a 17kV feeder cable or 17kV feeder breaker failure. The 17kV cabling system is routed to each of the process area pad mounted transformers via a series of underground conduits and medium-voltage vaults.

480-volt main switchboards are located at all process areas to provide service to local loads. 480-volt main switchboards contain automatic transfer switches (ATSs) to serve process loads from normal utility power and during an outage from the site emergency generator system. Service to the 480-volt main switchboard from normal utility power is from the local process area 17kV pad mounted transformer (described previously) to the normal power terminals of the ATS. The load terminals of the ATS provide both normal and emergency backed power to the 480-volt main switchboard bus. 480-volt feeder breakers at the main switchboard bus feed process area motor control centers (MCC), and other 480- volt loads.

9.13.2 Emergency Electrical Power System

The purpose of the emergency power system is to generate and distribute emergency power to all process loads connected through their automatic transfer switches (ATSs) at the individual process areas to the emergency power system.

There are four emergency generators at the WQCF. The generators are located at the IPS (1 generator), Effluent MCC/Generator Building (1 generator), and SSF MCC Building (2 generators). A future fifth emergency generator is planned for the Effluent MCC/Generator Building. The Effluent MCC/Generator Building is designed to accommodate this future emergency generator and its related switchgear.

The four emergency generators are identical Caterpillar diesel generators, rated 1500kW at 0.8 power factor (1875 KVA), with 480-volt, three-phase wye-grounded power output. Each generator has its own PLC-based control panel with graphical operator interface display providing alarms, diagnostics, status, and analog trending data.

9.13.3 Performance Assessment of Electrical Supply and Distribution

The existing electrical power system is performing satisfactorily and will not require major upgrades until the Phase IV Project Expansion Project.

The existing generators come on at the same time in parallel and load shed as needed. The generator system is performing satisfactorily. However, the generators run on analog Modbus, and controls need to be updated to interface better with the plant electrical system. The fifth emergency generator at the Effluent/Generator Building will not be required until the Phase IV Expansion Project.

9.14 INSTRUMENTATION AND ELECTRICAL CONTROLS

The WQCF is equipped with instrumentation and electrical controls which provide local monitoring and analytical capability as well as both manual and automatic process controls.

The City of Manteca has standardized on the use of Schneider-Electric Modicon PLCs for its controller platform. This platform of PLCs is used across all City systems including at the WQCF, remote lift and stormwater pumping stations, and at water facilities. Approximately 75% of controllers at the WQCF are Modicon with the majority of these being legacy Quantum, Compact, and Momentum models. There are a few Allen-Bradley PLCs mostly from package process control systems.

Each major process area has a programmable logic controller (PLC) to provide automatic process control and to function as a communication controller. Supervisory Control and Data Acquisition (SCADA) servers at Administration/Laboratory Building pull data directly from the PLCs. The communication protocol used is “Ethernet” over fiber optic cables in a star configuration between the PLCs and the SCADA servers.

The existing operator interfaces are mainly split between Schneider-Electric Magelis touchscreen interface terminals and Rockwell PanelView Plus touchscreens that have been provided with package systems. These operator interfaces are used by field operations to monitor systems and to make changes in the field. In some cases, these field interfaces only provide monitoring and control of specific processes and are generally from package system suppliers. In some cases, these local operator interfaces have additional information and functionality that has not been provided at the overall SCADA system, such as filter, power distribution, and UV systems.

9.14.1 Performance Assessment of Instrumentation and Electrical Controls

A SCADA Master Plan for the WQCF was completed in 2020 by Carollo Engineers. The Master Plan identified numerous operational and hardware deficiencies with the SCADA system. The following is a list of recommended improvements:

- Provide new core SCADA server and network system migrating to Ignition SCADA HMI software.
- Provide remote site PLC upgrades for sewer and stormwater lift stations.
- Replace existing WQCF legacy PLC systems and associated network hardware as well as the operator interfaced terminals (OITs) for modernization and standardization of equipment and added system reliability (this project was titled “WQCF Control Panel Upgrades” in the 2020 SCADA Master Plan but the fiber optic cabling portion of the project was already completed).
- Upgrade switchgear and power systems PLCs to latest supported model.

Recommended improvements to instrumentation and electrical controls are included with the Interim Improvement Projects listed in **Table 9-3.**

9.15 AUXILIARY SYSTEMS

The WQCF auxiliary systems include the chemical handling facilities, biofilters, and the plant water well system.

9.15.1 Chemical Handling Facilities

The chemical handling facilities include polymer blending/feed systems, chemical metering pumps, and chemical storage tanks. The chemical storage tanks were designed to hold polymer, poly aluminum chloride (PAC), and caustic soda. Coagulant and polymer can be added to secondary effluent immediately following the FFPS through a chemical injection line. Chemical addition is required by Title 22 when filter influent turbidities are greater than 5 NTU for more the 15 minutes. Historically, when the secondary treatment process is functioning well, chemical addition is not necessary. Caustic soda is injected when necessary to control pH levels.

9.15.2 Biofilter Systems

The biofilters are used to reduce the odorous gasses present at the Headworks and IPS and primary treatment facilities. Three biofilters are located at the WQCF. A lava rock biofilter which is described in the Headworks and IPS section of this chapter. Premanufactured “Biocube” odor control biofilter systems are located near the northside and southside primary treatment facilities (aerated grit tanks and primary sedimentation basins). The Biocube systems treat foul air from the covered aerated grit tanks and primary sedimentation basins. The Biocube biofilters are currently not in operation because the covers must be left open for maintenance access.

9.15.3 Plant Water Well System

The plant water well is located south of the recycled water pump station. The well was installed as part of the Phase III Expansion Project, Schedule D, to replace the existing wells at the plant. The plant water well consists of the well, pump, and a sand filter. This well system serves as a backup to the recycled water system and is connected to the same piping.

The plant water well is approximately 200 ft deep with a 16-inch diameter casing. The plant water well pump is a five stage, vertical turbine type pump with a rated capacity of 670 gpm at a TDH of 280 ft. and is driven by a constant speed 60-hp electric motor. The motor is equipped with a variable frequency drive.

9.15.4 Performance Assessment of Auxiliary Systems

The existing auxiliary systems are mostly performing satisfactorily except none of the aerated grit tanks and primary sedimentation biofilters are not in use because the odor control covers for are too heavy and difficult to open and close for maintenance, and therefore, are being left open.

The chemical handling caustic tanks and piping was not insulated, or heat traced. The WQCF needs caustic for alkalinity in the winter. To save money caustic is purchased as 50% solution, but the pipes will freeze which creates operational problems.

Future recycled water use is described in the Reclaimed Water Facilities Master Plan (January 2017 revised draft) and recommended improvements from this report may require modifications to the Reuse Pumps and backup plant water system.

9.16 RECOMMENDED INTERIM IMPROVEMENTS

A capacity study of the WQCF was recently completed (City of Manteca WQCF 2021 Capacity Assessment prepared by HERWIT Engineering [HERWIT] and Stantec, March 18, 2022) that determined immediate improvements to the WQCF that are needed for nitrogen removal. Without these improvements, the WQCF will be challenged to meet permit requirements for the projected near-term flows and loadings. The following **Table 9-3** lists the improvements and project costs from the WQCF 2021 Capacity Assessment, basis of design information from PACE and HERWIT Engineering for the secondary treatment improvements, and other improvements that were identified in this chapter from previous studies and interviews with plant staff.

The Interim Improvements project costs were developed from previous study cost estimates adjusted to the March 2023 Engineering News-Record Construction Cost Index (ENRCCI) 20-Cities Average of 13,176. Where previous cost estimates were not available, construction costs were developed using costs for similar construction at other wastewater treatment plants and equipment manufacturer quotes. Project costs for each item in **Table 9-3** were estimated as separate projects with 35 percent added to the construction estimate for engineering, construction management and administration.

Table 9-3. Recommended Interim Improvements Project Costs[1]

WQCF ID	Description	Estimated Project Cost
Recommended Interim Improvements Needed Immediately		
1	North and South Plant WAS Pump Replacement Project	$2,827,000
2	South Plant RAS Pump Replacement Project	$1,652,000
3	North and South Plant Aeration Basins Improvements	$11,696,000
	Subtotal	**$16,175,000**
Interim Improvements for Additional Surety and Ability to Accept Food Waste [2]		
4	Add sidestream treatment of sludge dewatering return flows to reduce nitrogen loads to the secondary treatment system, thereby improving nitrogen compliance and sludge settleability and providing flexibility to accept food waste.	$20,205,000
5	Add Centrifuge No. 3 to process additional solids at the dewatering building.	$5,130,000
6	Add DAFT No. 3 to provide redundant DAFT for thickening of sludge prior to digestion [2]	$3,930,000
	Subtotal	**$29,265,000**
Instrumentation and Electrical Control Improvements [3]		
7	Core Supervisory Control and Data Acquisition (SCADA) System	$1,127,000
8	Remote Site Process Logic Controller (PLC) Upgrades	$1,727,000
9	PLC and Operator Interfaced Terminal (OIT) Replacement	$1,374,000
10	Switchgear PLC Upgrades	$127,000
	Subtotal	**$4,355,000**
Other Improvements		
11	Add Influent Pump No. 5	$1,048,000
12	Lightweight Covers for aerated grit tanks, primary sed. basins, & chlorine contact tank	$5,792,000
13	Repair Biofilter and modify ventilation system at Headworks and IPS [4]	$2,080,000
14	UV Disinfection System Upgrade	$15,583,000
15	Piping Modification to Separate Plant Water System from Off-Site Reclaimed Water	$636,000
16	Replace Secondary Effluent Equalization Pond Liner	$2,101,000
17	Headworks Screen No. 3 [5]	$900,000
18	FOG Receiving Station Screening System	$200,000
19	Bulk Ferric Chloride Solution Tanks	$351,000
20	Construct new overflow boxes and piping for Digesters No. 1 and 2	$706,000
21	Provide platform and handrail for gas pressure relief valves at all digesters	$205,000
22	Install new waste heat radiator	$198,000
	Subtotal	**$29,800,000**
	Grand Total	**$79,595,000**

Notes:
[1] Total project cost includes 35% of the total construction cost for engineering, construction management and administration.
[2] Costs escalated from WQCF 2021 Capacity Assessment.
[3] Costs escalated from the report, City of Manteca WQCF SCADA Master Plan – Technology Drive Solutions for Safe and Reliable Water Quality (Carollo Engineers, Inc., April 2020).
[4] Cost escalated from the technical memo, Manteca WQCF Biofilter Evaluation (HERWIT and Stantec, February 2015).
[5] Cost obtained from the recent project, WQCF Bar Screen Project, which was started up in October 2022.

Key:
WAS = waste activated sludge
RAS = return activated sludge
IMLR = internal mixed liquor recycle
DAFT = Dissolved Air Flotation Thickener

10.0 WQCF PHASE IV EXPANSION PROJECT

To accommodate future increases in flows and loads the 2007 WQCF Master Plan Update prepared by Nolte Associates Inc. anticipated, under the Phase IV Expansion Project, expanding treatment capacity to 17.5 Mgal/d (ADWF) and another Phase V Expansion Project to accommodate build-out conditions at 27 Mgal/d (ADWF). The current Manteca full build-out flow presented in this WWMP (see **Chapter 5**) is approximately 15.3 Mgal/d (ADWF). Adding Lathrop's flow contribution of 1.45 Mgal/d (14.7% of 9.87 Mgal/d) gives a total flow of 16.8 Mgal/d (ADWF). Planning the next expansion for 17.5 Mgal/d (ADWF) would provide enough treatment for Manteca's full build-out flow plus Lathrop and any additional flow contributions from other developments outside of the City up to a limit of 0.70 Mgal/d (ADWF).

Based on a population growth rate of 2.8% and assuming influent loadings to the WQCF increase proportional to population growth, the proposed Interim Improvements will provide treatment capacity until FY 2030/2031. The Phase IV Expansion Project would then increase the true ADWF capacity (without in-plant recycle) from 8.23 Mgal/d to 17.5 Mgal/d and provide treatment capacity until FY 2057/2058 serving an equivalent Manteca population of 236,000 as shown on **Figure 10-1**.

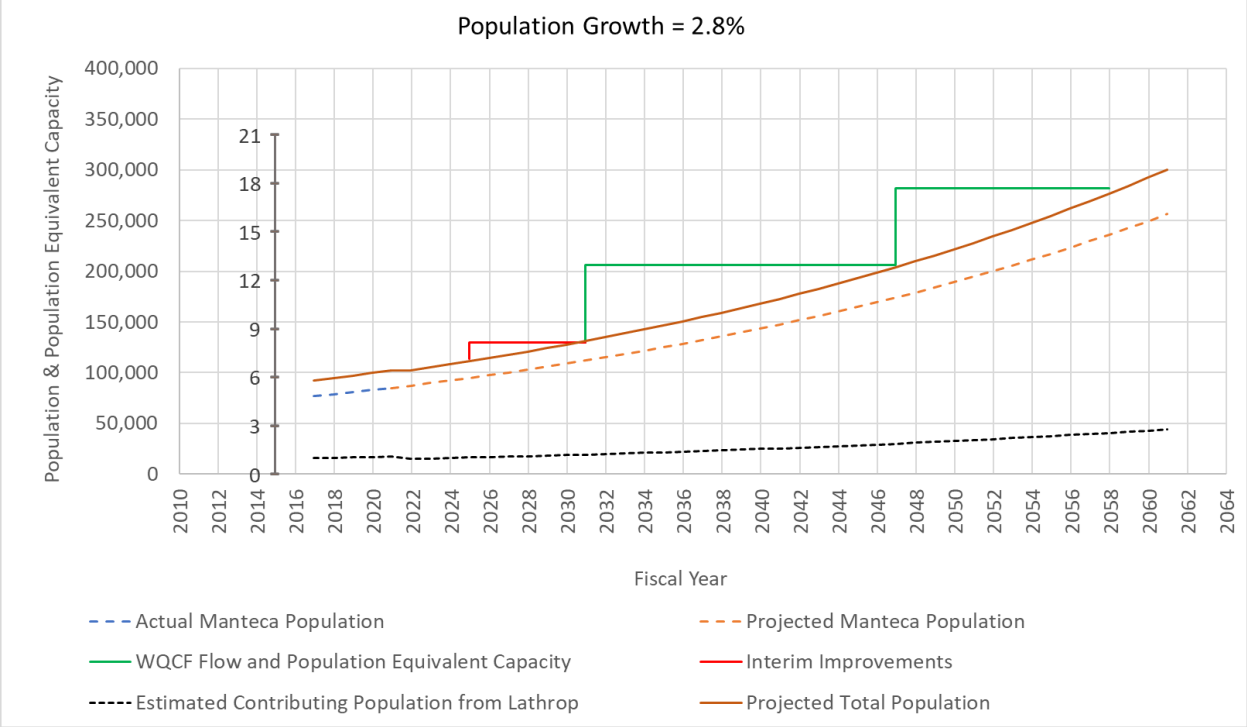


Figure 10-1. Estimated Population Growth and Proposed WQCF Phase IV Expansion

Expansion from 8.23 Mgal/d to 17.5 Mgal/d (i.e., building 27 years of treatment capacity) in one stage is not recommended because discharge permit requirements are subject to change every five years and future wastewater treatment technologies could make the current treatment technologies obsolete a decade from now. This alternatives analysis will assume the Phase IV Expansion Project is constructed in

two stages (Stage 1 and Stage 2) with each stage having an incremental treatment capacity of 4.65 Mgal/d ADWF (approximately 9.3 Mgal/d total of treatment capacity will be added when the two stages are completed).

The remainder of this chapter includes the following sections:

- Treatment Process Selection
- Recommended Phase IV Expansion Project
- Phase IV Expansion Project Costs

10.1 TREATMENT PROCESS SELECTION

The following treatment processes alternatives for the Phase IV Expansion Project are identified and described in this section:

- Alternative 1: Conventional Activated Sludge (CAS) Process.
- Alternative 2: Membrane Bioreactor (MBR) Process.
- Alternative 3: Sequencing Batch Reactor (SBR) Process.
- Alternative 4: Integrated Fixed-Film Activated Sludge (IFAS) System.
- Alternative 5: Granular Activated Sludge (GAS) Process.

10.1.1 Alternative 1: Conventional Activated Sludge (CAS) Process

The conventional activated sludge system for biological nitrogen removal uses the Modified Lutzak Ettinger (MLE) process, similar to the existing Southside Plant. Key components of the MLE process include reactor basins, secondary clarifiers, and a RAS pump station. The reactor basins include pre-anoxic zone followed by aerobic zone. At the end of the aerobic zone, there is an internal mixed liquor recycle pumping system that recycle mixed liquor back to the beginning of the pre-anoxic zone. Mixed liquor flows to the secondary clarifiers where sludge settles to the bottom and returned to the anoxic zone, whereas clarified effluent flows over the clarifiers weirs.

Primary sedimentation tank effluent is mixed with the return activated sludge (RAS) and flow to the anoxic basin where microorganisms utilize nitrates instead of oxygen for BOD removal. Nitrate is fed to the anoxic basin by two streams: (1) the RAS; and (2) the internal recycling from the end of the aeration zone. Mechanical mixers would be provided in the anoxic basin to keep the solids in suspension. Aeration is provided using air diffusion and blower system to supply oxygen needed for BOD and ammonia oxidation.

10.1.2 Alternative 2: Membrane Bioreactor (MBR) Process

A membrane bioreactor (MBR) is a suspended growth biological treatment system like conventional activated sludge. However, in the MBR, the secondary clarifier is replaced by a membrane filtration system. Membrane filtration units are typically placed inside activated sludge reactor basins that are specifically designed and located for this use (membrane basins). Treated wastewater effluent is drawn through the membranes, leaving activated sludge solids behind. The membranes provide such a high level of solids removal, that the effluent from the MBR does not need further filtration, such as required with conventional activated sludge. In fact, the MBR effluent is superior to the effluent of a conventional activated sludge system followed by effluent filters, having a typical effluent turbidity less than 0.2 NTU, compared to 2 NTU for the conventional system. The low turbidity is highly reliable because the membranes provide an absolute barrier to solids larger than the pore size of the membranes. Because solids settling is not required in a MBR system, mixed liquor solids concentrations can be typically about three times as high as those in a conventional activated sludge system. Because of this and because there is no need for clarifiers or separate filters, the MBR system will have a much smaller footprint than a conventional system.

10.1.3 Alternative 3: Sequencing Batch Reactor (SBR) Process

The Sequencing Batch Reactor (SBR) system is an activated sludge process designed to operate under non-steady state conditions. The SBR process is a fill and draw process that operates in a true batch mode with aerobic conditions, anoxic conditions, and sludge settlement all occurring in the same tank. The SBR process eliminates the need for secondary clarifiers, RAS pumping, and internal mixed liquor pumping.

Primary effluent is introduced into the SBR tank, one batch at a time. Normally, a minimum of two SBR tanks are provided, so that one tank receives wastewater at a time. Wastewater treatment is achieved by a timed sequence of operations which occur in the same SBR Tank, consisting of filling, reaction (aeration), settling, decanting, idling, and sludge wasting. The various stages in the sequence are as follows:

- **Stage 1: Fill** – During fill, the influent valve is opened allowing raw influent to enter the basin. At the beginning of the fill period, no aeration is allowed to promote anoxic conditions, which discourages the growth of filamentous bacteria and promotes nitrate removal. During the later part of the fill period, the aeration system is turned on to allow BOD oxidation and Simultaneous Nitrification/ Denitrification (SND). The high oxygen uptake creates an aerated anoxic condition where blowers are operated yet residual D.O. levels remain near zero.
- **Stage 2: Reaction** – Once the SBR reaches top water level or the designated fill time has been reached, the flow will be diverted to another SBR basin. Aeration and mixing occur in the rector until complete biodegradation of organics has occurred. Since no flow enters the basin during react, no short circuiting of raw, untreated waste can occur. The aeration system can be cycled on / off to help promote denitrification, if needed.

- **Stage 3: Settling** – Following react, the SBR will begin a settle mode in which liquids / solids separation occurs. No influent enters the basin during this period, allowing for a perfect quiescent condition. All the reactor volume is used for solids separation. The settle period typically lasts for 45 minutes but is field adjustable through the operator setpoints.
- **Stage 4: Decanting** – The effluent withdrawal (Decant) begins once the settling period is completed. A floating decanter is used to maximize interface between the withdrawal ports and the settled biomass. The decanter is designed to remove effluent from below the water surface to prevent the inclusion of foam, scum, or floatable materials. Typical systems will have roughly 25%-35% of the basin contents removed from the upper portion of the reactor during the decant period.
- **Stage 5: Idling** – During idle, waste activated sludge is typically removed to maintain a desired biomass inventory in the reactor. The aeration and mixing system are typically not operated during idling and the reactor simply waits for the next cycle to begin.

10.1.4 Alternative 4: Integrated Fixed-Film Activated Sludge (IFAS) System.

The IFAS is a process that includes fixed-film media inside conventional reactor basins so that the biomass will grow both on the media (attached) and in the bulk liquid (suspended). The biofilm on the media has a longer SRT than the bulk liquid SRT, which is beneficial to retain the slow growing microorganisms (nitrifiers) in the system. The media can be either fixed (web-type media or structured sheet media) or floating (loose plastic shapes that are free to circulate throughout the reactor basin). Screens or sieves would be used to keep the floating media from flowing out of the reactor basin with the mixed liquor outflow.

10.1.5 Alternative 5: Activated Granular Sludge (AGS) Process

AGS is a process in which microorganisms form dense granules rather than light flocs generally formed in conventional activated sludge. Granular sludge is compact and settles rapidly, which results in an increased capacity for a given volume by allowing the process to operate at higher mixed liquor concentrations. Granules consist of layers of specialized bacteria in aerobic, anoxic, and anaerobic zones, which allows nitrification, denitrification and enhanced biological phosphorus reduction processes to occur simultaneously.

AGS is a relatively new technology, and new methods for creating and sustaining a granular sludge are continuously under development. Most current methods rely on selectively wasting less-compact sludge and creating conditions that favor granule-forming biomass. AGS operation is similar to sequencing batch reactor (SBR) operation where all treatment (organics removal, nutrient reduction, and solids settling) takes place in one tank.

10.1.6 Screening Criteria Matrix

The above five technologies were screened based on eight evaluation criteria shown in **Table 10-1.** Alternative 1 - CAS and Alternative 2 – MBR have the highest favorable ratings and are shortlisted for further evaluation.

Table 10-1. Secondary Treatment Alternative Screening

	Criterion	Alternative 1 Conventional Activated Sludge (CAS)	Alternative 2 Membrane Bioreactor (MBR)	Alternative 3 Sequencing Batch Reactor (SBR)	Alternative 4 Integrated Fixed Film Activated Sludge (IFAS)	Alternative 5 Activated Granular Sludge (AGS)
1	Performance Robustness	● * Robust secondary treatment	● * Robust secondary treatment	● * Robust secondary treatment	● * Performance of biofilm processes is difficult to predict or model	● * Performance of granules is difficult to predict or model
2	Proven Technology	● * Tried-and-true	● * Proven technology	● * Proven technology	● * Performance of biofilm processes are difficult to predict or model	● * AGS is relatively new
3	Operational Complexity	● * Operations familiar with the system	● * Highly automated * Operators will operate two systems	● * Highly automated * Operators will operate two systems	● * Highly automated * Operators will operate two systems	● * Highly automated * Operators will operate two systems
4	Sustainability	● * Efficient BNR process	● * Required increaseed energy consumption for air scour and low alpha * Membrane replacement * Chemicals used for membrane cleaning	● * Efficient BNR process	● * Required increaseed energy consumption due to high DO set point	● * Required increaseed energy consumption due to high DO set point
5	Market Competition	● * Not a proprietary process	● * Proprietary process. Several vendors can supply	● * Proprietary process. Several vendors can supply	● * Proprietary process. Few vendors can supply	● * Proprietary process. Few vendors can supply
6	Footprint	● * Requires large footprint	● * Compact	● * Compact	● * Compact	● * Compact
7	Level of treatment / Effluent Quality	● * Low nitrogen concentration, moderate turbidity turbidity concentration	● * Low nitrogen and turbidity concentrations * Filtered	● * Low nitrogen concentration, potential high effluent TSS due to scum	● * Low nitrogen concentration, moderate turbidity turbidity concentration	● * Potential high effluent nitrogen and TSS.
8	Effect on Filtration and Disinfection	● * No effect	● * No effect	● * Post equalization required for continuous flow to UV	● * No effect	● * Post equalization required for continuous flow to UV

● Favorable ● Moderate ● Not Favorable

10.1.7 Evaluation of Shortlisted Alternatives

The 2007 WQCF Master Plan Update prepared by Nolte Associates Inc. recommended in-kind expansion of the existing Southside Plant facilities up to an ADWF of 17.5 Mgal/d for the Phase IV Expansion Project. The purpose of this section is to evaluate the in-kind CAS expansion versus the MBR (i.e., the two shortlisted alternatives) to determine which alternative is more appropriate, especially with the changed water quality objectives or other conditions since the last master plan update.

As described in **Chapter 8**, the most significant change to the water quality objectives since the last update is that an effluent limit on Nitrate + Nitrite Nitrogen for discharge to the San Joaquin River was added to the NPDES Permit. Recently completed upgrades to the secondary treatment processes and the proposed Interim Project Improvements are addressing this changed condition and can be accomplished with modifications to the existing secondary treatment facilities.

Another significant changed condition is the proposed sale of City owned property south the of main WQCF. This will limit the expansion of the Southside Plant as originally master planned. This site constraint can possibly be addressed by using a less land intensive process such as Membrane Bioreactors (MBRs).

The remainder of this section includes the following subsections:

- Project Alternatives Analysis
- Expansion with Conventional Activated Sludge
- Expansion with MBRs
- Cost Comparison of Alternatives
- Overall Alternatives Analysis
- Recommended Treatment Process Alternative

10.1.7.1 Project Alternatives Analysis

The following two shortlisted treatment alternatives were evaluated for the Phase IV Expansion Project: 1) Conventional Activated Sludge(CAS); and 2) Membrane Bioreactors (MBR).

Common Design Criteria

The secondary treatment process design criteria listed below are applicable to both expansion options.

Flows and Loads. The flows and loads to each expansion stage (the 4.65 Mgal/d) is listed in **Table 10-2**. The influent flow to the secondary treatment is the same as the primary effluent of the primary sedimentation tank. It is presumed that the in-plant recycle streams are returned upstream the primary sedimentation tank. Therefore, the secondary influent will include the raw influent plus the in-plant recycle minus what is removed by the primary sedimentation tank.

Table 10-2. Influent and Secondary Treatment Flows and Loads for 4.65 Mgal/d Design Expansion

Item	Raw Influent	Secondary Influent
Average Dry Weather Flow (ADWF), Mgal/d	4.65	5.21
Average Day Maximum Monthly Flow (ADMMF), Mgal/d	4.84	5.42
Peak Day Wet Weather Flow (PDWWF), Mgal/d	5.81	6.51
Peak Hour Wet Weather Flow (PHWWF), Mgal/d	9.77	10.94
Average Annual BOD5 Load to Secondary Process, lb/d	16,160	10,510
Peak Month BOD5 Load to Secondary Process, lb/d	19,400	12,610
Average Annual TKN Load to Secondary Process, lb/d	2,610	2,130
Peak Month TKN Load to Secondary Process, lb/d	3,130	2,550

Key:
BOD = Biochemical Oxygen Demand
lb/d = pounds per day
Mgal/d = million gallons per day
TKN = Total Kjeldahl Nitrogen

Temperature. It is important to determine the minimum sustained temperature that will exist in the activated sludge process because maximum growth rate for nitrifiers is reduced at low temperatures. The slower the growth rate of nitrifiers, the larger the reactor volume needs to be to promote successful nitrification. The maximum temperature is also important for design because microbial activities increase at high temperatures, resulting in higher rate of oxygen utilization, which impacts the sizing of the aeration equipment. Based on historical data from 2016 to 2020, the effluent temperature ranges from 18°C to 28°C

Solids Retention Time (SRT). The selection of the design solids retention time (SRT) or sludge age probably is the most important design decision because it determines the size of the secondary treatment facilities. The aerobic SRT must be sufficiently long to allow the nitrifying organisms to grow and metabolize essentially all the available ammonia-nitrogen. The anoxic SRT must be long enough for robust denitrification.

The required aerobic SRT varies with temperature, desired effluent ammonia-nitrogen concentration, dissolved oxygen (DO) concentration, and the fraction of the total reactor volume that is aerobic. As shown in **Figure 10-2,** the theoretical total SRT at the minimum design temperature of 18°C is 7.4 days (without a factor of safety), based on 65% of the total reactor volume being aerobic when the DO is 2 mg/L and the effluent ammonia-nitrogen concentration is 1 mg/L. To ensure reliable nitrification performance under actual field conditions, it is appropriate to apply a safety factor. A safety factor (SF) of 1.22 was selected. Accordingly, as shown in **Figure 10-2**, a design total SRT of 9 days is selected. The selected aerobic and anoxic SRTs were confirmed by BioWin simulation.

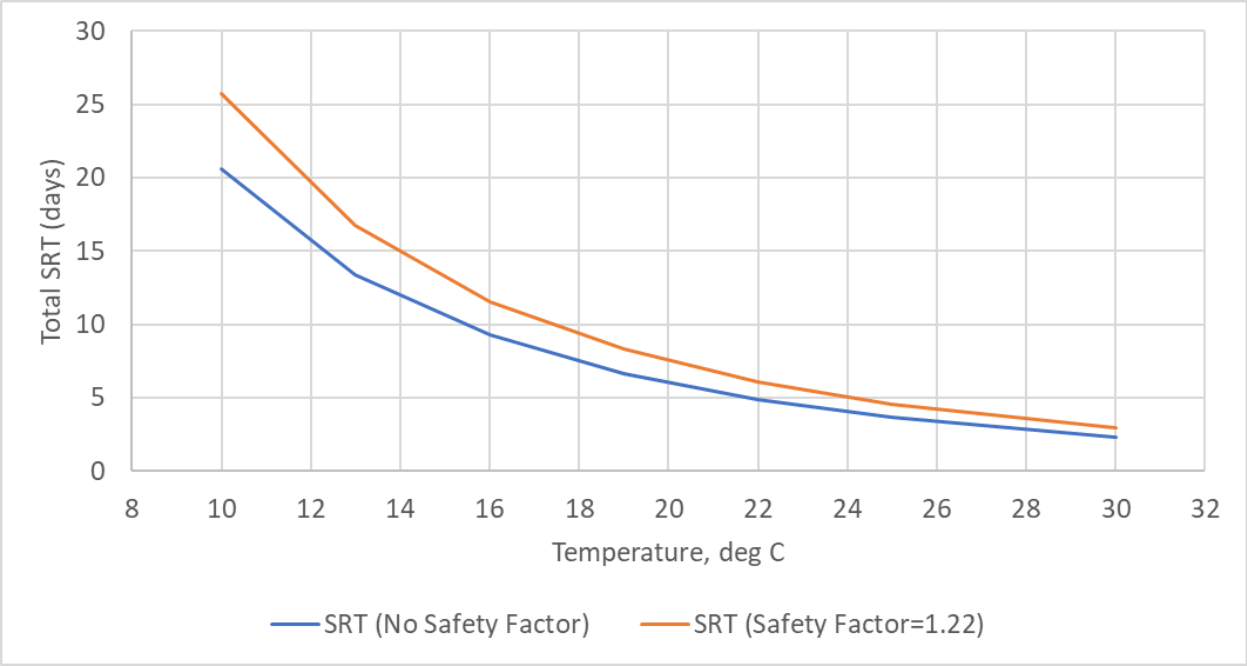


Figure 10-2. Total SRT with and Without Factor of Safety

Sludge Yield. The sludge yield was evaluated as a part of the WQCF 2021 Capacity Assessment. Actual sludge production values were comparable to MOP8 (i.e., the calculated actual sludge yield was 100% of the MOP 8 yield). Therefore, MOP8 sludge yield will be used for design.

Primary Sedimentation Basin BOD Removal Efficiency. Per the WQCF 2021 Capacity Assessment report, the average BOD removal efficiency in the primary sedimentation basin is about 35%, which is in the range of typical values.

10.1.7.2 Expansion with Conventional Activated Sludge

This alternative would include an expansion of the existing WQCF with a new reactor complex south of the Southside Plant Facilities similar to the Southside process except that the aeration basins would have larger anoxic zones for robust denitrification. The new design would have a design ADWF capacity of approximately 4.65 Mgal/d.

Process Design

The following outlines the proposed secondary treatment system process design.

Reactor Volumes. Based on a total SRT of 9 days and a minimum design temperature of 18 °C, the net sludge yield is estimated to be 0.69 lb TSS per lb BOD5 removed. The projected peak month BOD5 load (including in-plant recycles) is about 19,400 lb/d. Assuming 35% is removed in the primary sedimentation tank, the BOD load to the secondary treatment is approximately 12,4600 lb/d. The estimated sludge inventory is approximately 78,400 lbs. Assuming a MLSS concentration of 4,000 mg/L at the peak month

load condition, the required total reactor basin volume is approximately 2.35 million gallons (Mgal) to be split between five trains. Each basin would have an anoxic volume that is 35% of the total volume. The selected basin and zone volumes was validated through BioWin modeling.

Internal Mixed Liquor Recycle Pumps. The IMLR pumps are used to recirculate the mixed liquor from the end of the aerobic zone to the beginning of the anoxic zone where it is mixed with the secondary influent and RAS. It is recommended to install one IMLR wall pump per train. The design capacity of each wall pump should have an estimated capacity of approximately 5 Mgal/d (~500% of secondary influent flow per train.

Sludge Volume Index (SVI). The SVI was evaluated as a part of the WQCF 2021 Capacity Assessment. The SVI data from 2019 through 2021 for the existing Northside and Southside plants were 228, and 204 ml/g, respectively. It is expected that the design of the new train with appropriate size anoxic basin volume and higher dissolved oxygen concentration in the aerobic zone will provide a better settling sludge with a lower SVI. A reasonable SVI value of 200 ml/g is used for design.

Secondary Clarifiers. Two 110 ft diameter clarifiers are adequate to pass a peak hour flow (PHF) of 10.94 Mgal/d at a MLSS concentration of 4,000 mg/L, an SVI of 200, and an underflow rate of 500 GPD per square foot of clarifier area. The secondary clarifiers would have modern features such as an energy dissipating inlet and a flocculating well. A side water depth of 16 ft and an in-board launders are appropriate for this size clarifier.

RAS & WAS Pump Station. Similar to the existing pump station, the new pump station would have three 4.75 Mgal/d pumps. It is recommended to use screw centrifugal pumps (two duty and one standby) on a concrete pad.

Process Modeling. BioWin process simulation software was used to analyze the performance of the existing secondary treatment system. Because the secondary treatment system is directly impacted by the performance of the primary treatment system and by internal plant return flows, particularly those from the solids handling system and the tertiary filtration system, the entire wastewater treatment plant was modeled and simulated in BioWin. The new reactor complex was added to the configuration of the existing plant model previously developed in BioWin**.** Wastewater characteristics used in the BioWin simulations were as determined from previous modeling work at the WQCF, including the diurnal flow and loading pattern, which are needed for dynamic simulations.

The model was used to simulate the whole plant (including the proposed reactor complex) under peak month design loading conditions combined with ADWF. Combining peak month loads with ADWF results in the highest influent concentrations and the need for the most nitrogen removal. The simulation was conducted under the minimum temperature of 18 °C and the design total SRT of 9 days. In the simulation of the new reactor complex, the DO concentration set point was set for 2.0 mg/L in all aerobic zones. The simulation results indicated that the target effluent total nitrogen concentration (below 10 mg/L) could be achieved, thus supporting the proposed design. The BioWin flow diagram and effluent nitrogen concentrations are shown **Figure 10-3** and **Figure 10-4**, respectively.

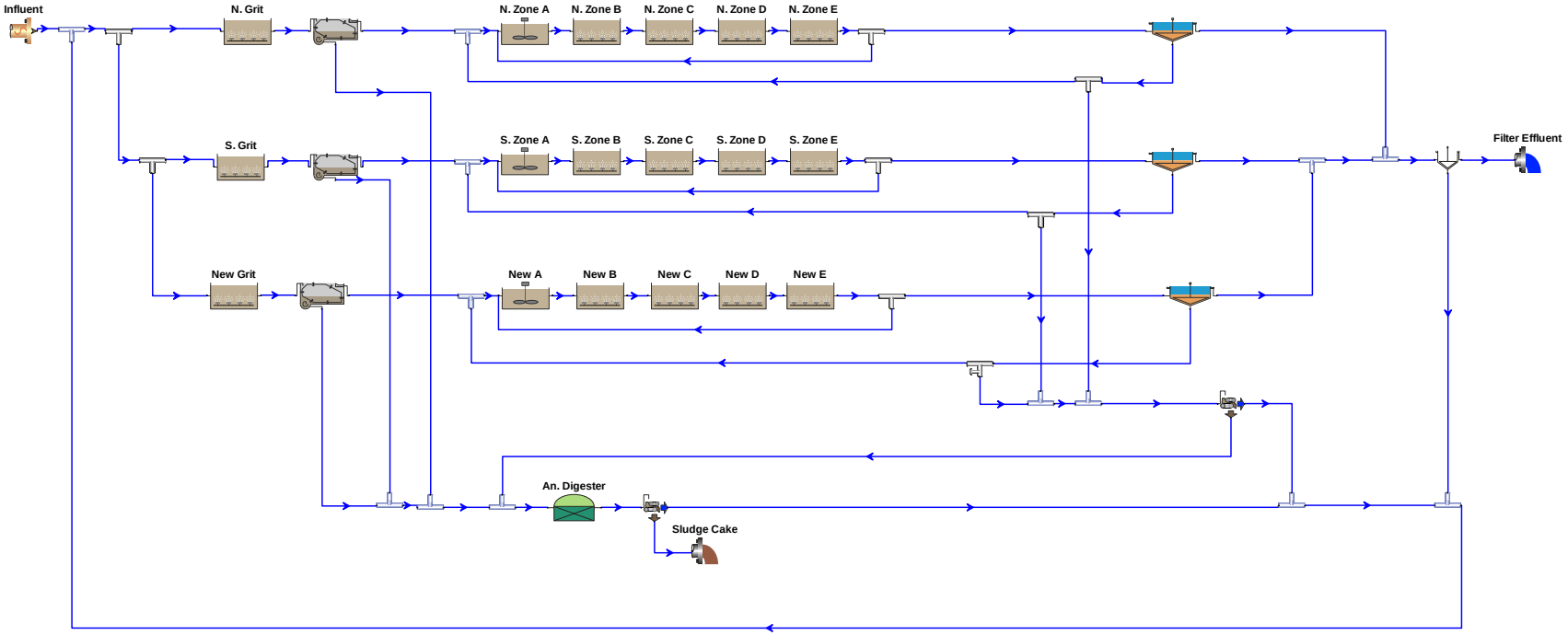


Figure 10-3. BioWin Flow Diagram of Conventional Activated Sludge Expansion Secondary Treatment

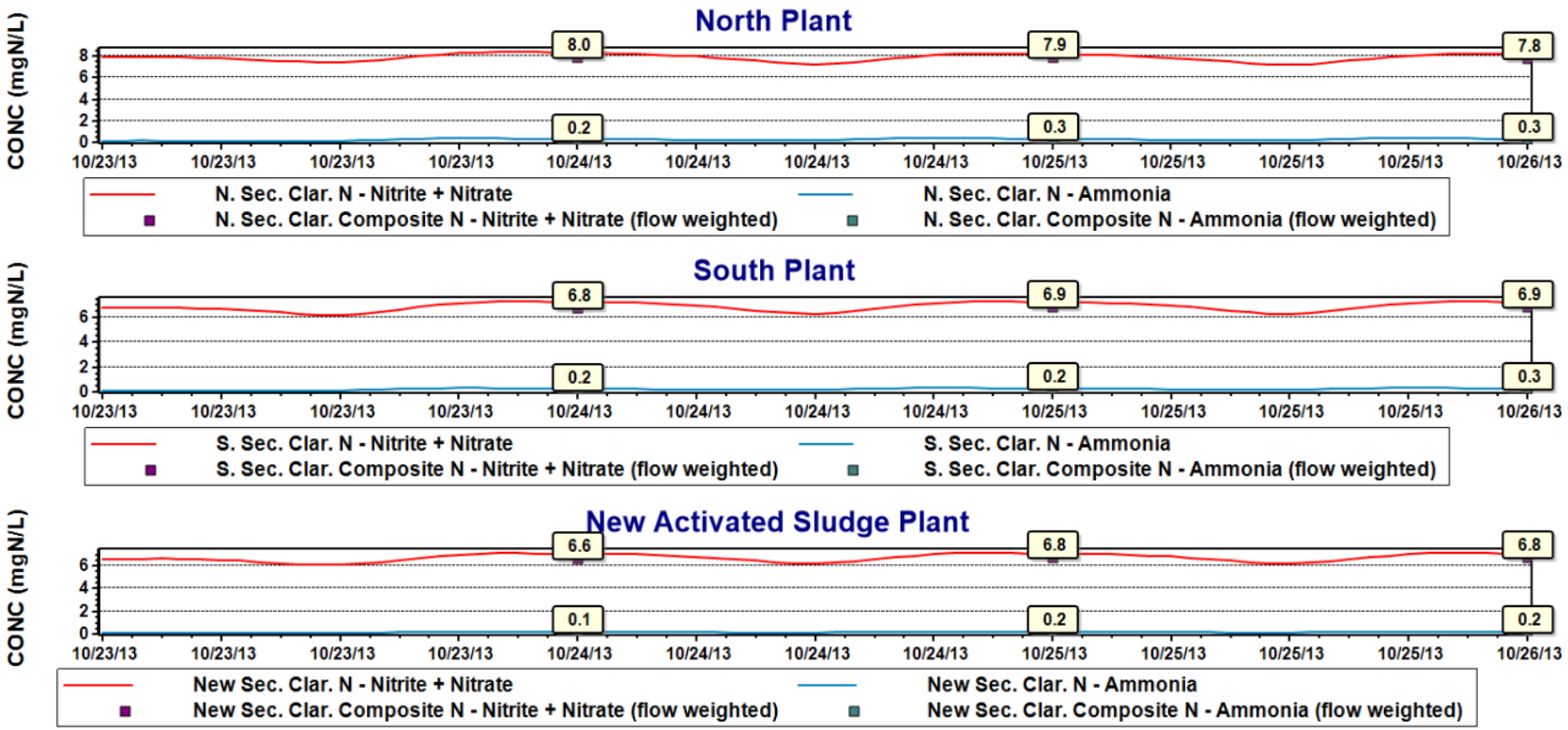


Figure 10-4. Dynamic Simulation Results for Effluent Nitrogen – Conventional Activated Sludge

10.1.7.3 Conventional Activated Sludge Design Summary for Stage 1 Expansion

The following **Table 10-3** is a summary the design criteria for the Conventional Activated Sludge process.

Table 10-3. Conventional Activated Sludge Process Design

Item	Value
Activated Sludge Design Parameters	
Minimum MLSS Temperature, deg C	18
SVI	200
SRT, days	9
MLSS, mg/L	4,000
Reactor Basins	
Total Volume, Mgal	2.35
Number of Trains	5
Volume (each Train), Mgal	0.47
Anoxic Zone Volume (each Train), Mgal	0.165
Aerobic Zone Volume (each Train), Mgal	0.305
Anoxic Zone Mixers	
Number of Mixers (per Train)	2
Type of Mixer	Submersible
Aeration System	
Diffuser Type	Tube Diffusers
Number of Aeration Blowers	3 (2 duty + 1 standby)
Blower Type	High Speed Turbo Blowers
Blower Capacity, scfm	3,900
Blower Horsepower	250
Internal Mixed Liquor Recirculation (IMLR) Pump	
Number of IMLR Pumps (per Train)	1
Pump Type	Wall Pump
Capacity	5 Mgal/d
Horsepower	TBD
Secondary Clarifiers	
Number of Secondary Clarifiers	2
Diameter, feet	110
Side Water Depth, feet	14
Motor Horsepower	1
Return Activated Sludge (RAS) Pump	
Number of RAS Pumps	3 (2 duty + 2 standby)
Pump Type	Screw Centrifugal
Capacity, Mgal/d	4.75

Item	Value
Scum Pump	
Number of Scum Pumps	2 (1 duty + 1 standby)
Pump Type	Chopper
Min Duty Point	60 gpm @ 32.5 feet TDH
Max Duty Point	420 gpm @ 10 feet TDH
Horsepower	5

Key:
gpm = gallons per minute
IMLR = Internal Mixed Liquor Recycle
mg/L = milligrams per liter
Mgal = million gallons
MLSS = Mixed Liquor Suspended Solids
scfm = standard cubic feet per minute
SRT = Solid Retention Time
SVI = Sludge Volume Index
TBD = To be determined
TDH = Total Dynamic Head

Figure 10-5 shows a preliminary site layout of the Conventional Activated Sludge (Stage 1 and 2) Alternative.

ATTACHMENT 3

Stantec

60" NORTH INFLUENT FLOW METERING MANHOLE, S1
NEW ACCESS ROAD AT INTERSECTION OF W YOSEMITE & SWANSON RD, S1
ROAD DEMO, S1
PARKING AREA, S1
MUNICIPAL UTILITIES BUILDING, S1
NEW GATES
COOLING TOWER 5, S2
COOLING TOWERS 1-4, S1
COOLING EFFLUENT BASIN, S1
MCC, S1
BIOSOLIDS DRYING FACILITY, S2
BIOSOLIDS DRYING FACILITY, S1
FOG RECEIVING STATION SCREENING SYSTEM, INT
DIGESTER CONTROL BUILDING, S1
AERATED GRIT TANKS, S2
PRIMARY CLARIFIER, S2
DIGESTER, S1
DIGESTER, S2
ELECTRICAL BUILDING, S2
AERATION BASINS, S2
DIGESTERS PRESSURE RELIEF VALVES PLATFORM & HANDRAILING, INSTALL NEW WASTE HEAT RADIATOR, DIGESTERS NO.1 AND NO.2 OVERFLOW BOXES, INT
NEW SIDESTREAM TREATMENT, INT
BULK FERRIC CHLORIDE SOLUTION TANKS, INT
BIO TOWERS DEMO, S1
COOLING BASIN EFFLUENT PUMP 4, S2
COOLING BASIN EFFLUENT PUMP STATION, S1
PRIMARY EFFLUENT PUMP STATION, INT
NEW DAFT, S1
NEW DAFT, INT
HEADWORKS, IPS, BIOFILTER IMP., INT
RAS PUMP STATION, S2
SECONDARY CLARIFIER, S2
REPLACE SECONDARY EFFLUENT EQUALIZATION POND LINER, INT
UV, INT
AERATED GRIT & PRIMARY SEDIMENTATION BASINS COVERS REPLACEMENT, INT
NEW WAS PUMPS, INT
SECONDARY CLARIFIER, S2
EFFLUENT PUMP, S1
EFFLUENT PUMP, S2
CHECK VALVE, S1
NEW CENTRIFUGE, INT
NEW CENTRIFUGE, S2
NEW CENTRIFUGE, S1
INFLUENT PUMP, S2
INFLUENT PUMP, S1
INFLUENT PUMP, INT
HEADWORKS SCREEN NO.3 , INT
NORTH AND SOUTH AERATION BASIN IMPROVEMENTS, INT
NEW GLYCERIN SYSTEM, INT
NEW RAS PUMPS, INT
AERATED GRIT & PRIMARY SEDIMENTATION BASINS COVERS REPLACEMENT, INT
AERATED GRIT TANKS, S1
RAS PUMP STATION, S1
PRIMARY CLARIFIER, S1
AERATION BASINS, S1
60" SOUTH INFLUENT FLOW METERING MANHOLE, S1
SECONDARY CLARIFIER, S1
SECONDARY CLARIFIER, S1

N

0 80 160 240 320 400 FEET

LEGEND

- INT Interim - 8.23 MGD
- S1 Stage 1 - 12.87 MGD
- S2 Stage 2 - 17.5 MGD
- Future

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Figure 10-5
Preliminary Site Layout for CAS Alternative

10.1.7.4 Expansion with MBR

Like conventional activated sludge, the MBR process utilizes suspended growth biological treatment. However, in the MBR, membrane filtration (instead of clarification) is used to achieve solids-liquid separation so that the solids can be returned to the reactor basin. This method of solids-liquid separation does not depend on solids settleability and is, therefore, much more reliable than clarification. Additionally, the MBR eliminates the need for downstream tertiary filtration and provides a superior quality effluent as compared to conventional activated sludge followed by tertiary filtration. The effluent from the MBR is easier to disinfect and requires lower ultraviolet dosing as compared to a conventional treatment system. Additionally, membrane filtration would serve as a necessary pretreatment step to possible future reverse osmosis for compliance with effluent salinity requirements (conventional treatment with tertiary filtration is not adequate).

Allowable mixed liquor suspended solids concentrations in an MBR are determined by membrane filtration characteristics, not by settling characteristics, and are much higher than those in conventional activated sludge. Typically, the biological reactors for an MBR are designed based on a MLSS concentration of 8,000 mg/L, compared to 3,000-4,000 mg/L in a conventional activated sludge system. The higher MLSS provides the benefit of greater treatment capacity per unit volume of reactor basin. All MBR systems must be preceded by fine screening to protect the membranes from materials in the wastewater such as hair, stringy materials, paper, and small plastic objects that can pass through typical headworks screens and primary clarifiers. The topic of fine screening is considered first below, followed by detailed analysis of the MBR system.

Fine Screens. Depending on the selected membrane supplier, maximum allowable screen openings are between 1 and 3 mm. For this analysis, a 2 mm screen is assumed, which is recommended by several leading MBR manufacturers and is the most common screen size based on Stantec experience. The 2 mm screen would be used for screening primary effluent ahead of the MBR.

Primary effluent would flow by gravity from the existing primary clarifiers effluent channel through the proposed new fine screens and to the MBR system. The MBR process flow would be controlled by a modulating gate or valve ahead of the fine screens. All remaining primary effluent flow not going to the MBR treatment system would go to the existing conventional treatment trains.

For Stage 1, the MBR Screenings Facility would be equipped with two (2) in-channel 2-mm drum screens - one duty and one standby. A third screen will be provided for Stage 2. Each screen would be rated to handle a maximum flow rate of 11.0 Mgal/d. The screenings would be washed and compacted within the screen mechanism before they are discharged into a screenings bin.

For odor and vector control, the screenings bin would be covered. Odors from the influent entering the MBR Screenings Facility will not be an issue since the influent wastewater has been passed through coarse screens, grit removal, and primary clarifiers. Therefore, an odor control system at the MBR Screening Facility would not be required. The fine screen design criteria are summarized in **Table 10-4**.

Table 10-4. Fine Screens Design Criteria

Parameter	Value
Quantity	3 (2 for Stage 1 + 1 for Stage 2)
Type	Drum
Opening Size	2 mm
Capacity (Each)	11 Mgal/d

MBR Process Design

The MBR biological treatment system would be designed as an MLE process similar to the conventional activated sludge alternative. The reactor basin would include an anoxic zone followed by an aerobic zone, each subdivided into compartments in series. Membrane basins containing the membrane filtration facilities would be located downstream from the reactor aerobic zones and would comprise additional aerobic volume. Concentrated mixed liquor remaining in the membrane basins after removal of membrane effluent would be returned to the anoxic zones by RAS pumps. Because the RAS would initially have high dissolved oxygen concentrations (up to 6 mg/L) resulting from air scouring of the membranes, the RAS would be passed through a deoxygenation zone before going into the anoxic zone. Just like the conventional MLE process, denitrification is facilitated by returning nitrates from aerobic zones (in this case from the membrane basins) to the anoxic basins in the RAS flow. The RAS flow in the MBR system would be similar to the IMLR flow plus RAS flow in the conventional system. If not reduced in the deoxygenation zone, the high dissolved oxygen concentration contained in the RAS would be utilized before nitrate in the anoxic basins for the treatment of influent carbonaceous substances, thus reducing the amount of carbonaceous substances available for denitrification and possibly resulting in the need to add glycerin that might not have otherwise been required.

For the purposes of this alternative analysis, the membrane basins considered in this analysis were as sized by Veolia. Additional MBR manufacturers can be considered during detail design, as appropriate. Because MBR systems by different manufacturers can require substantially different detailed designs, an evaluated bid pre-selection process would be recommended before selecting a final MBR system.

A key feature of the membrane filtration system design proposed by Veolia and used as the basis of this analysis is the level of redundancy to be provided. The proposed design is based on “N-1” redundancy, meaning that the membrane filtration system would be able to operate at peak day flow conditions for up to 7 days with one membrane basin out of service. For the Phase IV Stage 1 Expansion (two 4.65 Mgal/d MBR treatment trains), a total of four membrane basins would be provided and operation with only three membrane basins would be possible for up to 7 days. An additional two trains and four membrane basins will be added for Stage 2.

One RAS pump and one permeate pump is needed to be operational for each operational membrane basin. For this analysis, it is assumed that the number of RAS and permeate pumps would equal the number of membrane basins. Therefore, the loss of a RAS pump or a permeate pump would result in the need to take the connected membrane basin out of service.

MBR Modeling Overview. As was done for the conventional process analysis and for the same reasons, the new MBR was added to the configuration of the existing plant. The whole plant (including the new MBR) was simulated under the same conditions of the conventional activated sludge alternative (i.e., peak month load combined with ADWF, under the minimum temperature of 18 °C, at a total SRT of 9 days). The simulation results indicated that the target effluent nitrate plus nitrite concentration (below 10 mg/L) could be achieved, thus supporting the proposed design. The BioWin flow diagram and effluent nitrogen concentrations are shown **Figure 10-6** and **Figure 10-7**, respectively.

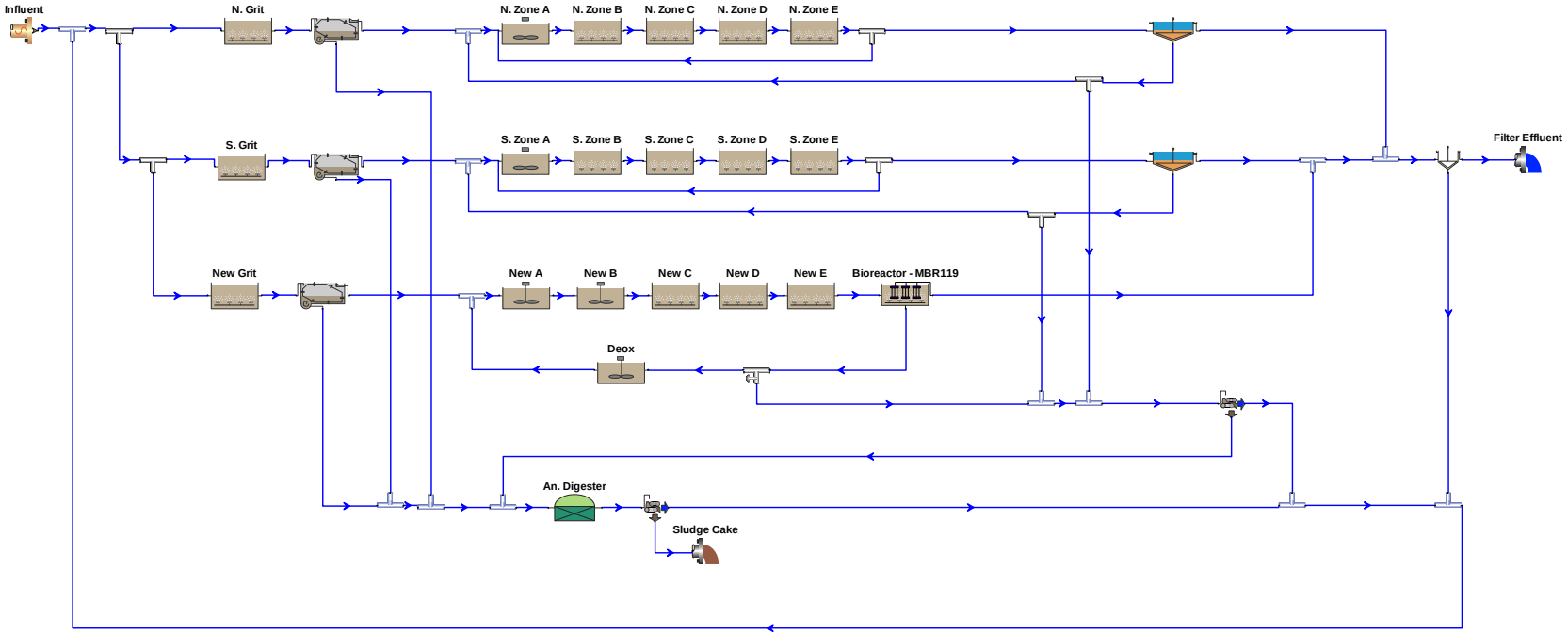


Figure 10-6. MBR Process Flow Diagram

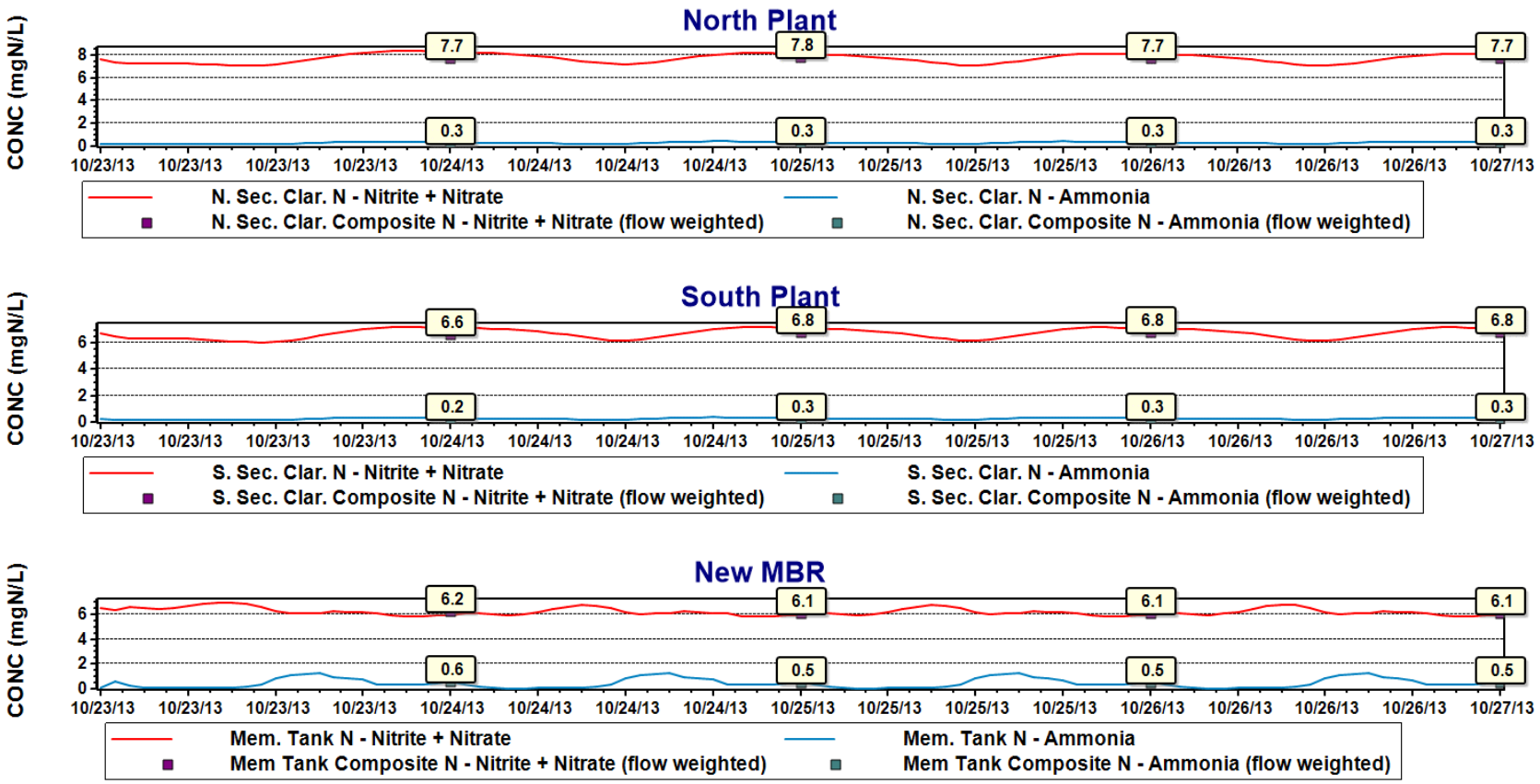


Figure 10-7. Dynamic Simulation Results for Effluent Nitrogen – MBR

10.1.7.5 Design Criteria for New MBR Process

Design criteria for the new MBR process are provided in **Table 10-5**. **Figure 10-8** shows a preliminary site layout of the MBR Process (Stage 1 and 2) Alternative.

Table 10-5. MBR Design Criteria for Stage 1 Expansion

Parameter	Total	Per Train	Notes
Influent Flows			
Average Dry Weather Flow (ADWF), Mgal/d	4.65	2.33	
Peak Month Flow (PMF), Mgal/d	4.84	2.42	
Peak Day Flow (PDF), Mgal/d	5.81	2.91	
Peak Hour Flow (PHF), Mgal/d	9.77	4.88	
MBR Flows and Loads			
Average Dry Weather Flow (ADWF), Mgal/d	5.21	2.60	1
Peak Month Flow (PMF), Mgal/d	5.42	2.71	1
Peak Day Flow (PDF), Mgal/d	6.51	3.26	1
Peak Hour Flow (PHF), Mgal/d	10.94	5.47	1
Average Annual BOD_5 Load to Secondary Process, lb/d	10,510	5,255	2
Peak Month BOD_5 Load to Secondary Process, lb/d	12,610	6,305	2
Other Design Parameters			
Minimum Monthly Temperature, ºC	18	18	
Aerobic SRT, days	5.8	5.8	
Reactor Basin Mixed Liquor Suspended Solids at Max Month Load, mg/L	8,000	8,000	
Membrane Basin Mixed Liquor Suspended Solids at Max Month Load, mg/L	10,000	10,000	
Membrane Bioreactor			
Total Volume of Basin, Mgal	1.23	0.615	
Reactor Anoxic Volume, Mgal	0.45	0.225	
Reactor Aerobic Volume, Mgal	0.49	0.245	
Deoxygenation Zone Volume, Mgal	0.15	0.075	
Number of Membrane Basins	4	2	
Membrane Basin Volume, Mgal	0.0844	0.0422	
Number of Air Scour Blowers	4	2	
Number of RAS Pumps	4	2	
Maximum RAS Flow per Pump, Mgal/d	10.4	10.4	3
Number of Permeate Pumps	4	2	
Permeate Pump Flow, Mgal/d	4	4	4

Notes:
[1] Includes 12% allowance for in-plant recycle flows.
[2] Assumed 35% BOD removal in primary clarifiers.
[3] Total Flow of 3 RAS Pumps (one out of service) = 6 times ADWF.
[4] Total Flow of 3 permeate pumps (one out of service) = 1.1 times PHF.

ATTACHMENT 3

Stantec

60" NORTH INFLUENT FLOW METERING MANHOLE, S1
NEW ACCESS ROAD AT INTERSECTION OF W YOSEMITE & SWANSON RD, S1
ROAD DEMO, S1
PARKING AREA, S1
MUNICIPAL UTILITIES BUILDING, S1
NEW GATES
BIOSOLIDS DRYING FACILITY, S2
BIOSOLIDS DRYING FACILITY, S1
COOLING TOWER 5, S2
COOLING TOWERS 1-4, S1
COOLING EFFLUENT BASIN, S1
MCC, S1
FOG RECEIVING STATION SCREENING SYSTEM, INT
DIGESTER CONTROL BUILDING, S1
DIGESTER, S1
DIGESTER, S2
DIGESTERS PRESSURE RELIEF VALVES PLATFORM & HANDRAILING, INSTALL NEW WASTE HEAT RADIATOR, DIGESTERS NO.1 AND NO.2 OVERFLOW BOXES, INT
NEW SIDESTREAM TREATMENT, INT
BULK FERRIC CHLORIDE SOLUTION TANKS, INT
BIO TOWERS DEMO, S1
HEADWORKS, IPS, BIOFILTER IMPROVEMENTS, INT
COOLING BASIN EFFLUENT PUMP 4, S2
COOLING BASIN EFFLUENT PUMP STATION, S1
PRIMARY EFFLUENT PUMP STATION, INT
NEW DAFT, S1
NEW DAFT, INT
REPLACE SECONDARY EFFLUENT EQUALIZATION POND LINER, INT
UV, INT
AERATED GRIT & PRIMARY SEDIMENTATION BASINS COVERS REPLACEMENT, INT
NEW WAS PUMPS, INT
INFLUENT PUMP, S2
INFLUENT PUMP, S1
INFLUENT PUMP, INT
NEW CENTRIFUGE, INT
NEW CENTRIFUGE, S2
NEW CENTRIFUGE, S1
HEADWORKS SCREEN NO.3 , INT
EFFLUENT PUMP, S1
EFFLUENT PUMP, S2
CHECK VALVE, S1
NORTH AND SOUTH AERATION BASIN IMPROVEMENTS, INT
SPLITTER STRUCTURE, S1
NEW RAS PUMPS, INT
AERATED GRIT & PRIMARY SEDIMENTATION BASINS COVERS REPLACEMENT, INT
AERATION BASINS, S1
PSB, S1
AERATED GRIT TANKS, S1
PSB, S2
AERATED GRIT TANKS, S2
BLOWER AND EQUIPMENT BUILDING, S1
MBR, S1
60" SOUTH INFLUENT FLOW METERING MANHOLE, S1
FINE SCREENS, S1
FINE SCREENS, S2
BLOWER AND EQUIPMENT BUILDING, S2
MBR, S2

N

0 80 160 240 320 400 FEET

LEGEND

- INT Interim - 8.23 MGD
- S1 Stage 1 - 12.87 MGD
- S2 Stage 2 - 17.5 MGD

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Figure 10-8

Preliminary Site Layout for MBR Alternative

10.1.7.6 Cost Comparison of Alternatives

Both the conventional activated sludge and the MBR processes have been analyzed as described in the previous subsections. In this section, cost and other factors relevant to a selection between these alternatives are presented.

Cost Comparison

In comparing costs for the two alternatives, it is important to consider not only the costs for the secondary treatment facilities, but also the costs for other plant facilities affected by the choice of secondary treatment system. In particular, it is noted that the MBR effluent is easier to disinfect and would normally require a less expensive UV disinfection system. It is also noted that the existing downstream tertiary filters have enough capacity for Stage 1 expansion but not for Stage 2. Therefore, tertiary filters for the conventional activated sludge alternative would only be required for Stage 2.

A summary of the facilities requirements and costs for Stage 1 (expansion to 12.87 Mgal/d ADWF) and Stage 2 (Expansion to 17.5 Mgal/d ADWF) for both alternatives is shown in **Table 10-6**. It would be possible to construct both stages at the same time, in which case the costs would be additive. All costs are engineering opinions of probable costs using an Engineering News Record Construction Cost Index (ENRCCI) of 13,176. This cost estimate would have to be adjusted as appropriate to get costs at the actual times of construction.

Table 10-6 shows capital costs, comparative annual costs (annual costs that would be different between the alternatives), and present worth costs. For the purpose of calculating present worth costs for Stage 2, it was presumed that Stage 2 would be constructed 15 years after Stage 1.

As indicated in the table, the capital cost and the total present worth of the MBR are slightly lower than that for the conventional activated sludge alternative in Stage 2 and in combined Stages 1 and 2.

Table 10-6. Facilities Descriptions and Costs

Item	Stage 1 (12.9 Mgal/d)		Stage 2 (17.5 Mgal/d)		Total Both Phases	
	Conv	MBR	Conv	MBR	Conv	MBR
Facilities Description						
Fine Screen Added	None	2 @ 11 Mgd	None	1 @ 11 Mgd		
Reactor Splitter Features	None	Yes	None	Yes		
Anoxic Basin Volume, Mgal	0.82	0.45	0.82	0.45		
Aerobic Basin Volume, Mgal	1.53	0.49	1.53	0.49		
Number of Membrane Basins	0	6	0	6		
Total Membrane Basin Volume, Mgal	0	0.15	0	0.15		
Deox Basin Volume, Mgal	0	0.14	0	0.14		
Membrane Removal Bridge Crane	None	Yes	None	Extend		
Blower Building	Yes	Yes	No	No		
Membrane Blower, Chemical, and Controls Bldg	None	Yes	None	Extend		
Number of Secondary Clarifiers	2	0	2	0		
Secondary Clarifier Diameter, ft	110	NA	110	NA		
RAS Pump Station Added	Yes	In MBR	Add Pump	In MBR		
Tertiary Disc Filters Added	No	None	Yes	None		
UV Added	Yes	None	No	None		
Capital Costs [1]						
Fine Screen System	0	1,868,000	0	600,000	0	2,468,000
Reactor Splitter Box or Other Splitter Features	0	312,000	0	42,000	0	354,000
Reactor Basin with Equipment (Includes MBR Deox)	6,438,000	3,408,000	6,438,000	3,408,000	12,876,000	6,816,000
Membrane Pump Gallery Structure	0	649,000	0	649,000	0	1,298,000
Membrane Equipment Package	0	4,000,000	0	4,000,000	0	8,000,000
Mem Equip Tax + Install (35%)	0	1,200,000	0	1,200,000	0	2,400,000
Membrane System Internal Piping	0	681,000	0	681,000	0	1,362,000
Blower and Equipment Building	1,000,000	1,252,000	1,000,000	1,252,000	2,000,000	2,504,000
MBR Bridge Crane System	0	328,000	0	328,000	0	656,000
Secondary Clarifier	5,729,000	0	5,729,000	0	11,458,000	0

CITY OF MANTECA WASTEWATER MASTER PLAN

WQCF Phase IV Expansion Project
February 2024

Item	Stage 1 (12.9 Mgal/d)		Stage 2 (17.5 Mgal/d)		Total Both Phases	
	Conv	MBR	Conv	MBR	Conv	MBR
RAS Pump Station	1,146,000	0	1,146,000	0	2,292,000	0
Tertiary Disc Filters	0	0	1,719,000	0	1,719,000	0
UV Disinfection	5,878,000	5,156,000	0	0	5,878,000	5,156,000
Subtotal 1	14,313,000	13,698,000	16,032,000	12,160,000	30,345,000	25,858,000
Mob/Demob, Site Work, Site Piping, Elect, etc. (50%)	7,160,000	6,850,000	8,020,000	6,080,000	15,180,000	12,930,000
Subtotal 2	21,473,000	20,548,000	24,052,000	18,240,000	45,525,000	38,788,000
Contingencies @ 30%	6,440,000	6,160,000	7,220,000	5,470,000	13,660,000	11,630,000
Subtotal 3 (Construction Cost)	27,913,000	26,708,000	31,272,000	23,710,000	59,185,000	50,418,000
Engineering, CM, and Admin @ 35%	9,770,000	9,350,000	10,950,000	8,300,000	20,720,000	17,650,000
Total Capital Cost	37,683,000	36,058,000	42,222,000	32,010,000	79,905,000	68,068,000
Present Worth of Capital Cost [2]	37,683,000	36,058,000	31,417,133	23,818,446	69,100,133	59,876,446
Comparative Annual Costs (Where Different) [1, 3]						
Anoxic and Deox Mixer Power	20,203	14,536	20,203	14,536	40,406	29,072
Aerobic Basin Aeration Power	125,159	141,912	125,159	141,912	250,317	283,824
Permeate Pump Power	0	18,834	0	14,126	0	32,960
Membrane Air Scour Power	0	35,369	0	26,526	0	61,895
Membrane Clean Chemicals	0	4,000	0	3,000	0	7,000
Membrane Replacement Fund	0	92,000	0	69,000	0	161,000
Total	145,361	306,651	145,361	269,100	290,723	575,751
Present Worth of Comparative Annual Costs [4]	2,162,608	4,562,187	427,295	791,030	2,589,904	5,353,217
Total Present Worth Cost	**39,846,000**	**40,620,000**	**31,844,000**	**24,609,000**	**71,690,000**	**65,229,000**

Notes:
[1] All costs are in dollars at March-2023 cost level, ENR CCI = 13,176
[2] Present worth for Phase 1 same as base estimate.
Present worth for Phase 2 assumes Phase 2 constructed 10 years after Phase 1. Present worth factor (10 yrs at 3%) = 0.7441
[3] Not all annual costs shown. Comparative annual costs include costs that are different between alternatives. Assumed power cost is $0.15/kWh
[4] Present worth of Phase 1 annual costs based on 20 years at 3%, Present Worth Factor = 14.8775
Present worth of Phase 2 annual costs based on years 17 through 20 at 3%, net Present Worth Factor = 2.9395

10.1.7.7 Overall Alternative Analysis

In addition to costs, other factors are also important in the evaluation of the alternatives. In this subsection, the two alternatives are rated with respect to several key economic and non-economic criteria, each of which has been assigned an importance weighting factor. The criteria and the weighting factors were developed with the input and review of Manteca staff in an effort to assure that they appropriately reflect the interests and concerns of the City. The criteria, weighting factors, and ratings are shown in **Table 10-7** and discussed briefly below.

Costs. Three different cost criteria are included in **Table 10-7**. The Stage 1 capital cost is considered most important and is assigned a weighting factor of 20%, while the future expansion cost, which might occur 16 years after Stage 1 is less important with a weighting factor of 10%. The comparative annual cost was assigned a weighting factor of 5% in recognition of the fact that these costs are much less important than the capital costs in the overall present worth cost calculation.

Adaptability to Future Permit Requirements. If more stringent salinity limits are enforced in the future, reverse osmosis (RO) will be required and the MBR would provide the pretreatment step necessary for RO. Therefore, the MBR is considered to be more adaptable to future permit requirements. This criterion was assigned a weighting factor of 20% of the total ranking score.

Plant Footprint. The MBR alternative would have the smallest footprint. This was assigned a weighting factor of 10%.

Robustness and Reliability. Robustness and reliability represent the degree to which the process is resilient and can perform consistently well, even in problematic conditions, such as influent flow or load spikes, extreme weather, or other challenging biological process conditions. Because the membranes provide an absolute barrier to the escape of particulate matter from the biological treatment system, very consistent performance can be assured. With a biological treatment system that relies on sludge settling in a clarifier, such as conventional activated sludge, there can be much more variability in effluent quality, which would lead to a higher probability (although still low if properly designed and operated) of potential permit violations. This factor was assigned a weighting factor of 20%.

Ease of Operation. This criterion was given a weighting factor of 15%. There are many considerations that go into ease of operation. The MBR has the benefit of being highly automated and requiring minimal routine operator activity. Sludge settleability monitoring, clarifier sludge blanket monitoring, and adjustments to RAS rates to control the sludge blanket are not required in the MBR. However, an MBR system added in parallel with conventional treatment trains results in operation of two types of processes simultaneously, which is a complication. Considering all factors, the score assigned for the MBR would be less than the conventional activated sludge.

Table 10-7. Alternatives Rating and Ranking

Criterion	Weighting Factor %	Alternatives Ratings [1]	
		Alternative 1 CAS	Alternative 2 MBR
Stage 1 Capital Cost	20	10	9
Stage 2 Capital Cost	10	9	10
Annual Operating Cost	5	10	6
Adaptability to Future Permit Requirements	20	8	10
Footprint	10	8	10
Robustness and Reliability	20	8	10
Ease of Operation	15	10	7
Overall Weighted Score [2]	100	8.90	9.15
Rank [3]		2	1

Notes:
[1] The highest rated alternative is assigned 10. Other alternatives are scored lower, according to the relative concerns.
[2] Summation of individual ratings multiplied by the corresponding weighting factors.
[3] The alternative with the highest score is ranked "1." Other alternatives are ranked according to their score.

10.1.7.8 Recommended Treatment Process Alternative

Based on the rankings shown in **Table 10-7**, the recommended alternative for WQCF Phase IV Expansion based on the detailed evaluation is Alternative 2 – MBR. While the MBR has a higher operating cost than conventional activated sludge, it has slightly lower capital costs, a smaller footprint and is more adaptable to future regulations.

10.2 RECOMMENDED PHASE IV EXPANSION PROJECT

A site plan showing the proposed new facilities for the Phase IV Expansion Project are shown on the MBR Process Alternative **Figure 10-8.** The overall hydraulic and organic loading design criteria for the recommended two expansion stages are shown in **Table 10-8**. Individual unit processes and design criteria are discussed in the following subsections.

Table 10-8. Overall Loading Design Criteria for Phase IV Project Expansion

Parameter [1]	Stage 1 14.44 Mgal/d [2, 3]	Stage 2 19.6 Mgal/d [2, 3]
ADWF (with Recycle)	14.44	19.6
ADWF (without Recycle)	12.89	17.5
Flow Ratios		
ADMMF/ADWF	1.04	1.04
PDF/ADWF	1.25	1.25
PHF/ADWF	2.10	2.10
Load Ratios		
ADMML/AAL	1.20	1.20
PDL/AAL	2.00	2.00
Flow, Mgal/d		
ADWF	14.44	19.6
ADMMF	15.02	20.38
PDF	18.05	24.50
PHF	30.32	41.16
Annual Average Load, lb/d		
BOD	44,800	60,809
TSS	33,601	45,608
TKN	7,226	9,808
Average Day Maximum Monthly Load, lb/d		
BOD	53,761	72,971
TSS	40,321	54,729
TKN	8,671	11,770
Average Constituent Concentrations, mg/L		
BOD	372	372
TSS	279	279
TKN	60	60
Constituent Concentrations with ADMMF and ADMML, mg/L		
BOD	429	429
TSS	322	322
TKN	69	69
Constituent Concentrations with ADWF and ADMML, mg/L		
BOD	446	446
TSS	335	335
TKN	72	72

Notes:
[1] ADWF = Average Dry Weather Flow, ADMMF = Average Day Maximum Monthly Flow, PDF = Peak Day Flow, PHF = Peak Hour Flow, AAL = Annual Average Load, ADMML = Average Day Maximum Monthly Load, PDL = Peak Day Load
[2] All flows and loads include in-plant recycle streams. Future projections assume recycle flow and load fractions remain unchanged.
[3] The Future condition is based on likely achievable plant capacity with improvements as discussed in Section 9-3. Flow and load peaking factors assumed same as existing.
Key:
mg/L = milligrams per liter
Mgal/d = million gallons per day

10.2.1 Headworks and Influent Pump Station

10.2.1.1 Influent Flow Meters

As discussed in Chapter 8, the flow meter that is used to measure the WQCF influent flow is located downstream from the return of in-plant recycle streams. The flows thus measured are reported as the plant influent flows, but they do not represent the true influent flows, which would exclude in-plant recycle streams. Therefore, it is recommended to install new flow meters upstream of the recycle streams to measure the true influent flows (one on both the north trunk and south trunk of the sanitary sewers entering the WQCF).

10.2.1.2 IPS Pumps

The existing IPS includes three duty pumps and one standby pump. The three duty pumps include two 100-hp screw centrifugal pumps which deliver screened wastewater to the Northside Plant and one 200-hp pump that delivers screened wastewater to the Southside Plant. Through the operation of valves, the standby 200-hp pump can discharge to either the Northside or Southside Plants. Space is provided in the Influent Pump Station to install four additional pumps to handle projected future flows. In addition to the pump recommended to be installed during the Interim Improvement Projects, the Phase IV Expansion project will require one new IPS pump for Stage 1 and an additional IPS pump for Stage 2 (for a total of seven IPS pumps for Stage 2, including the two dedicated Northside Plant pumps). The number of required IPS pumps is based on the current design capacity of the existing Southside Plant pumps of 10 Mgal/d. The revised capacity of these 200-hp pumps following the installation of additional pumps should be determined during preliminary design. At the Stage 2 peak flow of 32.59 Mgal/d, the velocity in the 30-inch force main would be 10.3 fps, which will incur significant headloss. Therefore, for the Stage 2 expansion, it is recommended to also install a parallel 30-inch force main to the Southside Plant. Design criteria for the existing and future pumps required for the Phase IV Expansion is presented in **Table 10-9.**

Table 10-9. Design Criteria for Influent Pumps for the Phase IV Expansion Project

Parameter	Existing Northside Facility	Existing Southside Facility (Interim Project)	Stage 1 Expansion of IPS at Southside	Stage 2 Expansion of IPS at Southside
Flows				
Average Flow[1], Mgal/d	4.08	5.15	10.36	15.52
Peak Flow[1], Mgal/d	8.57	10.82	21.76	32.59
Pumps				
Number of Pumps	2	3 [2,3]	4 [2,3]	5 [2,3]
Number of Duty Pumps	2	2 [3]	3 [3]	4 [3]
Pump Horsepower	100	200	200	200
Pump Capacity, Mgal/d @ ft TDH (each)	5 @ 54	10 @ 73 [4]	10 @ 73 [4]	10 @ 73 [4]
Force main				
Number of Force mains	1	1	1	2
Force main Diameter, inch	30	30	30	30

Notes:
[1] Includes 12% in-plant recycle flow.
[2] Includes one 200-hp standby pump that can convey screened wastewater to either the Northside Plant or Southside Plant.
[3] Includes the fifth IPS pump that is recommended to be installed during the Interim Improvements Project.
[4] The noted capacity of the 200-hp pumps is the current design capacity of the pumps. The revised capacity of these pumps following the installation of additional pumps should be determined during preliminary design.
Key:
TDH = total dynamic head

10.2.2 Aerated Grit Tanks

The Phase IV Expansion Project will require 2 new Aerated Grit Tanks for Stage 1 and additional 2 tanks for Stage 2. The proposed grit tanks for the Phase IV Expansion Project are designed with a minimum of 4-minute detention time at the peak flow as summarized in **Table 10-10**.

Table 10-10. Design Criteria for Aerated Grit Tanks for Phase IV Expansion Project

Parameter	Existing Northside Facility	Existing Southside Facility	Stage 1 Expansion of Grit Removal and Primary Clarifiers at Southside	Stage 2 Expansion of Grit Removal and Primary Clarifiers at Southside
Average Flow, [1] Mgal/d	4.08	5.15	10.36	15.52
Peak Flow, Mgal/d	8.57	10.82	21.76	32.59
Number of Grit Tanks	2	2	4	6
Tank Length, ft	24	24	24	24
Tank Width, ft	8	8	8	8
Tank Water Depth (Nominal), ft	10.75	10.5	10.5	10.5
Tank Volume, gal	15,437	15,080	15,080	15,080
Detention Time at Average Flow, min				
All Units in Service	10.9	8.4	8.4	8.4
One Unit out of Service	5.4	4.2	6.3	7.0
Detention Time at Peak Flow, min				
All Units in Service	5.2	4.0	4.0	4.0
One Unit out of Service	2.6	2.0	3.0	3.3

Note:
[1] Includes 12% in-plant recycle flow

The 3:1 length to width ratio of the grit tanks (24 ft long x 8 ft x 10.5 ft deep) along with the placement of coarse bubble aerators along one side of the tank creates a spiral flow pattern resulting in the separation of the heavy grit particles from the wastewater. Recommended aeration rates in aerated grit tanks range from 3 to 8 cfm/ft of length. A total airflow of 720 cfm to the grit tanks is recommended to supply an aeration rate of 5 cfm/ft.

Once separated from the wastewater, grit will settle into the hoppers in the bottom of the tanks. Grit collected in the hoppers will be discharged to a grit classifier by gravity for further concentration and washing of light organic material trapped with the grit. Concentrated and washed grit discharged from the classifier will be conveyed into a dumpster and periodically hauled to the landfill for disposal. Wash water from the classifier will be discharged into the plant drain system and returned to the IPS.

10.2.3 Primary Sedimentation Basins

The Phase IV Expansion Project will require 2 new Primary Sedimentation Basins for Stage 1 and additional 2 for Stage 2. It is expected that the four additional primary sedimentation tanks will be constructed at the Southside Plant. The design of primary sedimentation basins (PSBs) is based on overflow rates and to a lesser extent on detention time. Typical overflow rates range from 800 to 1,200 gpd/ft^2 under average flows to 2,000 to 3,000 gpd/ft^2 under peak flow conditions. Detention times for PSBs are 1.5 to 2.5 hours. Overflow rates and detention times for the PSBs are presented in **Table 10-11**. To mitigate potential odors, the PSBs will be covered, with foul air routed to the biofilter.

Table 10-11. Primary Sedimentation Basins Design Criteria for Phase IV Expansion Project

Parameter	Existing Northside Facility	Existing Southside Facility	Stage 1 Expansion of Grit Primary Clarifiers at Southside	Stage 2 Expansion of Primary Clarifiers at Southside
Average Flow,[1] Mgal/d	4.08	5.15	10.36	15.52
Peak Flow, Mgal/d	8.57	10.82	21.76	32.59
Basin Length, ft	130	110	110	110
Basin Width, ft	20	20	20	20
Side Water Depth, ft	12	12	12	12
Surface Area, ft	2600	2200	2200	2200
Average Flow				
Units in Operation	3	3	5	7
Overflow Rate, gpd/ft2	520	780	940	1010
HRT, hours	4.1	2.8	2.3	2.1
Units in Operation	2	2	4	6
Overflow Rate, gpd/ft2	785	1170	1177	1176
HRT, hours	2.7	1.8	1.8	1.8
Peak Flow				
Units in Operation	3	3	5	7
Overflow Rate, gpd/ft2	110	1640	1980	2120
HRT, hours	2.0	1.3	1.1	1.0
Units in Operation	2	2	4	6
Overflow Rate, gpd/ft2	1648	2458	2472	2469
HRT, hours	1.3	0.9	0.9	0.9

Note:
[1] Includes 12% in-plant recycle flow
Key:
HRT = hydraulic retention time
Mgal/d = million gallons per day
gpd/ft2 = gallons per day per square foot

10.2.4 Existing Secondary Treatment Process Improvements

10.2.4.1 Provide Larger Anoxic Zones Existing Southside Plant Aeration Basins

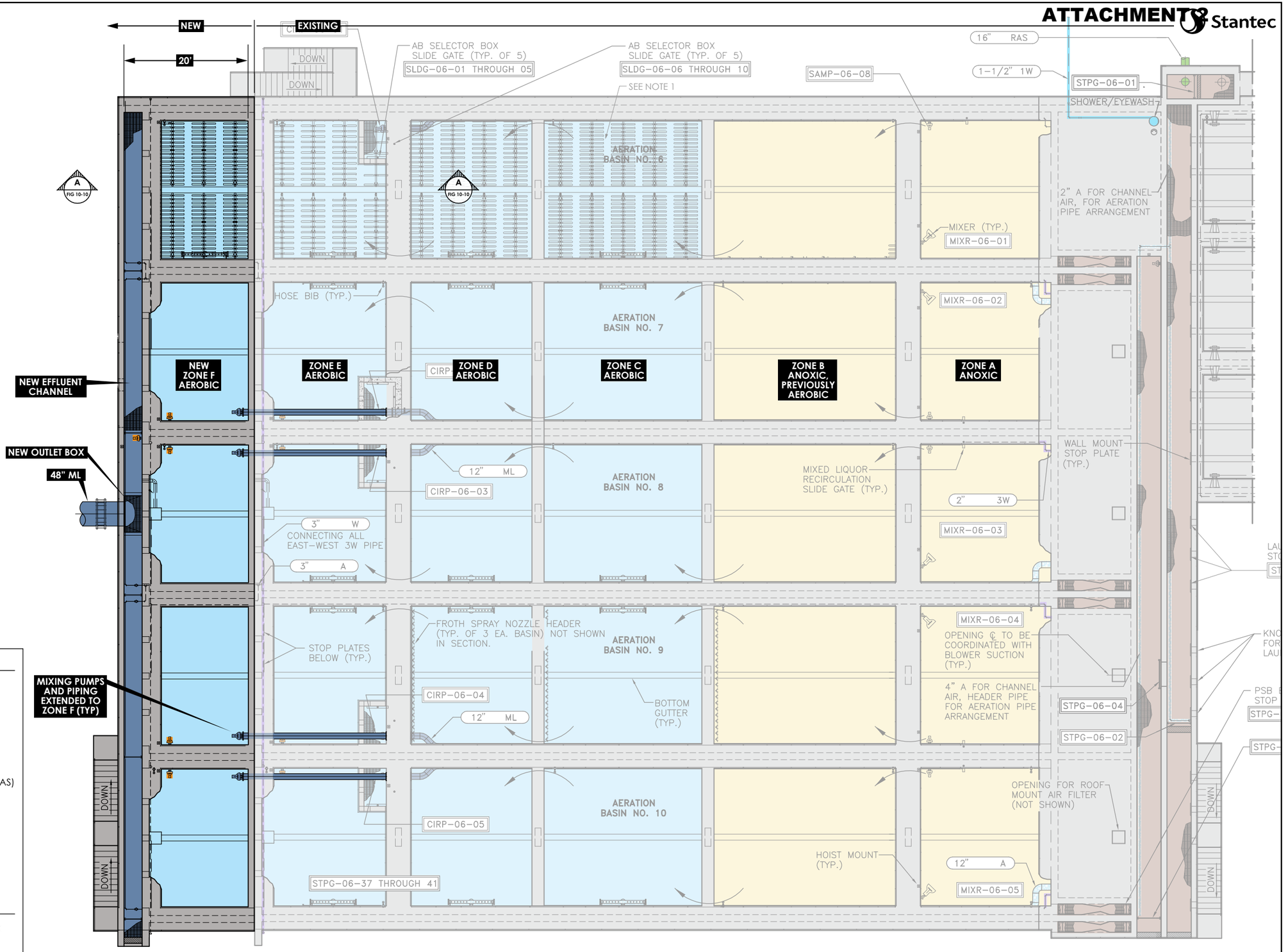
The Southside Plant is reaching its design capacity. The anoxic zone (zone A) is too small to achieve the required denitrification. If Zone B, originally designed as aerobic zone, is converted into an anoxic zone, the total aerobic zone will be too small to provide adequate nitrification. Currently, the plant is operating such that zone B at high and low dissolved oxygen set points encourages simultaneous nitrification and denitrification in the same zone. This mode of operation is challenging because it requires frequent adjustments to DO set points and cycle time. It is recommended to convert zone B to an anoxic zone and to increase the aerobic volume by extending the Southside aeration basins to the west about 20 ft as shown on **Figure 10-9** and **Figure 10-10,** respectively.

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N

0 5 10 15 20 25

APPROXIMATE SCALE IN FEET



LEGEND

- NEW / EXISTING
- AEROBIC BASIN
- ANOXIC BASIN
- MIXED LIQUOR (ML)
- PRIMARY EFFLUENT (PE)
- RETURN ACTIVATED SLUDGE (RAS)
- AERATION AIR (AA,A)
- RECYCLED WATER (3W,W)
- POTABLE WATER (1W)
- SAMPLE (SAMP)
- STRUCTURE

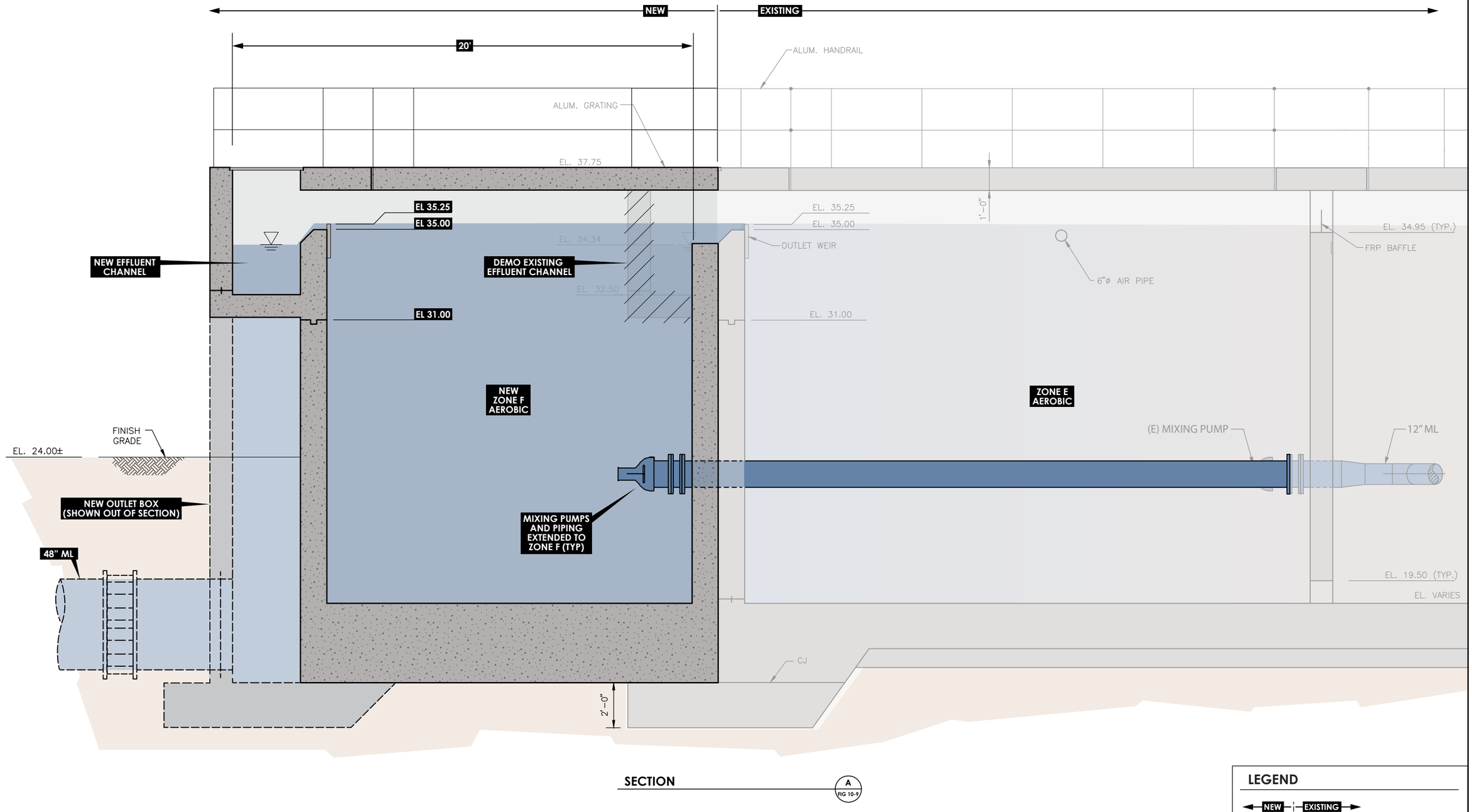
NOTES

1. DIFFUSER PANELS SHOWN IN AERATION BASIN No.6 FOR CLARITY. DIFFUSER PANEL LAYOUT IS THE SAME FOR AERATION BASINS No. 7-10.

Figure 10-9

WQCF Southside Aeration Basins Expansion Plan View

0 2 4 6 8 10
APPROXIMATE SCALE IN FEET



SECTION A FIG 10-9

LEGEND

NEW EXISTING

MIXED LIQUOR (ML)

STRUCTURE

Figure 10-10
WQCF Southside Aeration Basins Expansion Section View

10.2.5 New Membrane Bioreactors (MBR)

The proposed MBR for the Phase IV Expansion Project is shown on **Figure 10-11**. As noted previously, the MBR alternative developed for this investigation is based two 4.65 Mgal/d stages. Each 4.65 Mgal/d expansion stage will consist of two biological trains and four membrane tanks. Membrane sizes and costs are based on a preliminary proposal by Veolia. To allow competitive bidding by multiple MBR manufacturers, an evaluated bid pre-selection process is recommended before selecting a final MBR system which would be used to develop detailed construction drawings and specifications for the overall construction of the wastewater treatment plant expansion.

ATTACHMENT 2

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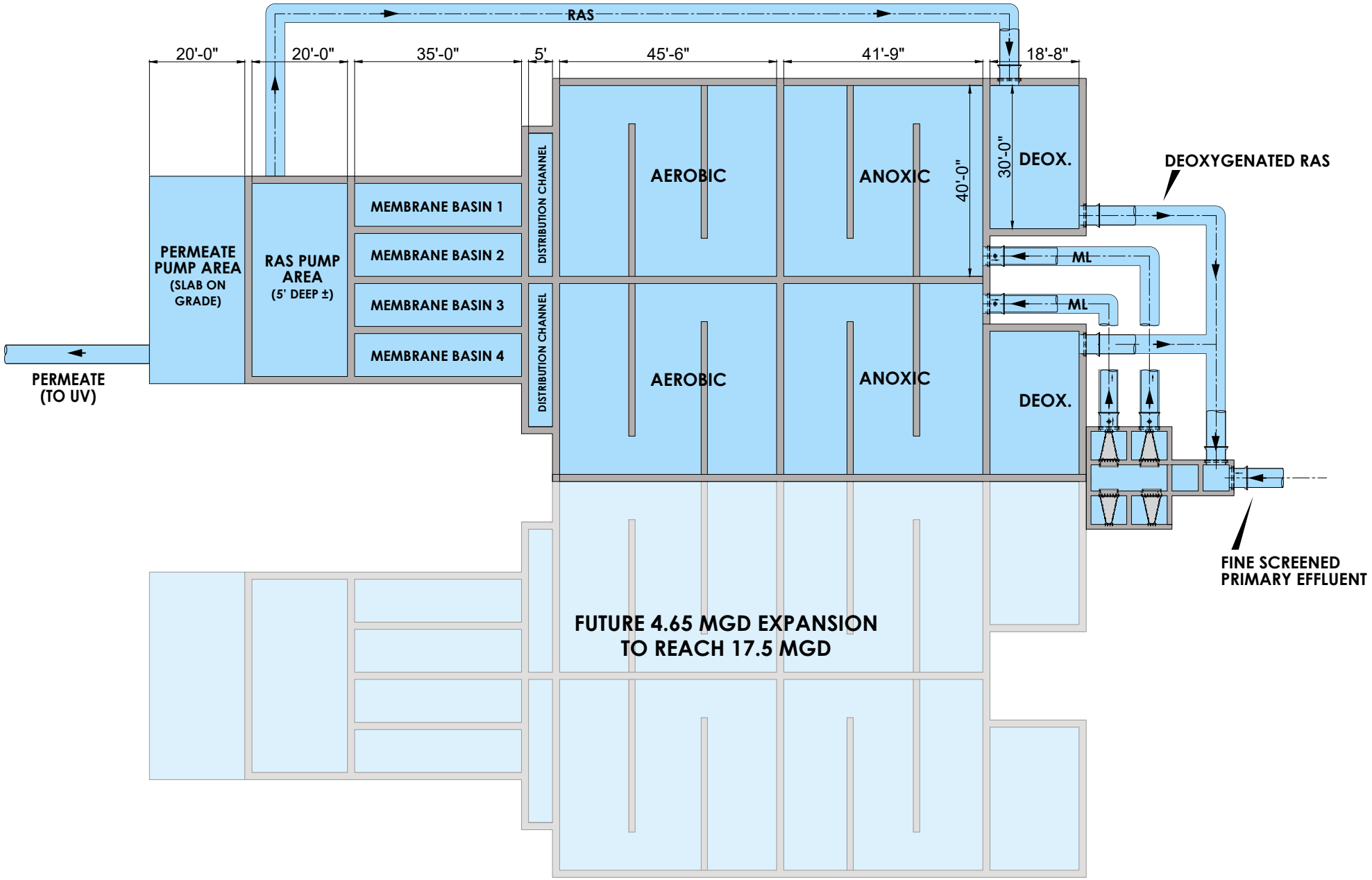


Figure 10-11
Proposed MBR for Phase IV Expansion Project

10.2.6 Biosolids Handling Facilities

10.2.6.1 Waste Activated Sludge Thickening

Sludge thickening facilities are currently comprised of two DAFTs and a third DAFT is recommended to be installed during the Interim Improvement Projects. The DAFT units were designed to thicken WAS to an approximate concentration of 3%, without using polymer, and 5% with polymer, and capture 85 to 95% of the input solids. Polymer is currently used at the DAFTs. The Phase IV Expansion Project will require one new DAFT for the Stage 1 project in order to meet the estimated peak month flow (no additional DAFTs are needed for the Stage 2 project). The fourth DAFT is proposed to match the existing DAFTs. Design criteria for the existing and future DAFTs required for the Phase IV Expansion is presented in **Table 10-12.**

Table 10-12. Design Criteria for DAFTs for the Phase IV Expansion Project

Parameter	Existing Facility (Interim Project)	Stage 1 Expansion of DAFT	Stage 2 Expansion of DAFT
Number of DAFTs [1]	3	4	4
Flows			
Average Solids Flow, dry lb/d [2]	14,432	20,343	27,358
Peak Month Solids Flow, dry lb/d [2]	17,114	24,340	32,785
Capacity			
DAFT Unit Capacity, dry lb/hr (each)	184-459	184-459	184-459
Maximum Capacity with One Unit Out of Service, dry lb/d	22,032	33,048	33,048
Dimensions			
Tank Length, ft	38.25	38.25	38.25
Tank Width, ft	12	12	12
Tank Height, ft	9	9	9

Notes:
[1] Includes one standby DAFT. Also includes the third DAFT that is recommended to be installed during the Interim Improvements Project.
[2] Includes impacts from food waste (approximately 10.4 – 11.0 dry lb/d of food waste from the recycle stream).
Key:
DAFT = dissolved air floatation thickener

10.2.6.2 Sludge Dewatering

Sludge dewatering facilities are currently comprised of two small centrifuges. A third larger centrifuge is recommended to be installed during the Interim Improvement Projects. The existing small centrifuges each have a rated capacity of 185 gpm and 1,540 dry lb/hr. However, the main treatment process is currently overloaded on nitrogen treatment capacity. As a result of this, only one centrifuge can be run at a time with a flow limit of 115 gpm. A liquid flow limit of 150 gpm per existing centrifuge was used in the analysis for determining dewatering needs for the Phase IV Expansion Project (assuming sidestream treatment would allow the centrifuges to be run at a higher flow than is currently possible). The new larger centrifuge is recommended to have a minimum capacity of 260 gpm and 3,000 dry lb/hr. Since the

existing Dewatering Building only has space for three centrifuges, the Phase IV Expansion Project will require replacement of the existing two small centrifuges with larger centrifuges to avoid having to expand the Dewatering Building, as shown on **Figure 10-12** (one centrifuge will be replaced for Stage 1 and the second existing centrifuge will be replaced for Stage 2). For Stage 1, the new large replacement centrifuge and the existing small centrifuge (1 standby large centrifuge) will require approximately 49 hours of operation per week (approximately 7 hours per day, 7 days a week) during maximum month conditions (assuming the existing small centrifuge has a capacity of 150 gpm and 1,540 dry lb/hr and the new large centrifuge has a capacity of 260 gpm and 3,000 dry lb/hr). For Stage 2, it is recommended to replace the second existing small centrifuge in order to have three large centrifuges (two duty plus one standby), which will also require approximately 49 hours of operation per week (approximately 7 hours per day, 7 days a week) during Stage 2 maximum month conditions (assuming all centrifuges will have a capacity of 260 gpm and 3,000 dry lb/hr). Design criteria for the existing and future centrifuges required for the Phase IV Expansion is presented in **Table 10-13**.

Table 10-13. Design Criteria for Centrifuges for the Phase IV Expansion Project

Parameter	Existing Facility (Interim Project)	Stage 1 Expansion of Centrifuges	Stage 2 Expansion of Centrifuges
Number of Centrifuges [1]	3	3	3
Number of Small Centrifuges	**2**	**1**	**0**
Small Centrifuge Max Liquid Flow Capacity, gpm (each) [2]	150	150	150
Small Centrifuge Max Solids Flow Capacity, dry lb/hr (each)	1,540	1,540	1,540
Number of Large Centrifuges [1]	**1**	**2**	**3**
Large Centrifuge Max Liquid Flow Capacity, gpm (each) [3]	260	260	260
Large Centrifuge Max Solids Flow Capacity, dry lb/hr (each) [3]	3,000	3,000	3,000
Liquid Flows & Capacity			
Average Liquid Flow, gal/wk [4]	654,437	956,431	1,272,012
Peak Month Liquid Flow, gal/wk [4]	767,249	1,129,583	1,507,093
Liquid Flow Capacity with a Large Unit Out of Service, gal/wk [2,5]	882,000	1,205,400	1,528,800
Solids Flows & Capacity			
Average Solids Flow, dry lb/wk [6]	128,352	184,198	243,908
Peak Month Solids Flow, dry lb/wk [6]	149,982	217,196	288,708
Solids Flow Capacity with a Large Unit Out of Service, dry lb/wk [5]	150,920	222,460	294,000

Notes:
[1] Includes one standby centrifuge. Also includes Centrifuge No. 3 (large) that is recommended to be installed during the Interim Improvements Project.
[2] The design maximum liquid flow capacity of the existing small centrifuges is 185 gpm. However, the main treatment process is currently overloaded on nitrogen treatment capacity. As a result of this, only one centrifuge can be run at a time with a flow limit of 115 gpm. A liquid flow limit of 150 gpm per centrifuge was used in the analysis (assuming sidestream treatment would allow the existing centrifuges to be run at a higher flow than is currently possible).
[3] The capacity of the new large centrifuges are estimated so that the required dewatering for each respective stage can be completed with approximately 7 hours of operation per day, 7 days per week.
[4] Includes impacts from food waste (7,226 gpd being fed directly to the digesters).
[5] Assumes operation of 7 hours/day, 7 days/week.
[6] Includes impacts from food waste (4,821 dry lb/d being fed directly to the digesters).

N

0 3 6 9 12 15 FEET

4" SD
2" VENT THROUGH ROOF
1-1/2" 3W
3/4" 1W
2" SD
4" DIP
C.O.
C.O.
4" WYE & 2" VENT
4" STUB-OUT FOR FUTURE CONNECTION CLOSET FLANGE
4" SDR-35
MCC ROOM
HOSE BIBB AND RACK (TYP.)
FLOOR DRAIN
TRENCH DRAIN
C.O.
DOWN
CENTRIFUGE PLATFORM FOR PARTIAL PLAN BELOW PLATFORM
HYDRAULIC UNIT (TYP.)
2" DSL
2" DSL
SOLIDS CHUTE
CENTRATE CHUTE
CENTRIFUGE NO. 1
CENTRIFUGE NO. 2
POLYMER STORAGE AREA
1" POL
1" 1W
EMERGENCY EYEWASH & SHOWER CONNECT TO 1W SYSTEM
CANOPY STRUCTURE
SEAL WATER ASSEMBLY (WALL MOUNTED)
UTILITY AND DRAIN TRENCH
POLYMER DILUTION UNIT (TYP.)
POLY-15-01
POLY-15-02
1-1/2" 1W
SEAL WATER
1" POL
1" SD
CENTRIFUGE FEED PUMP
CENP-15-01
SOLENOID VALVE (TYP.)
6"x3" RED
2" POL
4" DSL
1-1/2" 3W
POL
NEW CENTRIFUGE 2, S1
CENT-
NEW CENTRIFUGE 3, S2
NEW CENTRIFUGE 1, INT
DRAIN
TYP.
1" 1W
FROM SLUDGE BLENDING TANK
FOR 3/4" 1W, SEE P15.21
2" 3W
6" DSL
2" 3W
TO SOLIDS LOADING
1-1/2" 3W
NEW POLYMER DILUTION UNIT 3, INT
HOSE BIBB AND RACK (TYP.)
1-1/2" 3W
NEW CENTRIFUGE FEED PUMP 3, INT
ROOF ACCESS LADDER
INLINE GRINDER
GRND-15-01
TYPE L WALL PENETRATION
2" 3W
1-1/2" 3W
CONVEYOR
CONV-15-01
DOWN
8" CEN
CLEAN-OUT
INV. 20.0'
INV. 19.96'
8" RESTRAINED FLEX COUPLING (TYP.)
5'-0"
6" SD
8" SD
8" P-TRAP

SOLIDS LOADING AREA
CONNECT TO PNEUMATIC CYLINDER
AIR COMPRESSOR
COMP-15-01
1" CAS
PAD
2" STD

LEGEND

- INT Interim - 8.23 MGD
- S1 Stage 1 - 12.87 MGD
- S2 Stage 2 - 17.5 MGD
- Existing

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Figure 10-12
New Sludge Dewatering Centrifuges

10.2.6.3 Digesters and Control Building

The purpose of the anaerobic digesters is to stabilize the organic solids in the primary sludge and thickened WAS prior to dewatering. The anaerobic digesters are designed to attain volatile solids destruction in the range of 55 to 70% on a weight basis (resulting in an approximate volatile fraction in the digested sludge solids of 50-60%). Digesters No. 1 and 2 are 60 feet in diameter with fixed steel covers and hold 523,000 gallons each. Digesters No. 3 and 4 are 65 feet in diameter with floating steel covers and hold 662,000 gallons of sludge and 16,500 cubic feet of digester gas each. In order to achieve the minimum 15-day hydraulic residence time needed to produce Class B biosolids under peak month conditions, a fifth and sixth digester is needed for Stage 1 and Stage 2 of the Phase IV Expansion project, respectively. The fifth and sixth digesters are proposed to have a 65 ft diameter to hold 662,000 gallons of sludge. For each additional digester, a new sludge transfer pump (7.5-hp with a capacity of 800 gpm at 23 TDH) will be needed. Design criteria for the existing and future digesters required for the Phase IV Expansion is presented in **Table 10-14.**

Table 10-14. Design Criteria for Digesters for the Phase IV Expansion Project

Parameter	Existing Facility (Interim Project)	Stage 1 Expansion of Digesters	Stage 2 Expansion of Digesters
Number of Digesters	4	5	6
Total Volume, gal	2,370,000	3,032,000	3,694,000
Tank Diameter, ft	60 (2); 65 (2)	60 (2); 65 (3)	60 (2); 65 (4)
Flows			
Average Flow[1], gpd	93,491	136,633	181,716
Peak Month Flow[1], gpd	109,607	161,369	215,299
Hydraulic Residence Time			
Hydraulic Residence Time at the Average Flow, days	25.4	22.2	20.3
Hydraulic Residence Time at the Peak Month Flow, days	21.6	18.8	17.2

Notes:
[1] Includes food waste (7,226 gpd).
Key:
gpd = gallons per day

The Digester Control Building includes sludge control equipment, sludge transfer pumps, hot water equipment, heated sludge pumps, plant air system, and the biogas management system. The Digester Control Building will need to be expanded to include equipment needed for the fifth and sixth digester. For each additional digester, a new sludge pump, hot water pump with a 3-way valve (2-hp with a capacity of 150 gpm) and grinder (3-hp with a capacity of 1,100 gpm) will be needed. During the Stage 1 expansion, it is proposed to expand the Digester Control Building approximately 2,800 sq. ft., which will support four additional digesters.

10.2.6.4 Biosolids Disposal

Currently dewatering biosolids are disposed by loading into roll off bins and hauling to the Forward Landfill. However, there is uncertainty how much longer biosolids can be taken to this landfill which is estimated to run out of capacity by 2039. Also, a key strategy of SB 1383, Short-Lived Climate Pollutants Reduction Act is to divert organic waste from landfills which will make it difficult to take biosolids to any landfill in the future.

Biosolids disposal alternatives were evaluated in the Biosolids and Biogas Utilization Plan by HERWIT Engineering, April 2016. The recommendation from this study is to process the biosolids to Class A, or to Exceptional Quality (EQ) criteria. This is most easily achieved by drying dewatered biosolids from the centrifuge to greater than 75% solids. The benefit of this is additional flexibility in reuse, and reduction in biosolid hauling costs. This level of processing allows for sales to the public, and reuse of the product in City landscaping. Site space at the WQCF should be preserved to allow for future drying options as shown on **Figure 10-8**.

10.2.7 Effluent Cooling and Disposal

10.2.7.1 Effluent Cooling

The existing NPDES permit currently limits the maximum flow capacity to 9.87 Mgal/d average dry weather flow before cooling the effluent is required. This requirement is based on hydrodynamic and thermal modeling studies of the San Joaquin River in 2006 and 2008. A comparison of recent effluent discharge and river temperatures from 2016 through 2021 has shown an increase in the temperature difference between the plant effluent and the river of 2°F to 5°F over what was used for all previous modeling. Therefore, a new river temperature study is recommended before proceeding with the design of the effluent cooling system.

Instead of constructing cooling towers as recommended in the previous studies, effluent could be used for groundwater recharge to help mitigate overdraft of the Eastern San Joaquin Groundwater Basin. However, because of the relatively shallow depth to groundwater in the Manteca area, this use is not considered feasible in the central Manteca area. An export pump station and pipeline several miles in length would have to be constructed to an area of the basin with a greater groundwater deficit. As discussed in the Reclaimed Water Facilities Master Plan (Woodard & Curran, January 2023), this alternative has not been carried forward to the level of project alternative development but could be studied further in the context of the Sustainable Groundwater Management Act of 2014 which will require implementation of a Groundwater Sustainability Plan in the region.

Another potential alternative to the cooling towers is tertiary storage ponds where natural cooling can occur. A model was developed to estimate the magnitude of heat losses and gains by various mechanisms as listed below:

Heat Losses: Atmospheric Radiation
Surface Evaporation
Surface Convection

Heat Gains: Solar Radiation

Heat loss to the environment is dependent on the altitude, ambient air temperature, humidity, wind speed, and cloud coverage. Monthly average values for these parameters in Manteca were used. The monthly average temperatures for different size ponds are shown in **Figure 10-13**. It must be noted that the focus of the investigation was to determine the approximate impact that could be expected by adding the tertiary storage ponds. Since these calculations are not exact, but give a reasonable estimate of the heat loss, a pilot study would be required to verify the impact before embarking on the construction of a full-scale tertiary storage ponds.

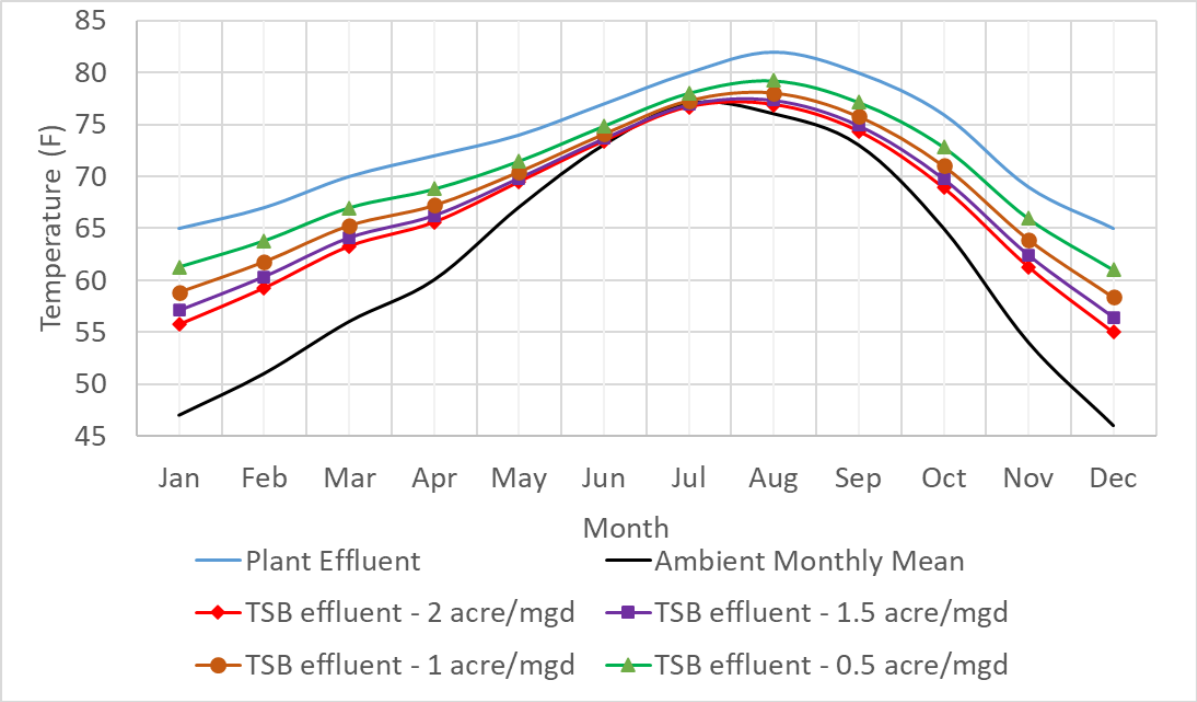
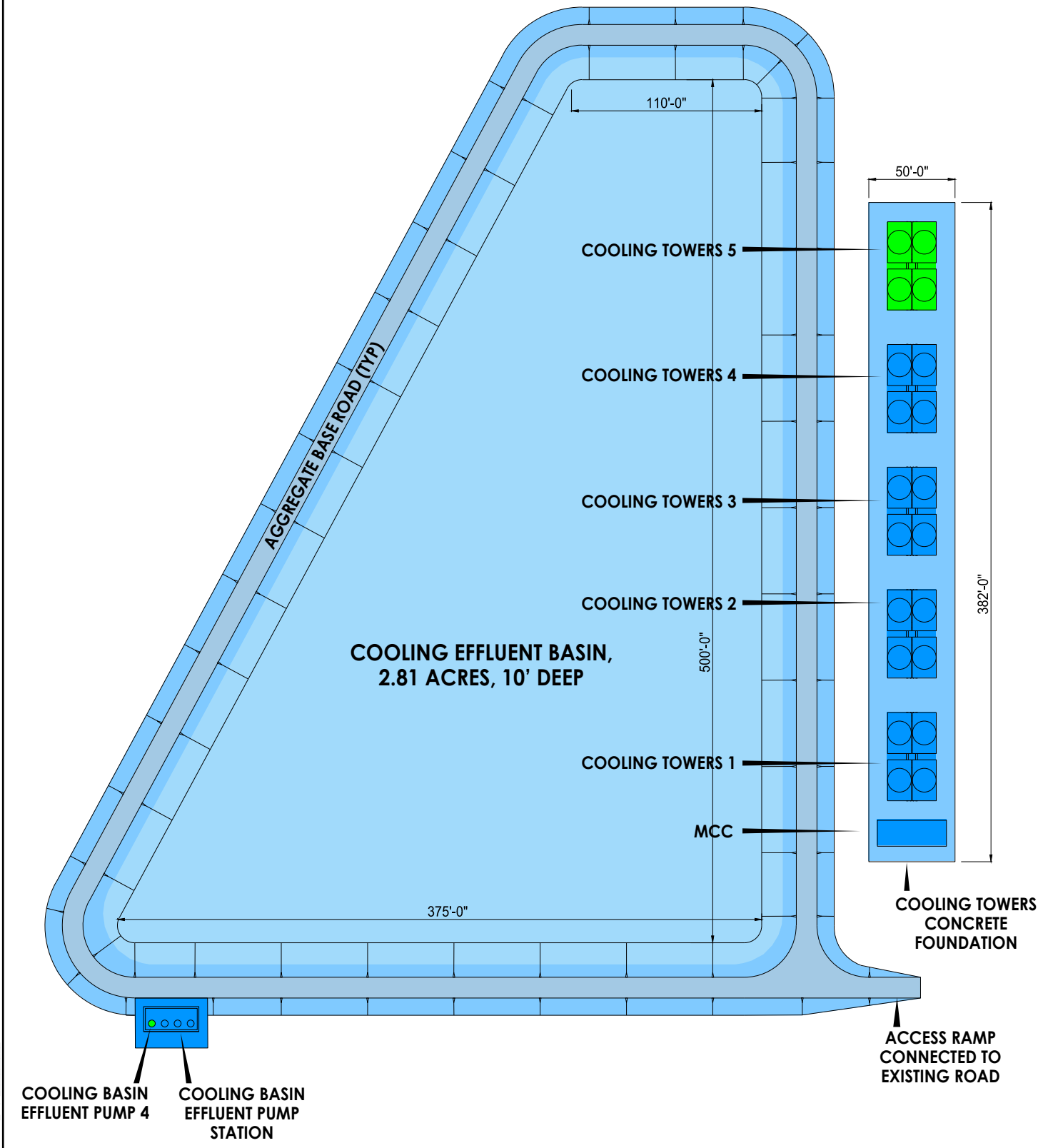


Figure 10-13. Tertiary Storage Basin Temperatures

As previously discussed, a new river modeling study is required to determine how much cooler the effluent must be for permit compliance, and through pilot testing, how many acres of ponds are needed for the next phase expansion project. Assuming a conservative estimate of 2 acres per Mgal/d, a total of 35 acres would be required for expanding the WQCF to 17.5 Mgal/d ADWF.

If a suitable groundwater recharge project is not found and effluent cooling basins can't provide sufficient cooling, then effluent cooling towers are recommended. Because the plant must comply with the permit at all times, a redundant cooling tower is recommended to allow maintenance of the cooling towers. Cooling towers are sized based on total effluent flow. To provide blending of the cooling tower effluent for temperature averaging, a cooling effluent storage basin will be constructed for storing the cooled effluent before delivery to the San Joaquin River. A new pump station will be required to pump the cooled effluent from the basin through the existing outfall pipeline to the San Joaquin River. A layout of the proposed cooling tower facility is shown in **Figure 10-14.**



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Figure 10-14
Effluent Cooling Towers

Design Criteria for the cooling towers is presented in **Table 10-15.**

Table 10-15. Design Criteria for Cooling Towers for the Phase IV Expansion Project

Parameter	Stage 1 Cooling Towers	Stage 2 Cooling Towers
Peak Flow, Mgal/d	21.30	31.08
Number of Cooling Towers [1]	4	5
Design Flow per Unit, Mgal/d, (each)	8.76	8.76
Design Flow with One Unit Out of Service, Mgal/d	26.3	35.0
Air flow per Unit, cfm (each)	780,200	780,200
Unit Dimensions (each)	28'-3 5/8" x 51'-1" x 19'-5 5/8"	
Entering Fluid Temperature, °F	75	
Leaving Fluid Temperature, °F	60	

Notes:
[1] Includes one standby cooling tower.
Key:
cfm = cubic feet per minute
Mgal/d = millions of gallons per day

10.2.7.2 Effluent Pumping

Effluent pumping at the WQCF is currently comprised of two 100-hp pumps (located in a wet well connected to the UV disinfection system) to convey final effluent during high water levels in the San Joaquin River. Currently, the pumps are designed for a capacity of 6,700 gpm (9.65 Mgal/d) at a TDH of 45 feet based on pumping to the San Joaquin River. The Phase IV Expansion project will require two new effluent pumps (one for Stage 1 and one for Stage 2) that will also be used to pump effluent to the proposed cooling towers. Since the pumps will still need to be able to convey final effluent to the San Joaquin River during high water levels, the same pump model as existing is recommended to be installed for the Phase IV Expansion project. However, there will not be firm capacity (standby pump) for the Phase IV Expansion project. The operators have noted that the existing effluent pumps have never been needed. Therefore, it is considered acceptable to not have an extra standby pump for pumping directly to the San Joaquin River. It is estimated that the same effluent pumps will have firm standby capacity to convey final effluent to the cooling towers, so if there is a situation where peak flows are occurring during high water levels in the San Joaquin River and there is an effluent pump out of service, the remaining effluent pumps can be used to convey effluent to the cooling towers instead (even if cooling is not needed at that time) as the cooling basin will offer some equalization capacity. The system curve for pumping to the cooling towers will be determined during preliminary design. However, it should be noted that since there is less headloss incurred when pumping to the cooling towers, it may be required to throttle the valve(s) on the discharge header(s) of the effluent pump(s) in use in order to not run off the pump curve when pumping to the cooling towers. The existing effluent pump wet well will need to be modified as shown on **Figure 10-15**.

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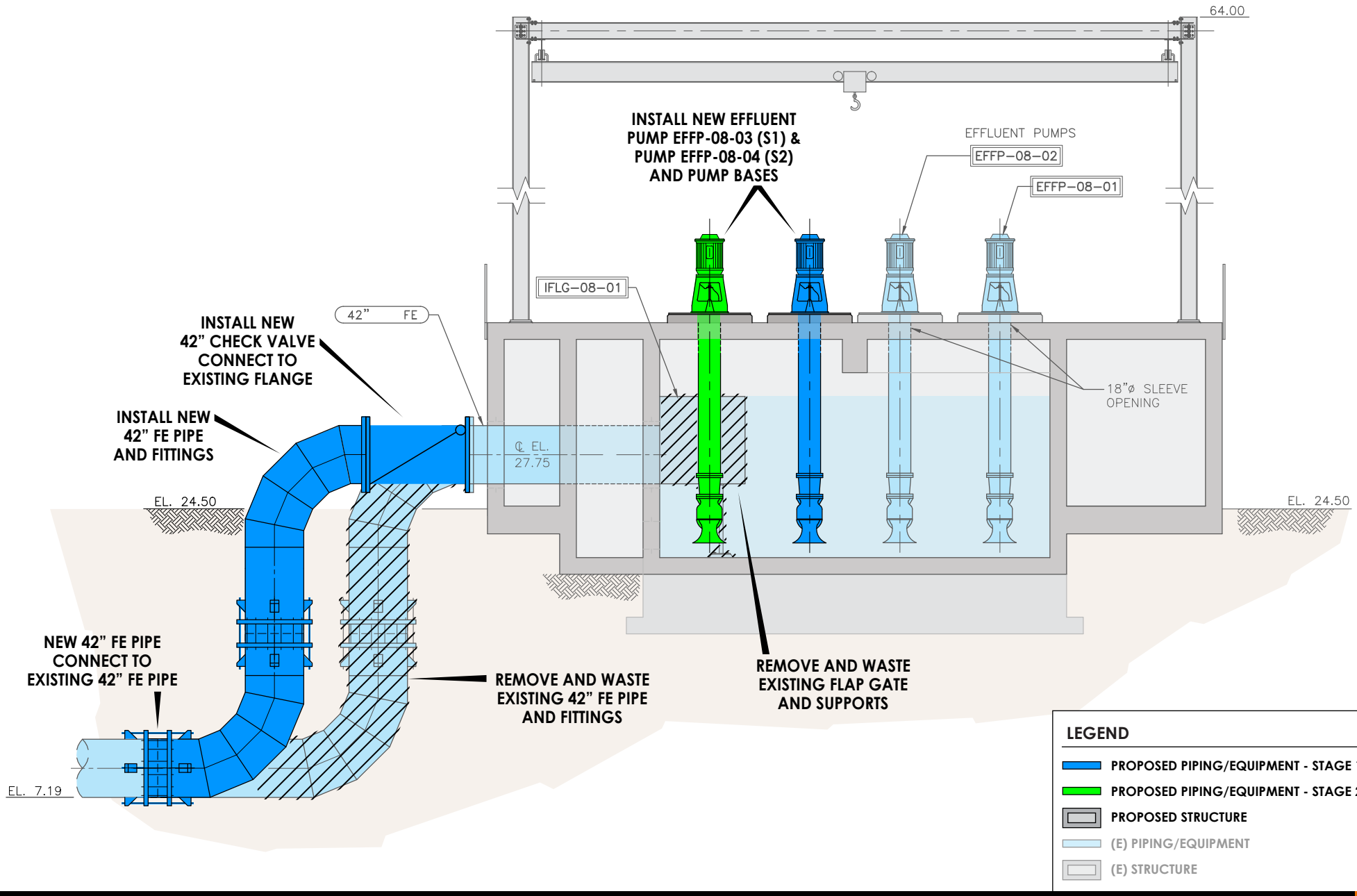


Figure 10-15
Effluent Pump Station Modifications

Design criteria for the existing and future effluent pumps required for the Phase IV Expansion is presented in **Table 10-16.**

Table 10-16. Design Criteria for Effluent Pumps for the Phase IV Expansion Project

Parameter	Existing Facility (Interim Project)	Stage 1 Expansion of Effluent Pumps at Southside	Stage 2 Expansion of Effluent Pumps at Southside
Peak Flow, Mgal/d	11.54	21.30	31.08
Number of Pumps	2	3	4
Pump Horsepower	100	100	100
Pump Capacity to San Joaquin River, Mgal/d @ ft TDH (each) [1]	9.65 @ 45	9.65 @ 45	9.65 @ 45
Pump Capacity to Cooling Towers	To be determined during preliminary design		

Notes:
[1] The noted capacity is the current design capacity of the pumps to convey final effluent to the San Joaquin River when water levels in the river are high. The revised capacity of these pumps following the installation of additional pumps should be determined during preliminary design.
Key:
Mgal/d = millions of gallons per day
TDH = total dynamic head

It was assumed that the cooling basin effluent pump station would have the same layout and pumps as the effluent pump station connected to the UV disinfection system. Since the cooling effluent basin provides some equalization capacity, it is estimated that this model pump will provide firm capacity with three pumps for Stage 1 and four pumps for Stage 2. Design criteria for the Cooling Effluent Pumps is presented in **Table 10-17**.

Table 10-17. Design Criteria for Cooling Basin Effluent Pumps for the Phase IV Expansion Project

Parameter	Stage 1 Cooling Basin Effluent Pumps	Stage 2 Cooling Basin Effluent Pumps
Peak Flow, Mgal/d [1]	21.30	31.08
Number of Pumps	3	4
Pump Horsepower	100	100
Pump Capacity [2]	To be determined during preliminary design	

Notes:
[1] This is the peak flow from the UV disinfection system. The cooling basin will provide some equalization capacity. The required design capacity of the cooling basin effluent pumps will be determined during preliminary design.
[2] The capacity of the current pumps at the UV disinfection facility to convey final effluent to the San Joaquin River when water levels in the river are high is 9.65 Mgal/d at a TDH of 45 feet. The new cooling basin effluent pump station will have a different design capacity as the elevations and force main length will be slightly different. The capacity of the cooling basin effluent pumps will be determined during preliminary design.
Key:
Mgal/d = millions of gallons per day
TDH = total dynamic head

10.2.8 New Municipal Utilities Building and Entrance Road

The WQCF has inadequate building space for the existing plant staff. New building space will also be required for additional staff to operate and maintain new treatment facilities for the next plant expansion as discussed in **Chapter 11**. To provide the required building space, it is recommended that a new Municipal Utilities Building be constructed at the WQCF. The proposed building, as shown on **Figure 10-8,** would be located adjacent to a new entrance road at the northeast end of the WQCF property just south of the intersection of West Yosemite Avenue and Swanson Road where a new intersection with traffic signal lights is being planned.

The proposed Municipal Utilities Building will serve all departments in public works including water, solid waste, and wastewater. The building will have a future occupancy of approximately 160 people and include reception area, restrooms, office space, conference rooms, and will also include shower and locker room space for operations and maintenance staff. Based on a building occupancy space requirement of 312.5 square feet per occupant the proposed Municipal Utilities Building will be approximately 50,000 square feet. The estimated construction cost (in current dollars) is $30M which will be shared equally between the three departments.

The recommended project will also include an asphalt paved parking lot for the building and automated road access gates on the entrance road after the building to restrict public access to the main treatment plant as shown on **Figure 10-8**.

10.3 PHASE IV EXPANSION PROJECT COSTS

Preliminary estimates of total project costs are presented in the following **Table 10-18**. Construction costs were developed using costs for similar construction at other wastewater treatment plants and equipment manufacturer quotes. These costs are based on an Engineering News Record Construction Cost Index (ENRCCI) 20-Cities Average of 13,176 (representing costs in March 2023 dollars). The total project costs (including project construction, engineering, administration, and construction management) are estimated at $146.3 million and $70.6 million for the Stage 1 and Stage 2 expansions, respectively. It should be noted that these costs will have to be escalated as appropriate to get costs at the actual times of construction.

Table 10-18. Phase IV Expansion Project Costs

Description	Stage 1 Project Cost	Stage 2 Project Costs
Influent Flow Meters	$896,000	$0
Influent Pumps	$597,000	$989,000
Aerated Grit Tanks at Southside Plant	$1,055,000	$1,055,000
Primary Sedimentation Basins at Southside Plant	$4,611,000	$4,611,000
Extend Aeration Basins at Southside Plant	$936,000	$0
Splitter Structure	$468,000	$63,000
Fine Screens for MBRs	$2,802,000	$900,000
MBRs Structure & Equipment	$15,399,000	$15,399,000
MBR Blower Building and Equipment	$1,878,000	$1,878,000
Effluent Pump Station Expansion & Pumps	$806,000	$582,000
Cooling Effluent Basin	$2,013,000	$0
Effluent Cooling Towers	$11,835,000	$2,555,000
Cooling Basin Effluent Pump Station	$2,658,000	$582,000
DAFTs	$2,240,000	$0
Biotower Demolition	$500,000	$0
Anaerobic Digesters	$2,660,000	$2,660,000
Digester Control Building Extension & Equipment	$1,095,000	$255,000
Centrifuge and Ancillary Equipment	$2,923,000	$2,923,000
Municipal Utilities Building and Entrance Road	$10,685,000	$0
Biosolids Drying Facilities	$17,308,000	$5,769,000
Subtotal Construction Estimate	**$83,365,000**	**$40,221,000**
Construction Estimating Contingency @30%	$25,010,000	$12,066,000
Construction Cost with Contingency	**$108,375,000**	**$52,287,000**
Engineering, CM, and Admin @35%	$37,931,000	$18,300,000
Total Project Cost	**$146,306,000**	**$70,587,000**

Key:
MBR = Membrane Bioreactor
DAFT = Dissolved Air Flotation Thickener
CM = Construction Management

11.0 STAFFING PLAN

11.1 INTRODUCTION

The City of Manteca wastewater collection system includes 250 miles of sanitary sewers, 18 lift stations, 18 miles of force mains, and 4,672 manholes. The California State Water Resources Control Board (SWRCB) requires that there be an adequate number of qualified wastewater personnel to maintain efficient operation of the wastewater infrastructure.

The WQCF consists of a single permitted treatment plant with the main secondary treatment process split into two plants: The Northside- and the Southside-Plant. The WQCF has a common influent pump station and headworks before flow is split to the Northside and Southside Plants. The secondary effluent is combined into a single process flow stream and is sent to a common filter feed pump station, flocculation basin, tertiary filter, and UV facility, prior to final effluent pumping and disposal. The solids handling and biogas treatment and reuse system for the Northside and Southside Plants are combined into a common biosolids/biogas treatment system.

The WQCF is currently classified by the SWRCB as a Class IV plant (a tertiary plant with design flows greater than 1.0 and less than 10.0 Mgal/d). For the Phase IV Stage 1 Expansion Project, the plant will need to be reclassified to a Class V because it will surpass the 10 Mgal/d threshold.

11.2 PURPOSE

The WQCF will undergo Interim capacity improvements that will increase capacity to 8.23 Mgal/d and then a proposed Phase IV Expansion in two stages. Stage 1 will expand the WQCF treatment capacity from about 8.23 Mgal/day to 12.9 Mgal/day and Stage 2 will expand it to a capacity of 17.5 Mgal/day.

The purpose of this chapter is to estimate the manpower requirements to operate the wastewater collection and treatment systems and to discuss the personnel qualifications, responsibilities, and certifications. Further, it will provide recommendations on staffing levels needed to manage the future WQCF and sewer collection infrastructure.

11.3 PLANT CLASSIFICATION AND OPERATOR CERTIFICATION

The City of Manteca WQCF is classified by the California State Water Resources Control Board (SWRCB) as a class IV plant (a tertiary plant with design flows greater than 1.0 and less than 10.0 Mgal/d). The Chief Plant Operator (CPO) must possess at least a valid Grade IV operator certificate and is responsible for the overall operation of the WQCF, including compliance with the WDR. When the plant is expanded above 10 Mgal/d, the plant will be classified to Class V and the Chief Plant Operator (CPO) must possess a valid Grade V operator certificate. (See **Tables 11-1** and **11-2**). When the CPO is unable to carry out the responsibilities of the position, they must appoint a Designated Operator-in-Charge (DOIC). The DOIC must possess a valid Grade III operator certificate and will be responsible for the overall operation of the WWTP when the CPO is unavailable. Each operator shall possess at least a

Grade I certificate or a valid operator-in-training (OIT) certificate. 50% of operators shall possess at least a valid Grade II certificate or valid OIT certificates at the Grade II level or higher.

In order for a Grade II operator to be responsible for the overall operation of the WQCF, temporarily considered a DOIC when neither the CPO or DOIC are available, the operator needs specific approval granted by the State Board to be designated a “Lone Operator”. To receive Lone Operator designation, the City must demonstrate difficulty, despite due diligence, in hiring a certified operator of the appropriate grade. If granted, the Lone Operator approval is only valid for six-months. Further, there must be procedures in place that document how the Lone Operator will communicate with the CPO or DOIC when direction is needed. It is important for the City to consider underlying risks associated with rotating a Lone Operator into a position directly responsible for the overall operation of the WWTP when they are not receiving immediate supervision.

11.3.1 Operator Certification

There are five levels of operator certification (Grades I through V). To receive a certificate, a person must meet the minimum experience and education requirements and pass a written test. **Table 11-3** details the experience and education requirements of the State Water Resources Control Board for each operator grade level. For more information on the certification of operators, contact:

The SWRCB, Office of Operator Certification
Post Office Box 944212
Sacramento, CA 94244
(916) 341-5639/341-5985
https://www.waterboards.ca.gov/water_issues/programs/operator_certification/exams.html

Table 11-1. Wastewater Treatment Plants Classification [1,2]

Class	Wastewater Treatment Process	Design Flow (Mgal/d)
I	Primary…….. Conventional Treatment Pond……	1.0 or less All
II	Primary…….. Biofiltration……. Modified Treatment Pond……	>1.0 - 5.0 1.0 or less All
III	Primary…….. Biofiltration……. Activated Sludge…….. Sequencing Batch Reactor……. Tertiary……..	>5.0 - 20.0 >1.0 - 10.0 5.0 or less 1.0 or less 1.0 or less
IV	Primary…….. Biofiltration……..….. Activated Sludge…….. Sequencing Batch Reactor…..….. Tertiary……..	>20.0 >10.0 - 30.0 >5.0 - 20.0 >1.0 - 10.0 >1.0 - 10.0
V	Biofiltration……..….. Activated Sludge…….. Sequencing Batch Reactor…….. Tertiary……..	>30.0 >20.0 >10.0 >10.0

Notes:
[1] Section 3675 of Operator Certification Regulations: California Code of Regulations, title 23, division 3, chapter 26, section 3670 et seq.
[2] Obtained from the SWRCB Wastewater Treatment Plant Classification Brochure.

Table 11-2. Minimum Required CPO and DOIC [1,2]

WWTP Classification	Minimum Grade Level of CPO	Minimum Grade Level of DOIC
I	I	I
II	II	I
III	III	II
IV	IV	III
V	V	III

Notes:
[1] Section 3680(a) of Operator Certification Regulations: California Code of Regulations, title 23, division 3, chapter 26, section 3670 et seq.
[2] Obtained from the SWRCB Wastewater Treatment Plant Classification Brochure.

Table 11-3. Operator Certification Requirements Table [1,2]

PATH	EXAMINATION Education Requirements		CERTIFICATION Qualifying Experience Requirements
GRADE 1			
1	High school diploma or equivalent and 6 educational points	**and**	1 year of full-time qualifying experience
GRADE II			
1	High school diploma or equivalent and 9 educational points	**and**	18 months of full-time qualifying experience as a Grade I operator
2	High school diploma or equivalent and 12 educational points	**and**	2 years of full-time qualifying experience
3	Associate's degree, a higher degree, or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	**and**	1 year of full-time qualifying experience
GRADE III			
1	High school diploma or equivalent and 12 educational points	**and**	3 years of full-time qualifying experience as a Grade II operator
2	High school diploma or equivalent and 18 educational points	**and**	4 years of full-time qualifying experience
3	Associate's degree or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	**and**	2 years of full-time qualifying experience
4	Bachelor's degree or a higher degree, including a minimum of 30 semester units of science courses	**and**	1 year of full-time qualifying experience
GRADE IV			
1	High school diploma or equivalent and 32 educational points	**and**	6 years of full-time qualifying experience
2	Associate's degree or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	**and**	4 years of full-time qualifying experience
3	Bachelor's degree or a higher degree, including a minimum of 30 semester units of science courses	**and**	3 years of full-time qualifying experience
4	Valid registration as a chemical, civil, or mechanical engineer issued by the California Board for Professional Engineers and Land Surveyors or by another state, territory, or Indian tribe	**and**	2 years of full-time qualifying experience
GRADE V			
1	High school diploma or equivalent and 48 educational points	**and**	10 years of full-time qualifying experience
2	Associate's degree or a minimum of 60 college semester units, including a minimum of 15 semester units of science courses	**and**	6 years of full-time qualifying experience
3	Bachelor's degree or a higher degree, including a minimum of 30 semester units of science courses	**and**	5 years of full-time qualifying experience
4	Valid registration as a chemical, civil, or mechanical engineer issued by the California Board for Professional Engineers and Land Surveyors or by another state, territory, or Indian tribe	**and**	4 years of full-time qualifying experience

Notes:
[1] Applicants must take and pass the Office of Operator Certification Wastewater Treatment Plant Operator Examination before applying for Certification.
2 Obtained from the SWRCB Operator Certification Requirements Table (April, 2013)

11.4 STAFF RESPONSIBILITIES

11.4.1 Operations

General operations tasks for the WQCF will include daily inspections, running equipment, biological and mechanical process adjustment and monitoring, management of delivery and hauling of chemicals, conducting and participating in coordination meetings, and reporting.

11.4.2 Maintenance

Maintenance is needed for the WQCF and for the wastewater collection systems. WQCF maintenance tasks will generally include equipment removal, disassembly, rebuild, and reinstallation. Regular maintenance activities include daily checks to ensure that equipment is operating properly and identify maintenance issues that require attention. In general, rotating equipment such as rotating screens, thickeners, centrifuges, blowers, and pumps will require regular cleaning and replacement of lubrication oil and filters, belt tension adjustment, chemical pump calibration, and vibration checks, etc.

Maintenance for wastewater collection includes inspecting the pipes and manholes for damage or blockages, removing any debris that may be clogging the pipes, and flushing the system to remove any buildup and sediment that may have accumulated.

11.4.3 Laboratory & Regulatory Compliance

Laboratory staff are responsible for regular monitoring of process performance and permit-required analysis, including sampling at various locations in the plant, laboratory analysis of the samples, report preparation, and nutrient analysis. Regulatory and Compliance staff ensure that the facility is following all applicable environmental laws and regulations.

11.4.4 SCADA

Supervisory Control and Data Acquisition (SCADA) staff are responsible for designing, installing, programming, and monitoring systems for wastewater treatment plants. SCADA engineers ensure the treatment system is running reliably, alarm the operators if equipment is not functioning properly, store historical data, and troubleshoot any issues that arise to improve the overall efficiency of the system. Other tasks include ensuring data collected is accurate and representative.

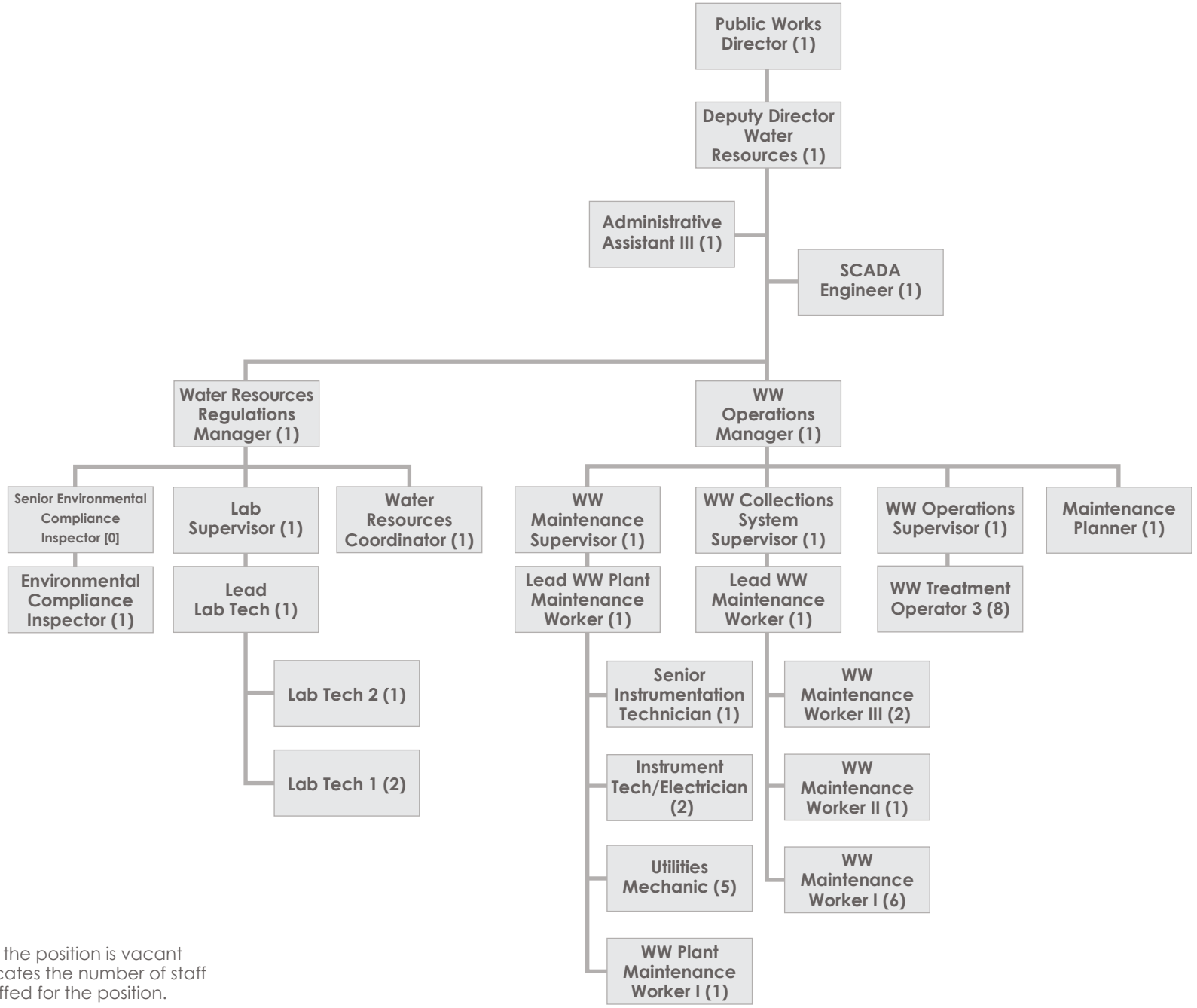
11.4.5 Supervisory

Supervisory staff perform duties that include managing staff, implementing procedures to complete all operation and maintenance tasks, coordinating with other City officials and outside agencies, and ensuring that the plant meets all regulatory requirements. Supervisors schedule staff to ensure that enough personnel are on-site to meet operations, maintenance, and laboratory needs.

11.5 CURRENT STAFFING

Half the staff at Manteca WQCF are currently working Monday through Thursday and the other half work Tuesday through Friday. The WQCF is manned by one operator who works overtime on the weekends, plus callouts. In general, staffing positions are designated into five categories: operations and maintenance, laboratory & regulatory compliance, collection system, supervisory/administration, and SCADA. Currently, there are 45 full-time employees for the wastewater treatment and collection system. The current organization chart is shown in **Figure 11-1** below.

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Note:
[0] indicates the position is vacant and **(#)** indicates the number of staff currently staffed for the position.

Figure 11-1
Current Organization Chart

11.6 FUTURE EXPANSION

The Manteca WQCF will undergo an expansion from 8.23 Mgal/d to 17.5 Mgal/d that will take place in 2 Stages with each stage having an incremental treatment capacity of 4.65 Mgal/d.

Each stage would include the constructing of a two train 4.65 Mgal/d Membrane Bioreactor (MBR) with appropriate expansion to the influent pump station, grit removal, primary sedimentation tanks and solids handling. The expansion will likely trigger adding cooling towers. The MBR and the cooling towers are new processes which would require more staffing.

11.7 STAFFING FOR CURRENT AND FUTURE EXPANSIONS

Staffing for operations and maintenance of the WQCF and its laboratory was primarily estimated from the *Northeast Guide for Estimating Staffing at Publicly and Privately Owned Wastewater Treatment Plants.* That guide was prepared by the New England Interstate Water Pollution Control Commission in November 2008. Engineering judgment and data from similar facilities were used when not explicitly included in the Northeast Staffing Guide. The current and future staffing requirements are based on the number of unit processes and the time required for operations and maintenance of each unit process/equipment. The total number of hours to operate and maintain the WQCF needs to be matched with onsite person-hours (i.e., excluding vacation, sick time, daily breaks, and daily mobilization and demobilization). This analysis assumed that the City of Manteca staff would have approximately 1,500 onsite person-hours per year.

11.7.1 Operations and Maintenance for WQCF

Tables 11-4 and **11-5** show the operation and maintenance estimate summary for Stage 1 and Stage 2, respectively. As shown in the Tables, the Stage 1 would require about 19,319 operations hours, which is equivalent to 13 operators (19,319 /1,500 = 13). No more operators are needed for Stage 2 because the number of operators is determined by the how many processes in the system rather than the number of units in each process.

Unlike operations, the more units in each process, the more time (and personnel) needed to maintain the equipment. The time required to maintain future expansions would be 19,445 and 23,594 hours per year which would require 13 and 16 maintenance staff members for Stages 1 and 2, respectively.

Table 11-4. WQCF Operations and Maintenance Staff Requirements for Stage 1 [1]

Parameter	# of Units	More Description	Operations (hr/Year)	Maintenance (hr/Year)	Total Hours (O&M)
Stage 1 (12.9 Mgal/d)					
Mechanical Screens	**4**		**522**	**1,044**	**1,566**
Manual Screens	1		13	65	78
Septage Receiving	1		261	65	326
Grit Removal	**6**	**Tanks**	**1,044**	**783**	**1,827**
Influent Pump Station	**5**	**Pumps**	**261**	**261**	**522**
Primary Sedimentation Tanks	**8**	**Tanks**	**2,349**	**2,088**	**4,437**
Aeration Basins	**12**	**Basins**	**4,176**	**3,758**	**7,934**
Secondary Clarifiers	5	Clarifiers	1,044	653	1,697
RAS/WAS Pump Station	**10**	**Pumps**	**783**	**522**	**1,305**
DAFT	**3**		**261**	**235**	**496**
Filter Feed Pump Station	4	Pumps	261	209	470
Tertiary Filtration	6	Filters	261	313	574
UV Disinfection	10	Racks	261	914	1,175
Effluent Pump Station	**5**	**Pumps**	**261**	**261**	**522**
Chlorine Contact Basin	1	Basin	26	78	104
Chemical Feed System	2	System	488	157	645
Digesters	**5**		**261**	**2,610**	**2,871**
Centrifuge Dewatering	2	Centrifuges	1,044	1,566	2,610
Gas Conditioning	1		131	131	261
Odor Control / BioFilter	1		261	131	392
Standby generator	1		26	52	78
Irrigation Pump Station	4	Pumps	1,044	209	1,253
Flare	1		26	52	78
Secondary Effluent Equalization Pond	1		26	26	52
Water Reuse	1		52	522	574
Janitorial/Custodial Staff	1	Service	0	196	196
Mowing	1	Service	0	65	65
Vehicle Maintenance	1	Service	0	26	26
Membrane Basins	**4**	**Basins**	**2,610**	**1,044**	**3,654**
Permeate Pumps	**4**	**Pumps**	**261**	**209**	**470**
Cooling Towers	**4**	**Towers**	**1,044**	**1,044**	**2,088**
Cooling Effluent Pumps	**3**	**Pumps**	**261**	**157**	**418**
Summary			19,319	19,445	38,764

Notes:
[1] Bold indicates new or changed.

Table 11-5. WQCF Operations and Maintenance Staff Requirements for Stage 2 [1]

Parameter	# of Units	More Description	Operations (hr/Year)	Maintenance (hr/Year)	Total Hours (O&M)
Stage 2 (17.5 Mgal/d)					
Mechanical Screens	**5**		**522**	**1,305**	**1,827**
Manual Screens	1		13	65	78
Septage Receiving	1		261	65	326
Grit Removal	**8**	**Tanks**	**1,044**	**1,044**	**2,088**
Influent Pump Station	**6**	**Pumps**	**261**	**313**	**574**
Primary Sedimentation Tanks	**10**	**Tanks**	**2,349**	**2,610**	**4,959**
Aeration Basins	**14**	**Basins**	**4,176**	**4,385**	**8,561**
Secondary Clarifiers	5	Clarifiers	1,044	653	1,697
RAS/WAS Pump Station	**14**	**Pumps**	**783**	**731**	**1,514**
DAFT	**4**		**261**	**313**	**574**
Filter Feed Pump Station	4	Pumps	261	209	470
Tertiary Filtration	6	Filters	261	313	574
UV Disinfection	10	Racks	261	914	1,175
Effluent Pump Station	**6**	**Pumps**	**261**	**313**	**574**
Chlorine Contact Basin	1	Basin	26	78	104
Chemical Feed System	2	System	488	157	645
Digesters	**6**		**261**	**3,132**	**3,393**
Centrifuge Dewatering	2	Centrifuges	1,044	1,566	2,610
Gas Conditioning	1		131	131	261
Odor Control / BioFilter	1		261	131	392
Standby generator	1		26	52	78
Irrigation Pump Station	4	Pumps	1,044	209	1,253
Flare	1		26	52	78
Secondary Effluent Equalization Pond	1		26	26	52
Water Reuse	1		52	522	574
Janitorial/Custodial Staff	1	Service	0	196	196
Mowing	1	Service	0	65	65
Vehicle Maintenance	1	Service	0	26	26
Membrane Basins	**8**	**Basins**	**2,610**	**2,088**	**4,698**
Permeate Pumps	**8**	**Pumps**	**261**	**418**	**679**
Cooling Towers	**5**	**Towers**	**1,044**	**1,305**	**2,349**
Cooling Effluent Pumps	**4**	**Pumps**	**261**	**209**	**470**
Summary			19,319	23,594	42,914

Notes:
[1] Bold indicates new or changed.

11.7.2 Laboratory & Regulatory Compliance

The laboratory's staffing requirements include direct effort, and indirect effort. Direct effort is time spent to sample analysis. For example, if it is required to measure BOD four times per week and it takes 2.5 hours for a laboratory tech to collect and analyze the sample, then the direct effort for this test is calculated as follows:

2.5 hours/test x 4 tests/week x 52 weeks / year = 520 hours/year

Actual in-house testing parameters for different sampling locations, frequency and time needed for analysis of these parameters are obtained from the WQCF laboratory. The sum of the total hours required for the direct efforts are summarized in **Table 11-6**.

Table 11-6. Direct Labor Required for WQCF Laboratory

Parameter	Testing Time (hrs/Yr)
Influent Monitoring	1,342
Effluent Monitoring	897
Land Application Area Wastewater Monitoring Requirements	451
Recycled Water Monitoring Requirements	365
Receiving Water Monitoring Requirements	65
Groundwater Monitoring Requirements	672
Total Time Spent on Testing (Hours)	**3,792**

The indirect effort accounts for all daily testing-related tasks include:

- Instrument calibration
- Planned and unplanned instrument and automation maintenance
- Performing quality control
- Performing proficiency testing
- Stocking supplies
- Filling out paperwork/data entry
- Clerical work
- Managing phone calls
- Report revisions
- Repeat testing
- Test development

Currently, there are four (4) laboratory technicians and one (1) laboratory supervisor with a total of five (5) full time employees (FTE) for the laboratory. The total manpower of the laboratory staff (excluding supervisory) is 6,000 manhour/year (1,500 hour/year/FTE x 4 FTE). The calculated indirect effort is 2,208 hour/year (6,000-3,792), which is almost 37% of the total effort.

In the future, there will be more effluent testing for the MBR, mainly turbidity, ammonia, and nitrate. It is estimated that the MBR direct effort to the MBR effluent would be approximately 500 hours. Accounting for the indirect effort associated with the extra testing, one more FTE employee will be needed for Stage 1. No more lab employees will be needed for Stage 2 expansion.

There is currently one staffed regulatory compliance position and one vacant regulatory compliance position. It is recommended to fill the vacant position and add an additional regulatory compliance position to meet existing needs.

11.7.3 Wastewater Collection

Data from other wastewater collection systems (length of sewers and force mains, number of manholes, and number of lift stations) and the number of wastewater collection maintenance employs were obtained to benchmark the staffing requirements for Manteca. It was found that there is a correlation between the total sewer length and the number of wastewater collection maintenance staff as shown in **Figure 11-2**. It appears that the wastewater collection maintenance staff is understaffed because there are only 10 employees for 250 miles of sewers compared to 16 employees for Merced, which has only 20 more miles of sewers (270 miles). In addition to the workload, the sanitary sewer collection maintenance crew also maintain the stormwater collection, which includes 114 Storm Stations. This requires approximately 1,150 manhours per year. The stormwater workload warrants one extra full time employee. To manage Manteca's existing 250 miles of sewers, it is recommended to add three (3) more staff (two [2] wastewater collection and one for storm water) for a total of 13. It is recommended that after each expansion stage, one additional wastewater collection maintenance staff member be added to manage the expanded collection system (i.e., total of 14 and 15 employees for Stage 1 and Stage 2, respectively).

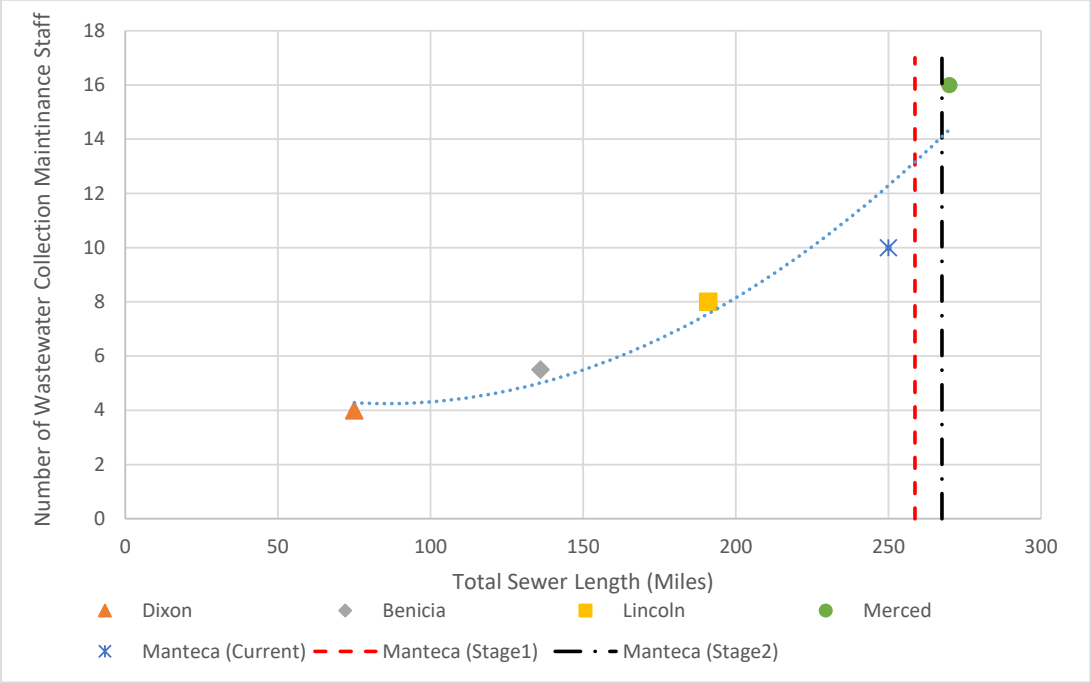


Figure 11-2. Correlation Between Total Sewer Length and Number of Maintenance Employees

11.7.4 Supervisors/Administration

There are currently eleven (11) full time supervisory and administrative staff: eight (8) supervisors and three (3) in administration. It is recommended to include one additional admin staff as the current workload of the Administrative Assistant III is unmanageable. No additional staff is needed for the Stage 1 or 2 expansions to maintain sufficient operation of the WQCF and collection system.

11.7.5 SCADA

There is currently one (1) full time SCADA Engineer. If the workload exceeds their capabilities, it is recommended to outsource some of the work to outside instrumentation and control consultants.

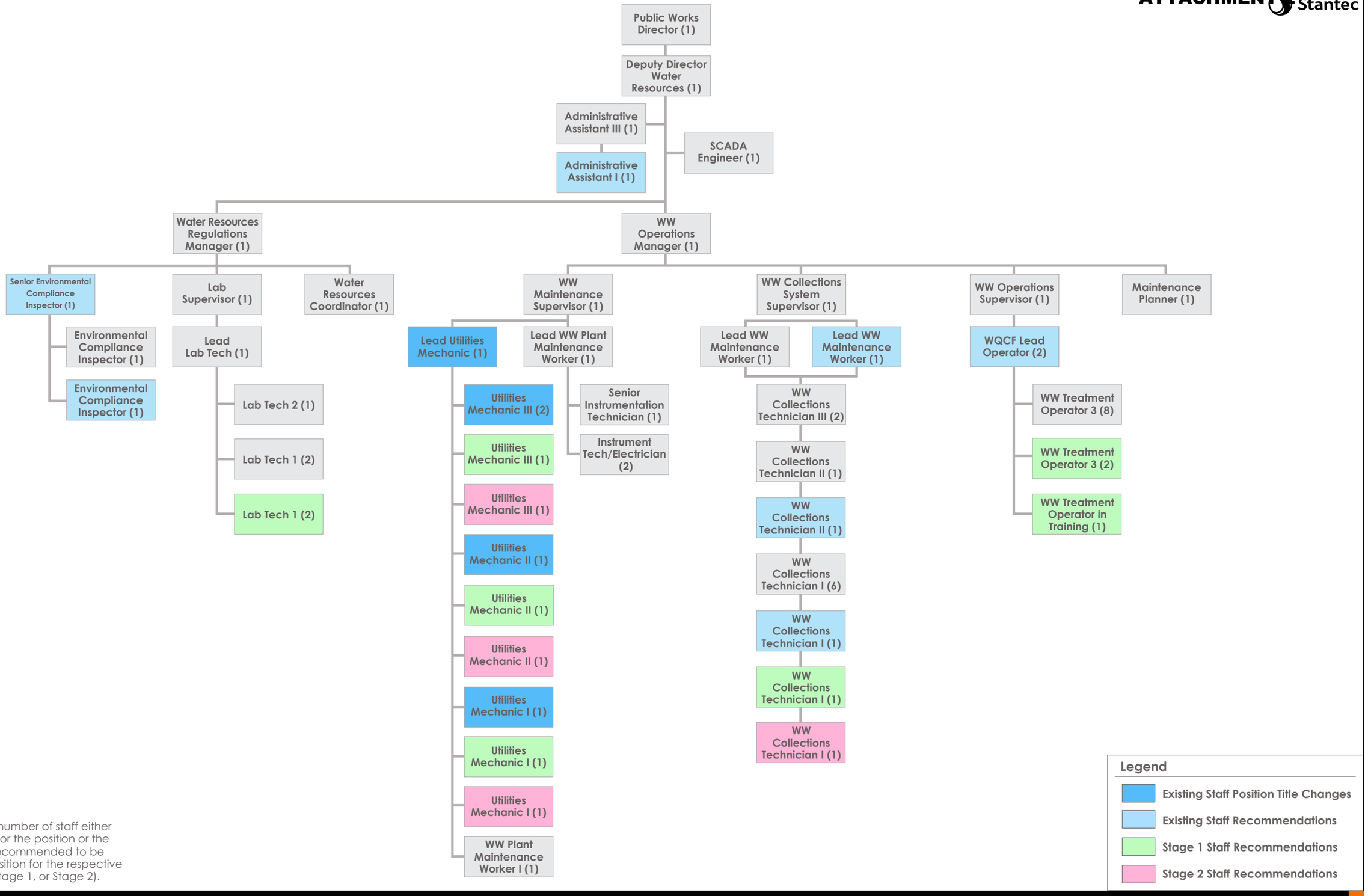
11.8 SUMMARY

A summary of the staffing recommendations for before and after the expansions are shown in **Table 11-7**.

Table 11-7. Summary of Staffing Recommendations

Parameter	Persons			
	Existing	Recommended for Existing	Stage 1 (12.9 Mgal/d)	Stage 2 (17.5 Mgal/d)
WQCF Operations	8	10	13	13
WQCF Maintenance	10	10	13	16
Laboratory & Regulatory Compliance	5	7	8	8
SCADA	1	1	1	1
Collection System	10	13	14	15
Supervisory/Admin	11	12	12	12
Net Total	**45**	**53**	**61**	**65**

A total of eight (8) more FTE are recommended for the existing WQCF and collection system. After the Stage 1 expansion, total recommended personnel will increase to a total of 61 and after the Stage 2 expansion it will increase to a total of 65. SCADA and Supervisory staff will experience no change during the expansions unless it is deemed necessary. **Figure 11-3** shows the additional staffing recommendations. Blue is what is recommended for the existing plant, green is for Stage 1, and pink for Stage 2.



Note:
(#) indicates the number of staff either currently staffed for the position or the number of staff recommended to be staffed for the position for the respective phase (existing, Stage 1, or Stage 2).

U:\184031535\drawing\graphics\manteca_wqcf_____ai mlm march-2023

Figure 11-3
Recommended Organization Chart

CITY OF MANTECA WASTEWATER MASTER PLAN

Staffing Plan
February 2024

City-specific staffing details, including compensatory time off, monthly rotation days off, and infrastructure condition/age/probability of failure, must be taken into consideration when determining the final personnel required to successfully operate and maintain the City's infrastructure investment. The operating hours shown in **Tables 11-4** and **11-5** were generated from an established model created by a committee that covers several northeastern states (Interstate Water Pollution Control Commission) but does not consider City-mandated scheduling conflicts or the condition of the infrastructure. The numbers generated in this report should be used as a general guide that can be refined based on site-specific details that are not incorporated into the model. The final staffing decisions should be made based on professional judgement of an experienced local operator.

12.0 CAPITAL IMPROVEMENT PROGRAM

The purpose of this chapter is to present a Capital Improvement Program (Program) that summarizes the Capital Improvement Projects (CIPs) identified in the previous chapters of this Master Plan. CIPs are presented chronologically to distribute costs over time in keeping with each project's criticality or other City priorities, but final project inclusion in the adopted Capital Improvement Program and associated dates are approximate and adjustable. No CIP is final until acted on by the City Council.

This chapter is divided into the following sections:

- Background
- Project Prioritization
- Cost Estimating Methodology
- Proposed Capital Improvement Program

12.1 BACKGROUND

Based on the completed hydraulic modeling and evaluation of the City of Manteca's wastewater collection system and capacity assessment of the Manteca Wastewater Quality Control Facility (WQCF), a prioritized Capital Improvement Program (Program) was prepared. It is important to note that the Program represents a snapshot of known/observed conditions as of March 2023. Due to the dynamic nature of the wastewater collection system and WQCF operations, project priorities and schedules may change over time. Furthermore, several of the projects identified will require additional analysis, beyond the scope of this Master Plan to determine the exact scope of necessary improvements. Finally, the projects and associated costs identified herein are presented in 2023 dollars and should be reviewed and updated on an annual basis using the Engineering News Record Construction Cost Index (ENRCCI) or another recognized index. The recommended CIPs are segmented into two categories: 1) Wastewater Collection System Projects (WCS), and 2) Wastewater Quality Control Facility Projects (WQCF).

12.2 PROJECT PRIORITIZATION

The Capital Improvement Program CIP prioritization for scheduling projects is based on giving the highest priority to those projects that pose the most risk to the community. The priority raking is as follows: 1) The highest risk to the community is infrastructure that is in poor condition that could potentially cause failure such as a collapsed gravity sewer pipe or treatment process that is not functioning properly; 2) The second highest risk is failure to comply with regulatory requirements such as non-compliant wastewater discharged to the San Joaquin River subjecting the City to mandatory fines; 3) The third highest risk is limited capacity under current flows to convey and treat the wastewater such as gravity sewers that are surcharging at the manholes, 4) The fourth highest priority is limited capacity to serve future growth; and 5) The lowest priority are projects desired by City staff to improve operation and maintenance.

The wastewater collection system evaluation identified seven CIPs (WCS-26 through 32) in **Chapter 6** with Priority Ranking 1, and six CIPs in **Chapter 5** (WCS-1 through 6) with Priority Ranking 3 because of

hydraulic capacity limitations at current flows. The remaining CIPs for the wastewater collection system are Priority Ranking 4 to accommodate future growth. **Chapter 9** identified 22 Interim CIPs at the WQCF with Priority Rankings from 2 to 5 including permit compliance projects and projects to accommodate population growth until FY 2030/2031. To accommodate future growth beyond FY 2030/2031, two CIPs with Priority Ranking 4 (WQCF-23 and WQCF-24) are identified in **Chapter 10** (WQCF Phase IV Expansion Stage 1 and Stage 2 Projects).

12.3 COST ESTIMATING METHODOLOGY

A key element to the Capital Improvement Program planning process is determining budgets for each of the identified Capital Improvement Projects. The projects and associated costs identified herein are presented in March 2023 dollars (Engineering News Record Construction Cost Index [ENRCCI] of 13,176) and should be reviewed and updated on an annual basis using the ENRCCI or another recognized index. The project cost estimates include base construction costs and soft costs. The engineering opinion of probable costs for the wastewater collection system falls under Classification 5 (as defined by Association for the Advancement of Cost Engineering, AACE) with an expected accuracy range of -50% to +100%. For projects at the WQCF, the engineering opinion of probable costs falls under Classification 4 with an expected accuracy range of -30% to 50%.

Construction costs were developed based on a combination of equipment quotes supplied from manufacturers, bids on other City wastewater facilities projects, construction cost estimates from similar type construction projects, and standard cost estimating guidelines.

Soft costs include a 30 percent mark-up for construction cost estimating and a 35 percent mark-up of the total construction cost for engineering, construction management and administration.

12.4 PROPOSED CAPITAL IMPROVEMENT PROGRAM

The recommended CIPs are shown in following **Tables 12-1 through 12-4** for the wastewater collection system and **Tables 12-5 through 12-7** for the WQCF. A 25-year proposed schedule of the identified CIPs and their associated estimated annual costs was developed and is included in **Appendix J.** The schedule was prepared based on the Priority Ranking and the costs were then roughly distributed as annual expenditures. However, in some cases, projects with lower rankings are scheduled for implementation sooner than higher ranking projects to address specific City needs. **Figure 12-1** shows the annual estimated expenditures for both wastewater collection system and the WQCF.

12.4.1 On-going Collection System Rehabilitation and Replacement Projects

The City of Manteca Sewer Condition Assessment Report (MSCA) dated August 2017 identified 14 project areas with defective gravity sewer pipelines and/or manhole in need rehabilitation and repair (R&R). Seven of these projects yet to be completed, as identified in Chapter 6, are listed in **Table 12-1**. It is recommended these projects be given the highest priority because of the potential risk of infrastructure failure.

Table 12-1. Ongoing Collection System Rehabilitation and Replacement Projects

CIP	Description	Project Costs	Scheduled Completion (FY)
WCS-26	UPRR Right of Way and Alley Between Center Street and Yosemite Avenue	$489,000	2025
WCS-27	Moffat Boulevard and Main Street	$1,022,000	2025
WCS-28	Oak Street from Main Street to Willow Avenue	$98,000	2025
WCS-29	Sequoia Avenue from Oregon Street to Alley north of Nevada Street	$53,000	2025
WCS-30	Tidewater Bike Path from Sandalwood Lane to Louis Avenue	$348,000	2025
WCS-31	Walnut Avenue from the alley north of Nevada Street to the UPRR	$279,000	2025
WCS-32	St. Dominic's Drive from north of Yosemite Avenue to Golf Course	$29,000	2025

12.4.2 Existing Wastewater Collection System Capacity Improvements

Wastewater collection system capacity system improvements identified in **Chapter 5** to eliminate existing sewer capacity deficiencies are listed in **Table 12-2.**

Table 12-2. Existing Wastewater Collection System Capacity Improvements

CIP	Description	Project Costs	Scheduled Completion (FY)
WCS-01	W. Center Street Trunk	$4,880,000	2032
WCS-02	Elm/West North Street Trunk	$5,080,000	2032
WCS-03	10-inch East North Street Trunk	$1,660,000	2032
WCS-04	8-inch East North Street Trunk	$510,000	2032

12.4.3 Previously Identified Wastewater Collection System Projects

The City has already made investments in their future collection system by preemptively installing oversized lines for future gravity sewers. Projects that would complete the construction of these gravity sewers are summarized in **Table 12-3.**

Table 12-3. Previously Identified Wastewater Collection System Improvements

CIP	Description	Project Costs	Scheduled Completion (FY)
WCS-05	South Woodward Trunk Extension	$12,640,000	2032
WCS-06	Central Union Road Trunk Extension	$16,170,000	2027
WCS-07	North Trunk Extension on Airport Way	$34,340,000	2036

12.4.4 Future Wastewater Collection System Improvements

Wastewater collection system capacity system improvements identified in **Chapter 5** to serve future development areas are listed in **Table 12-4.**

Table 12-4. Future Wastewater Collection System Improvements

CIP	Description	Project Costs	Scheduled Completion (FY)
WCS-08	S. Main Trunk to Evans	$7,180,000	2033
WCS-09	S. Airport Way and Yosemite Ave. (Fishback)	$3,100,000	2033
WCS-10	S. Airport Way Roberts Estates to Daniels	$1,750,000	2033
WCS-11	Yosemite Square Lift Station and Improvements	$12,880,000	2033
WCS-12	Austin Road Industrial Area Trunk	$20,810,000	2036
WCS-13	South Austin Road - Industrial Area	$5,780,000	2037
WCS-14	Yosemite Square Service Area	$4,240,000	2038
WCS-15	Oleander Avenue Extension/ S. Airport Way Sewer	$6,660,000	2037
WCS-16	Highway 99 Crossing at Northland Road	$9,310,000	2039
WCS-17	East Lathrop Road Trunk	$12,060,000	2041
WCS-18	Construct new 24-inch bypass sewer	$6,630,000	2040
WCS-19	Northland Road Branches	$6,350,000	2041
WCS-20	Louise/ Nehemiah Branches	$5,160,000	2041
WCS-21	South Union Road Extension	$4,590,000	2042
WCS-22	Cottage Avenue	$3,080,000	2043
WCS-23	North Shed Union Road Trunk	$13,130,000	2044
WCS-24	Manteca Junction Trunk	$3,730,000	2045
WCS-25	Lovelace Road - 99 Crossing	$18,090,000	2045

12.4.5 WQCF Capacity Assessment Interim Improvements

As identified in the WQCF 2021 Capacity Assessment Study, there have been several changed conditions at the WQCF since 2001 that affect the capacity of the WQCF, some of these include the following:

- Drought conditions and water conservation in recent years have resulted in increased wastewater strength as the pollutants contributed by a given population are carried in less water to the WQCF.
- An effluent limit on Nitrate + Nitrite Nitrogen (10 mg/L monthly average) was added to the National Pollution Discharge Elimination System (NPDES) Permit for the WQCF. The Phase III design did not consider or provide adequate facilities to meet this requirement at the original 9.87 Mgal/d design flow.
- The biotowers in the Northside Plant, which provided a portion of the treatment capacity established in the Phase III Basis of Design Report, were removed from service because they remove the carbon source needed for denitrification. Therefore, they were incompatible with meeting the new nitrogen permit limit.

Because of these changed conditions, the WQCF does not have the treatment capacity to support ongoing growth within the City. It is recommended that the Interim Improvements listed in **Table 12-5** be constructed to increase treatment capacity from 6.36 Mgal/d to 8.23 Mgal/d ADWF (true influent flow without plant recycle). Based on the projected population annual growth rate of 2.8 percent, the interim improvements are expected to provide treatment capacity until FY 2030/2031.

Table 12-5. WQCF Capacity Assessment Interim Projects

CIP	Description	Project Costs	Scheduled Completion (FY)
WQCF-01	North and South Plant WAS Pump Replacement Project	$2,827,000	2025
WQCF-02	South Plant RAS Pump Replacement Project	$1,652,000	2025
WQCF-03	North and South Plant Aeration Basins Improvements	$11,696,000	2026
WQCF-04	Sidestream Treatment System	$20,205,000	2029
WQCF-05	Add Centrifuge No. 3	$5,130,000	2027
WQCF-06	Add DAFT No. 3	$3,930,000	2027

12.4.6 Instrumentation and Electrical Improvement Projects

The following **Table 12-6** lists instrumentation and electrical improvements identified in **Chapter 9** from previous studies and interviews with plant staff.

Table 12-6. Instrumentation and Electrical Improvement Projects

CIP	Description	Project Costs	Scheduled Completion (FY)
WQCF-07	I&E Core Supervisory Control and Data Acquisition (SCADA) System	$1,127,000	2027
WQCF-08	I&E Remote Site Process Logic Controller (PLC) Upgrades	$1,727,000	2027
WQCF-09	I&E PLC and Operator Interfaced Terminal (OIT) Replacement	$1,374,000	2030
WQCF-10	I&E Switchgear PLC Upgrades	$127,000	2028

12.4.7 Other WQCF Interim Projects

The following **Table 12-7** lists other improvements that were identified in **Chapter 9** from previous studies and interviews with plant staff.

Table 12-7. Other WQCF Interim Improvement Projects

CIP	Description	Project Costs	Scheduled Completion (FY)
Other Interim Improvement Projects			
WQCF-11	Add Influent Pump No. 5	$1,048,000	2025
WQCF-12	Lightweight Covers for Process Basins	$5,792,000	2030
WQCF-13	Headworks, IPS and Biofilter Improvements	$2,080,000	2027
WQCF-14	UV Disinfection System Upgrade	$15,583,000	2027
WQCF-15	Plant Water System Piping Modifications	$636,000	2025
WQCF-16	Replace Secondary Effluent Equalization Pond Liner	$2,101,000	2025
WQCF-17	Headworks Screen No. 3	$900,000	2028
WQCF-18	FOG Receiving Station Screening System	$200,000	2025
WQCF-19	Bulk Ferric Chloride Solution Tanks	$351,000	2025
WQCF-20	Digesters No. 1 and 2 Overflow Boxes	$706,000	2025
WQCF-21	Digester Pressure Relief Valves Platform & Handrailing	$205,000	2025
WQCF-22	Install New Waste Heat Radiator	$198,000	2025

12.4.8 WQCF Phase IV Expansion Projects

Based on a population growth rate of 2.8 percent and assuming influent loadings to the WQCF increase proportional to population growth, the proposed Interim Improvements will provide treatment capacity until FY 2030/2031. The Phase IV Expansion Project would then increase the true ADWF capacity (without in-

plant recycle) from 8.23 Mgal/d to 17.5 Mgal/d and provide treatment capacity until FY 2057/2058, serving an equivalent Manteca population of 236,000.

Expansion from 8.23 Mgal/d to 17.5 Mgal/d (i.e., building 27 years of treatment capacity) in one stage is not recommended because discharge permit requirements are subject to change every five years and future wastewater treatment technologies could make the current treatment technologies obsolete a decade from now. It is recommended that the Phase IV Expansion Project be constructed in two stages, as shown in **Table 12-8**.

Table 12-8. WQCF Phase IV Expansion Project

CIP	Description	Project Costs	Scheduled Completion (FY)
WQCF-23	WQCF Phase IV Stage 1 Expansion Project	$146,306,000	2031
WQCF-24	WQCF Phase IV Stage 2 Expansion Project	$70,587,000	2047

Figure 12-1 shows the annual estimated expenditures for both wastewater CIP categories.

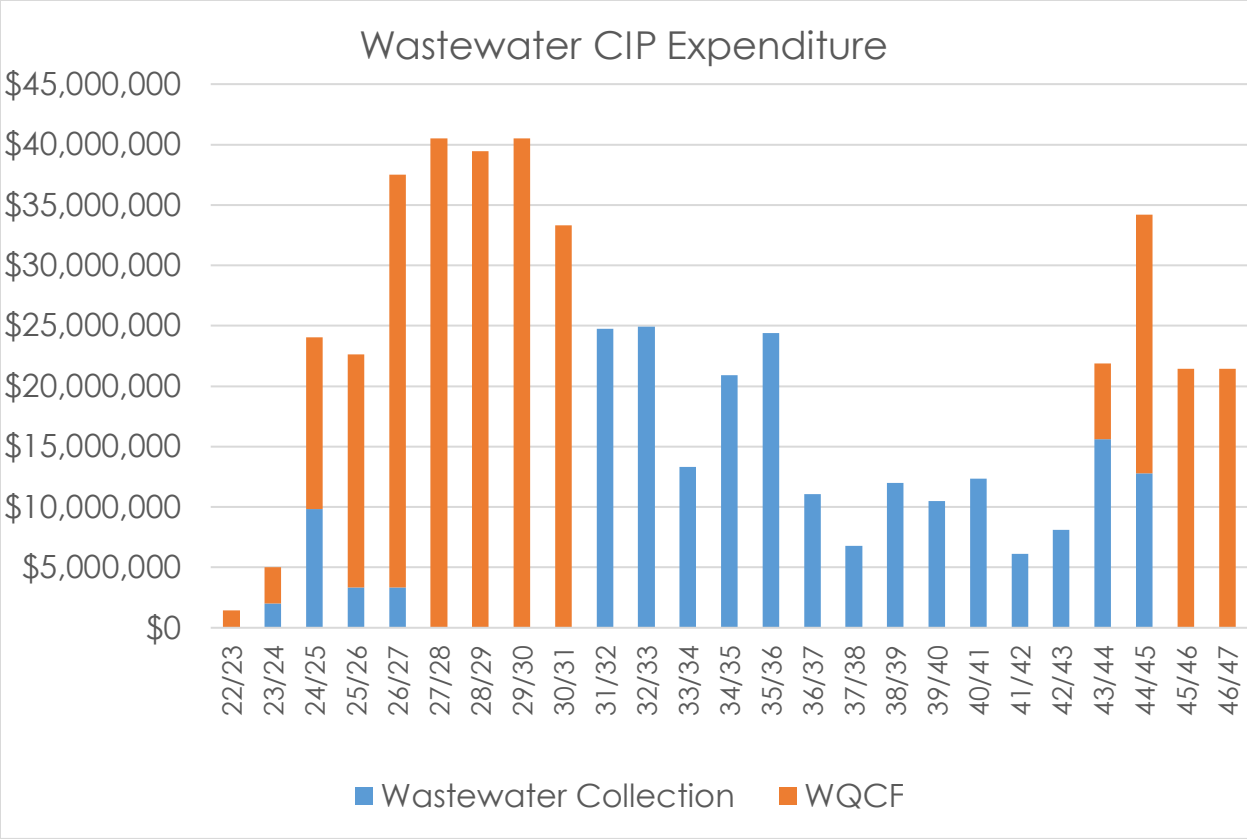


Figure 12-1. Proposed CIPs Annual Estimated Expenditures

12.5 CONCLUSIONS AND RECOMMENDATIONS

Key conclusions and recommendations from this WWMP and Capital Improvement Program include:

- The average per capita ADWF discharged to the WQCF is 61 gallons per person per day (gpcd). The United States Census Bureau identifies an average household density of approximately 3.19 persons per household, or persons per equivalent dwelling unit (EDU) within the City of Manteca and was used to translate the per capita flow into the ADWF unit rate of 195 gpd/EDU.

- The Manteca full build-out flow (see **Chapter 5**) is approximately 15.3 Mgal/d (ADWF). Adding Lathrop's flow contribution of 1.45 Mgal/d gives a total flow of 16.8 Mgal/d (ADWF). Master Planning for 17.5 Mgal/d (ADWF) would provide enough capacity for Manteca's full build-out flow plus Lathrop and other flow contributions from developments outside of the City such as Oakwood Shores and Raymus Village. Based on an annual population growth rate of 2.8% and assuming influent loadings to the WQCF increase proportional to population growth, 17.5 Mgal/d would provide capacity until FY 2057/2058 serving an equivalent Manteca population of 236,000.

- Residual pipe capacity is defined as the remaining capacity in a sewer under peak flow conditions. Areas without residual capacity under existing conditions primarily exist in the Central Shed. Four CIP projects within the Central shed (see **Table 5-5**) are recommended for pipe upsizing to eliminate these capacity deficiencies. The proposed improvements are sized to accommodate PWWF under future buildout development conditions.

- Based on the review of the previous wastewater collection system planning documents, the City has alternated between two collection system strategies: 1) The 2012 Master Plan strategy includes a shallower collection system with a number of interim and permanent sewage lift stations; and 2) The 2006 Master Plan strategy which includes deeper trunk sewers minimizing the overall need for sewage lift stations. This WWMP assumes a deeper trunk strategy to avoid major upgrades to the existing sewage lift stations that would be required to accommodate growth, and to reduce the maintenance costs associated with operating numerous pump stations in the system.

- The City recently completed a project replacing the North Trunk Sewer. The project replaced the 36-inch trunk sewer with a larger and deeper 54-inch sewer. The Central Trunk should be extended from the upstream point of the North Trunk project to bypass the Union Road Sewage Lift Station and allow flow from the Central Shed to flow by gravity to the WQCF. This project identified as the Central Union Road Truck Extension (WCS-06) in the Capital Improvement Program would allow decommissioning of the Union Road Sewage Lift Station which is beyond its useful life and in very poor operating condition.

- The alternative improvements recommended for the Woodward Park Sewage Lift Station include: 1) increasing the firm pumping capacity to meet the maximum inflow of approximately 2.8 Mgal/d by adding an additional pump to the station or swapping out the existing pumps, or 2) installing 4,030 LF of 36-inch sewer to extend the existing South Trunk in Woodward Avenue to reach the unused existing 36-inch sewer at the intersection of Woodware Avenue and S. Main Street. The

recommended project (WCS-05) is to install the 36-inch sewer pipe which would eliminate the Woodward Park Sewage Lift Station and the Evan's Sewage Lift Station.

- Seven rehabilitation and replacement projects identified in **Chapter 6** were given the highest priority rating in the Capital Improvement Program due to the potential for failure such as a collapsed sewer pipe or sanitary sewer overflow due to blockage. It is recommended these projects be scheduled as soon as practical and to continue cleaning and inspecting the pipelines and manholes within the system at a rate of approximately 5% to 10% per year, respectively.

- A capacity study of the WQCF completed in 2021 determined immediate improvements to the WQCF that are needed for nitrogen removal. Without these improvements, the WQCF will be challenged to meet permit discharge requirements. The proposed improvements, including side-stream treatment to remove nitrogen from the digester centrate, will provide an estimated 8.23 Mgal/d of ADWF capacity.

- Measured influent flows at the WQCF include plant recycle flows and are not the true influent flow from Manteca's wastewater collection system and City of Lathrop. The measured influent flow at the WQCF includes plant recycle flows which are approximately 12% of the total measured flow. From December 2019 through November 2020, the City of Lathrop's average annual flow was 1.07 Mgal/d or 16.8% of the total true influent flow of 6.36 Mgal/d. Lathrop's flow limit, if they participate in funding their share of the proposed Interim Improvements, would increase to 1.21 Mgal/d (14.7% x 8.23 Mgal/d).

- Several other Interim Improvement projects to correct WQCF deficiencies are identified in Chapter 9. These projects, listed on **Table 9-3**, include safety items such as improving the ventilation system for the Headworks and Influent Pump Station, and permit compliance improvements such as upgrading the UV disinfection system.

- The recommended WQCF Phase IV Expansion Project to increase the plant capacity to 17.5 Mgal/d ADWF will be constructed in two stages. The first stage project scheduled for completion in FY 2030/2031, will add Membrane Bioreactors (MBRs) that will be operated in parallel with the existing Conventional Activated Sludge (CAS) treatment system. The project will also include in-kind expansion of pumps, aerated grit tanks, primary sedimentation basins, DAFT, dewatering equipment, digesters, and cooling towers.

- Instead of constructing cooling towers as recommended in the previous studies, effluent could be used for groundwater recharge to help mitigate overdraft of the Eastern San Joaquin Groundwater Basin. However, because of the relatively shallow depth to groundwater in the Manteca area, this use is not considered feasible in the central Manteca area. Further investigation of a suitable groundwater recharge site is recommended as the preferred alternative to cooling towers.

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Appendix
February 2024

APPENDIX A

City of Manteca 2020 Sewer System Management Plan

ATTACHMENT 2

City of Manteca
Sewer System Management Plan

8 January 2020

Prepared for

City of Manteca
1001 W. Center Street
Manteca, CA 95337

Prepared by

Kennedy/Jenks Consultants
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K/J Project No. 1970006.00

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Abbreviations and Acronyms

ARV	air release valves
AVRV	air/vacuum release valve
BMP	best management practices
CCTV	closed circuit television
CIP	Capital Improvement Plan or Capital Improvement Program
CIPP	Capital Improvement Projects Plan
City	City of Manteca
CIWQS	California Integrated Water Quality System
CMMS	Computerized Management and Maintenance System
CWEA	California Water Environment Association
DEH	Department of Environmental Health
FOG	fats, oils and grease
FTE	full-time equivalent
gal	gallon
GIS	Geographic Information System
gpm	gallons per minute
HAZMAT	hazardous materials
hp	horse power
I/I	infiltration and inflow
mgd	million gallons per day
MRP	Monitoring and Reporting Program
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
OES	Office of Emergency Services
OSHA	Occupational Safety and Health Administration
PFIP	Public Facilities Implementation Plan
PLSD	private lateral sewage discharge
PM	preventative maintenance
RWQCB	Regional Water Quality Control Board
SCADA	supervisory control and data acquisition
SSMP	Sewer System Management Plan

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SSO	sanitary sewer overflow
SSORP	Sanitary Sewer Overflow Response Plan
SWRCB	State Water Resources Control Board
TV	television
U.S.	United States
URPS	Union Road Pump Station
VFD	variable frequency drive
WDR	Waste Discharge Requirement
WQCF	Wastewater Quality Control Facility

Executive Summary

The City of Manteca (City) is currently operating under Waste Discharge Requirement (WDR) Order No. R5-2009-0095 and National Pollutant Discharge Elimination System (NPDES) Permit CA0081558. Special Provision VII.B.5.c of this WDR/NPDES requires the City to submit a Sewer System Management Plan (SSMP). The State Water Resources Control Board (SWRCB) has developed a statewide general WDR whose provisions also require all publicly-owned wastewater dischargers with a collection system greater than one-mile in length develop a SSMP. As the SWRCB adopted the new statewide general WDR in May 2006, this SSMP has been prepared in accordance with the SWRCB WDRs.

Table ES-1 below summarizes where the specific SWRCB WDRs are addressed in the following sections of this SSMP report.

Table ES-1: Waste Discharge Requirements

WDR Section	WDR Description	SSMP Section
D.13.ii.a	The name of the responsible or authorized representative as described in Section J of this Order.	2.2
D.13.ii.b	The names and telephone numbers for management, administrative, and maintenance positions responsible for implementing specific measures in the SSMP program. The SSMP must identify lines of authority through an organization chart or similar document with a narrative explanation; and	Attachment V of Appendix A & Figure 2-2 in Section 2.2
D.13.ii.c	The chain of communication for reporting sanitary sewer overflows (SSOs), from receipt of a complaint or other information, including the person responsible for reporting SSOs to the State and Regional Water Board and other agencies if applicable (such as County Health Officer, County Environmental Health Agency, Regional Water Board, and/or State Office of Emergency Services [OES]).	Figure 1 in Appendix A
D.13.iii.a	Prevent illicit discharges into its sanitary sewer system (examples may include infiltration and inflow [I/I], stormwater, chemical dumping, unauthorized debris and cut roots, etc.);	5.1
D.13.iii.b	Require that sewers and connections be properly designed and constructed;	5.3
D.13.iii.c	Ensure access for maintenance, inspection, or repairs for portions of the lateral owned or maintained by the Public Agency;	5.5
D.13.iii.d	Limit the discharge of fats, oils, and grease and other debris that may cause blockages, and	5.6
D.13.iii.e	Enforce any violation of its sewer ordinances.	5.7
D.13.iv.a	Maintain an up-to-date map of the sanitary sewer system, showing all gravity line segments and manholes, pumping facilities, pressure pipes and valves, and applicable stormwater conveyance facilities;	6.1

ATTACHMENT 2

WDR Section	WDR Description	SSMP Section
D.13.iv.b	Describe routine preventive operation and maintenance (O&M) activities by staff and contractors, including a system for scheduling regular maintenance and cleaning of the sanitary sewer system with more frequent cleaning and maintenance targeted at known problem areas. The preventative maintenance (PM) program should have a system to document scheduled and conducted activities, such as work orders;	6.3
D.13.iv.c	Develop a rehabilitation and replacement plan to identify and prioritize system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. The program should include regular visual and television (TV) inspections of manholes and sewer pipes, and a system for ranking the condition of sewer pipes and scheduling rehabilitation. Rehabilitation and replacement should focus on sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Finally, the rehabilitation and replacement plan should include a capital improvement plan (CIP) that addresses proper management and protection of the infrastructure assets. The plan shall include a time schedule for implementing the short- and long-term plans plus a schedule for developing the funds needed for the CIP	6.8
D.13.iv.d	Provide training on a regular basis for staff in sanitary sewer system O&M, and require contractors to be appropriately trained; and	6.5 & 6.6
D.13.iv.e	Provide equipment and replacement part inventories, including identification of critical replacement parts.	6.4
D.13.v.a	Design and construction standards and specifications for the installation of new sanitary sewer systems, pump stations and other appurtenances; and for the rehabilitation and repair of existing sanitary sewer systems; and	7.1
D.13.v.b	Procedures and standards for inspecting and testing the installation of new sewers, pumps, and other appurtenances and for rehabilitation and repair projects.	7.2
D.13.vi.a	Proper notification procedures so that the primary responders and regulatory agencies are informed of all SSOs in a timely manner;	Appendix A
D.13.vi.b	A program to ensure an appropriate response to all overflows;	Appendix A
D.13.vi.c	Procedures to ensure prompt notification to appropriate regulatory agencies and other potentially affected entities (e.g., health agencies, Regional Water Boards, water suppliers, etc.) of all SSOs that potentially affect public health or reach the waters of the State in accordance with the Monitoring and Reporting Program (MRP). All SSOs shall be reported in accordance with this MRP, the California Water Code, other State Law, and other applicable Regional Water Board WDRs or NPDES permit requirements. The SSMP should identify the officials who will receive immediate notification;	Appendix A
D.13.vi.d	Procedures to ensure that appropriate staff and contractor personnel are aware of and follow the Emergency Response Plan and are appropriately trained;	6.5 & Appendix A
D.13.vi.e	Procedures to address emergency operations, such as traffic and crowd control and other necessary response activities; and	Appendix A

WDR Section	WDR Description	SSMP Section
D.13.vi.f	A program to ensure that all reasonable steps are taken to contain and prevent the discharge of untreated and partially treated wastewater to waters of the United States (U.S.) and to minimize or correct any adverse impact on the environment resulting from the SSOs, including such accelerated or additional monitoring as may be necessary to determine the nature and impact of the discharge.	Appendix A
D.13.vii.a	An implementation plan and schedule for a public education outreach program that promotes proper disposal of fats, oils and grease (FOG);	4.5
D.13.vii.b	A plan and schedule for the disposal of FOG generated within the sanitary sewer system service area. This may include a list of acceptable disposal facilities and/or additional facilities needed to adequately dispose of FOG generated within a sanitary sewer system service area;	4.2
D.13.vii.c	The legal authority to prohibit discharges to the system and identify measures to prevent SSOs and blockages caused by FOG;	4.4
D.13.vii.d	Requirements to install grease removal devices (such as traps or interceptors), design standards for the removal devices, maintenance requirements, Best Management Practices (BMP) requirements, record keeping and reporting requirements;	4.2
D.13.vii.e	Authority to inspect grease producing facilities, enforcement authorities, and whether the Enrollee has sufficient staff to inspect and enforce the FOG ordinance;	4.3
D.13.vii.f	An identification of sanitary sewer system sections subject to FOG blockages and establishment of a cleaning maintenance schedule for each section; and	4.1
D.13.vii.g	Development and implementation of source control measures for all sources of FOG discharged to the sanitary sewer system for each section identified in (f) above.	4.2
D.13.viii.a	Evaluation: Actions needed to evaluate those portions of the sanitary sewer system that are experiencing or contributing to an SSO discharge caused by hydraulic deficiency. The evaluation must provide estimates of peak flows (including flows from SSOs that escape from the system) associated with conditions similar to those causing overflow events, estimates of the capacity of key system components, hydraulic deficiencies (including components of the system with limiting capacity) and the major sources that contribute to the peak flows associated with overflow events;	Section 8
D.13.viii.b	Design Criteria: Where design criteria do not exist or are deficient, undertake the evaluation identified in (a) above to establish appropriate design criteria; and	Section 8 and 7.1
D.13.viii.c	Capacity Enhancement Measures: The steps needed to establish a short- and long-term CIP to address identified hydraulic deficiencies, including prioritization, alternatives analysis, and schedules. The CIP may include increases in pipe size, I/I reduction programs, increases and redundancy in pumping capacity, and storage facilities. The CIP shall include an implementation schedule and shall identify sources of funding.	Section 8 & 6.8
D.13.viii.d	Schedule: The Enrollee shall develop a schedule of completion dates for all portions of the capital improvement program (CIP) developed in (a)-(c) above. This schedule shall be reviewed and updated consistent with the SSMP review and update requirements as described in Section D. 14.	6.8

WDR Section	WDR Description	SSMP Section
D.13.ix.a	Maintain relevant information that can be used to establish and prioritize appropriate SSMP activities;	9.1
D.13.ix.b	Monitor the implementation and, where appropriate, measure the effectiveness of each element of the SSMP;	9.1
D.13.ix.c	Assess the success of the PM program;	9.3
D.13.ix.d	Update program elements, as appropriate, based on monitoring or performance evaluations; and	9.2
D.13.ix.e	Identify and illustrate SSO trends, including: frequency, location, and volume.	Appendix E and Figure 2-1
D.13.x	As part of the SSMP, the Enrollee shall conduct periodic internal audits, appropriate to the size of the system and the number of SSOs. At a minimum, these audits must occur every two years and a report must be prepared and kept on file. This audit shall focus on evaluating the effectiveness of the SSMP and the Enrollee's compliance with the SSMP requirements identified in this subsection (D.13), including identification of any deficiencies in the SSMP and steps to correct them.	9.3
D.13.xi	The Enrollee shall communicate on a regular basis with the public on the development, implementation, and performance of its SSMP. The communication system shall provide the public the opportunity to provide input to the Enrollee as the program is developed and implemented. The Enrollee shall also create a plan of communication with systems that are tributary and/or satellite to the Enrollee's sanitary sewer system.	10.1.1

The City's current O&M procedures are largely informal with minimal written procedures and documentation. Throughout this document recommendations will be made for the City to formalize their programs with references of examples in Appendix C. A summary of the recommendations made in the 2006 and 2014 SSMP are listed below with an update as to whether the recommendation is still warranted for this 2019 SSMP. For the recommendations that are still warranted they are further described throughout the SSMP.

Table ES-2: Summary of Recommendations

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section
Staffing Workload Evaluation	Recommendation is still warranted as staffing will need to be continually evaluated with changes in organization structure, population growth in the City and maintenance activities.	Recommendation is still warranted as staffing will need to be continually evaluated with changes in organization structure, population growth in the City and maintenance activities.	2.3.1
Tracking and Recording SSOs	The City is recording and tracking their SSOs; therefore, this recommendation is no longer warranted.		N/A
Reporting	The City is currently reporting their SSOs per the SWRCB WDR requirements; therefore, this recommendation is no longer warranted.		N/A
Database Objective	Recommendation is still warranted as the City is initiating the use of the Computerized Management and Maintenance System (CMMS) and will be populating with data in order to assist the objectives described in the recommendation.	Recommendation is still warranted; the City has completed transferring collection system data from AutoCAD to Geographic Information System (GIS), and the data will be used to meet the objectives described.	3.2.1 6.1
FOG Program	The City updated and adopted the Industrial Waste Ordinance, which includes FOG Control component; therefore, the recommendation has been fulfilled and no longer warranted.		N/A
Pollutant Requirements	The City recently updated their Industrial Waste Ordinance; therefore, the recommendation is no longer warranted.		N/A

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section
Inspection Services	Recommendation is still warranted as the City should review and consider the CCTV and inspection of installed sewer mains and laterals prior to the one year warranty period expiring.	Recommendation is still warranted as the City should review and consider the CCTV and inspection of installed sewer mains and laterals prior to the one-year warranty period expiring.	5.8.2
Ownership of Laterals	The City is in the process of clarifying ownership of laterals. For now, the current policy remains in place.	The City should continue to collect data on lateral SSOs to determine if they are a significant source of total SSOs in the City and which are caused by private property owners.	Appendix G
Collection System Map	The City has completed the transfer of collection system components from AutoCAD to Geographic Information System (GIS) and has begun the integration process with other City owned utilities. The City is commencing the next phase of integrating the mapping with the CMMS.	The City has completed the transfer of collection system components from AutoCAD to Geographic Information System (GIS) and has begun the integration process with other City owned utilities. The City has integrated the mapping with the CMMS, which is used to generate reports on asset performance and identify hot spot locations.	6.1
Updating As-Builts	The City has a procedure in place for updating collection system mapping; therefore, this recommendation is no longer warranted.		N/A
Wastewater Collection System Asset Identification	As part of the conversion into GIS mapping the City has assigned a unique identifier to each collection system sewer asset; therefore, this recommendation is no longer warranted.		N/A
CIP Prioritization	Recommendation is still warranted.	Recommendation is still warranted.	6.8.1
Updated Rate Study	The City performed an updated rate study in 2008; therefore, this recommendation is no longer warranted.	The next rate study is not anticipated for another two years.	N/A
Formal Inspection/Cleaning Procedures	Recommendation is still warranted.	Recommendation is still warranted.	6.8.2

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section
CMMS	Recommendation is still warranted.	The City is utilizing CMM as recommended, however, as not all assets have been entered, this recommendation is still warranted.	6.8.3
Condition Assessment Program	Recommendation is still warranted.	The City now performs their own CCTV inspections following PACP coding guidelines. Therefore, this recommendation is no longer warranted.	N/A
Contingency Equipment and Replacement Inventories	The City keeps on hand the necessary contingency equipment and has their process in place for replacement inventories; therefore, this recommendation is no longer warranted.		N/A
Training	The City keeps track of training attendance by date and topic covered for internal training or on the job training. Documentation is also kept on file for attendance to California Water Environment Association (CWEA) or other professional training. The current training program meets their needs, therefore, the recommendation is no longer warranted.		N/A
Plumbers and Contractors Outreach Program	Recommendation is no longer warranted as the number of SSOs attributed to construction/contractor is minimal.		N/A
Sanitary Sewer Standards Update	Recommendation is still warranted.	Recommendation is still warranted.	7.3.1
Inspection and Testing Standards	Recommendation is still warranted.	Recommendation is still warranted.	7.3.2
Implementation Schedule	Recommendation is still warranted.	Recommendation is still warranted.	8.3.1
SSMP Monitoring	This recommendation is addressed within the SSMP Audit Template, therefor, this recommendation is no longer warranted.		N/A

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section
Audit Report	This recommendation is addressed within the SSMP Audit Template; therefore, this recommendation is no longer warranted.		N/A
Public Outreach Communication Program	Recommendation is still warranted as the City will need to continually evaluate the effectiveness of its outreach program/activities.	Recommendation is still warranted as the City will need to continually evaluate the effectiveness of its outreach program/activities.	10.1.1

Section 1: Introduction

The purpose of the Sewer System Management Plan (SSMP) is to describe the actions that will prevent and/or minimize sanitary sewer overflows (SSOs). The City is also completing the SSMP in order to comply with State Water Resources Control Board (SWRCB) Waste Discharge Requirement (WDR) Order No. 2006-0003-DWQ.

A SSO is any overflow, spill, release, discharge or diversion of untreated sewage from a sanitary sewer system. SSOs often contain high levels of suspended solid, pathogenic organisms, toxic pollutants, nutrients, oxygen demanding organic compounds, oil and grease and other pollutants. SSOs may cause a nuisance, a temporary exceedance of water quality standards when the sewage is discharged to surface waters of the United States (U.S.), pose a threat to the public health, adversely affect aquatic life and impair the public recreational use and aesthetic enjoyment of surface waters (SWRCB).

1.1 Regulatory Requirements

As California's wastewater collection system begins to age, the need to proactively manage this valuable asset becomes increasingly important. Collection systems are the most recent major component of the wastewater management system to be regulated. On May 2, 2006 the SWRCB adopted Order No. 2006-0003, Statewide General WDRs for Sanitary Sewer Systems. The primary objectives of the WDR being 1) to initiate a proactive approach among public entities to ensure the development of system wide operation, maintenance and management plans to reduce SSOs thereby reducing impacts to the State's water bodies and protecting public health and 2) to establish an enforceable regulation that allows the SWRCB to gather consistent data on causes and sources of SSOs. Under the WDR, all public entities that own or operate sanitary sewer systems greater than one mile in length that collect and/or convey untreated or partially untreated wastewater to a publicly owned treatment facility in the State of California are required to comply with these requirements. Another component of the WDR is the Monitoring and Reporting Program (MRP) that includes specific SSO notification, reporting and record keeping requirements to meet SSO reporting requirements in the Water Code and facilitate compliance monitoring and enforcement for violations. On August 6, 2013 the SWRCB adopted Amending MRP Order No. WQ 2013-0058-EXEC, which became effective September 9, 2013 and rescinded MRP Order 2008-0002-EXEC. This report incorporates the requirements of SWRCB WQ 2013-0058-EXEC.

1.2 System Overview

The City's Wastewater Quality Control Facility (i.e., WQCF or Wastewater Treatment Plant) serves the City of Manteca, City of Lathrop, and Raymus Village in San Joaquin County. The City provides wastewater service through approximately 19,500 connections to a population of approximately 81,345 (City of Manteca, General Plan Update, 2018). There are an estimated 225 miles of sewer trunk lines and 110 miles of local laterals in the sewer collection system. The WQCF currently treats 6.5 million gallons per day (mgd) of wastewater, and has been rated with a capacity of approximately 9.8 mgd. A plant expansion to 9.8 mgd was completed in 2007 (City of Manteca website).

The existing sewer collection system consists of 6- to 36-inch-diameter gravity flow pipelines, 6- to 24-inch-diameter force mains, and 16 wastewater pump stations. A summary of the City's wastewater pump stations is shown in Table 1-1.

Table 1-1: Summary of City of Manteca Wastewater Pump Stations

Wastewater Pump Station Name	Description of Approximate Location	Pump Information				
		No. of Pumps	Manufacturer	Horsepower (hp)	Design Flow (gpm)	Design Head (feet)
Union Road	Union Road and Center Street	1 2	Fairbanks Morse Worthington	25 50	3,500 7,000	19 19
Robert Estates	Airport Way and Wawona Street	2	Flygt	3	200	13
Fishback	Yosemite Avenue and Fishback Road	2	Flygt	3	100	14
Chadwick Unit 5	Airport Way and Geneva Way	2	Flygt	10	875	24
Frito Lay	Spreckels Avenue and Moffat Blvd.	2	Flygt	3	200	48
Curran Grove	Norman Drive and Dyer Avenue	2	Flygt	3	140	18
Villa Ticino	Airport Way and Northgate Drive	2	Flygt	7.5	510	23
Woodward Park	Woodward Avenue and Buena Vista Drive	2	Flygt	10	550	63
Bella Vista	Woodward Avenue and Bella Terra Drive	2	Flygt	20	600	58
Eckert Cold Storage	Moffat Blvd. near South Powers Avenue	2	Flygt	20	750	51
Antigua	Pagola Avenue and Woodard Avenue	2	Flygt	10	193	53
Tara Park	McKinley Avenue and Woodward Avenue	2	Cornell	25	NOT IN SERVICE	NOT IN SERVICE
Woodbridge	Daisywood Drive and Airport Way	2	Flygt	30	1,450	50
Solera (TEMPORARY)	Mirassou Drive and Pillsbury Road	2	Flygt	10	Not Available	Not Available
Evans Estates (TEMPORARY)	Main Street south of Legacy Street	2	Flygt	25	Not Available	Not Available
South Trunk (TEMPORARY)	Woodward Ave and Galleria	1	Flygt	10	Not Available	Not Available

Source: Table 3-1 City of Manteca Wastewater Collection System Master Plan Update (Nolte, 2005)

The majority of the collection system serves the core of the City (Central Trunk Sewer Shed or Central Shed), approximately bound by SR-120, Austin Road, Union Road, and Lathrop Road. Subdivisions located on the perimeter or beyond the Central Shed have installed temporary wastewater pump stations. These pump stations have been decommissioned and these subdivisions are connected to gravity trunk sewers. Within the Central Shed, the majority of the collection system flows by gravity to the Union Road Pump Station (URPS). Downstream of the URPS, wastewater flows to the WQCF by gravity via a 36-inch diameter sewer. A map of the existing sewer collection system showing gravity sewers 6-inch and larger is provided in Appendix D as Figure 1-1 Existing Collection System.

City personnel perform regular maintenance on the collection system and wastewater pumping stations. Regular maintenance activities include:

- Clearing blockages due to solids and grease buildup with high pressure jetting and vacuuming equipment;
- Inspection of the system with closed circuit television (CCTV) and removing floating material and submerged debris from wastewater pump stations to mitigate the potential for pump and vacuum/air-release valve fowling and failures; and
- Routine valves exercising to maintain and ensure valve function.

Problems detected in the system are recorded and corrective actions are taken when warranted.

1.3 Objectives

The objective of the SSMP is to provide a plan and schedule to properly manage, operate and maintain all parts of the wastewater collection system and to:

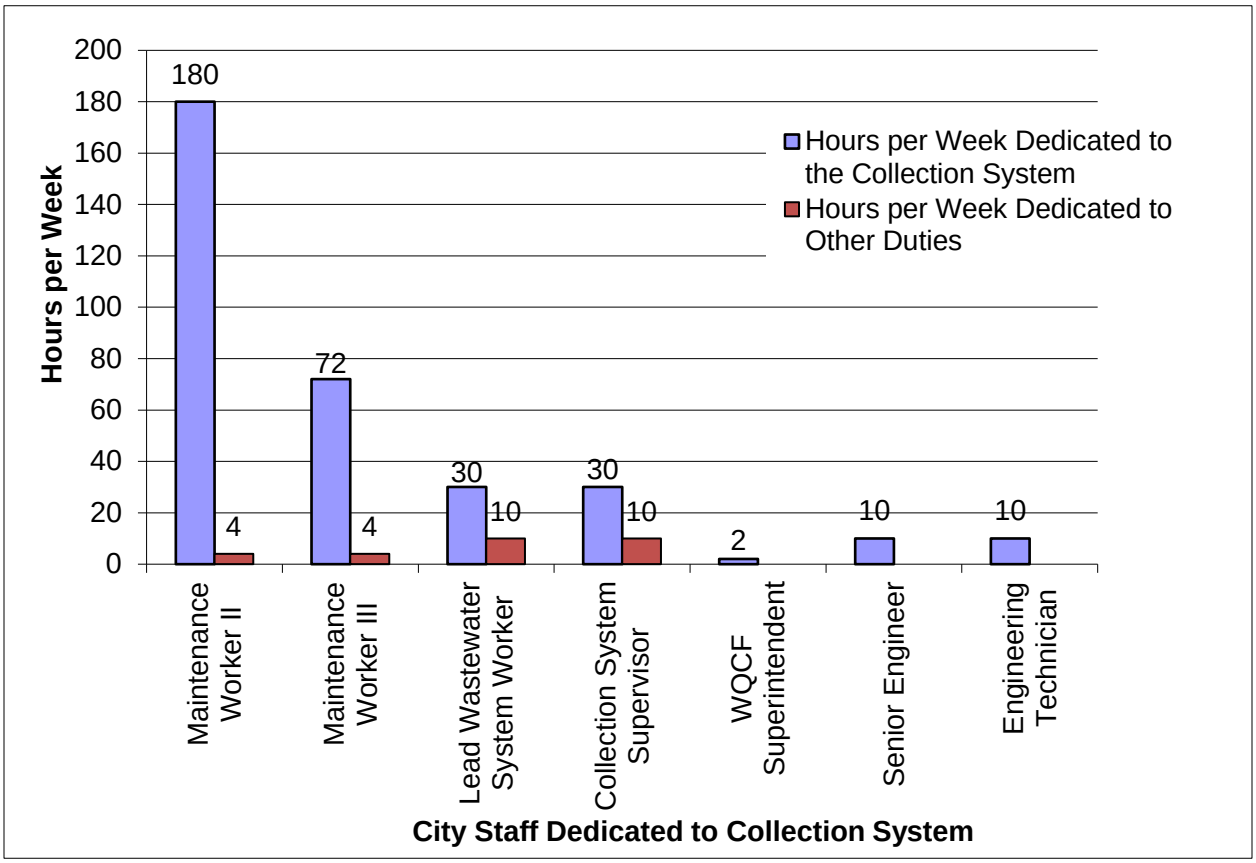
- Eliminate preventable SSOs
- Protect public health and safety
- Minimize adverse impacts of SSOs
- Prevent adverse impacts to the environment, waterways of the U.S., and their beneficial uses
- Ensure corrective action is taken in a timely manner
- Ensure compliance with current regulatory requirements
- Document and define procedures to address SSO prevention and response

Section 2: Organization

2.1 City Wastewater Collection System Organization

The City's wastewater collection system staff consists of maintenance workers, supervisors, administrative staff and engineering. A summary of the City staff time dedicated to the operation, maintenance and improvement of the wastewater collection system is shown in Figure 2-1 in Appendix D. There are eight maintenance workers operating a modified five days per week schedule. On average two maintenance workers dedicate 35 hours per week to the collection system, two maintenance workers spends about 36 hours per week on the wastewater pump stations and vacuum/air-release valves, two maintenance workers performing preventative and corrective maintenance, and the seventh maintenance worker spends about 36 hours per week on service lateral installation/repairs and customer service calls. The Lead Was System Worker spends about 30 hours per week coordinating and recording work activity. The remainder of the time these maintenance workers are working at the WQCF or conducting storm drain system maintenance. Two supervisory positions: WQCF Superintendent, which on average dedicates 1 to 2 hours per week to the collection system, and Collection System Supervisor, which on average dedicates 30 hours per week to the collection system, are both assigned to manage, operate and maintain the wastewater collection system. The collection system crew is responsible for gravity and force main sewers, pump stations and storm water system maintenance. The system is monitored twenty-four hours a day either by staff during regular hours or by the WQCF operator on duty during evenings, nights, and weekends using a supervisory control and data acquisition (SCADA) system to monitor wastewater pump station operation. An equivalent of 0.5 FTE Engineering staff have been hired with duties related to the collection system.

Figure 2-2: City Staff Dedicated to Collection System Operation, Maintenance and Improvements



In 2017, two field crew were hired to perform routine CCTV inspections on a full-time basis. The engineering staff dedicated to the wastewater collection system includes one senior engineer with support from one engineering technician in the Public Works Department and the City's Public Works Director and Deputy Public Works Director. The administrative assistant at the WQCF handles all of the administrative duties for the twenty-seven employees that maintain and work at both the WQCF and collection system. The administrative assistant answers all incoming calls for the staff including customer complaints, routes them to the appropriate individual and inputs data into the Computerized Management and Maintenance System (CMMS) database. The City over the last five years on average has dedicated about 1.2 engineering staff years to planning, managing and improving the wastewater collection system. Based on review of system performance, the City seems to have the proper organizational staff in place for proper maintenance and response to collection system problems. The administrative assistant at the WQCF may need additional support should the workload or additional duties be redistributed. This is further detailed in Section 2.3.1 Staffing Workload Evaluation.

2.2 Implementing, Managing and Updating the Sanitary Sewer Maintenance Plan

The City's formal organizational chart showing staff responsibility for implementing, managing and updating the SSMP is shown in Figure 2-2 City of Manteca Organizational Chart for Implementing, Managing and Updating the SSMP. The authorized representative for the City is Heather Grove.

The collection system staff responsible for implementing, managing and updating the SSMP includes: The WQCF Superintendent and Collection System Supervisor, with contribution from the Lead Collection System Worker and maintenance workers. Responsibilities of the wastewater collection system staff are:

Senior Engineer – Plan, coordinate and manage public works construction, alteration and installation projects; perform a variety of professional engineering duties in the planning, design, contracting, budgeting, bidding and analysis of assigned projects; and train and provide work direction and guidance to assigned personnel.

WQCF Superintendent – Plan, organize and direct the laboratory, operations and activities related to the maintenance and repair of City wastewater and storm water systems, facilities and related equipment; coordinate and manage the development and implementation of Department guidelines and procedures to assure compliance with established local, State and federal laws, codes and regulations; and train and evaluate the performance of assigned personnel.

Maintenance Supervisor – Under the direction of the WQCF Superintendent, organize and direct operations and activities related to the maintenance and repair of WQCF facilities and related equipment; provide adequate scheduling, supplies and equipment to assure smooth and efficient system operations; and train and provide work direction to assigned personnel.

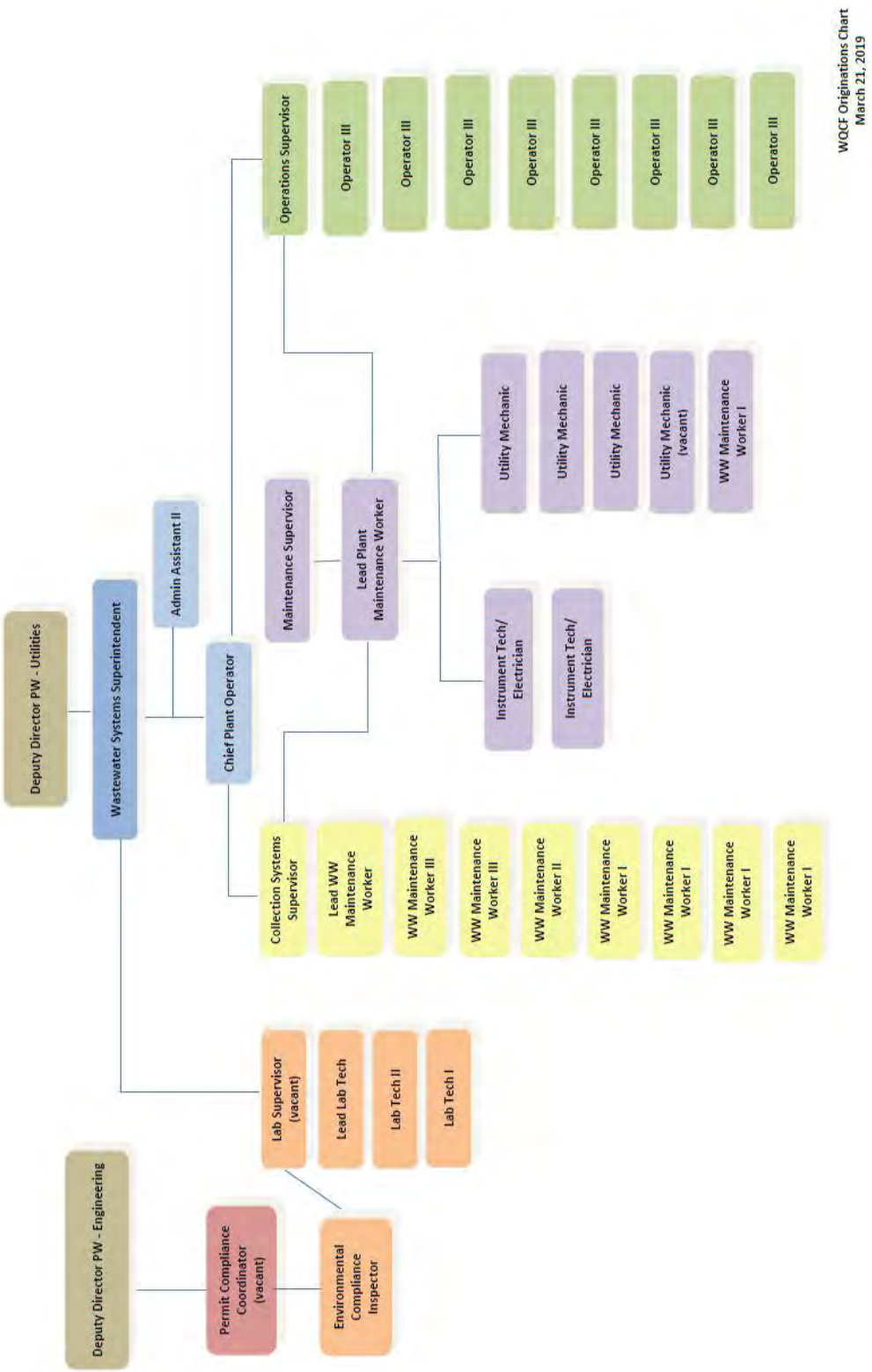

WQCF Originations Chart
March 21, 2019
Deputy Director PW - Utilities
Wastewater Systems Superintendent
Admin Assistant II
Chief Plant Operator
Operations Supervisor
Operator III
Operator III
Operator III
Operator III
Operator III
Operator III
Operator III
Operator III
Maintenance Supervisor
Lead Plant Maintenance Worker
Utility Mechanic
Utility Mechanic
Utility Mechanic
Utility Mechanic (vacant)
WW Maintenance Worker I
Instrument Tech/ Electrician
Instrument Tech/ Electrician
Collection Systems Supervisor
Lead WW Maintenance Worker
WW Maintenance Worker III
WW Maintenance Worker III
WW Maintenance Worker II
WW Maintenance Worker I
WW Maintenance Worker I
WW Maintenance Worker I
WW Maintenance Worker I
Lab Supervisor (vacant)
Lead Lab Tech
Lab Tech II
Lab Tech I
Deputy Director PW - Engineering
Permit Compliance Coordinator (vacant)
Environmental Compliance Inspector

Figure 2-3: City of Manteca Organizational Chart for Implementing, Managing and Updating the SSMP

Collection System Supervisor – Under the direction of the WQCF Superintendent, organize and direct the maintenance and repair activities of the wastewater treatment facility and/or wastewater and storm water conveyance systems. Plan, organize and direct assigned staff performing skilled work in the maintenance and repair of the sewer collection and storm water pumping systems, ensure that all work performed is done in compliance with proper procedures provide adequate scheduling, supplies and equipment to assure smooth and efficient system operations; and train assigned personnel. Oversee and ensure that the CMMS is functioning properly and that all necessary records, readings and reports are complete, organized and up to date.

Utilities Mechanic – Under the direction of the Maintenance Supervisor, perform skilled work in the maintenance and repair of wastewater and storm water facilities. Troubleshoot and repair wastewater and storm water facilities, including motor, pumps and blowers.

Lead Wastewater Worker – Under the direction of the Collection System Supervisor, lead and participate in a variety of skilled work in the installation, maintenance and inspection of City sewer lines and laterals, storm drains, and the WQCF; inspect and assess pipelines using PACP; operate a variety of light and heavy maintenance and construction equipment; and train and provide work direction to assigned staff.

Wastewater Worker III – Under the direction of the Collection System Supervisor, participate in a variety of skilled work in the installation, maintenance, and inspection of City sewer lines and laterals, storm drains, and the WQCF; inspect and assess pipelines using PACP; operate a variety of light and heavy maintenance and construction equipment; and train and provide work direction to assigned staff.

Wastewater Worker II – Under the direction of the Collection System Supervisor, perform a variety of skilled duties in the maintenance and repair of City wastewater and storm water systems, facilities and related equipment; and operate a variety of power-driven and heavy equipment to perform assigned duties.

Wastewater Worker I – Under the direction of the Collection System Supervisor, perform a variety of duties in the maintenance and repair of City wastewater and storm water systems, facilities and related equipment; and operate a variety of power-driven and heavy equipment to perform assigned duties.

Instrumentation/Electrician – Under the direction of the Maintenance Supervisor, performs skilled work in the maintenance, repair and calibration of electrical systems, equipment, appurtenances, instrumentation and controls related to the wastewater treatment facility and/or wastewater and storm water conveyance systems.

Permit Compliance Coordinator – Administers the Fats, Oils and Grease (FOG) program.

Environmental Compliance Inspector – Implements the FOG program.

Also, Figure 1 in Appendix A - City of Manteca SSO Response Field and Reporting Procedures flowchart illustrates the organizational chart for SSO response and reporting. For a full description of the SSO Response Plan see Appendix A.

2.3 Recommendations

The following recommendation for organization of the wastewater collection system staff is based on the evaluation of the City's current full time equivalent staff and the time spent servicing and maintaining the collection system.

2.3.1 Staffing Workload Evaluation

The City wastewater collection system is divided up into three different sewer sheds per the Wastewater Collection System Master Plan Update and as shown on Figure 2-3 in Appendix D as follows:

- Central Trunk Sewer Shed (Central Shed)
- North Trunk Sewer Shed (North Shed)
- South Trunk Sewer Shed (South Shed)

The Central Shed serves the majority of the City with the other areas serving newer developed areas that surrounds the central area of the City. The Central Trunk Sewer Shed (Central Shed) is predominantly where the City historically spends most of their resources responding to sewer spills and maintenance requests (e.g., grease blockages, etc.). The estimate is about 80% of the resources are used in the Central Shed to operate and maintain the system.

Considering the City currently has eight full-time equivalent (FTE) staff dedicated to the collection system and eighty percent (80%) of the City's resources are used to maintain the Central Shed, 4.8 FTEs are assigned to service and maintain the central sewer shed and 1.2 FTEs to maintain the remainder of the collection system. In addition to the FTE staff evaluation for maintenance of the collection system, 0.8 FTE of administrative staff is used to support the Central Shed and 0.2 FTE the two other sheds.

In Sections 9 and 10 it is stated that this SSMP should be updated every five years and audited every two years. The City will use the information developed in this section to evaluate future FTE needs and distribution among the different sewer sheds as the system ages and improvements are made per the Wastewater Collection System Master Plan Update.

Section 3: Overflow Response Plan

3.1 Sanitary Sewer Overflow History

The causes of SSOs are specific to each system, some of the principal causes of SSOs include: grease blockages, root blockages, sewer line flood damage, manhole structure failures, vandalism, pump station mechanical failures, power outages, storm or ground water inflow/infiltration, debris blockages, sanitary sewer system age and construction material failures, lack of proper operation and maintenance (O&M), lack of capacity and contractor caused damages (reference: SWRCB).

SSOs have been categorized by the SWRCB WDR in the MRP as category 1, category 2, category 3, and private lateral sewage discharge (PLSD). The definition of these are described in Appendix A – SSO Response Plan.

The City has reported one category 1 and one category 2 SSO from 2014 – 2018 to the Regional Water Quality Control Board (RWQCB). A summary of the number of SSOs by category is shown in Table 3-1, and are shown by location in Figure 2-3 in Appendix D.

Table 3-1: Number of SSOs for 2014 – 2018 by Category

Year	Category 1	Category 2	Category 3	Total SSOs	Total Spill Volume (gal)	Total Recovered (gal)	Total Volume to Reach Surface Waters (gal)
2014	0	0	13	13	2,204	2,204	-
2015	0	0	4	4	474	474	-
2016	0	0	9	9	773	773	-
2017	1	0	4	5	420,615	2,615	41,800
2018	0	1	4	5	52,791	52,791	-
Total	1	1	34	36	476,857	58,857	41,800

A summary of the SSO by cause is shown below in Table 3-2.

Table 3-2: Summary of SSOs by Cause

Cause	Number of SSOs (2007 – 2013)	Number of SSOs (2014 – 2018)
Grease	14	19
Roots	11	6
Debris	68	8
Pump Station Failure	0	0
Pipe Structural Problem/Failure	4	2
Construction/Contractor	1	0
Other	8	0
Total	106	36

The cause for the Category 1 spill was a ruptured force main and the cause of the Category 2 spill was a pipe structural problem/failure on a gravity pipeline.

The main cause of the SSOs was attributed to grease. The City maintains a database with all service requests logs, which include a section for priority code, location, problem and resolution. Additionally, photos and additional documents can be attached to the work order.

An SSO Response Plan is enclosed as Appendix A of this report.

3.2 Recommendations

The following recommendation for the City's SSO Response Plan are based on an evaluation of the City's current procedures of tracking, recording and reporting of SSOs. Modify the database configuration to accommodate a variety of identifiers that would be assigned to each spill to record and analyze the causes of the spills.

3.2.1 Database Objective

The database described in Section 6.1 should be used as a basis for prevention, monitoring for compliance, improvements to be made in the system, equipment needs and crew performance.

The purpose of the database is to:

- Serve as a records retention system.
- To provide regular reports on training, maintenance, spill responses.
- Provide input into fiscal management of the sewer collection system.

Section 4: Fats, Oils and Grease Control Program

4.1 Grease Blockages History

A review of the reported SSOs was conducted to determine the number of SSOs and their locations. Of the 36 SSOs reported from 2014 – 2018, nineteen (19) were identified as being associated with grease blockage or grease buildup.

4.2 Source Control Measures

The City has an Industrial Waste Ordinance in place that has been reviewed and approved by the RWQCB, which includes Section 13.20.110 – FOG Control. The City's Industrial Waste Ordinance, Chapter 13.20 describes the City's Industrial Pretreatment Program. The purpose of the pretreatment program is to control and regulate the discharge of industrial and hazardous waste into the collection system. Chapter 13.20 contains the following pertinent subchapters to facilitate the City with the adequate mechanisms to establish pretreatment requirements for any discharger to the City's wastewater collection system:

- Authority and Responsibility,
- Standards and Limitations,
- Administration,
- Reporting Requirements,
- Inspection and Monitoring,
- Confidentiality,
- Enforcement,
- Hearings and Appeals,
- FOG Control, and
- Severability

4.3 Inspection of FOG-producing Facilities

The City ensures adequate authority to inspect the premises of any person discharging waste to the collection system through Section 13.20.030 Authority and Responsibility of the City's Municipal Code. Also, the City has added an Environmental Inspector to enforce compliance.

4.4 Legal Authority to Prohibit Discharges

The City has set forth adequate prohibitions and limitations for industrial waste discharge or discharge of concern into the collection system, which can be found in Section 13.20.040 Standards and Limitations of the Municipal Code.

4.5 Public Education Outreach Program

The City has developed brochures to educate the public about the City's FOG Control Program, and Collections Staff also carry pamphlets for distribution. The City is also in the process of developing its Commercial FOG Control Program and has already begun outreach to restaurants and mechanics shops through Environmental Compliance. It is anticipated that the Commercial FOG Control Program will help the City reduce the number of SSOs due to FOG.

Section 5: Legal Authority

The City's legal jurisdiction is defined by its Municipal Code; specifically Title 13 Public Services and Title 15 Buildings and Construction. The chapters in the Municipal Code that have been reviewed and which provide adequate legal authority for the City to construct, finance, own, manage, operate and maintain a wastewater collection system are:

- 13.12 – Sewer Connection Charges
- 13.14 – Sewer Capacity Charges
- 13.16 – Sewer Service Charges
- 13.20 – Industrial Waste
- 13.24 – Septic Tank Cleaning
- 13.38 – Public Facilities Implementation Program Fees
- 15.12 – Plumbing Code

These sections of the Municipal Code can be found in Appendix B. The Industrial Pretreatment Program is covered under Section 13.20

5.1 Prevent Illicit Discharges into the System

The City has set forth adequate prohibitions and limitations for illicit waste discharge into the collection system in the following City Municipal Code:

Chapter 13.20 Industrial Waste

- Section 13.20.030.A.11 – Authority and Responsibility
- Section 13.20.040.C & D – Standards and Limitations
- Section 13.20.050.B.3.e – Administration
- Section 13.20.090.A.3, A.6.a & C - Enforcement

Chapter 13.24 – Septic Tank Cleaning

- Section 13.24.050 – Permit-Suspension-Revocation

Also the City has an Industrial Pretreatment Program, which contains the Industrial User Waste Discharge Permit Template, Industrial User Inventory, Enforcement Response Guide, Pretreatment Program Resources and Organization, Adopted Industrial Waste Ordinance and Multi-jurisdictional Agreement between the City of Lathrop and the City.

5.2 Control Infiltration/Inflow

According to City maintenance staff the collection system does not experience major problems related to infiltration and inflow (I/I). I/I experienced by the City is considered to be normal resulting in increased flows to the WQCF.

Currently the City has legal authority to control I/I into its collection system in accordance with Chapter 13.20 of the City's Municipal Code. Stormwater and other illicit discharges as described in Section 13.20.040 are also prohibited and fall under the general heading of Standards and Limitations.

5.3 Proper Design and Construction of New and Rehabilitated Sewer Connections

The City ensures proper design and construction of new and rehabilitated sewer connections through the use of City Standards and Specifications. All sewer designs are carefully reviewed by qualified City staff. Before the 100-percent submittal drawings for new development and redevelopment projects are accepted, the Public Works Director and Senior Engineer review and approve the design drawings. For new subdivisions the Senior Engineer Technician and/or Senior Engineer and the Public Works Director review and approve the design drawings. The City's formal review of proposed projects is adequate.

5.4 Proper Installation, Testing, and Inspection of New and Rehabilitated Sewers

Currently the City employs two full-time inspectors to observe construction of all City projects to ensure the proper installation, testing and inspection of new and rehabilitated sewers. The need for additional inspectors should be evaluated on an as-needed basis. For new sewer installation the mainline is cleaned, pressure tested and videotaped by the contractor prior to acceptance by the City. Currently the City does not require testing of their laterals, unless specifically requested, which is recommended in detail in Section 5.8.

5.5 Access for Maintenance, Inspection, or Repairs for Portion of City Owned Laterals

The City ensures authority to inspect the premises of any person discharging waste to the collection system through Section 13.20.110 Authority and Responsibility of the City's Municipal Code.

5.6 Limit the Discharge of Fats, Oils and Grease and Other Debris

The City ensures authority to limit the discharge of fats, oils and grease to the collection system through Section 13.20.110

5.7 Enforcement of the City's Sewer Ordinances

The City has enforcement mechanisms and penalties available to respond to instances of noncompliance as part of Chapter 13.12 – Sewer Connection Charges, Chapter 13.20 – Industrial Waste, Section 13.20.090 Enforcement and Chapter 13.24 Septic Tank Cleaning, Section 13.24.050 Permit-Suspension-Revocation of the City's Municipal Code. The enforcement mechanisms and penalties contained in the City's sewer ordinance are adequate to regulate and provide a safe wastewater collection system.

5.8 Recommendations

The following recommendations for legal authority of the City's collection system are based on the review of the current City ordinances and as described above.

5.8.1 Inspection Services

The City should consider using developer fees to cover the cost to inspect laterals and CCTV the lines prior to the one-year guarantee expiration period.

As part of the formal project review, it is recommended that the City develop inspection requirements as part of their engineering standards for the contractor to provide CCTV records of all newly constructed sewer mains and laterals within one year of their installation.

Section 6: Operations and Maintenance

6.1 Collection System Map

Comprehensive mapping of the collection system provides an important management and operations tool that is used to properly operate and maintain the collection system.

Recently, the City completed transferring collection system data from AutoCAD to Geographic Information System (GIS). The GIS mapping includes the following collection system asset information:

- Gravity and force mains with pipe material, diameter and direction of flow.
- Pump station location defined by coordinates; SCADA monitoring will continue to be used to monitor wet well operating depth.
- Manhole location including rim elevation. The City will continue to confirm invert elevations, pipe size and material as they perform cleaning and maintenance; it is estimated more than 90 percent of pipe material has been identified.
- Drop manholes and air vacuum relief valves locations.
- Mainline cleanout location.

Lateral connection locations are not part of the GIS collection system files and currently the City does not plan to collect this information. In future SSMP Updates and/or audits; the City will continue to monitor and assess whether this information will be of value in assisting the City in meeting the objectives of the SSMP. Currently the City's collection system map (Figure 1-1 in Appendix D) shows location of gravity lines, force mains and pump stations.

An element of a well-managed collection system is the ability to track the performance of collection system assets. Each individual wastewater collection system asset has a unique identifier. Tracking each asset provides management with the information needed to properly allocate fiscal and labor resources. Proper system asset management allows City staff to make cost effective management decisions regarding capital procurement and setting annual O&M budgets. The City began using the CMMS program to generate work orders for both preventative and corrective maintenance in the third quarter of 2013. The City tracks assets, preventative and corrective maintenance activities, and industrial pretreatment program inspector compliance findings to generate reports on asset performance and identify hot spot locations. Section 6.8 provides more details regarding asset management recommendations.

Maintenance workers need up-to-date maps to operate and maintain the collection system in order to function efficiently. Maintenance workers use computer tablets in the field to access the City's GIS based collection system maps. When maintenance workers find a discrepancy between collection system maps and field conditions, corrections are noted and sent to the City Engineering office. The corrections are compared to the record map information and once the discrepancy is agreed upon the AutoCAD and GIS map line work is updated.

6.2 Resources and Budget

The City has both a sewer connection and a monthly sewer user fee rate structure with different categories to accommodate new development and existing users. City authority to levy and collect fees for connection to and use of the sewer collection system and WQCF is established in the Municipal Code specifically within Title 13, Public Services.

Chapter 13.12, 13.14 and 13.16 of the Municipal Code governs Sewer Connection Charges to residential, commercial and industrial users. This chapter also provides for the annual adjustment of connection fees to accommodate increases in construction and engineering costs. Chapter 13.12.090 covers revenue use and requires that all revenue derived from connection charges be deposited in the capital improvement fund and used for the acquisition, construction, reconstruction, reimbursement, maintenance and operation of the City's sanitary sewer and treatment system. The sewer collection system fee for new development is called the Public Facilities Implementation Plan (PFIP) sewer collection system fee.

The City conducts rate studies periodically; the last rate study was completed in 2008. As a result of the 2008 revised rate study, in 2009 the City implemented new monthly sewer service fees for existing customers. Also, the connection fees and sewer user charges can be increased annually based on construction cost index with City Council approval; however, there have not been any increases since 2010. Another rate study is not anticipated for another two years, based on review of reserves and operations and maintenance budgets.

The City does have a Capital Improvement Plan (CIP) that provides for system repair/replacement. Projects are prioritized based on the Wastewater Collection System Master Plan Update. Priorities for rehabilitation, replacement and repair are based on the criticality of the project and funding availability. Rehabilitation projects are funded through sewer user fees. The City's existing sewer system is similar to most growing cities with the older existing infrastructure located around the town center and new building/infrastructure surrounding the older system. Therefore most of the work done within the existing system is funded through monthly sewer user rates, while the new infrastructure is usually funded through development sewer connection fees.

The current resources and budget pool appears to be sufficient to maintain the current collection system at its current level of operation. However, many maintenance and operational functions are very informal with little or no documentation or asset performance tracking. Typically, collection system management has to become more formal as the collection system grows. Specific recommendations on system management formality are presented in Section 6.8.

6.3 Prioritized Preventative Maintenance

The purpose of preventative maintenance (PM) is to ensure ongoing reliable regulatory compliant sewer collection and treatment services. A properly maintained collection system will help minimize overflows in addition to addressing other operational issues on a proactive basis. Reducing SSOs reduces mitigation costs and protects public health and the environment.

6.3.1 Scheduled Inspections and Condition Assessment

6.3.1.1 Pipeline Inspection and Maintenance

Additional City staff and equipment resources has resulted in the sewer collection system being cleaned from approximately every 5-years to approximately every 3.5-years. Based on the history of complaints and known "hot spots" at approximately 90 sites, the City visits these locations on a quarterly to semi-annual basis resulting in a significant decline in SSOs generated from these sites. There is no formal written procedure for cleaning the system, but inspections are conducted using the Pipeline Assessment Certification Program (PACP). It is recommended that Formal Inspection/Cleaning Procedures be developed as described in detail in Section 6.8.

The procurement of two new FTE maintenance workers and CCTV equipment has expanded the use of CCTV inspection to include general and scheduled condition assessment of the sewer collection system infrastructure. A formal program for CCTV inspection is in place and being performed by trained and certified operators. City staff follow PACP coding guidelines.

If the condition of a pipeline is found to be compromised, the following repair, rehabilitation, and/or replacement options are considered:

1. **Spot Repair** – If the pipeline is structurally sound, the hydraulic capacity is sufficient, and the problem is isolated, the pipeline may be cleaned, open-cut repaired or replaced, grouted, or rubber sealed with stainless-steel mechanical bands.

2. **Rehabilitation** – Rehabilitation may be used to improve the hydraulic capacity and/or improve the structural integrity of the pipeline. Rehabilitation options may include use of slip-lining, cured-in-place pipe, fold-and-form lining, segmental lining or on-line replacement. The preferred rehabilitation option is selected based on economic considerations and the specific circumstances of the proposed pipeline rehabilitation.

3. **Replacement** – Pipeline replacement may be used when the integrity of the pipe is severely compromised and/or increased hydraulic capacity or relocation of the pipeline alignment is needed. The methods that may be used include open cut excavation, pipe bursting, or pipe reaming. The preferred replacement option is selected based on economic considerations and the specific circumstances that may select a specific replacement method.

6.3.1.2 Pump Station Inspection and Maintenance

The City's PM program has evolved from being relatively informal with no written procedures or checklists to one where a checklist for mechanical functionality and general conditions is now utilized for pump station inspections.

Currently the City inspects all sewer pump stations weekly and cleans and inspects wet wells approximately once every three months. Inspections are performed in the same manner each time. The pump stations are visited and checked for general conditions including odors, building condition, electrical component condition, alarm and remote monitoring system condition, and evidence of leakage. A Sewer Lift Station Routine Check List and Lift Station Log are included in Appendix C. Typically the major maintenance procedure performed during wet well cleaning and inspection is grease removal. Old or defective equipment is replaced on an as needed basis.

Standby power is provided at each pump station. Each pump station has an electrical connection and transfer switch that allows standby power to operate the pump station. The City has two portable generators, which is sufficient for local loss of power at the smaller pump stations. Four pump stations serving effectively as sub-regional units are equipped with permanent emergency standby power. Due to more restrictive Occupational Safety and Health Administration (OSHA) safety requirements connection of a portable generator has been restricted to persons "qualified" to perform electrical work. Consequently, all maintenance workers should be trained to connect the portable generator to the pump station through execution of new electrical safety requirements. Each pump station can be bypassed through a portable pump and existing cam lock fittings at each site without the need of a permanent generator. Each pump station piping system, is equipped with backup pumping capacity, and are monitored and controlled via wireless SCADA. If the power goes out the levels are still monitored for at least twelve hours as the controls and SCADA are on back-up battery power.

The alarm signals for each of the pump stations include:

- Motor fail to start
- Motor overload
- High water level alarm.
- Low water level alarm.
- Loss of power
- Intrusion alarms to several of the pump stations

Staff response time during off hours is forty-five minutes, which is sufficient to prevent wet well overflows, which typically prevents an SSO.

Currently no reports are written for a pump station failure, the only available documentation are the corrective work orders written in CMMS for the parts or labor. The City has standardized the type of pumps and only uses Flygt pumps; unless otherwise warranted. The pumps are operated automatically based on wet well level. For a list of pumps, see Table 1-1.

6.3.1.3 Manhole Inspection and Maintenance

The City's current manhole maintenance is typically completed during the CCTV inspection or cleaning of pipelines. Manhole maintenance typically includes inspection of the manhole structure on the interior and by visual observation. With the new CMMS system a formal process for maintenance workers to document manhole inspections is being developed. Recommendations for a formal manhole inspection procedure are described in more detail under Section 6.8.

6.3.1.4 Air Release Valves Inspection and Maintenance

Currently, there are approximately 40 cast iron air release valves (ARVs) located in the collection system. Most of the ARVs are manufactured by either APCO or Crispin and have been in service since about 1998. Figure 1-1 in Appendix D shows the location of the ARVs in the collection system.

The City's current ARV maintenance typically includes cleaning, flushing, and testing the isolation valve operation. The frequency is approximately once every year. It is recommended a

more formal inspection/cleaning procedure be developed as described in detail under Section 6.8 for ARV stations.

6.3.1.5 Other Key Collection System Component Inspection and Maintenance

Currently the City has monitoring requirements based on their waste discharge permit for industrial users. The City's Municipal Code, Chapter 13.20 describes the City's Industrial Waste Ordinance (see Section 4.2 of this report for further details).The permitted industries are self-monitored and send their reports to the City twice a year. The consequences for not submitting a report or exceeding water quality or flow numerical limits ranges from a notice of violation to discharge shut down.

6.4 Contingency Equipment and Replacement Inventories

Adequate spare/replacement parts are kept in inventory to minimize equipment/facility downtime in the event of an unplanned failure. Replacement parts for pumps, motors, and vehicles and appropriately maintained emergency response equipment and accessories allow maintenance workers to effectively respond to incidents and efficiently perform routine maintenance. The City currently stores the following equipment:

- Two 6-inch pump and 500-feet of hose each
- One 4-inch pump and 500-feet of hose
- One 3-inch pump and 300-feet of hose
- One portable hose reel with 2,500-feet of 10-inch hose
- Two vacuum trucks
- One rodder truck with 250-feet of rod
- Miscellaneous size of pipe plugs
- Confined space entry equipment
- Spill response truck equipped to respond to SSOs

6.5 Training

Training is an essential part of the inspection and maintenance program. Topics covered in regularly scheduled staff and safety meetings include:

- Emergency response procedures
- Safety procedures
- O&M procedures
- Identification of potential problems within the system
- Data collection and record keeping
- Distinction between structural and hydraulic failures, and their remedies
- Bypass pumping procedures
- Confined space and traffic safety training

The maintenance workers are trained to the same level of competency to provide the greatest level of redundancy in trained staff resources.

Not all of the training for the City is conducted at the City's facilities or by the City, some is formally structured and formal training is documented such as attendance to the California Water Environment Association (CWEA) or other webinars, workshops and conferences.

6.6 Outreach to Plumbers and Building Contractors

Currently the City has an informal reactive program of distributing copies of their sewer standards to plumbers or building contractors who have improperly repaired and/or installed sewer components. In reviewing the SSOs over the last seven years it does not appear that a more formal program is needed at this time with only one (1) SSO reported as being caused by construction/contractor.

The City does ensure that contract design engineers have access to a complete set of the sewer design standards and that the design standards are incorporated into the construction contract documents.

6.7 Corrective Maintenance

Priorities for rehabilitation, replacement and repair are established by how critical the project is and the availability of funds and other resources. The City has completed projects involving sewers that appear to be in a state of imminent failure. As discussed in the CIP Prioritization and condition assessment recommendations in Section 6.8, the City should consider adopting the programs in order to convert to a PM mode.

6.8 Recommendations

The following recommendations for O&M of the City sewer collection system are based on an assessment of the current O&M practices used by the City. The current O&M practices have frequently been described as "informal" in that there is little documentation and tracking of O&M activities. Documentation of O&M activities helps ensure that all maintenance workers perform their O&M duties uniformly and to the same standard of care and excellence, thus helping ensure uniform and consistent sewer collection service while minimizing SSOs. Tracking O&M activities provides a record of performance for both equipment and maintenance workers that should be used by the supervisor and management to correctly allocate resources, direct training, develop relevant capital budgets and develop annual operating budgets. The tracking system is a critical feedback element necessary for all functioning management systems.

6.8.1 Capital Improvement Program Projects Prioritization

Capital Improvement Program Projects (CIPPs) should be prioritized based on a set of criteria developed by the City. CIPPs should be prioritized on at least the following criteria:

- Reduced risk and minimization of liability to the City
- Available funding
- Implementation period
- Areas of high maintenance or frequent SSOs

- Areas of limited capacity
- Project cost benefit analysis

When fully implemented, CIPPs should reduce the risk and liability exposure to the City. These projects should include maintaining and improving service and reliability to City critical functions such as emergency services (fire, police, hospitals, and ambulance/emergency health care) and emergency support services such as municipal, state and federal functions. Clearly this approach requires an analysis of sewer collection services throughout the City and an assignment of relative importance to sewer collection sheds.

To determine which has the highest priority, the criteria that may be considered for prioritizing the Capital Improvement Program (CIP) may include review of maintenance activities, known extensive maintenance areas, SSO history, potential impacts to public/environment should a failure occur, capacity issues, and does the asset meet City's minimum design standards.

A CIPP implementation schedule should be developed such that the three new trunk sewers, existing sewer improvements, and increased or scheduled maintenance line items are budgeted by the following proposed schedule (the three main trunk sewers may need to be divided into phases to be designed and constructed):

- 2019 to 2023 – CIP project name
- 2024 to 2028 – CIP project name

This would better define the budget necessary to complete the CIPP each year, confirm that revenue from development connection fees and sewer user charges are adequate, and keep the City on track to make sure wastewater collection system assets are in place prior to need.

It is recommended the criteria used to prioritize the CIPP should be reviewed on a periodic basis versus the CIP. If needed, the CIPP implementation schedule may need to be adjusted. This should be done about once every year to once every two years depending on development and SSO history during that period.

6.8.2 Formal Inspection/Cleaning Procedures

Formal inspection and cleaning procedures are part of a properly operated and maintained collection system. The City should develop Standard Operating Procedures (SOPs) for inspection and cleaning in order to standardize how the system is cleaned and to document debris analysis and other observations made by the maintenance workers.

A condition assessment program should be implemented to serve as a means of determining how well O&M procedures are working. This is covered by provision 13, SSMP paragraph (x), SSMP Program Audits; see Condition Assessment Program recommendation below. With the new CMMS, the City will be able to document and track how often assets are maintained, the results of the invested maintenance, and schedule future maintenance by asset.

Pipeline – Pipeline inspection procedures should include documented regular periodic surface inspection along the sewer alignments to detect problems such as construction-related damages and leaks or failures. See Appendix C, form C.4 for a sample inspection form. CCTV

inspection is recommended as part of the Condition Assessment Program described in Section 6.8.4. It is recommended that CCTV inspection and cleaning of sewer pipelines be completed at a rate of approximately 5% and 10% per year, respectively.

Manholes – Manhole inspection procedures should include visually inspecting the frame condition and checking for offsets or misalignments, checking for evidence of surcharge and I/I, checking for evidence of corrosion damage, checking for accumulations of grease, debris, or grit, and checking flow characteristics. Manholes located in the roadway should be inspected for settlement and subsidence around the outside of the manhole. See Appendix C, form C.2 for a sample inspection form.

Manholes with noted deficiencies and corrosive damage should be inspected annually to monitor condition. Other manhole inspections should be completed as needed in response to a flow inconsistency or other indications of incipient failure in the collection system or approximately 5% of the system's manholes each year.

ARVs – Inspection of the ARV should continue to be scheduled once every year (or more frequently should field conditions warrant additional attention) and includes visually inspecting the ARV assembly condition; verifying that the ARV is in service; and checking for evidence of leaking, for the presence of corrosion, and for accumulation of debris on the assembly. In addition, the regular periodic inspection of the pipeline alignment includes inspection of the ARV area for evidence of damage, leaks, and failures. Also the manufactures recommendation for cleaning and inspection should be followed (i.e., frequency of back flushing). See Appendix C, form C.3 for a sample inspection form.

Other inspection items should include checking the condition of, operation of, and access to valves, operators, cleanouts, and bypass assemblies. Maintenance structures are also checked for condition, evidence of leaking, and evidence of structural problems. These inspections are conducted every two years to annually and in coordination with other collection system inspections.

6.8.3 Computerized Management and Maintenance System

The City utilizes the CMMS to schedule PM, capture preventative and reactive maintenance operations, and track performance and level of effort required to operate and maintain individual and sewer shed sewer system assets. An evaluation of the CMMS data would determine if tools, equipment, services and/or staffing is adequate to properly operate and maintain the wastewater collection system. In addition, the proper allocation of FTEs by asset would be evaluated using this tool. The steps taken to adequately operate and maintain the wastewater collection system would be either verified or new or additional steps recommended. The CMMS data would also be used to determine when a proactive rehabilitation, repair and/or replacement of deteriorating wastewater collection system asset(s) should be scheduled.

Section 7: Design and Construction Standards

7.1 Standards for Installation, Rehabilitation, and Repair of Sanitary Sewers

The City's standards for the design of sanitary sewer systems is covered by the City's Standard Plans and Specifications Section 71 – Sanitary Sewers (2006), for recommendations to updating the standards see Sanitary Sewer Standards Update under Section 7.3.

7.2 Standards for Inspection and Testing for New and Rehabilitated Sanitary Sewer Facilities

Currently the City employs two full-time inspectors for all City projects as described in Section 5.4 of this report

The City's Standard Plans and Specifications outline the acceptance testing for sanitary sewer construction. The City standards include:

- Compaction testing of bedding and backfill.
- Pipelines – mandrel deflection testing and air testing.

Refer to the Inspection and Testing Standard recommendation (Section 7.3) for suggestions to modifying the current procedures.

7.3 Recommendations

The following recommendations for design and construction standards are based on the evaluation of the City's current standard plans and specifications.

7.3.1 Sanitary Sewer Standards Update

Upon review of the Standard Plans and Specifications for Sanitary Sewers there are a number of improvements to be considered for materials and methods of construction. The City should consider conducting a formal review and develop appropriate amendments to the existing City standards. The standards should be adopted by the City, distributed electronically (place on City website) and advertised to the development, contracting and engineering community of the updated standards.

7.3.2 Inspection and Testing Standards

The City's testing and inspection for new sanitary sewer system should be reviewed and updated as well as evaluated to ensure adequate inspection staff is provided. Examples of areas that should be considered for revision include:

- Require CCTV inspection of all mains and laterals 11 months after installation, just prior to the end of the one-year warranty period.
- Require vacuum testing of manholes after backfilling is complete.

Section 8: Capacity Management

8.1 Capacity Assessment

The City determines the system capacity through regular master plan updates. The last wastewater collection system master plan update was completed in January 2013 with prior updates in 2005, 1993 and 1989. The wastewater collection system master plan update contains pertinent sections such as design criteria, recommended collection system strategy and recommended system improvements.

The hydraulic sewer model is used for future planning purposes to evaluate the impacts and needs to meet future development. The City uses the appropriate tools to proactively evaluate and adequately track the available collection system capacity.

8.2 System Evaluation and Capacity Assurance Plan

The system evaluation is in the form of a master plan update, which includes recommendations for sewer system rehabilitation, replacement and repair. The CIP and emergency projects are prioritized based on which are most critical (high traffic areas, temporary repair not functioning, system in jeopardy of eminent failure, etc.), and funding availability.

In 2017 the south trunk was upgraded to a 48-inch gravity line. The north trunk line upgrade has stalled due to a lack of funding, but it is next priority. Once the north trunk upgrade is complete, engineering will begin work on the central trunk line upgrade.

8.3 Recommendations

The following recommendation for the City's capacity management is based on the assessment of the Wastewater Collection System Master Plan Update.

8.3.1 Implementation Schedule

It is recommended that the City develop an implementation schedule for the north and central trunk sewer sheds. The schedule should be based on the use of a calibrated hydraulic model, the City's general plan and any specific plans that have/are or will be permitted. For further details of this recommendation see Section 6.8.1.

Section 9: Monitoring, Measurement and Program Modifications

9.1 Implementation and Effectiveness of the SSMP Elements

A brief description of how the City implements and measures the effectiveness of the major operational components of the SSMP is described below. The actual evaluation is summarized in the SSMP 2-year Program Audit found as Appendix E.

- O&M Program: Monitoring implementation of the O&M program is the responsibility of the City's Wastewater Collection System Supervisor. Effectiveness of the O&M program is measured based on the following:
    - Number of SSOs per year
    - Number of dry weather SSOs per year
    - Number of SSOs per year by cause (e.g., grease, roots, debris, etc.)
    - Length of gravity sewers cleaned annually
    - Actual versus scheduled cleaning dates for gravity sewers
    - Length of gravity sewers CCTV inspected annually
    - Record of pump station maintenance work orders completed annually
- FOG Control Program: Effectiveness of the FOG Control Program is measured based on the occurrence of SSOs caused by FOG.
- System Evaluation and Capacity Assurance Plan: Effectiveness of the capacity assurance plan is based on the occurrence of capacity related overflows and by the timely completion of identified sewer replacement projects as a sewer reaches its capacity.

These metrics are to assist the City in measuring the effectiveness of the SSMP and determine if program changes are warranted.

9.2 Updating SSMP

The SSMP should be updated at least once every five years by the Collection System Supervisor with the contribution of the maintenance workers, the WQCF Superintendent and Senior Engineer. The review would be based on results from the two-year SSMP audits. A report should be prepared and kept on file. If warranted, addendums or modifications will be made and reviewed with Engineering, O&M Supervisors and maintenance workers once every five years. Should major changes arise, the SSMP may need to be updated and approved through the City Council.

9.3 SSMP Audits

The City will conduct an audit every two years and update the SSMP once every five years. Any major modifications to the SSMP that result from the audit will require certification by the City

Council. As part of the 2014 SSMP Update an Audit Template was developed as a guide for conducting the audits and is included in Appendix E.

Table 9-1 below provides a schedule over the next 16 years for when the City is to conduct Audits versus SSMP updates.

Table 9-1: SSMP Audit and Update Schedule

Year	SSMP Requirement
2019	SSMP Update
2020	
2021	Audit
2022	
2023	Audit
2024	SSMP Update
2025	
2026	Audit
2027	
2028	Audit
2029	SSMP Update
2030	
2031	Audit
2032	
2033	Audit
2034	SSMP Update
2035	

Section 10: Outreach Communications Program

As part of the SSMP, a public outreach communication program may be warranted for certain elements of the SSMP (e.g., FOG program, illegal and illicit connections, etc.). Refer to the recommendation below for further discussion.

10.1 Recommendations

10.1.1 Public Outreach Communication Program

The City should evaluate if an active or passive public outreach communication program is needed. Active public outreach programs include flyers, door knob hangers, advertisements and public meetings. Passive programs would include mailers and leaflets. Initially, a passive program is recommended. The effectiveness will be measured each year as described in Sections 9 and 10 of this report and any modifications recommended in the audit.

Section 11: Sewer System Management Plan – Summary of Recommendations

In evaluating the City's current O&M procedures, a largely informal system is in practice with minimal written procedures and documentation. A summary of the recommendations made in the 2006 and 2014 SSMP are listed below with an update as to whether the recommendation is still warranted for this 2019 SSMP Update. For the recommendations that are still warranted they are further described throughout the report. As these changes are implemented, the City's approach to O&M of their wastewater collection system will progress to operating in a preventative mode.

Table 11-1: Summary of Recommendations

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section	Schedule
Staffing Workload Evaluation	Recommendation is still warranted as staffing will need to be continually evaluated with changes in organization structure, population growth in the City and maintenance activities.	Recommendation is still warranted as staffing will need to be continually evaluated with changes in organization structure, population growth in the City and maintenance activities.	2.3.1	Ongoing
Tracking and Recording SSOs	The City is recording and tracking their SSOs; therefore, this recommendation is no longer warranted.		N/A	
Reporting	The City is currently reporting their SSOs per the SWRCB WDR requirements; therefore, this recommendation is no longer warranted.		N/A	
Database Objective	Recommendation is still warranted as the City is initiating the use of the Computerized Management and Maintenance System (CMMS) and will be populating with data in order to assist the objectives described in the recommendation.	Recommendation is still warranted; the City has completed transferring collection system data from AutoCAD to Geographic Information System (GIS), and the data will be used to meet the objectives described.	3.2.1 6.1	Ongoing

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section	Schedule
FOG Program	The City updated and adopted the Industrial Waste Ordinance, which includes FOG Control component; therefore, the recommendation has been fulfilled and no longer warranted.		N/A	
Pollutant Requirements	The City recently updated their Industrial Waste Ordinance; therefore, the recommendation is no longer warranted.		N/A	
Inspection Services	Recommendation is still warranted as the City should review and consider the CCTV and inspection of installed sewer mains and laterals prior to the one year warranty period expiring.	Recommendation is still warranted as the City should review and consider the CCTV and inspection of installed sewer mains and laterals prior to the one-year warranty period expiring.	5.8.2	Ongoing
Ownership of Laterals	The City is in the process of clarifying ownership of laterals. For now, the current policy remains in place.	The City should continue to collect data on lateral SSOs to determine if they are a significant source of total SSOs in the City and which are caused by private property owners.	Appendix G	Ongoing
Collection System Map	The City has completed the transfer of collection system components from AutoCAD to Geographic Information System (GIS) and has begun the integration process with other City owned utilities. The City is commencing the next phase of integrating the mapping with the CMMS.	The City has completed the transfer of collection system components from AutoCAD to Geographic Information System (GIS) and has begun the integration process with other City owned utilities. The City has integrated the mapping with the CMMS, which is used to generate reports on asset performance and identify hot spot locations.	6.1	Ongoing
Updating As-Builts	The City has a procedure in place for updating collection system mapping; therefore, this recommendation is no longer warranted.		N/A	

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section	Schedule
Wastewater Collection System Asset Identification	As part of the conversion into GIS mapping the City has assigned a unique identifier to each collection system sewer asset; therefore, this recommendation is no longer warranted.		N/A	
CIP Prioritization	Recommendation is still warranted.	Recommendation is still warranted.	6.8.1	Ongoing
Updated Rate Study	The City performed an updated rate study in 2008; therefore, this recommendation is no longer warranted.		N/A	
Formal Inspection/Cleaning Procedures	Recommendation is still warranted.	Recommendation is still warranted.	6.8.2	Ongoing
CMMS	Recommendation is still warranted.	The City is utilizing CMM as recommended, however, as not all assets have been entered, this recommendation is still warranted.	6.8.3	Ongoing
Condition Assessment Program	Recommendation is still warranted.	The City now performs their own CCTV inspections following PACP coding guidelines. Therefore, this recommendation is no longer warranted.	N/A	
Contingency Equipment and Replacement Inventories	The City keeps on hand the necessary contingency equipment and has their process in place for replacement inventories; therefore, this recommendation is no longer warranted.		N/A	

2006 Recommendation	2014 SSMP Update	2019 SSMP Update	SSMP Section	Schedule
Training	The City keeps track of training attendance by date and topic covered for internal training or on the job training. Documentation is also kept on file for attendance to California Water Environment Association (CWEA) or other professional training. The current training program meets their needs, therefore, the recommendation is no longer warranted.		N/A	
Plumbers and Contractors Outreach Program	Recommendation is no longer warranted as the number of SSOs attributed to construction/contractor is minimal.		N/A	
Sanitary Sewer Standards Update	Recommendation is still warranted.	Recommendation is still warranted.	7.3.1	Ongoing
Inspection and Testing Standards	Recommendation is still warranted.	Recommendation is still warranted.	7.3.2	Ongoing
Implementation Schedule	Recommendation is still warranted.	Recommendation is still warranted.	8.3.1	Ongoing
SSMP Monitoring	This recommendation is addressed within the SSMP Audit Template, therefor, this recommendation is no longer warranted.		N/A	
Audit Report	This recommendation is addressed within the SSMP Audit Template; therefore, this recommendation is no longer warranted.		N/A	
Public Outreach Communication Program	Recommendation is still warranted as the City will need to continually evaluate the effectiveness of its outreach program/activities.	Recommendation is still warranted as the City will need to continually evaluate the effectiveness of its outreach program/activities.	10.1.1	Ongoing

References

Metcalf & Eddy. 2003. Wastewater Engineering Treatment and Reuse, Fourth Edition, McGraw Hill, Inc., New York.

Nolte Associates, Inc. 2005. Draft City of Manteca Wastewater Collection System Master Plan Update.

NV5. 2013. City of Manteca Wastewater Collection System Master Plan Update.

ATTACHMENT 2

Appendix A

Sanitary Sewer Overflow Response Plan

ATTACHMENT 2

City of Manteca
Sanitary Sewer Overflow
Response Plan

4 April 2014

Prepared for

City of Manteca
1001 W. Center Street
Manteca, CA 95337

K/J Project No. 1270003.00

ATTACHMENT 2

CITY OF MANTECA

SANITARY SEWER OVERFLOW RESPONSE PLAN

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Prepared by:

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Engineers & Scientists

CITY OF MANTECA

SANITARY SEWER OVERFLOW RESPONSE PLAN

Introduction to Sanitary Sewer Overflow Response Plan

The City of Manteca's (City's) Sanitary Sewer Overflow Response Plan (SSORP) presents a documented procedure for:

- identifying a sanitary sewer overflow (SSO);
- responding to a SSO;
- notifying City, emergency and regulatory officials;
- notifying the public of potential environmental and health hazards, if applicable;
- documenting the SSO event and response;
- reviewing the cause and generating improvements to prevent a future SSO event; and
- developing an implementation plan to prevent a future SSO event.

This SSORP describes the need to mobilize labor, materials, tools, and equipment to correct conditions that may cause or contribute to a non-permitted discharge. The plan applies to a wide range of potential system failures that could create an overflow event. The SSO Response Plan is composed of the following sections: 1) notification, 2) response, and 3) reporting.

This SSORP is an update of the City's previous SSORP, incorporating the changes from the amended State Water Resources Control Board's (SWRCB) Monitoring and Reporting Program (MRP) (Order 2013-0058-EXEC) to ensure compliance with the Waste Discharge Requirements (WDR).

SSO Classification

Under the newly amended MRP Order No. 2013-0058-EXEC, SSOs are categorized into the following categories described below. However, regardless of the SSO category or of its volume, it does not alter the City's SSO response procedures (containment, control, and recovery) or staff's responsibility to understand and comply with notification and reporting processes.

Category 1

Discharges of untreated or partially treated wastewater of **any volume** resulting from the City's sanitary sewer system failure or flow condition that:

- Reach surface water and/or reach a drainage channel tributary to a surface water; or

- Reach a Municipal Separate Storm Sewer System (MS4) and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly. Any volume of wastewater not recovered from the MS4 is considered to have reached surface water unless the storm drain system discharges to a dedicated storm water or groundwater infiltration basin (e.g., infiltration pit, percolation pond).

Category 2

Discharges of untreated or partially treated wastewater **greater than or equal to 1,000 gallons** resulting from the City's sanitary sewer system failure or flow condition that does not reach a surface water, a drainage channel, or the MS4 unless the entire SSO volume discharged to the storm drain system is fully recovered and disposed of properly.

Category 3

All other discharges of untreated or partially treated wastewater resulting from the City's sanitary sewer system failure or flow condition.

Private Lateral Sewage Discharges

Discharges of untreated or partially treated wastewater resulting from blockages or other problems **within a privately owned sewer lateral** connected to the City's sanitary sewer system or from other private sewer assets. Private Lateral Sewage Discharges (PLSDs) that the City becomes aware of may be voluntarily reported to the SWRCB California Integrated Water Quality System (CIWQS) Online SSO Database.

Section 1 – Notification to the City

Overflows may be reported by City employees, contractors or by the general public. Indications of an SSO could include "dirty" discharge, foul odor, or unusual flooding such as overflowing manholes, cleanouts or pump stations. City employees report problems directly to wastewater maintenance or City staff. Telephone calls from the public are received by plant staff at the City's Wastewater Quality Control Facility (WQCF) and/or the City's police department and routed to the WQCF staff. For the complete chain of communication for responding to SSOs refer to Figure 1, SSO Response Field and Reporting Procedures Flowchart.

After receiving notification of a possible SSO, the City records all relevant information on a Request for Service Form (Attachment I). Relevant SSO information recorded on the Request for Service Form includes:

- Time and date call was received;
- Specific location;
- Description of problem;
- Time possible SSO was noticed by the caller;
- Caller's name and phone number;
- Observations of the caller (e.g., odor, duration, back or front of property); and
- Other relevant information that will enable the maintenance worker to quickly locate, assess, and stop the overflow.

Information from the Request for Service Form is used by the plant staff to dispatch the appropriate maintenance worker or crew to the area. Once arriving on the site and the maintenance worker or crew confirms that an SSO is occurring then an SSO Field Report form will be completed as shown in Attachment II.

Standard Operating Practices are followed when an SSO reaches waters of the United States (U.S.), for notification procedures refer to Figure 2, City of Manteca WQCF SSO Notification List.

Section 2 – Response by City

Any system failure within the City's service area that causes or threatens to cause an SSO will initiate an immediate response to isolate and correct the problem. Crews and equipment are available 24 hours per day. ***The maintenance worker must use discretion when assisting private property owners, occupants, or other non-City employees, as the City could face increased liability for damages inflicted to private property during such assistance.***

The following procedures have been developed for responding to SSOs. The purpose of these procedures is to ensure that all SSO responses are handled efficiently and effectively and that all regulatory requirements are met. Maintenance workers are required to know and follow these procedures. Figure 1 summarizes the chain of communication for responding to an SSO.

In order to limit public access to and contact with areas affected with SSOs, maintenance workers/supervisor will follow the following response procedures:

I. Investigate and Assess the Problem:

A. Plant staff notifies the maintenance worker of potential SSO and issues Request for Field Service for response.

B. Maintenance worker arrives on site and performs an investigation and assessment of the overflow. The maintenance worker will take immediate action to establish a perimeter and barricade the overflow in order to contain the area. Once the overflow perimeter has been established appropriate health hazard signs will be posted to protect the public from coming in contact with the overflow. The maintenance worker will determine the extent of the overflow, what additional City Operation and Maintenance (O&M) resources will be needed (spill response vehicle, vactor truck, rodder, backhoe and operator, etc.), what additional contract services may be needed (e.g., construction contractor, closed circuit television [CCTV] crew, etc.), and if notification of other agencies is required at that time. Pictures and/or video of the SSO and surrounding area will be taken to document the SSO.

C. Maintenance worker notifies City staff of recommended response. Maintenance worker will take the lead by following these procedures:

1. Locate SSO by address, cross street and point of overflow (i.e., manhole, cleanout, pump station, broken or damaged pipe, air/vacuum release valve [AVRV], flow meter structure, etc.).

2. Determine the current magnitude of the SSO.
   - Flooded structure
   - Storm water inlet or exposure to waters of the U.S.
   - Potential for public exposure
   - Potential for other environmental impacts
   - Related problems

a. Is overflow related to a street collapse?
b. Is overflow related to construction work?
c. Is overflow related to fats, oil and/or grease (FOG) or other debris?
d. Is overflow causing a traffic hazard such as displaced manhole cover or street flooding?

- Provide initial estimate of overflow rate using pictures (refer to Attachment III).
- If the SSO meets any one or all of the criteria listed below immediately contact designated City staff:
  - Discharged to surface water and/or reaches a drainage channel tributary to a surface water, or
  - Reaches a MS4.
- Estimated damage to public and private property. City staff may enter private property for the purposes of documenting structural damage, floor and wall coverings, and personal property.
- Take photographs and/or videotape of SSO event and response as necessary to document the event.

3. Sampling of receiving waters impacted by the overflow is required by regulatory agencies or at the direction of the Collection System Supervisor, particularly whenever an overflow is greater than 50,000 gallons and reaches a storm drain or surface water. Sampling at appropriate locations such as upstream, at entry point and downstream of overflow location will allow the City to establish and monitor the levels of contamination as well as to establish or compare with the natural background levels of bacteria in the receiving waters. If sampling is to be conducted, the Collection System Supervisor will communicate with the laboratory personnel to establish and complete the sampling regime. The Laboratory Analyst will notify San Joaquin County Department of Environmental Health (DEH) that sampling and monitoring is being conducted, and to verify if additional testing is required. The sampling regime is to be continued until a determination is made that contamination resulting from the overflow event no longer exists and no longer poses a health risk to the public.
   - Contact lab personnel and transport sample to laboratory for analysis along with appropriate chain of custody form (Attachment IV). The sample will at least test for Fecal Coliform as a bacterial indicator to comply with the Fourth Edition of the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins.

4. Begin initial documentation by completing SSO Field Report Form (Attachment II).

II. Coordination with Hazardous Material Response:

If a suspicious substance (e.g., oil sheen, foamy residue) or odor (e.g., gasoline) is detected, the maintenance worker will contact City staff before taking further action. The City staff will contact the appropriate Hazardous Materials (HAZMAT) response team, according to City protocol, should site conditions be determined hazardous. The maintenance worker will remain at the perimeter of the area.

PLEASE NOTE: Vehicle engines, portable pumps, and open flames (e.g., cigarette lighter) may cause an explosion or fire if exposed to flammable fluids or vapors. All City personnel will keep a safe distance and observe caution until the proper authority declares the area to be safe for entry.

Cleanup of the hazardous material is supervised by the HAZMAT team. The maintenance worker(s) follows the instructions of the HAZMAT supervisor, but does not participate in the cleanup of the hazardous material. The maintenance worker proceeds with SSO response procedures only after the HAZMAT supervisor determines it is safe to enter the area.

III. Traffic Control:

Traffic control may be needed immediately to protect the public or City staff. Typically, immediate traffic control is needed if there is a street collapse or significant depression in the pavement that is related to the sewer, if the manhole is ajar, or if the overflow causes flooding of the street. Traffic control may also be needed to prevent wastewater from being further dispersed and to protect the maintenance worker(s) while containing the overflow and removing the blockage, determining the cause or repairing the problem.

A. Provide traffic control per City Standards and regulatory standards.

B. If necessary, contact City police, highway patrol and County of San Joaquin Sheriff to assist with providing proper traffic control.

IV. Contain SSO:

Containment of the overflow is the next step. Containment becomes more difficult if the overflow reaches the storm drain system or drainage way since the overflow can rapidly contaminate receiving waters such as creeks, streams, rivers, and other water bodies. Figure 3 – Existing Collection System and Storm Drainage is a guide to use by City maintenance worker(s) to contain the overflow. During dry weather, the storm drain system may be used to store the overflow if it can be plugged downstream of the overflow or if the downstream storm drain pump station can be deactivated.

A. Options for containing overflow:
    1. Overflow onto ground
        a. Rubber mats at catch basin or drain inlet.
        b. Sand bags in gutter.
        c. Dig trench in earth.
    2. Overflow into storm drainage
        a. Trace overflow in storm drainage system to downstream end point.
        b. Plug all affected storm system outlets or block the creek and channels if necessary to contain spill.
        c. If possible, turn off storm water pump station.

3. Overflow onto private and/or public property
    a. Confirm SSO not caused by the City sewer system (pump station, interceptor, trunk, main or lateral).
    b. Notify property owner or resident.
    c. Suggest private property owner or resident contact local plumber or other appropriate services such as restoration contractor.

B. Post warning signs around contaminated area

C. Required equipment for containing overflows:
1. Overflow onto ground and in buildings
    a. Rubber mats
    b. Sand bags
    c. Plastic sheets
    d. Bypass pumps and pipes/hoses
    e. Vactor truck
    f. Spill Response Truck
    g. Portable emergency generator
2. Overflow into storm drain
    a. Plugs
    b. Bypass pumps and pipes/hoses
    c. Vactor truck
    d. Spill Response Truck
    e. Portable emergency generator
3. Overflow at pump station
    a. Emergency generator
    b. Bypass pumps and pipes/hoses
    c. Vactor truck
    d. Spill Response Truck
    e. Portable emergency generator
4. Additional warning signs
    a. If public notification is determined necessary, City Management will determine the need for further public notification through printed or electronic news media or by alternative notification measures (i.e., front door hangers). During the initial investigation and assessment of the SSO the City will barricade the overflow and post the appropriate warning signs (refer to Section 2, paragraph I.B.). Table 1 below describes the procedures to follow for additional public notification:

Table 1: Sanitary Sewer Overflow Posting Decision Process

Sanitary Sewer Overflow Response Plan
City of Manteca

SSO Posting for a Confirmed Overflow
1 Maintenance worker confirms a possible SSO to City staff
2 The maintenance worker provides detailed SSO information to City staff • Overflow history at the SSO site • Rainfall data, if wet weather related • Map identifying the SSO location, surrounding area, and surface waters that may be impacted • Maintenance worker provides input on the posting recommendation
3 City staff consults and recommends whether or not to post warning signs.
4 If posting is recommended, warning signs are posted by the maintenance worker at specified locations.
5 City staff decides when the warning signs are to be removed after notification of clean up by the maintenance worker.

5. Begin preliminary notifications:

   Refer to Figure 2 for SSO reportable procedures, and to the SSO Field Report Form, Attachment II.

V. Correct Cause

The cause of the overflow may be located a considerable distance downstream of the actual overflow in areas with flat terrain. During large storms, overflows may occur because of infiltration and inflow (I/I) of storm water into the sewer system. I/I can greatly increase the flow in the collection system and cause overflows from pipes that are only partially blocked by roots, grease, or debris. However, during very large storms I/I can cause the flow in the collection system to exceed the hydraulic capacity of the pipes or pump stations. Under these conditions, it may not be possible to stop the overflow until the flows recede.

A. Locate cause of overflow

   1. Sewer main

      a. Check flow in manholes.

      b. Blockage should be between manhole with sluggish flow or surcharging (upstream manhole) and manhole with very little flow or is dry (downstream manhole).

2. Sewer lateral
    a. Check flow in City cleanout. If cleanout does not have flow, stoppage is located on private property and is not the City's responsibility.
    b. If there is no existing City cleanout, notify property owner to clear stoppage.
3. Pump station
    a. Check alarm system for indication of problem. All alarms are telemetered by the supervisory control and data acquisition (SCADA) system to the WQCF on Yosemite Road.
    b. If power failure has occurred, determine if pump station has an emergency generator and if emergency generator is operating. If pump station has an emergency generator outlet, deliver City's portable emergency generator to the site.
    c. Observe pump station for proper operation.

B. Clear Blockage
1. Within Sewer Main
    a. Clear line from dry manhole, if possible, with high pressure cleaning or power rodding equipment and vactor truck.
    b. Determine cause of blockage (if possible) by evaluating sample of debris or material captured downstream of cleaning and/or conduct CCTV inspection.
2. Within Sewer Lateral
    a. Maintenance worker will rod from property line cleanout to eliminate stoppage in City lateral.
3. If blockage cannot be cleared:
    a. Increase containment or initiate bypass pumping.
    b. Perform CCTV inspection to determine problem.
    c. Repair broken sewer line or excavate pipe and remove section with blockage and replace with a new pipe section and couplings.

C. Pump station:
1. If pump station does not have power, connect portable emergency generator or portable bypass pump system.
2. Check fuel for emergency generator or bypass pump system.
3. If a pump is not operating properly, activate standby pump system.
4. Investigate force main for possible damage or blockage.
5. Make other repairs as necessary.

VI. Final Volume Estimate:

SSO response staff should make every effort to maintain a careful chronology of the events during an overflow event and make every attempt to conduct linear measurements of the discharge streams and flow velocities in order to effectively quantify the overflow volume. Photo documentation of the overflow event should also become a routine procedure in the overflow documentation process. The final overflow volume is estimated and based on the results additional reporting to regulatory agencies is completed. Final overflow volume will be stored in the City's records.

A. Estimate final overflow rate using tables and pictures (refer to Attachment III).

B. Overflow volume can also be estimated by multiplying the overflow duration by the overflow rate.

C. Enter overflow volume in the SSO Field Report Form.

VII. Initiate Clean-up:

Removal and replacement or disinfection of contaminated soil or drainage ways is only performed when directed by the appropriate agencies (e.g., DEH, California Department of Fish and Wildlife, etc.).

A. Storm drain or drainage way:

1. Pump or vacuum out wastewater
2. Remove debris
3. Wash concrete and contain wash water, pump or vacuum out
4. Remove contaminated soil/plants
5. Remove all plugs/dams used to contain overflow

B. Street:

1. Remove debris
2. Wash pavement and contain wash water
3. Contain and transport wastewater by pumping or vacuuming

VIII. Receiving Water Sampling – See Section 2.I.C.3.

Section 3 – Reporting Procedure

Certain overflows are required by law to be promptly reported to regulatory agencies. As described in the MRP, the timeframe for SSO reporting depends on the SSO category:

- Category 1 and Category 2 – Must be reported to the CIWQS Online SSO Database as follows:
  - Draft reports will be submitted to the SWRCB CIWQS Online SSO Database **within three (3) business days** of the City becoming aware of the SSO.

- A final report will be certified through the CIWQS Online SSO Database **within 15 calendar days** of the end date of the SSO.

> **Additional Reporting Requirements for Category 1 SSOs**
>
> The City will submit an SSO Technical Report in the CIWQS Online Database within 45 calendar days of the SSO end date for any SSO in which 50,000 gallons or greater are spilled to surface waters.

- Category 3 will be reported to the CIWQS Online SSO Database and certified within 30 calendar days after the end of the calendar month in which the SSO occurs (e.g., all Category 3 SSOs occurring in the month of February will be entered into CIWQS and certified by March 30).

- PLSDs – Reported to the CIWQS Online SSO Database upon the City's discretion.

- No Spill Certification – If there are **no SSOs** during the calendar month, the City will either:

  - Certify, within 30 calendar days after the end of each calendar month a "No Spill" certification statement in the CIWQS Online SSO Database certifying that there were no SSOs for the designated month; or

  - Certify, quarterly within 30 calendar days after the end of each quarter, "No Spill" certification statements in the CIWQS Online SSO Database certifying that there were no SSOs for each month in the quarter being reported on.

The designated staff will report as required above and continue with completing and processing the closure report as described below:

A. Review, complete and sign required reports:

   1. Reportable SSO Field Report Form (Attachment II).

B. Documentation and Data Tracking:

   1. Forward a copy of each signed report to the Collection System Supervisor for tracking and Sewer System Management Plan (SSMP) audits.

   2. Assign each SSO Field Report Form with respective CIWQS ID number.

C. Review the SWRCB MRP Statewide General WDR for Wastewater Collection System Agencies to confirm the appropriate requirements are satisfied.

D. Reports and Data Capture:

   Periodically, SSOs may occur in privately owned laterals. While the City is not legally required to respond to these SSOs, the City will use its resources to clean up the SSO if it flows onto public property. The Collection System Supervisor and City Staff decide whether or not to bill the owner for these City services.

   1. Assure that appropriate documentation has been completed.

2. For “Private Lateral SSOs” provide copies of job-sheets/time-sheets to City staff.

E. Customer Satisfaction

City staff or maintenance worker may follow up in person or by telephone with interested citizen(s) who either reported the overflow or expressed concerns about public health or the environment. Document the discussion in a memo to the file and add SSO CIQWS identification number, date, person contacted, and phone number.

F. Media Notification Procedure

If an overflow affects surface water or private property, media notification may be necessary. The City Public Works Director or City designated representative determines if media notification is necessary. If so, the City will take the following steps:

- The maintenance worker verifies the SSO and reports back to City staff, who then informs the Public Works Director;
- The Public Works Director is the "first line" of response to the media for any SSO;
- Calls received from the media at any time are referred to the Public Works Director; and
- The Public Works Director or City designated representative is the only City representative authorized to be interviewed by the media. No other personnel are authorized to speak on behalf of the City unless authorized by the City Public Works Director.

Section 4 – Required Notifications (Not to be confused with Reporting)

Effective September 9, 2013, an amendment by the SWRCB to the Monitoring and Reporting Requirements for Statewide General WDR for Sanitary Sewer Systems Order No. WQ 2013-0058-EXEC was issued. The revised WDR stipulated the following notifications requirements be included in this SSORP:

For any Category 1 SSO **greater than or equal to 1,000 gallons** that results in a discharge to a surface water, either directly or by way of a drainage channel or MS4, the City will, as soon as possible, **but not later than two (2) hours** after:

- The City has knowledge of the discharge,
- Notification is possible, and
- Notification can be provided without substantially impeding cleanup or other emergency measures,

notify the California Office of Emergency Services (OES) and obtain a notification control number.

SSO Tracking

All complaints, confirmed SSOs, and sanitary sewer system repairs will be recorded into the City's CMMS database for Request for Service.

Staff and Contractor Personnel Awareness/Training

For construction projects that involve excavation in and around existing wastewater facilities, the appropriate City Staff and contractor personnel will be made aware of and follow the SSORP procedures by:

- During the design process for sewer related projects the response plan will be part of the specifications.
- For sewer related projects a pre-construction meeting will be held to emphasize important issues related to the project. One of the key points will be review of the SSO Response Plan.
- Initial Training Program – City O&M Department for the Collection System and WQCF will review the SSO Response Plan and be trained to complete a SSO Field Report Form, notification procedure, protection procedures for City Staff, public, and environment, clean up procedures, and implementation plan to prevent future SSO events.
- Training Program – City O&M Department Staff will be trained once per year on the SSO Response Plan elements.
- New Employee Training – prior to starting work in the field for the City, each new employee will be required to review with their properly trained supervisor the SSO Response plan elements.

Key Staff

The key SSO response staff are listed in Attachment V.

ATTACHMENT 2

Figures

Figure 1 - City of Manteca SSO Response Field and Reporting Procedures Flowchart

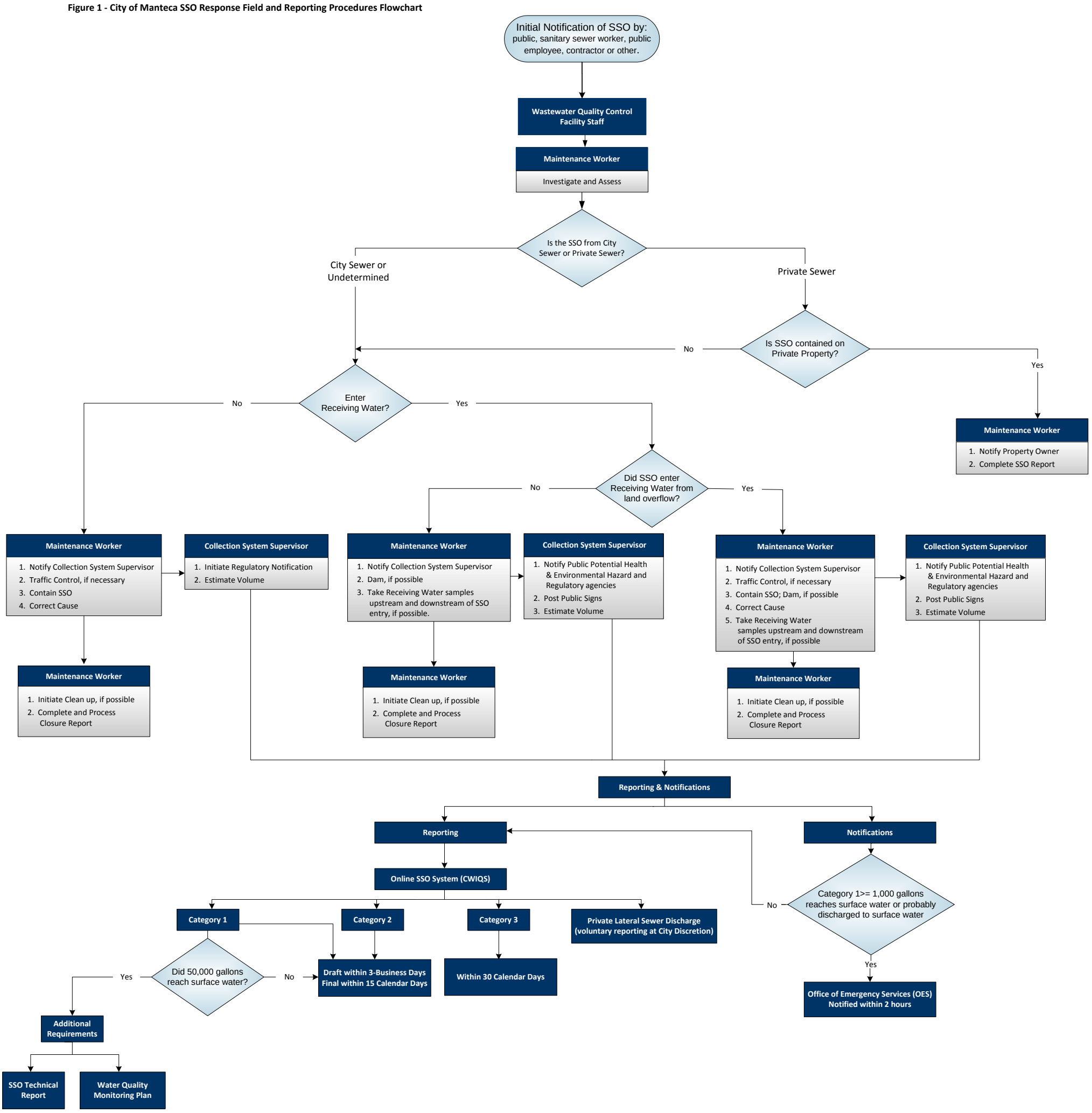


FIGURE 2

City of Manteca WQCF Sanitary Sewer Overflow Notification List
Sanitary Sewer Overflow Response Plan

1. Within two hours of becoming aware of any Category 1 sanitary sewer overflow (SSO) greater than or equal to 1,000 gallons discharged to surface water or spilled in a location where it probably will be discharged to surface water, notify the California Office of Emergency Services (OES) and obtain a notification control number. Follow direction from the OES on additional agencies that may need to be contacted. Document direction issued by OES. Follow plan for written reporting per SSO Response Plan.

2. Required Notification Contact Phone Numbers (See Item 4 below for possible information required to report to OES):

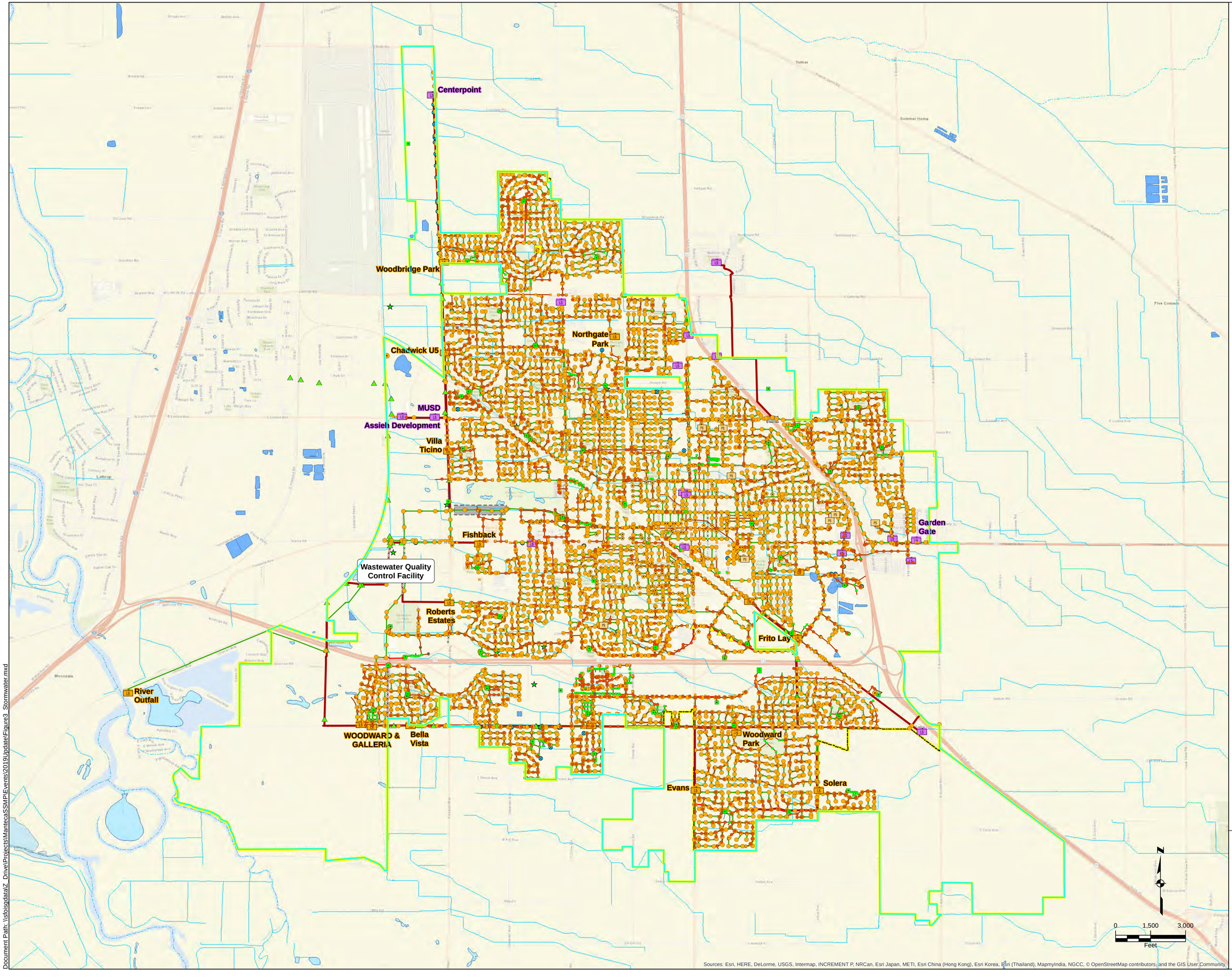
   - Office of Emergency Services (OES), State Warning Center (800) 852-7550

3. Optional/Additional Notification Contact Phone Numbers:

   - South San Joaquin Irrigation District (SSJID), Sam Bologna (209) 249-4600
   - San Joaquin County Environmental Health Department, front desk (209) 468-3400
   - California Department of Health Services (DHS), Stockton, CA (Bhupinder Sahota as of February 2014) (209) 948-7696
   - California Department of Fish and Wildlife, Rancho Cordova, CA (916) 445-0045
   - City of Manteca Police Department (209) 456-8100
   - San Joaquin County Sherriff's Department (209) 468-4400
   - State of California Highway Patrol (209) 943-8600
   - Regional Water Quality Control Board (RWQCB), (Mohammad Farhad as of February 2014) (916) 464-1181

4. Provide the requested information to OES; which may include the following information:

    - Name of person notifying OES and direct return phone number.
    - Estimated SSO volume discharged (gallons).
    - If ongoing, estimated SSO discharge rate (gallons per minute).
    - SSO Incident Description:
        - Brief narrative.
        - On-scene point of contact for additional information (name and cell phone number).
        - Date and time enrollee became aware of the SSO.
        - Name of sanitary sewer system agency causing the SSO.
        - SSO cause (if known).
    - Indication of whether the SSO has been contained.
    - Indication of whether surface water is impacted.
    - Name of surface water impacted by the SSO, if applicable.
    - Indication of whether a drinking water supply is or may be impacted by the SSO.
    - Any other known SSO impacts.
    - SSO incident location (address, city, state, and zip code).



Legend

- Storm Drain - Pump Station
- Storm Drain - Lift Station
- Storm Drain - Air Release Valve
- Storm Drain - Catch Basin
- Storm Drain - Drop Inlet
- Storm Drain - Manhole
- Storm Drain - Treatment
- Storm Drain - Treatment Private
- Flushing Station
- Lift Station
- Lift Station - Private
- Sanitary Sewer - Manholes
- Sanitary Sewer - Air Release Valve
- Sanitary Sewer - Cleanout
- Sanitary Sewer - Lamp Hole
- Storm Drain - Force Main
- Storm Drain - Gravity Main
- Storm Drain - Lateral
- Subdrain, City
- Sanitary Sewer - Force Main, Abandoned
- Sanitary Sewer - Force Main
- Sanitary Sewer - Gravity Main, Abandoned
- Sanitary Sewer - Gravity Main
- Sanitary Sewer - Gravity Main, Private
- SCADA
- SCADA SENSOR

Waterbody

- Estuary
- Ice Mass
- Lake Pond
- Playa
- Reservoir
- SwampMarsh

Waterways

- ArtificialPath
- CanalDitch
- Coastline
- Connector
- Pipeline
- StreamRiver
- Underground Conduit
- Blind Areas
- City Boundary

Kennedy/Jenks Consultants

City of Manteca
Sewer System Management Plan

Existing Sewer Collection and Existing Stormdrain System

K/J 1970006.00
October 2019

Figure 3

Document Path: \\sfofsp\data\Z_Drive\Projects\Manteca\SSMP\Events\2019Update\Figure3_Stormwater.mxd

Attachment I

Request for Service Form

ATTACHMENT 2

ID: _____

Rev. 9-24-13

REQUEST FOR SERVICE

*To Be Completed By Person Answering The Phone

*Date: _____ *Time: _____ Am/Pm

*Resident's Name: _____

*Address: _____

*Cross Street: _____

*Phone: _____ Home/Work/Cell (Please Circle)

*Call Received By: _____

(Office Use Only)

Circle One

Sewer Station	Storm Station
Clean Out	Flooding
Main Line	Storm Basin
Odor	
WQCF	

Other: _____

Longitude: _____

Latitude: _____

Event ID: _____

Confirmation #: _____

*Request: _____

_____

_____

Response By: _____

Action: _____

_____

_____

Tools Used To Clear Blockage: Sand Points _____ 2.5" _____ 3.5" _____

Footage Of Cable From Top Of Clean Out To Plug: _____ Feet.

Did Sewage Spill? (Check One) Yes _____ No _____ Amount Of Gallons: _____

Did Spill Reach Storm Drain Inlet? (Check One) Yes _____ No _____

How Was Spill Cleaned Up? Vacuum: _____ Jetted: _____

How Often Have We Been There? _____

How Often Does The Resident Say We've Been There? _____

Does This Site Need To Have A Video Done? (Check One) Yes _____ No _____

Mainline: (Check One) Yes _____ No _____

Jetted From Dry Manhole At: _____

Other Notes: _____

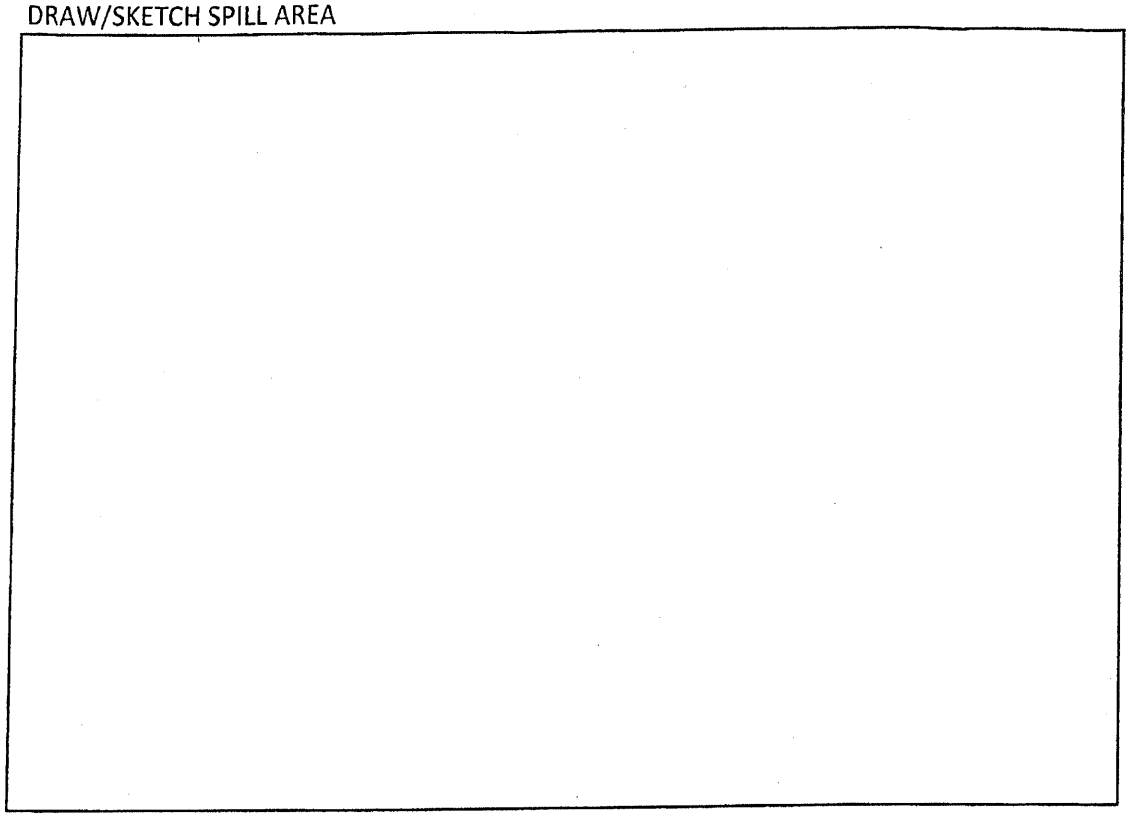
_____

_____

Arrival Time: _____ Completion Time: _____ Total: _____

SPILL ESTIMATION WORKSHEET **ATTACHMENT 2**

DRAW/SKETCH SPILL AREA



AREA OF A SQUARE/RECTANGLE IS; Length x Width x Depth = cu ft

AREA OF A CIRCLE IS: Dia x Dia x 0.785 x Depth = cu ft

AREA OF A TRIANGLE IS: Base x Height x 0.5 x Depth =cu ft

1/8" = 0.01'	3" = 0.25'
1/4" = 0.02'	4" = 0.33'
3/8" = 0.03'	5" = 0.42'
1/2" = 0.04'	6" = 0.50'
5/8" = 0.05'	7" = 0.58'
3/4" = 0.06'	8" = 0.67'
7/8" = 0.07'	9" = 0.75"
1" = 0.08'	10" = 0.83"
2" = 0.17'	12" = 1.00'

_____cu ft x 7.48 gallons = _____**Gallons spilled**

Attachment II

(Sample) SSO Field Report Form

(Sample) SSO Field Report Form

CITY OF MANTECA

SANITARY SEWER OVERFLOW (SSO) FIELD REPORT FORM

ALL ITEMS MUST BE COMPLETED

General Information

1. SSO Event ID No (Issued automatically by CIWQS):_____-_____-_____
1a. Customer Service Call Number:_____
2. Call Received From:_____
3. Date Received: _____/_____/_____ (MM/DD/YY)
4. Time Received: _____:_____ (24-Hour Time)
5. Report Filled Out By:_____ Phone Number (_____)_____-_____

Section A. Physical Location Details (REQUIRED FOR CATEGORIES 1, 2, & 3 SSOS)

1. Spill Location Name:_____
   (If the overflow did not occur at a street location, then use other identifiers such as intersection or manhole number)
2. Latitude:_____ deg. _____ min. _____ sec or _____ decimal degrees
3. Longitude:_____ deg. _____ min. _____ sec or _____ decimal degrees
4. Street Type: ☐ Alley, ☐ Avenue, ☐ Boulevard, ☐ Circle, ☐ Freeway, ☐ Highway, ☐ Lane, ☐ Loop, ☐ Trail, ☐ Other _____
5. Cross Street:_____
6. City:_____
7. County:_____
8. Spill Location Description:_____

   _____

   _____

   _____
9. Regional Water Quality Control Board: _____

   _____

(Sample) SSO Field Report Form

Section B. Spill Details

1. Number of Appearance Points:_____

2. Spill Appearance Point:
   - ☐ Building or Structure
   - ☐ Force Main or Pressure Sewer
   - ☐ Gravity Sewer
   - ☐ Manhole
   - ☐ Other Sewer System Structure
   - ☐ Pump Station
   - ☐ Other (specify) _____

3. Did the spill discharge to a drainage channel and/or surface water? ☐ Yes ☐ No

4. Did the spill discharge to a storm drainpipe that was not fully captured and returned to the sanitary sewer system? ☐ Yes ☐ No

5. Private lateral spill? ☐ Yes ☐ No

6. Name of Responsible Party (if private lateral) _____

7. Final spill destination(check multiple if necessary):
   - ☐ Beach
   - ☐ Building or structure
   - ☐ Other paved surface
   - ☐ Storm drain
   - ☐ Street/curb and gutter
   - ☐ Surface Water
   - ☐ Unpaved surface
   - ☐ Other (specify) _____

   a. Explanation of final spill destination _____
   b. Did spill create a nuisance (e.g., traffic or pedestrian impacts, private or public property impacts, etc.)? ☐ Yes ☐ No

8. Estimated total spill volume (gallons):_____

   a. Volume that reached a separate storm drain that flows to a surface water body? _____gallons
   b. Volume that reached a drainage channel that flows to a surface water body? _____gallons
   c. Volume discharged directly to a surface water body? _____gallons
   d. Volume discharged to land (e.g., soil, grass, curb, street, etc.)? _____gallons

9. Estimated total spill volume recovered (gallons): _____

(Sample) SSO Field Report Form

a. Volume recovered from the separate storm drain that flows to a surface water body (**Do not include wash water recovered**)? _____gallons

b. Volume recovered from a drainage channel that flows to a surface water body? _____gallons

c. Volume recovered from the surface water body? _____gallons

d. Volume recovered from the discharge to land? _____gallons

10. Estimated volume of spill that reached surface water, drainage channel, or not recovered from a storm drain (gallons): _____

11. Estimated current spill rate (gallons per minute, if applicable): _____

12. Estimated spill start Date/Time:_____/_____/____ (MM/DD/YY) _____:_____ (24:00)

    a. Explanation of volume estimation methods used: _____

    _____

    Provide diagrams and/or photographs of spill incident. Include details that will help explain how overflow volume was determined.

13. Sanitary sewer system agency was notified of or discovered spill Date/Time:

    _____/_____/_____ (MM/DD/YY) _____:_____ (24:00)

14. Estimated Operator arrival Date/Time: _____/_____/____ (MM/DD/YY) _____:_____ (24:00)

15. Estimated spill end Date/Time: _____/_____/____ (MM/DD/YY) _____:_____ (24:00)

16. Spill cause:

☐ Debris
☐ Flow exceeded capacity
☐ Grease deposition (FOG)
☐ Operator error
☐ Pipe structural problem/failure
☐ Pump station failure
☐ Rainfall exceeded design
☐ Root intrusion
☐ Vandalism

☐ Other (specify) _____

    a. Spill cause explanation _____

    b. Where did failure occur? _____

    c. Explanation of where failure occurred _____

    _____

(Sample) SSO Field Report Form

17. If spill caused by wet weather, choose storm size:
    - ☐ 1 Year
    - ☐ 2 Year
    - ☐ 5 Year
    - ☐ 10 Year
    - ☐ 50 Year
    - ☐ 100 Year
    - ☐ >100 Year
    - ☐ Unknown
    - ☐ _____ Number of inches in time (hours or minutes)

    a. Was there measurable precipitation during the 72-hour period prior to the overflow? ☐ Yes ☐ No

18. Diameter of sewer pipe at the point of blockage or spill cause (inches, if applicable):

    _____

    _____

19. Material of sewer pipe at the point of blockage or spill cause (if applicable):

    _____

    _____

20. Estimated age of sewer pipe at the point of blockage or spill cause (if applicable):

    _____

    _____

21. Description of terrain surrounding the point of blockage or spill cause (if applicable):
    ☐ Flat ☐ Mixed ☐ Steep

QUESTIONS 22-33 FOR CATEGORY 3 NOT REQUIRED (SKIP TO SECTION C)

22. Spill response activities (check multiple if necessary):
    - ☐ Cleaned-up (mitigated spill effects)
    - ☐ Contained all or portion of spill
    - ☐ Inspected sewer using CCTV to determine cause
    - ☐ Restored flow
    - ☐ Returned all or portion of spill to sanitary sewer system
    - ☐ Other (specify) _____

    a. Explanation of spill response activities _____

    _____

(Sample) SSO Field Report Form

23. Spill response completion Date/Time: _____/_____/____ (MM/DD/YY) _____:_____ (24:00)

24. Spill corrective action taken (check multiple if necessary):
    - ☐ Added sewer to preventive maintenance program
    - ☐ Adjusted schedule/method of preventive maintenance
    - ☐ Enforcement action against FOG source
    - ☐ Plan rehabilitation or replacement of sewer
    - ☐ Repaired sewer
    - ☐ Other(specify) _____

    a. Explanation of spill corrective action taken _____

QUESTIONS 25-33 FOR CATEGORY 2 NOT REQUIRED (SKIP TO SECTION C)

25. Visual inspection results from impacted receiving water: _____

26. Health warnings posted? ☐ Yes ☐ No

26a. If health warnings posted, list the location(s) of posting:

27. Did the spill result in a beach closure? ☐ Yes ☐ No
    a. Name of impacted beach(es) (if applicable): _____

28. Name of impacted surface water(s) (if applicable): _____

29. Is there an ongoing investigation? ☐ Yes ☐ No

    a. Describe Ongoing Investigations: _____

30. Were samples of the contamination receiving water obtained? ☐ Yes ☐ No

(Sample) SSO Field Report Form

30a. If samples were obtained, list the location(s) in relation to point of entry

_____

30b. If samples were obtained, who obtained the samples?_____

30c. Samples Delivered to for Testing:

_____

30d. Chain of Custody number for samples: _____

and Date: _____/_____/____ (MM/DD/YY)

31. Water quality samples analyzed for (check multiple if necessary):

☐ Dissolved oxygen

☐ Other chemical indicator(s) (specify) _____

☐ Biological indicator(s) (specify) _____

☐ No water quality samples taken

☐ Not applicable to this spill

☐ Other (specify) _____

a. Explanation of water quality samples analyzed for _____

_____

32. Water quality sample results reported to (check multiple if necessary):

☐ County Health Agency

☐ Regional Water Quality Control Board

☐ None of the above

☐ No water quality samples taken

☐ Not applicable to this spill

a. Explanation of water quality samples reported to _____

_____

33. Overall spill description: _____

_____

_____

_____

(Sample) SSO Field Report Form

Section C. Notification Details

1. California Office of Emergency Services(OES) Control Number:

   _____

2. Cal OES Called Date/Time: _____/_____/____ (MM/DD/YY) _____:_____ (24:00)
3. County health agency notified? ☐ Yes ☐ No
4. County health agency notified Date/Time: _____/_____/____ (MM/DD/YY)

   _____:_____ (24:00)

5. Regional Water Quality Control Board (RWQCB) notified? ☐ Yes ☐ No
6. RWQCB notified Date/Time: _____/_____/____ (MM/DD/YY) _____:_____ (24:00)
7. Other agency notified? ☐ Yes ☐ No If yes, Name of agency _____
8. Other agency notified Date/Time: _____/_____/____ (MM/DD/YY) _____:_____ (24:00)
9. Was any of this spill report information submitted via fax to the Regional Water Quality Control board? ☐ Yes ☐ No
10. RWQCB faxed spill report information Date/Time: _____/_____/____ (MM/DD/YY)

    _____:_____ (24:00)

Section D. Cost Recovery (FOR CITY USE ONLY)

Was the SSO from a private system or caused by an outside agency, contractor or person?
☐ Yes ☐ No (If 'Yes', continue filling in as much information as possible.)

☐ The SSO was from a private system.

☐ The SSO was caused by an activity being performed by an outside:

☐ Agency ☐ Contractor ☐ Person ☐ Other _____

(Sample) SSO Field Report Form

Name of complex, agency, contractor or person:_____

Address of complex, agency, contractor or person:_____

_____

Name of insurance company, agent's name and phone number, if known:

_____

Name of person providing information:_____

Name and phone number of any witness(es):

_____

_____

_____

Attachment III

SSO Flow Estimation Pictures

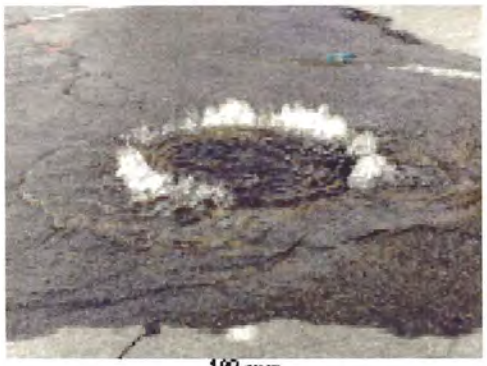
Reference Sheet for Estimating Sewer Spills from Overflowing Sewer Manholes

All estimates are calculated in gallons per minute (gpm)


5 gpm


25 gpm


50 gpm

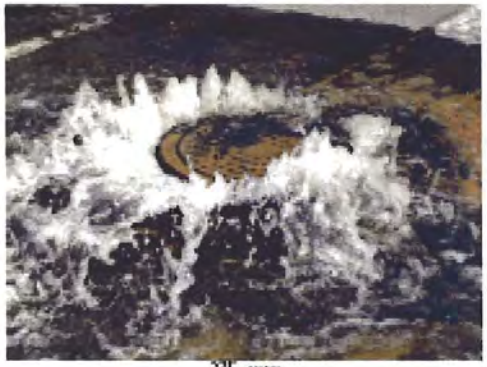

100 gpm


150 gpm


200 gpm


225 gpm


250 gpm


275 gpm

SSO Flow Estimation Pictures

Sewer Spill Estimation

EXAMPLE 1: To calculate the estimated amount of gallons in a ponded sewage spill you must determine the volume of the spill. If it is a rectangular contained area,

Volume = Length x Width x Depth x 7.48 gallons/cu. ft. = Gallons

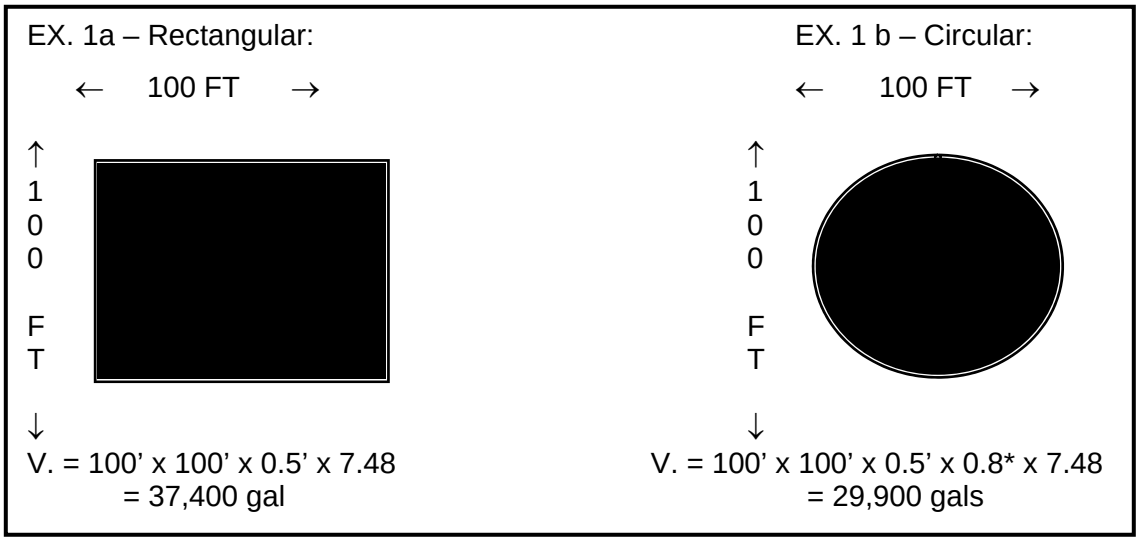
A spill 100' x 100' x 6" x 7.48 gal/cu. ft. = 100' x 100' x 0.5' x 7.48 gal/cu. ft. = 37,400 gal

See illustration below for estimating the volume of a circular ponded area.

EXAMPLE 2: If you are dealing with a spill that has been running into a storm drain, you must estimate the gallons by the amount of time of the overflow times the number of connections on the receiving line (assume 240 gal per household per 24 hrs).

If you have a line with 6 houses on it, and it has been overflowing for 24 hrs:

6 houses x (240 gal/house) x 24 hours = 1,440 gal



*Factor for estimating area of a circle as a portion of the area of a square.

EXAMPLE 3a: If the overflow is less than 24 hours in duration, then the calculation must prorate the daily sewage generation rate. If you have 60 houses on a line that has been overflowing for 1 hr:

60 houses x (240 gal/day/house) x 1 hr x (1day/24hr) = 600 gal

EXAMPLE 3b: If you have 6 houses on a line that has been overflowing for 12 hours:

6 houses x (240 gal/day/house) x 12 hrs x (1day/24hr) = 720 gal

Note that the time of day of the overflow should be considered in the calculation of its volume especially if the land use of the tributary area to the overflow is predominantly residential. Over 90% of the daily sewage discharge from an average home occurs between the hours of 6 am and 12 midnight with 50-75% of the daily sewage discharge occurring between 8 am to noon and 7 pm to 11 pm ("diurnal peak hours"). This could result in a flow rate of 15 to 22.5 gal/hr during the diurnal peak hours vs. 10 gal/hr (average) over 24 hours.

If there is mixed land use tributary to an overflowing sewer, the following unit flow rates should be used in addition to the residential, as appropriate: hotel/motel – 100 gpd/room; restaurant - 55 gpd/seat; business offices - 175 gpd/1000 sq. ft.; and commercial/retail - 75 gpd/1000 sq.ft.

Wet weather conditions could further affect the per home daily sewage contribution due to infiltration and inflow (I/I) sources.

Attachment IV

City of Manteca Chain-of-Custody Record and Analysis Request

Laboratory Chain of Custody

ATTACHMENT 2

Submission:

City of Manteca
2450 W. Yosemite Ave., Manteca, CA 95337

Client	Report Attention	Phone
Address	Project Name:	FAX
City, State, Zip	Copy to:	System #
Sampling Info	Sampled by:	Project ID

			Date	Time	Sample Description / Location	Comment or Station Code											

Signature	Print Name	Company	Date	Time
Received / Reliquished by:				
Received / Reliquished by:				
Received / Reliquished by:				
Received / Reliquished by:				
Received / Reliquished by:				

Attachment V

City of Manteca Key Personnel

ATTACHMENT 2

City of Manteca Key Sanitary Sewer Overflow Response Staff

- Wastewater Quality Control Facility (209) 456-8470
- WQCF Collections System Supervisor (209) 456-8472

  (209) 496-4991
- WQCF Chief Plant Operator (209) 456-8486
- WQCF Superintendent (209) 456-8473
- Maintenance Workers
  - Lead Maintenance Worker (209) 639-4886
  - Maintenance Worker I (209) 639-4886
  - Maintenance Worker II (209) 639-4886
  - Maintenance Worker III (209) 639-4886
  - Standby Worker (209) 639-4892

ATTACHMENT 2

Appendix B

City Ordinance

ATTACHMENT 2

Chapter 13.12 SEWER CONNECTION CHARGES

13.12.010 Sewer connection charges.

Sewer connection charges are established in the amounts set forth in this chapter for the privilege of connecting to the sanitary sewer system of the city. (Prior code § 14-7)

13.12.055 Additional connection charge.

A. Each residential dwelling utilizing Phase 3 wastewater treatment capacity and each commercial, industrial and institutional facility shall pay a sewer connection charge as follows:

LAND USE	CHARGE
Residential	
Very Low Density	$3,961 per unit
Low Density	$3,961 per unit
Medium Density	$3,301 per unit
High Density	$3,301 per unit
Commercial	
Office Professional	$1,493 per 1,000 sq. ft.
Neighborhood/Community Commercial	$1,640 per 1,000 sq. ft.
Business/Visitor Services	$1,640 per 1,000 sq. ft.
General Commercial	$1,640 per 1,000 sq. ft.
Commercial Recreation	$1,640 per 1,000 sq. ft.
Light Industrial	$1,692 per 1,000 sq. ft.
Heavy Industrial	$1,692 per 1,000 sq. ft.

B. The connection charges specified in subsection A shall be subject to payment in accordance with Section 13.12.070 of this chapter. Nonpayment of such charge may result in disconnection in accordance with Section 13.12.080 of this chapter. All revenue derived from the connection charges provided by this section shall be used for the Manteca wastewater quality control facility Phase 3 upgrade and expansion project. (Ord. 1518 § 2, 2013; Ord. 1294 § 2, 2005; Ord. 1244 § 2, 2003)

13.12.057 WQCF Phase 3 completion charge.

A. In addition to the sewer connection charges provided by Section 13.12.055 of this chapter, each residential dwelling utilizing WQCF Phase 3 wastewater treatment capacity and each commercial, industrial and institutional facility shall pay a sewer connection charge as follows:

Land Use	WQCF Phase 3 Completion Charge	Basis on Which Charged
Residential		
Very Low Density	$2,003	per unit
Low Density	$2,003	per unit

ATTACHMENT 2

Medium Density	$1,802	per unit
High Density	$1,802	per unit
Commercial		
Office Professional	$815	per 1,000 sq. ft.
Neighborhood/Community Commercial	$895	per 1 000 sq. ft.
Business/Visitor Services	$895	per 1 000 sq. ft.
General Commercial	$895	per 1,000 sq. ft.
Commercial Recreation	$895	per 1 000 sq. ft.
Light Industrial	$924	per 1,000 sq. ft.
Heavy Industrial	$924	per 1,000 sq. ft.

B. The connection charge specified in subsection A of this section shall be subject to payment in accordance with Section 13.12.070 of this chapter. Nonpayment of such charge may result in disconnection in accordance with Section 13.12.080 of this chapter. All revenue derived from the connection charge provided by this section shall be used for the Manteca wastewater quality control facility Phase 3 upgrade and expansion project. (Ord. 1518 § 3, 2013; Ord. 1411 § 2, 2009)

13.12.070 Payment.

A. Except as provided in subsection C, connection charges shall be due and payable at the time building permits are obtained or, when no building permit is required, prior to actual connection to the city system. For mobile home parks, connection charges shall be paid prior to the time of first connection for the total number of mobile home spaces permitted by the terms of the use permit.

B. The charges paid shall be the charge that is applicable at the time the permit is obtained or connection is made.

C. Connection charges for residential dwellings existing and lawfully occupied as of July 1, 1991 within the city limits may be paid over a five-year period (twenty percent of the charge each year) where the dwelling is owner-occupied at the time of the application for connection and the household income for the occupants of the dwelling does not exceed the moderate income level designated by the income standards used by the county in administering community development block grant funding in effect at the time of application. In such cases, the first payment shall be made at the time of actual connection to the city system and the remaining payments shall be due annually on the anniversary date of the connection. (Ord. 905 § 1, 1991; Ord. 884 § 1, 1990; prior code § 14-7.6)

13.12.080 Disconnection for nonpayment.

The city may disconnect any facility from the sewer system if connection was made without city permission and without the payment of the appropriate connection charge. The cost to the city of disconnection shall be paid in addition to connection charges prior to reconnection. (Prior code § 14-7.8)

13.12.090 Revenue use.

All revenue derived from connection charges shall be deposited in the capital improvement fund and used for the acquisition, construction, reconstruction, reimbursement, maintenance and operation of the sanitary sewer and treatment system of the city. (Prior code § 14-7.9)

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Chapter 13.14 SEWER CAPACITY CHARGES

13.14.010 Pestana Avenue sewer capacity charges.

Those property owners who are served by the Pestana Avenue sewer trunk line shall pay a sewer capacity charge in the amount set forth in the Table of Pestana Avenue Sanitary Sewer Capacity Charges adopted by the city council and on file in the department of public works. (Ord. 1008 § 2, 1994)

13.14.020 Collection of capacity charges.

Capacity charges required pursuant to Section 13.14.010 shall be due and payable at the time that a building permit is obtained for a building that will connect to the Pestana Avenue sewer. However, if no capacity charge was paid at the time that a building permit was issued for a building that will connect to the Pestana Avenue sewer, then the capacity charge will be paid prior to actual connection to the Pestana Avenue sewer. For mobile home parks, capacity charges for the total number of mobile home spaces shall be paid prior to the time of the connection of the first space to the Pestana Avenue sewer.

The capacity charge shall be paid in the amount that is in effect at the time of payment. (Ord. 1008 § 2, 1994)

13.14.030 Adjustment.

Capacity charges shall be adjusted on January 1st of each year based upon the change to the Twenty-City Engineering News-Record Construction Costs Index. The adjusted capacity charges shall be calculated by the public works director using the following formula:

$$\text{Adjusted capacity charge} = \text{(Capacity charge set forth in the Table of Pestana Avenue Sanitary Sewer Capacity Charges)} \times \frac{\text{(ENR index for January 1st}}{\text{ENR index of 5070.66 for January, 1993)}}$$

The adjusted capacity charge shall be rounded to the nearest dollar. (Ord. 1008 § 2, 1994)

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Chapter 13.16 SEWER SERVICE CHARGES

13.16.010 Monthly rates.

Customers of the city's sewer collection and treatment system shall pay monthly charges as follows:

Rate Category	Jan. 1, 2009 through Dec. 31, 2009	Jan. 1, 2010 through Dec. 31, 2010	Jan. 1, 2011 through Dec. 31, 2011	Jan. 1, 2012 through Dec. 31, 2012	Jan. 1, 2013 and Thereafter	Basis on Which Rates Charged
Residential and equivalents	$39.50	$43.30	$43.30	$43.30	$43.30	per unit
Trailer park	$33.36	$36.57	$36.57	$36.57	$36.57	per 1,000 CF
Rooming houses	$25.26	$27.70	$27.70	$27.70	$27.70	per 1,000 CF
Commercial/retail	$28.24	$30.96	$30.96	$30.96	$30.96	per 1,000 CF
Hotel/motel	$30.84	$33.81	$33.81	$33.81	$33.81	per 1,000 CF
Hotel/motel w/kitchen	$56.47	$61.89	$61.89	$61.89	$61.89	per 1,000 CF
Car washes/ laundromats	$22.37	$24.53	$24.53	$24.53	$24.53	per 1,000 CF
Service stations (metered)	$31.05	$34.04	$34.04	$34.04	$34.04	per 1,000 CF
Office/light industrial	$23.12	$25.35	$25.35	$25.35	$25.35	per 1,000 CF
Restaurants	$66.09	$72.42	$72.42	$72.42	$72.42	per 1,000 CF
Markets	$68.85	$75.45	$75.45	$75.45	$75.45	per 1,000 CF
Mortuaries	$68.85	$75.45	$75.45	$75.45	$75.45	per 1,000 CF
Hospitals	$29.82	$32.69	$32.69	$32.69	$32.69	per 1,000 CF
Elementary schools	$21.94	$24.06	$24.06	$24.06	$24.06	per 1,000 CF
Secondary schools	$21.94	$24.06	$24.06	$24.06	$28.71	per 1,000 CF
Churches	$26.18	$28.71	$28.71	$28.71	$28.71	per 1,000 CF
Nonprofit	$25.37	$27.82	$27.82	$27.82	$27.82	per 1,000 CF
Commercial mixed use	$36.70	$40.23	$40.23	$40.23	$40.23	per 1,000 CF

Rate Category	Jan. 1, 2009 through Dec. 31, 2009	Jan. 1, 2010 through Dec. 31, 2010	Jan. 1, 2011 through Dec. 31, 2011	Jan. 1, 2012 through Dec. 31, 2012	Jan. 1, 2013 and Thereafter	Basis on Which Rates Charged
Industrial						
flow	$1,841.15	$2,023.24	$2,023.24	$2,023.24	$2,023.24	per MG
biochemical oxygen demand (BOD)	$0.368	$0.404	$0.404	$0.404	$0.404	per lb
suspended solids (SS)	$0.696	$0.765	$0.765	$0.765	$0.765	per lb
nitrogen (N)	$2.608	$2.866	$2.866	$2.866	$2.866	per lb
Septage	$150.76	$165.16	$165.16	$165.16	$165.16	per 1,000 gallons

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City of Lathrop	per contract	
Raymus Village	per contract	

(Ord. 1515 § 2, 2012; Res. R2011-221; Res. R2010-268; Ord. 1410 § 2, 2008; Ord. 1242 § 1, 2003; Ord. 1155 § 1, 2000; Ord. 916 § 1, 1991; Ord. 817 § 1, 1988; Ord. 794 § 1, 1988; Ord. 788 §§ 1-3, 1988; Ord. 770 § 1, 1987; prior code § 14-8)

13.16.011 Industrial sewer service charge for Eckert Cold Storage.

A. Effective December 1, 2013, the industrial sewer service charge for Eckert shall be as provided in subsections B through D of this section.

B. The variable charge is the sum of: (1) the actual electricity costs for the Moffat Boulevard pump station, the pond pump station and the pond aerator system; (2) the actual wastewater laboratory testing costs for the industrial sewer system; and (3) the actual odor control chemical costs for the industrial sewer system. Variable charges are payable each month and are based on actual usage. For calendar year 2013, the variable charges billed on December 1, 2013, or as soon thereafter as practicable, shall be the actual variable costs for January 1, 2013 through November 30, 2013, less any actual variable costs paid by Eckert for January 1, 2013 through November 30, 2013. For December 2013 and for calendar years 2014, 2015 and thereafter, variable charges shall be billed monthly based on the previous month's actual costs.

C. The fixed charge is an annual charge that is based on estimated operations, maintenance and replacement costs. The annual fixed charge is ninety-six thousand seven hundred ten dollars for 2013, ninety-nine thousand four hundred eighty-two dollars for 2014 and one hundred two thousand three hundred thirty-five dollars for 2015 and thereafter. The total annual fixed charge for 2013 is payable on December 31, 2013. The annual fixed charge for 2014, 2015 and thereafter is payable in six equal installments on the first business day of each month, beginning in June and ending in November of each year.

D. In any calendar year in which Eckert does not discharge industrial wastewater to the industrial sewer system or the modified industrial sewer system due to acts of God, acts of a government, fires, floods, epidemics, quarantine restrictions, strikes, earthquakes, explosion or any similar catastrophic event or occurrences beyond the control of Eckert, the city shall determine the fixed charge per the following formula:

$$\text{Fixed Charge in Calendar Year of Catastrophe} = \text{Fixed Charge} \times \frac{\text{Actual days discharged in calendar year of catastrophe}}{\text{Average total days discharged in immediately preceding three consecutive calendar years}}$$

(Ord. 1534 § 2, 2013; Ord. 1469 § 1, 2010; Ord. 1439 § 2, 2009)

13.16.015 Senior citizen rebates.

A. A senior citizen shall be defined as a resident who is age sixty or older.

B. Low-income senior shall be defined as a senior citizen whose combined family income does not exceed fifty percent of the medium income for San Joaquin County, according to the income limitations for the Federal Community Development Block Grant (CDBG) and Home Investment Partnership Act (HOME) programs.

C. The amount of the rebate shall be five dollars per month per unit, which will be credited annually to the billed customers. Credits will cover the fees charged in a fiscal year. This credit becomes effective February 1, 2004.

D. In order to qualify for the rebate, the qualifying low-income senior must provide the following:

1. A copy of the most recent 1040 federal income tax form demonstrating income eligibility and/or social security annual statement;

2. A signed affidavit provided by the city ensuring that all information provided is accurate and complete;

3. In the event the low-income senior does not have a utility account established with the city because the sewer charges

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are paid as part of a multi-unit meter, the property manager and/or owner responsible for the utility account will collect the signed low-income forms from the individuals and submit them to the city finance department. This credit will be applied to the multi-unit account. The property manager and/or owner are/is responsible to pass on the credit to the eligible senior. It is unlawful and a misdemeanor for any person to violate this provision.

E. Documentation noted above shall be provided to the city no later than July 15th of each year. The city will have sixty days from this date to apply the credit to the account.

F. Customers who cancel their services prior to the July 15th deadline may request a rebate. The noted documents above need to be submitted along with their request to cancel the services. The credit will be applied to their final utility billing. This provision shall not apply to multi-unit customers. (Ord. 1256 § 1, 2004)

13.16.020 Billing—Collection.

A. The charges fixed in this chapter for any premises shall be billed and collected with the charges and rates for city utility services furnished by the city to such premises. Such charges fixed in this chapter shall be due and payable in advance at the same time that such charges for city utility services are due and payable.

B. In the event the premises to be charged for sewer service are not connected to the city water distribution system, then, and in that event, the city water department shall bill and collect for the appropriate sewer service charges.

C. All sewer service revenues collected shall be retained by the city regardless of the date of termination of sewer service and no rebates will be made for midmonth disconnection.

D. If the monthly service rate is not paid when due, on the first day of each calendar month thereafter a penalty of two percent of the amount of the delinquent rate shall be added. (Ord. 1410 § 3, 2008; Ord. 1184 § 1, 2001; prior code § 14-9)

13.16.030 Delinquent charges—Lien.

Charges for services and facilities furnished by the city shall constitute a lien against the lot or parcel of land against which such charge is imposed if such charges remain delinquent for a period of sixty days. (Prior code § 14-10)

13.16.040 Discontinuance of service.

A. In the event the owner, occupant or lessee of premises connected to the sewer system shall fail to pay the sewer service charges provided in this chapter by the fifteenth day of the month following presentation of a bill therefor, the city may in addition to all of the remedies it may have, discontinue furnishing sewer service by means of water service disconnection, and shall not resume the same until all delinquent charges and penalties under this chapter together with any service charge necessitated by the resumption of sewer service have been fully paid. However, service to delinquent customers will not be shut off until the customer is first notified of the intended shut off and given an opportunity for a hearing on the matter.

B. As an alternative to any of the other procedures provided in this chapter or given by law, the city may bring an action against the owner, occupant or lessee of the premises to whom the service was rendered for the collection of the amount of the delinquent rate and all penalties and costs of collection including a reasonable attorney’s fee. (Ord. 775 § 12(part), 1987; prior code § 14-11)

13.16.050 Privately owned water system—Charge.

In any case where rates are based on water used and the premises are not connected to the city water system, then, in such case, all unmetered water service which flows from a privately owned water system shall be estimated by the city or measured by a meter approved by the city to be furnished and installed by the user, and a sewer service charge will be applied which will be equivalent to that which would be applied if the water were being purchased from the city. (Ord. 775 § 12(part), 1987; prior code § 14-12)

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Chapter 13.20 INDUSTRIAL WASTE

13.20.010 Purpose.

A. The city of Manteca does ordain that this chapter shall be known as the "City of Manteca Industrial Waste Ordinance (Waste Ordinance)" and may be so cited.

B. This chapter is adopted pursuant to provisions of California Government Code 54725 and modifications and inclusions of Senate Bill 10.24.

C. This chapter sets forth the uniform requirements for direct and indirect contributors to the Manteca water pollution control system, and enables the city of Manteca to protect its collection, treatment, pumping, and disposal systems and to comply with all state and federal laws.

D. Objectives. The objectives of this chapter are to:

1. To prevent the introduction of pollutants into the Manteca water pollution control system that will interfere with the operation of the POTW, including the land disposal facilities.

2. To prevent the introduction of pollutants into the Manteca water pollution control system that could cause pass-through into receiving waters, the atmosphere, or otherwise be incompatible with the POTW systems.

3. To regulate the acceptance of wastes to:

a. Protect the physical structures of the water pollution control system and the efficient functioning of its component parts.

b. Protect the health and safety of the personnel of the city of Manteca and its member jurisdictions, and to preserve the health and safety of the public.

c. Comply with all of the applicable and compatible local, state of California, and federal laws, rules, regulations, codes, or orders.

d. Protect the environment from threat of hazard or harm resulting from the disposal of wastes.

E. Applicability. The requirements of this chapter are applicable to all persons within the city of Manteca, and to all persons outside the city of Manteca who are, by contract, agreement or action, users of the

city of Manteca water pollution control system; including any and all new and prospective users and any and all existing users.

F. The director of public works for the city of Manteca shall administer, implement, and enforce the provisions of this chapter. (Ord. 1275 § 2 (part), 2004)

13.20.020 Definitions and abbreviations.

A. List of Definitions.

"Act" means any regulation contained in or amendment of the Clean Water Act.

"Additional inclusions" means violations of compliance schedule milestones, by ninety days or more after the schedule date; failure to provide reports within thirty days from the due date; failure to accurately report non-compliance; and any other violation or group of violations that Manteca considers to be significant.

"Administrative order" means an enforcement document which directs industrial users to implement corrective or remedial measures. Levels of enforcement include: cease and desist orders, compliance orders, and show cause orders.

"Agent" means any person designated or retained by Manteca to fulfill the sampling, monitoring, reporting, or inspection services of Manteca as required by this chapter, the industrial discharge permit and/or all applicable state, federal, or local regulations, and/or to perform the enforcement actions required by this chapter. Agents may include, but are not limited to, any of the following: the Manteca director of public works, assistant director of

public works, inspector, supervisor, and city attorneys, and any consultant retained by the city to perform such services.

"Approval authority" means the California Regional Water Quality Control Board, Central Valley Region.

"Assistant director of public works" means the assistant director of public works for the city of Manteca or his or her agent.

"Authorized representative of the industrial user" means an authorized representative of an industrial user shall be: a principal executive officer of at least the level of vice president, a general partner or proprietor of the user, or a duly authorized representative of the person holding the industrial discharge permit, if such representative is responsible for the overall operation of the industrial facilities from which the discharge originates. The authorized representative shall be identified on the Industrial Discharge Permit.

"Categorical user" means any industrial user who, on the basis of the industrial activity at the facility in question, must comply with national categorical standards.

"Cease and desist order" means an administrative order issued by Manteca requiring a discharger to halt discharge to the water pollution control system.

"Chronic violation" means a violation of significant noncompliance when sixty-six percent or more of sample measurements exceed the same daily maximum limit or the same average limit over a six-month period.

"City" or "Manteca" refers to the city of Manteca.

"Compliance order" means an administrative order directing the discharger to achieve or restore compliance by a specified date. A Compliance Order may include a compliance schedule with specific milestones for achieving steps toward compliance, for tracking progress, and for the discharger to report progress.

"Control authority" means the POTW or the city of Manteca.

"Director of public works" means director of public works for the city of Manteca or his or her agent.

"Discharger" means any person discharging industrial waste to the water pollution control system. This term specifically includes any categorical users connected to the water pollution control system, whether or not they discharge process wastewater. It also includes any facilities with a reasonable potential for discharging significant quantities of industrial waste, whether or not they are currently discharging process waste.

"Domestic waste" means any waterborne waste of the type normally resulting from flushing and washing waste products from residences and lavatories.

"Federal pretreatment regulations" means any regulations promulgated by EPA in accordance with Sections 307(B)and (C) and 402(B)(8) of the "Act" (33 U.S.C. 1317) for the implementation, administration, and enforcement of pretreatment standards.

"Illegal discharge" means any discharge of waste prohibited by state or federal law, or local limits including discharge to the wastewater treatment plant and collection system, or to the storm drain system.

"Indirect discharge" means any discharge of waste which enters or flows into the Manteca water pollution control system through a connection of a member jurisdiction (e.g. city of Lathrop collection system) or through a septic contributor.

"Industrial user or users" means any source of direct or indirect discharge of commercial or industrial waste.

"Industrial waste" means any waterborne waste, excluding domestic waste. Waterborne wastes from "commercial" activities, such as automobile repair or photo processing, are expressly included in this definition.

"Industrial discharge permit" means a control mechanism issued to a significant industrial user, or any person discharging to the water pollution control system that the director of public works determines needs a permit, to regulate its discharge of toxic, organic, or hydraulic loading to the water pollution control system.

"Interference" means any discharge which, alone or in conjunction with a discharge or discharges from other sources, 1) inhibits or disrupts the treatment processes or operations of the water pollution control system, or its sludge processes, use or disposal; and 2) therefore is a cause of a violation of any requirement of the Manteca NPDES permit, including an increase in the magnitude or duration of a violation, or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued

thereunder (or more stringent California state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including California state regulations in any California state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research, and Sanctuaries Act.

"Manteca Pretreatment Program." The purpose of the Manteca Pretreatment Program (MPP) is to provide a means to control and regulate the discharge of industrial and hazardous waste to the Manteca water pollution control system and the wastewater treatment plant. The program applies to all discharges to the water pollution control system and the wastewater treatment plant. The components of the MPP include the development and use of the following:

Local Limits. Specific limits on the concentration of materials and chemical constituents allowed in the industrial waste discharge.

"Enforcement Response Plan" means guidelines for Manteca's enforcement of federal, state, and local laws related to waste discharge to the POTW, either directly or indirectly, and to waters of the state and/or United States, and enforcement of the Manteca Waste Ordinance No. 13.20; Manteca Waste Ordinance No. 13.20, which describes the authorities of the city of Manteca to enforce E.P.A. and local requirements related to waste discharge to the Manteca water pollution control system.

"Manteca industrial discharge permit" means a permit stating the conditions, prohibitions, limits, and requirements for discharges to the Manteca water pollution control system that is issued to all significant industrial users and any other users that discharge to the water pollution control system a waste, of substantial volume or of a concentration, that the director of public works deems significant and therefore requires a permit.

"Member jurisdiction" means any city or agency, such as the city of Lathrop, which owns and operates a collection system connected to the city of Manteca water pollution control system. The relation of a member jurisdiction is specified in a jurisdictional agreement.

"National pretreatment standards" means any regulations containing pollutant discharge limits promulgated by EPA in accordance with Section 307(b) and (c) of the Act (33 U.S.C. 1317) and which apply to a specific category of industrial users. These regulations are found at 40 CFR Chapter I, Subchapter N, Parts 405-47. This term includes prohibitive discharge limits established pursuant to Section 403.5.

"New source" means any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commences after the publication of proposed Pretreatment Standards under section 307(c) of the Act which will be applicable to such source if such standards are thereafter promulgated in accordance with that section, provided that:

a. The building, structure, facility, or installation is constructed at a site which no other source is located; or

b. The building, structure, facility, or installation totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or

c. The production or wastewater generating processes of the building, structure, facility, or installation is substantially independent of an existing source at the same site. In determining whether these are substantially independent, factors such as the extent to which the new facility is integrated with the existing plant, and the extent to which the new facility is engaged in the same general type of activity as the existing source, should be considered.

Construction on a site at which an existing source is located results in a modification rather than a new source if the construction does not create a new building, structure, facility, or installation meeting the criteria of paragraph (b) or (c) above but otherwise alters, replaces, or adds to existing process or production equipment.

Construction of a new source as defined under this paragraph has commenced if the owner or operator has:

a. Begun, or caused to begin, as part of a continuous onsite construction program:

i. Any placement, assembly, or installation of facilities or equipment;

ii. Significant site preparation work including clearing, excavation, or removal of existing buildings, structures, or facilities which is necessary for the placement, assembly, or installation of new source facilities or equipment; or

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b. Entered into a binding contractual obligation for the purchase of facilities or equipment which are intended to be used in its operation within a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility, engineering, and design studies do not constitute a contractual obligation under this paragraph.

"Noncompliance" means any violation of any part of this chapter, the industrial discharge permit, or national categorical standards.

"Notice of violation (NOV)" means an official communication from the city to the non-compliant industrial user informing the industrial user that a violation has occurred.

"Nuisance" means any nuisance defined by California statutes or known at common law or in equity jurisprudence.

"Pass-through" means a discharge which exits the Manteca's treatment works into the waters of the state or into Manteca's land disposal system in quantities or concentrations, which alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of Manteca's NPDES permit or of Manteca's RWQCB permit, including an increase in the magnitude or duration of a violation.

"Permittee" means the person to whom an industrial discharge permit has been issued pursuant hereto.

"Person" means any individual, firm, partnership, corporation, association or public agency, including the state of California and the United States of America. The singular shall include the plural.

"Pretreatment" means any operations performed on sewage prior to discharge into the water pollution control system.

"Pretreatment requirement" means any substantive or procedural requirement related to pretreatment, other than a national pretreatment standard, applicable to an industrial user.

"Premise" means the location of the process, storage, discharge, and business actions of any person discharging to the water pollution control system.

"Self-monitoring" means wastewater sampling performed by a discharger, in accordance with Manteca's Pretreatment Program. Self-monitoring requirements will be specified in the user's industrial discharge permit.

"Service area" means the geographical area served by the Manteca water pollution control system.

"Sewage" means any combination of domestic waste and industrial waste together with such ground, surface and storm waters as may be present.

"Show cause order" means an order for the industrial user to appear before the Manteca director of public works, to explain the noncompliance and why more severe enforcement actions should not be taken. Manteca may designate a hearing officer to hear testimony for the hearing.

"Significant industrial user (SIU)" includes all of the following in accordance with 40 CFR 403.3 (t). All categorical industrial users and any non-categorical industrial user which discharges an average of twenty-five thousand gallons per day or more of process wastewater, excluding sanitary, noncontact cooling, and boiler blowdown wastewater; contributes a process wastewater which makes up five percent or more of the average dry weather hydraulic or organic (BOD, TSS, TDS, ammonia, and/or phosphorus) capacity of the POTW; or has a reasonable potential, in the opinion of the director of public works or his or her agent, to adversely affect the POTW's operation or to violate a pretreatment standard or requirement.

"Significant noncompliance" includes any of the following: chronic violations, technical review criteria (TRC) violations, or any other violation or violations of an effluent limit that Manteca believes has caused, alone or in combination with other discharges, interference or pass through, or has endangered the health of the sewage treatment plant personnel or the public, or any pollutant violation that has caused imminent endangerment to human health or welfare, or to the environment and has resulted in the city's exercise of its emergency authority to halt or prevent such a discharge.

"Slug discharge" means a slug discharge is any discharge of a non-routine, episodic nature, including but not limited to a bypass of the pretreatment system, or a non-customary batch discharge. A slug discharge also includes any intentional discharge to the water pollution control system in such quantity or concentration that has the potential to cause upset to the water pollution control system.

"Technical review criteria (TRC) violation" means a violation of significant noncompliance when thirty-three percent or more of all of the measurements for each pollutant, taken during a six month period, equal or exceed

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the product of the daily maximum limit or the average limit multiplied by the applicable TRC. Group 1: For conventional pollutants, the TRC is 1.4. For all other pollutants, the TRC is 1.2.

"Waste ordinance" refers to this chapter and any amendments thereto.

"Water pollution control system" means all facilities of the city of Manteca and/or all facilities of any member jurisdiction for collecting, pumping, treating and disposing of sewage.

"Working day" means Monday, Tuesday, Wednesday, Thursday, or Friday, excluding federal or California state holidays.

B. List of Abbreviations.

BOD	Biochemical Oxygen Demand
CCR	California Code of Regulations
CFR	Code of Federal Regulations
City	City of Manteca
CWA	Clean Water Act
DPW	Director of Public Works of the City of Manteca
ADPW	Assistant Director of Public Works of the City of Manteca
EPA	Environmental Protection Agency of the United States
IU	Industrial User
Manteca	City of Manteca
mg/L	Milligrams per liter concentration
µg/L	Microgram per liter concentration
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
pH	A numerical value representing the relative acidity or alkalinity of the waste discharge
POTW	Public Owned Treatment Works
RWQCB	Regional Water Quality Control Board, Central Valley Region
SIU	Significant Industrial User
TSS	Total Suspended Solids
TDS	Total Dissolved Solids

(Ord. 1275 § 2 (part), 2004)

13.20.030 Authority and responsibility.

A. Authorities of the City of Manteca Public Works Department.

1. Manteca and its agent shall have the authority to inspect the premises of any person discharging waste to the Manteca water pollution control system, including but not limited to, any areas or points of sampling, discharge, process, storage, record keeping and/or any other areas as deemed reasonable and necessary by the Director of Public Works to document the person's compliance with the requirements of this chapter or the industrial discharge permit.

2. Manteca and its agent, shall have the authority to witness any sampling and sampling procedures as required of the user as part of the self-monitoring program and under the terms of this chapter and the industrial discharge permit.

3. Manteca and its agent shall have the authority to terminate service and disconnect any person from the water pollution control system who does not comply with the requirements of this chapter or the industrial discharge permit.

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4. Manteca and its agent shall have the authority to obtain copies of any monitoring and sampling records as necessary to establish compliance or non-compliance with the objectives of this chapter or the industrial discharge permit, and if necessary, remove those records from the premises for copying purposes. These records include, but are not limited to, record keeping required under 40 CFR 403.12 of the Act.

5. Manteca and its agent shall have the authority to require an industrial waste discharger to install and operate pretreatment facilities as deemed reasonable and necessary by the assistant director of public works to meet the EPA categorical pretreatment standards and the local limits described in this chapter.

6. Manteca and its agent shall have the authority to specify a compliance schedule for the user to install pretreatment, monitoring, and sampling equipment, and shall have the authority to require compliance reports on meeting scheduled milestones.

7. Manteca and its agent shall have the authority to inspect the installation and operation of the pretreatment facilities.

8. Manteca and its agent shall have the authority to issue an administrative order, including a show cause order, cease and desist order, and compliance order to any person discharging to the water pollution control system.

9. Manteca and its agent shall have the authority to seek injunctive relief and pursue civil and criminal penalties for violations of this chapter as may be provided for under the act and state and federal laws.

10. Manteca and its agent shall have the authority to levy fees for additional services or to recover damage costs, which are a result of a discharge, as described in Section 13.020.050(C) of this chapter.

11. Manteca and its agent shall have the authority to halt or suspend a discharge in the event of an actual or threatened discharge which is in violation of this chapter, the industrial discharge permit, or the regulatory conditions of 40 CFR 403.8(F)(1)(f)(B), or in the event of an emergency, or a condition in which the safety of humans or the environment is threatened.

B. Authorities of the Director and/or Assistant Director of Public Works.

1. The assistant director of public works of the city of Manteca or his or her agent shall have the authority to inspect the premises of the industrial waste discharger, including but not limited to the process facilities, discharge points, sampling points, and storage facilities, and/or any other facilities as deemed reasonable and necessary by the assistant director of public works, to ensure that the user is in compliance with all provisions of the user's industrial discharge permit and of this chapter. The authority to inspect includes the authority to collect samples of any wastes either being discharged to the water pollution control system or having the potential to be discharged.

2. The assistant director of public works of the city of Manteca or his or her agent shall have the authority to require submission of all notices and self-monitoring reports from any industrial user as required by this chapter and the user's permit, and any additional reports required to demonstrate compliance with this chapter and the permit requirements, including, but not limited to, the reports required in Section 403.12, and signatory and record keeping requirements of 40 CFR 403.12(1).

3. The assistant director of public works of the city of Manteca or his or her agent shall have the authority to require industrial users to develop a compliance schedule to meet all applicable national pretreatment standards, California state regulations, Manteca local limits, and all provisions of the industrial discharge permit, and of this chapter. The assistant director of public works also shall have the authority to require any person in non-compliance to submit progress reports for meeting the goals provided under the compliance schedule.

4. The assistant director of public works of the city of Manteca or his or her agent shall have the authority to enter the premises of any person discharging industrial waste into the Manteca system, at any time, as deemed reasonable by the assistant director of public works.

5. The assistant director of public works of the city of Manteca or his or her agent shall have the authority to witness sampling and sampling procedures of any person discharging industrial waste into the Manteca water pollution control system.

C. Responsibilities of the Director of Public Works.

1. The director of public works shall be charged with the administration of the water pollution control system and the enforcement of the provisions of this chapter. For such purposes, upon presentation of proper credentials and identification, he or she or his or her agent may enter at reasonable times any premise in the service area to perform any duty imposed upon him or her by this chapter.

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2. The director of public works shall be responsible for checking the quantitative or qualitative compliance with the established regulations. Such quantitative or qualitative analysis may be made either by spot checks or regularly scheduled checks of all waste material.

3. If the waste material is found to be in violation of the standards established in Section 13.020.040 of this chapter, it will be the responsibility of the director of public works or his or her agent to request compliance and compliance reports from the user on the progress of corrective measures.

4. The director of public works or his or her agent shall have the authority to invoke emergency powers as described in Section 13.020.090(C) of this chapter.

(Ord. 1275 § 2 (part), 2004)

13.20.040 Standards and limitations.

A. The city of Manteca has set forth the following prohibitions and limitations for waste discharge to the Manteca water pollution control system. Where national categorical standards are applicable, the discharger must comply with the more stringent requirement of the Manteca local limit or the applicable categorical standard for the given pollutant.

B. General Discharge Prohibitions. These general prohibitions and specific prohibitions that follow apply to each user introducing pollutants into the POTW whether or not the user is subject to other national pretreatment standards or any national, state or local pretreatment requirements.

C. No person shall contribute to or cause to be contributed to the water pollution control system any waste or any pollutant that will:

1. Interfere with, inhibit, or disrupt the operation, processes, or performance of the water pollution control system (including the collection, treatment, disposal systems, and sludge processes) or adversely affect the effluent and sludge quality, in violation of Manteca's NPDES permit or any other state or federal permit; or which cause Manteca to be in noncompliance with statutory authorities cited in 40 CFR 403.3(a)(2).

2. Damage the water pollution control system.

3. Cause pass through of the water pollution control system.

4. Obstruct Manteca's wastewater treatment or collection facilities.

5. Cause hazard to the public safety, the environment, or to Manteca personnel.

6. Singly, or in combination with waste present in the water pollution control system, exit the Manteca water pollution control system into waters of the United States and cause Manteca to violate any requirement of its NPDES permit or any other state, federal, or local permits or laws, including magnitude of the violation.

D. Other Prohibitions. No person shall discharge any pollutant(s), waste, industrial or domestic, to the water pollution control system, except through sewer connections approved by Manteca and the relevant member jurisdiction or at approved discharge locations at the Manteca treatments works. Discharge at any other location, including collection system manholes, is prohibited without prior written approval from the director of public works.

1. Storm Drainage and Groundwater Prohibition. Storm water, groundwater, street drainage, subsurface drainage, or yard drainage shall not be discharged, either directly or indirectly, to the water pollution control system. If such discharge is necessary, the city of Manteca director of public works may approve an application for temporary discharge of such substances in the event no alternate method of disposal is reasonably available. Application for discharge of storm water, groundwater, street drainage, subsurface drainage, or yard drainage shall be made to the director of public works in writing and must be approved by the director of public works prior to discharge to the water pollution control system. Such discharges shall be subject to all applicable requirements of this chapter and any applicable fees of the city of Manteca.

2. Unpolluted Water Prohibition. Unpolluted water, such as single-pass cooling water, boiler blow-down water, and swimming pool water, shall not be discharged, either directly or indirectly, to the water pollution control system. If such discharge is necessary, the city of Manteca director of public works may approve an application for temporary discharge of such substances in the event no alternate method of disposal is reasonably available. Application for discharge of unpolluted water shall be made to the director of public works in writing and must be approved by the director of public works prior to discharge to the water pollution control system. Such discharges

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shall be subject to all applicable requirements of this chapter and any applicable fees of the city of Manteca.

3. Additional Prohibitions. Except as hereinafter provided, no person shall discharge, or cause to be discharged, to the water pollution control system any of the following described waters, pollutants or wastes:

a. Any solid or viscous pollutants in amounts which will cause obstruction to the flow in the collection system or the treatment works, or which will require unusual attention or expense to convey and/or treat.

b. Any discharge which creates a fire or explosion hazard in the collection system or the treatment works, including but not limited to, waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit (60 degrees Celsius) using test methods specified in 40 CFR 261.21.

c. Any heated discharges which cause the influent into the treatment works to exceed 104 degrees Fahrenheit, and any heated discharges which create a hazard to the water pollution control system personnel or inhibit biological activity in the treatment plant.

d. Any discharge which has been diluted as a partial or complete substitute for treatment to achieve compliance with this chapter, the user's industrial discharge permit, or the national categorical standards.

e. Any discharge of hazardous waste, as defined by Title 22 of the California Code of Regulations without the written approval of the director of public works.

f. Any discharge which causes noxious or malodorous gases at or near the Manteca water pollution control system facilities or the facilities of any member jurisdiction of the city of Manteca, or which otherwise creates a public nuisance.

g. Any discharge which results in the formation of toxic gases, fumes, or vapors in a quantity that endangers the health or safety of Manteca personnel or the public.

h. Any discharge of pesticides, herbicides, or polychlorinated biphenyls (PCBs) in quantities deemed significant by the director of public works.

i. Any radioactive wastes, except as allowed under the "California Radiation Control Regulations", CCR Title 23 sec 30100 et seq.

j. Any discharge of any pollutant, including oxygen demanding pollutants (BOD, etc.), released at a flow rate and/or concentration which either singly or by interaction with other pollutants will cause interference with the water pollution control system.

k. Any discharge waters having an average daily flow greater than 0.5 percent of Manteca's average dry weather flow (ADWF), without the approval of the director of public works.

l. Any discharge containing petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that, alone or in conjunction with other discharges, will cause interference or pass through.

m. Pollutants that will cause corrosive structural damage to the POTW, but in no case discharges with a pH lower than 6.0, unless the works is specifically designed to accommodate such discharges.

n. Any trucked or hauled pollutants, except at discharge points designated by the POTW.

o. Any solid material not capable of passing through a 3/8 inch mesh screen.

E. Limits. Any exceedance or violation of these limits is considered to be a violation of this chapter and is enforceable by penalties.

1. Any discharge with a pH less than 6.0 or greater than or equal to 12.5.

2. Any discharge having a closed cup flashpoint of less than 140 degrees Fahrenheit (60 degrees Celsius) using test methods specified in 40 CFR 261.21.

3. The following table lists the maximum waste discharge concentration for the listed pollutants. The director of public works may impose mass limits in addition to, or in place of the maximum concentration limits.

Pollutant	**Maximum Concentration (mg/L)**
Antimony	0.6
Arsenic	0.6
Barium	12.0

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Beryllium	6.0
Boron	12.0
Cadmium	0.12
Chromium (Total)	0.6
Copper	2.4
Lead	0.6
Manganese	0.6
Mercury	0.005
Molybdenum	0.06
Nickel	4.1
Selenium	0.12
Silver	0.6
Tin	24.0
Vanadium	1.2
Zinc	1.0
Cyanide (Total)	1.2
Iron	None

F. National Categorical Standards. The national categorical standards found at 40 CFR Chapter I, Subchapter N, Parts 405-471, are hereby incorporated into this chapter and made a part thereof. All categorical users are required to comply with those national categorical standards, which are applicable to them.

G. Point of Application of Limits. Compliance with the discharge limits and standards listed in this section shall be determined at a location or locations deemed appropriate by the director of public works. Where the national categorical standards are applicable, the point of application shall be appropriate for these standards. (Ord. 1275 § 2 (part), 2004)

13.20.050 Administration.

A. Classification of Users. All users shall be classified for wastewater disposal purposes in accordance with the activities conducted upon the premises, as determined by the director of public works. The purpose of classification is to facilitate the regulation of wastewater dischargers and the recovery of equitable and appropriate fees. The classification of a user will be used to determine the Discharge Fee and Connection Fee, as described in the Manteca fee schedule.

B. Notification of Industrial Discharge. Any person contributing industrial waste to the Manteca water pollution control system is required to notify the Manteca Department of Public Works of their discharge. Any new business is required to notify the department of their intent to discharge industrial waste ninety days prior to commencing the discharge. These notification requirements are effective upon the adoption date of this chapter.

Discharge of industrial waste from any of the following sources is subject to the approval of the director of public works: new connections, added burden from increased or changed discharge by existing sources, contaminated groundwater disposal, septage disposal, and limited and temporary disposal of trucked or hauled waste.

1. Discharge Limitations. All industrial waste dischargers, users of the Manteca Water Pollution Control System, and permittees shall comply with all provisions of this chapter, the industrial discharge permit, any applicable waste ordinance or permit of a member jurisdiction; and any other applicable federal, state or local laws, regulations, or permits for all discharges to the water pollution control system.

2. Industrial Discharge Permit Requirements. Industrial discharge to the Manteca water pollution control system may be permitted by the assistant director of public works. Upon notification of an occurring or potential industrial waste discharge, the assistant director of public works or his or her agent will evaluate the waste flow, concentration, and make-up to determine if the user requires an industrial discharge permit. If a permit is required,

the user will be required to complete an application for an industrial discharge permit, to be submitted to the Manteca department of public works within ninety days of the date of the notice to apply. The submittal of an application form, application fee, or renewal form does not guarantee the granting of a permit, and the application for permit may be denied.

Industrial discharges which may require an industrial discharge permit, and the permit requirements, procedures, and industrial user classification are described in the Manteca Pretreatment Program and the Manteca Pretreatment Program requirements are hereby incorporated as part of this chapter.

3. Permit Limitations.

a. All industrial discharge permits shall be expressly subject to all provisions of this chapter and all rates and charges established by Manteca. All permits shall be issued for a specified time period, not to exceed five years. The assistant director of public works may establish renewal dates from one to sixty months.

b. No vested rights of any type whatsoever of discharge to or sewerage capacity in the sanitary sewer system is created by the issuance of an industrial discharge permit.

c. Each permit is subject to renewal upon request to Manteca. Applications for permit renewal shall be submitted to Manteca by the deadline stated in the user's waste discharge permit. Permit renewal is not guaranteed and shall be subject to capacity limitations, treatment requirements, and compliance history considerations.

d. The permitted discharge is accepted only on a capacity available basis. Such discharge is subject to reduction, modification, suspension, or termination at any time by Manteca with a phone call or written notice. Discharge shall cease immediately upon request by Manteca and shall not be continued without written permission from Manteca.

e. Any permit issued pursuant to this chapter may be revoked or suspended at any time by the director of public works for fraud, misrepresentation, or false statement contained in an application for permit, or for violation of any condition of permit, or of any provisions of this chapter.

f. Any permit issued pursuant to this chapter may be modified, at any time, by the assistant director of public works, including the term and conditions for industrial discharge, discharge quantity, and/or concentration limits authorized therein.

4. Permit Transfer. The industrial discharge permit is issued only to a specific person and for a specific location, as designated in the permit, and shall not be assignable nor transferable to any other person or any other location. Sale or relocation of a business, public agency, or person shall obligate the business, public agency, or person to obtain written approval from the assistant director of public works prior to continuing the discharge under the terms and conditions of the original permit, and to make application to obtain new industrial discharge permit ninety days before commencing the continued discharge. Permit transfer as a result of corporate or personnel reorganization, insolvency or bankruptcy shall be subject to the approval of the assistant director of public works and must be requested in writing by the user.

C. Authority to Assess and Collect Fees. All discharges to the Manteca water pollution control system shall be subject to the terms and conditions of this chapter and to the terms, conditions, fees, and fines as described below and as contained in the Manteca Fee Schedule and as set forth in Section 13.020.090 of this chapter.

Manteca shall have the authority to assess and collect fees, for cost recovery purposes. The fees are cumulative and may include, but are not limited to, the following:

1. Permit Fee. A permit fee is due when the permit application is submitted to Manteca. The purpose of this fee is to recover costs incurred by Manteca for application review, permit issuance, and administration of the permit. The permit fee shall be as below, based on the classification of the discharger by the director of public works or his or her agent. The classification will be based primarily on the amount of Manteca resources expected to be required for permit issuance and administration. Where a permit is denied, after payment of the permit fee, a portion of the fee may be refunded to the discharger, at the discretion of the director of public works.

2. Inspection Fee. The purpose of this fee is to recover Manteca costs for review and/or inspection of a user's pretreatment system design, drawings, construction and/or operations, chemical or hazardous materials storage and/or sampling facilities, and procedures used by the user, as applicable and as deemed necessary and reasonable by the assistant director of public works, to demonstrate compliance with this chapter or any directive of the

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director of public works or Manteca. This fee is due when the service is rendered.

3. Sampling Fee. The purpose of this fee is to recover Manteca costs for sampling, lab fees, travel, equipment, labor or any other costs accrued by Manteca to complete sampling as required by this chapter, the industrial discharge permit, or under directive of the director of public works to demonstrate compliance. This fee is due when the service is rendered.

4. Noncompliance Fees. These are fees resulting from violations of this chapter or the industrial discharge permit. There is no upper limit for noncompliance fees which may include any or all of the following, dependent upon the severity of the violation or violations.

a. Inspection Fee. The purpose of this fee is to reimburse Manteca for any inspection costs as necessary and reasonable to demonstrate compliance with this industrial ordinance and/or the industrial discharge permit, following a violation.

b. Additional Sampling Fee. The purpose of this fee is to recover Manteca costs for sampling, lab fees, travel, equipment, labor and any other costs incurred by Manteca, to complete sampling and to demonstrate compliance with this chapter and/or the industrial discharge permit.

c. Damage Fee. The purpose of this fee is to recover costs incurred by Manteca for the protection from or repair of damage to the water pollution control system because of a harmful or hazardous discharge in violation of this chapter by any person.

d. Manteca Permit Violation Fee. The purpose of this fee is to recover costs assessed to Manteca as a result of a user discharge violation causing pass through or interference, such that Manteca is unable to meet the requirement of its NPDES Permit or any other permit requirements, including an increase in the magnitude or duration of a violation. The fee shall include the amount of any fine(s) levied against Manteca by the EPA or any other regulatory agency issuing a fine, because of a violation of Manteca's permit. The permit violation fee shall also include reimbursement of costs for sampling, travel, labor, and any other expenses incurred by Manteca as a result of the person's discharge causing Manteca to be in violation of its permit.

The fees listed and described in this section shall be payable to Manteca only and do not include any additional fees which may be levied by any member jurisdiction providing collection services.

D. Delinquent Fees. All fees as described above, are due and payable within five days of the posted mailing date of the notice. All fees not paid within thirty days of issuance will be considered delinquent and are subject to a subsequent delinquent charge amounting to ten percent of the amount of the fee in question. Failure to pay fees within ninety days of issuance shall result in enforcement action by Manteca. This enforcement action may include termination of service and/or civil action to collect all outstanding fees, and delinquent charges. All costs resulting from this enforcement action will be paid by the user. (Ord. 1275 § 2 (part), 2004)

13.20.060 Reporting requirements.

A. What to Report. Under the terms and conditions of this chapter and the industrial discharge permit, all persons discharging to the Manteca water pollution control system shall report to Manteca any and all of the following events:

1. Noncompliance. Any person required to perform self-monitoring shall report any violation to the assistant director of public works or his or her agent, within twenty-four hours of becoming aware of the violation. Notification to Manteca may be by telephone, in person, or in writing. All verbal notifications shall be followed by a written report of the violation. This reporting will coincide with, or be in addition to, any self-monitoring reports required by the industrial discharge permit. Where the discharge in violation has a reasonable potential to affect the water pollution control system, notification to Manteca will be made immediately. The authority to require such reporting is provided in the federal Clean Water Act.

Under the requirements of 40 CFR, 403.12(G), if sampling by the discharger indicates a violation of this chapter or the industrial discharge permit requirements, the discharger shall notify Manteca of the violation within twenty-four hours of becoming aware of the violation and shall repeat the sampling and analysis and submit the results of the repeat analysis to Manteca within thirty days after becoming aware of the violation.

2. Change in Process. All persons discharging industrial waste to the water pollution control system shall report in writing in their industrial, manufacturing, or operating processes that could effect the quality or quantity of their

discharge, prior to commencing the changed discharge. Notification will be to the assistant director of public works or his or her agent. Where the anticipated changes in discharge volume or content have a reasonable potential to affect the water pollution control system, notification shall be at least ninety days prior to commencing the changed discharge.

3. Storage of Materials and Waste. Within the Manteca service area, all persons storing or using materials or waste in such quantities that a spill or leakage could adversely affect the water pollution control system, shall report in writing such storage to the assistant director of public works or his or her agent. The director of public works may, as deemed necessary, require a written report including, but not limited to, any or all of the following elements. The deadline for submission of the report shall be as deemed necessary and reasonable by the director of public works.

a. Description of stored materials and waste, including description of storage and disposal practices;

b. Description of discharge practices, including non-routine "batch" discharges;

c. Procedures for immediately notifying Manteca of spills or other atypical discharges to the water pollution control system;

d. Procedures for preventing and/or mitigating spills or other atypical discharges to the water pollution control system. Procedures addressing spills to the storm drain or surface waters may also be required.

4. Slug Discharge. Any person who must make a slug discharge shall notify the assistant director of public works or his or her agent of the discharge immediately. This notification shall be by phone call or in person. The assistant director of public works may require a subsequent written report of the event.

At least once every two years, the assistant director of public works shall evaluate whether each significant industrial user needs an accidental discharge/slug control plan. The assistant director of public works may require any user to develop, submit for approval, and implement such a plan. Alternatively, the assistant director of public works may develop such a plan for any user. An accidental discharge/slug control plan shall address, at a minimum, the following:

a. Description of discharge practices, including non-routine batch discharges;

b. Description of chemicals stored;

c. Procedures for immediately notifying the assistant director of public works and the POTW and any accidental or slug discharge.

d. Procedures to prevent adverse impact from any accidental or slug discharge. Such procedures include, but are not limited to, inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operation, control of plant site runoff, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants, including solvent, and/ or measures and equipment for emergency response.

5. Discharge of Hazardous Waste. All industrial users shall notify Manteca, the EPA, and the California Waste Management Board, in writing, of any discharge into the water pollution control system of any substance which, if otherwise disposed, would constitute a hazardous waste under 40 CFR 261. The information required in the notification, the time frames for reporting, and conditions under which notification does not have to be made are all as specified in 40 CFR 403.12(p). The director of public works shall make determination if routine, permitted discharges of hazardous waste of no more than fifteen kilograms per one calendar month (less than one pound per day) to the water pollution control system must be reported to the POTW. This determination shall be made on a case by case and user basis.

6. Baseline Monitoring Reports. All categorical industrial users must submit baseline monitoring reports, compliance schedule progress reports, ninety-day compliance reports, periodic reports on continued compliance, and notices of slug loading per 40 CFR 403.12 at a frequency deemed reasonable by the director of public works.

B. Types of Reports. The assistant director of public works or his or her agent may require any person discharging industrial waste to submit any or all of the following reports in addition to any reports required under Section 13.020.060(A) of this chapter.

1. Baseline monitoring reports;

2. Compliance reports;

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3. Compliance schedule progress reports;

4. Any other reports as reasonable and necessary to demonstrate compliance with this chapter or the waste discharge permit.

All submitted baseline monitoring reports, compliance reports, and compliance schedule progress reports shall be signed by the industrial user or his or her authorized agent in accordance with 40 CFR 403.12(1). This person shall be the same person who signs the application for an Industrial Discharge Permit, unless an agent is designated at the time the industrial discharge permit is issued. These reports shall contain the certification statement specified in 40 CFR 403.6(A)(2)(b).

The reports which may be required by the assistant director of public works are discussed below.

1. Baseline Monitoring Report. Within either one hundred eighty days after the effective date of a categorical pretreatment standard or the final administrative decision on a category determination under 40 CFR 403.6(A)(4), whichever is later, existing categorical users currently discharging to or scheduled to discharge to the POTW shall submit to the assistant director of public works a report which contains the information listed in paragraph 2 below. New sources and sources that become categorical users subsequent to the promulgation of an applicable categorical standard shall submit, ninety days before commencement of discharge, a report that contains the information listed in paragraph 2. This report shall be in writing and be submitted to the assistant director of public works. Baseline monitoring reports for categorical users shall include all the information set forth in 40 CFR 403.12(B)(1) through (7). Baseline monitoring report information users required to submit a baseline monitoring report shall include the following information in the baseline monitoring report.

a. Identifying Information. The name and address of the facility, including the name of the operator and owner.

b. Environmental Permits. A list of any environmental control permits held by or for the facility.

c. Description of Operations. A brief description of the nature, average rate of production, and standard industrial classifications of the operation(s) carried out by such user. This description should include a schematic process diagram that indicates points of discharge to the POTW from the regulated process.

d. Flow Measurement. Information showing the measured average daily and maximum daily flow, in gallons per day, to the POTW from regulated process streams and other streams, as necessary, to allow use of the combined waste stream formula set in 40 CFR 403.6(E).

e. Measurement of Pollutants. The categorical pretreatment standards applicable to each regulated process.

The results of sampling and analysis identifying the nature and concentration, and/or mass, required by the standard or by the city, of regulated pollutants in the discharge from each regulated process. Instantaneous, daily maximum, and long-term average concentrations, or mass, where required, shall be reported. The sample shall be representative of daily operation and shall be analyzed in accordance with procedures set out in Section 13.020.070 of this chapter. Sampling must be performed in accordance with procedures set out in Section 13.020.070 of this chapter.

f. Certification. A statement, reviewed by the user's authorized representative and certified by a qualified professional, indicating whether pretreatment standards are being met on a consistent basis, and if not, whether additional operation and maintenance and/or additional pretreatment is required to meet the pretreatment standards and requirements.

g. Compliance Schedule. If additional pretreatment and/or operation and maintenance will be required to meet the pretreatment standards, the shortest schedule by which the user will provide such additional pretreatment and/or operation and maintenance. The completion date in this schedule shall not be later than the compliance date established for the applicable pretreatment standard. A compliance schedule pursuant to this section must meet the requirements set out in Section 13.020.060(B)(2) of this chapter.

h. Signature and Certification. All baseline monitoring reports must be signed and certified in accordance with Section 13.020.060(B) of this chapter.

2. Compliance Reports. Any person discharging industrial waste to the water pollution control system may be required to submit a report demonstrating compliance with this chapter and any applicable industrial discharge permit to the assistant director of public works. This report shall be submitted, at a minimum, semi-annually and as specified in the person's industrial discharge permit.

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In cases of known or suspected noncompliance, the assistant director of public works may require additional and more frequent compliance reporting.

All categorical users shall submit a report demonstrating compliance with the applicable national categorical standards within ninety days following the date for final compliance with those standards.

a. All significant industrial users shall, at a frequency determined by the assistant director of public works, but in no case less than twice per year (in June and December), submit a report indicating the nature and concentration of pollutants in the discharge, and the measured or estimated average and maximum daily flow for the reporting period. Categorical industry compliance reports shall include pollutants regulated by the applicable pretreatment standard. Non-categorical significant industry compliance reports shall include the pollutants identified in the user's industrial discharge permit. All periodic compliance reports must be signed and certified in accordance with Section 13.020.060(B) of this chapter.

b. All wastewater samples must be representative of the user's discharge. Wastewater monitoring and flow measurement facilities shall be properly operated, kept clean, and maintained in good working order at all times. The failure of user to keep its monitoring facility in good working order shall not be grounds for the user to claim that sample results are unrepresentative of its discharge.

c. If a user subject to the reporting requirement in this section monitors any pollutant more frequently than required by the assistant director of public works, using the procedures prescribed in Section 13.020.070 of this chapter, the results of this monitoring shall be included in the report.

3. Compliance Schedule Progress Reports. All persons found to be in violation of this chapter, the industrial discharge permit, or any state or federal regulation prohibiting or limiting waste discharge, may be required to prepare a schedule of actions to bring the discharge into compliance under the direction of the assistant director of public works.

The director of public works shall have the final authority to determine if an action is acceptable and appropriate; to set the time frame to complete compliance action; to set the frequency of required compliance reporting; to set the frequency for required sampling; to set monitoring and inspection requirements; and to determine any additional actions necessary for the user to meet the compliance schedule on a timely basis.

Any user subject to a compliance schedule shall submit to Manteca, for each compliance step in the schedule, a report stating whether or not compliance was achieved. Where a compliance schedule milestone is not met, the report must state the reasons for noncompliance, the steps being taken to comply with the compliance schedule, and the date when the compliance will be met. Each report must be submitted not later than fourteen days after the date of the compliance step, specified in the compliance schedule.

The following conditions shall apply to the compliance schedule required by Section 13.020.060(B)(2)(g) of this chapter.

a. The schedule shall contain progress increments in the form of dates for the commencement and completion of major events leading to the construction and operation of additional pretreatment required for the user to meet the applicable pretreatment standards (such events include, but are not limited to, hiring an engineer, completing preliminary and final plans, executing contracts for major components, commencing and completing construction, and beginning and conducting routine operations);

b. No increment referred to above shall exceed nine months;

c. The user shall submit a progress report to the assistant director of public works no later than fourteen days following each date in the schedule and the final date of compliance, including, as a minimum, whether or not the increment of progress is complied with, the reason for any delay and, if appropriate, the steps being taken by the user to return to the established schedule; and

d. In no event shall more than nine months elapse between such progress report to the assistant director of public works.

4. Categorical Pretreatment Standard Deadline Compliance Report. Within ninety days following the date for final compliance with applicable categorical pretreatment standards, or in the case of a new source following commencement of the introduction of wastewater into the POTW, any user subject to such pretreatment standards and requirements shall submit to the assistant director of public works a report containing the information described in Section 13.020.060(B)(2) of this chapter. For users subject to equivalent mass or concentration limits

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established in accordance with the procedures in 40 CFR 403.6(C), this report shall contain a reasonable measure of the users long-term production rate. For all other users subject to categorical pretreatment standards expressed in terms of allowable pollutant discharge per unit of production (or another measure of operation), this report shall included the user's actual production during the appropriate sampling period. All compliance reports must be signed and certified in accordance with Section 13.020.060(B) of this chapter.

5. Changed Condition Reports. Each user must notify the assistant director of public works of any planned significant changes to the user's operations or system which might alter the nature, quality, or volume of its wastewater at least ninety days before the change. Any user increasing the volume of wastewater above its sewer allocation must apply for and receive an additional sewer allocation through the Community Development Department.

a. The assistant director of public works may require the user to submit such information as may be deemed necessary to evaluate the changed conditions, including the submission of wastewater discharge permit application under Section 13.020.050 of this chapter.

b. The assistant director of public works may issue a wastewater discharge permit under Section 13.020.050 of this chapter or modify an existing wastewater discharge permit under Section 13.020.050 of this chapter in response to changed conditions or anticipated changed conditions.

c. For the purpose of this requirement, significant changes include, but are not limited to flow increases of twenty percent or greater, flow increases greater than the user's sewer allocation, and the discharge of any previously unreported pollutants.

6. Other Reports. All industrial users shall submit to the assistant director of public works any other reports as deemed reasonable and necessary by the assistant director of public works, in addition to those described above, to demonstrate compliance with this chapter, the industrial discharge permit, or any applicable state and federal regulations. Such reports include, but are not limited to, any reports or plans required by federal, California state, or local laws or regulations.

C. Record Keeping Requirement. All persons subject to the reporting requirements of this chapter and 40 CFR 403.12 shall maintain records of all information resulting from any monitoring activities and results, and make such records available for inspection and copying by EPA officials and Manteca personnel or agents, for a minimum of three years or a period of litigation, whichever is longer. (Ord. 1275 § 2 (part), 2004)

13.20.070 Inspection and monitoring.

A. Inspection Procedure. Manteca shall inspect the premises of any user to establish compliance with the provisions of this chapter, the user's industrial discharge permit, and any applicable California state, federal, and local laws pertaining to the treatment and discharge of waste to the water pollution control system.

1. Inspections shall be made under the provisions of this chapter and/or the user's industrial waste permit. If the user refuses reasonable access to the premises for purposes of inspection and monitoring, Manteca shall notify the user that he or she is in violation of this chapter, and the assistant director of public works may issue an administrative order, mandating such access by a specified date and at all reasonable times subsequent to that date.

2. An administrative warrant may be obtained in instances where the assistant director of public works or his or her agent believes there is substantial evidence that user refusal to consent to inspection and/or monitoring is concealing criminal acts, or willful or negligent discharges in violation of this chapter or any other applicable laws or regulations.

3. Where deemed necessary to protect the water pollution control system, the environment or the public health, safety or welfare from the effects of present or imminent discharges, the director of public works or his or her agent may invoke emergency measures as described in Section 13.020.90(C) of this chapter. These measures include providing access to a premise for the director of public works or his or her agents, without the consent of the owner or user.

4. Manteca retains the right to enter the premises to inspect the premises, processes, and records of the user; to sample or monitor the discharge, and to copy all records relating to pretreatment, chemical and waste storage, and waste discharge to the Manteca water pollution control system, pursuant to 40 CFR 403.8(F)(1)(e), to verify that the waste discharge is in compliance with industrial discharge permit, with this chapter, and all applicable state,

federal, and local laws pertaining to pretreatment and waste disposal to POTWs or waters of the United States. Manteca shall also have the right to install and operate any necessary sampling and monitoring equipment on the premises of the user, at a fee cost to the user, to document compliance.

5. The user shall provide a discharge sampling point and Manteca staff shall have access to the sampling point at all reasonable times. Manteca has the right to observe any waste sampling conducted by the user.

6. In the event of an emergency or a spill on the user's premises, the user shall notify the Manteca POTW and the Fire Department that a spill has occurred or is occurring and of the type of spill, including the content, volume, location, and approximate time that the spill occurred or began. Notification to Manteca of a spill implies consent for Manteca to enter and inspect the premises. Manteca staff may enter and inspect the premises at that time, as reasonable, to abate the spill or emergency event and to determine the circumstances of the spill event.

B. Monitoring Requirements. Manteca may require users to monitor their discharge to the water pollution control system and report the results of the monitoring to Manteca periodically. These monitoring and reporting requirements are specific to the discharger, and are listed in the industrial discharge permit. The assistant director of public works may require additional monitoring and reporting to document compliance.

1. Manteca may require waste dischargers to install and operate monitoring facilities at the point of discharge to the water pollution control system, at the expense of the discharger. Manteca may also choose to install and operate monitoring facilities on the premises of the discharger to document compliance. These Manteca installed and operated facilities, if required, will be at a fee cost to the user. The monitoring facilities will be constructed, installed and operated to allow for inspection, sampling, and measurement of flow or other parameters of the regulated discharge. The monitoring facilities shall be in accordance with Manteca construction standards and specifications. The facilities also shall be maintained at all times in a safe and proper operating condition at the expense of the discharger.

2. Manteca may require the discharger to conduct sampling and analysis of the discharge at a frequency and type as specified by the assistant director of public works or as required by the federal Pretreatment Regulations to demonstrate compliance with the prescribed waste discharge limits.

C. Sampling. The user shall sample his or her discharge to the waste pollution control system at the frequency provided in the industrial discharge permit or as deemed reasonable and necessary by the assistant director of public works to demonstrate compliance. The assistant director of public works may require sampling to be conducted by nonpermitted users, at his or her discretion, or if noncompliance is suspected, in which case, nonpermitted dischargers will be subject to the same sampling and reporting requirements as permitted dischargers. The discharger shall use the sampling and test procedures prescribed in 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants," or amendments thereto, or otherwise approved by EPA. Manteca also may specify additional sampling requirements or conduct sampling as necessary and reasonable to insure compliance with this chapter and/or the industrial discharge permit.

Initial sampling equipment and methods shall be observed by the assistant director of public works or his or her agent. Before conducting initial sampling, the user shall notify Manteca three days in advance and schedule a time for Manteca staff to be present to observe the sampling procedure. All sampling required by the industrial discharge permit, this chapter, or Manteca shall be at the expense of the user. The installation of sampling equipment and/or the conducting of sampling on the user's premises is at a fee cost to the user. All discharge samples for monitoring and reporting shall be analyzed at a laboratory facility approved by the assistant director of public works.

D. Pretreatment. Persons discharging waste to the Manteca water pollution control system shall install and operate any necessary wastewater treatment facilities or equipment as required by the assistant director of public works to achieve compliance with this chapter and all national pretreatment standards, within the time limitations specified in the National Pretreatment Regulations, this chapter, or the industrial discharge permit, whichever occurs first. Any pretreatment facilities or equipment required to bring the discharge in compliance with federal regulations, the requirements of this chapter, or the industrial discharge permit shall be provided by the user at his or her expense.

Detailed plans for the construction and operation of the pretreatment facilities shall be provided to Manteca for review and approval prior to commencing construction. However, the review and approval of such plans shall in no way relieve the user of the responsibility to modify the pretreatment facilities, equipment, or operating procedures as necessary to bring the discharge to an acceptable level of treatment. Any subsequent changes to the design, installation, construction, or operation of the pretreatment facilities or equipment shall be reported to Manteca in writing and shall be acceptable

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to Manteca prior initiating such changes.

Manteca may specify operational and/or recording procedures relative to routine operation of the pretreatment facilities. Such requirements may include, but are not limited to, operation and maintenance manuals, operation logbooks, operator training, and on-site storage of spare parts and reserve treatment chemicals.

E. Restaurant Grease Traps. Restaurant process drains shall be connected to a grease trap of a size and design deemed sufficient by the assistant director of public works. These will be accessible for inspection by the assistant director of public works or his or her agent at all reasonable times. The traps will be maintained as deemed sufficient by the assistant director of public works. (Ord. 1275 § 2 (part), 2004)

13.20.080 Confidentiality.

All information and data submitted by the industrial user or obtained from the user, in accordance with this chapter, shall be available to the public and/or governmental agencies without restriction, unless protected by state law. (Ord. 1275 § 2 (part), 2004)

13.20.090 Enforcement.

A. Enforcement Mechanisms. This section presents the enforcement mechanisms and penalties available to the city of Manteca to respond to instances of noncompliance. The remedies for noncompliance, enforcement mechanisms, and penalties are cumulative.

The intent of this subsection is to provide adequate mechanisms to achieve a maximum degree of compliance from all waste dischargers. The following enforcement provisions apply to all users of the Manteca water pollution control system, either directly or indirectly, to the extent that a user violates any provision of this chapter, the industrial discharge permit, or an administrative order issued by Manteca.

1. Notice of Violation (NOV). An NOV is always presented to the user in writing. An NOV may be issued by the assistant director of public works or his or her agent in response to minor violations of this chapter or the industrial discharge permit. Manteca shall issue an NOV within ten working days of a violation or notification that a violation has occurred. In an emergency, Manteca may issue a verbal NOV which will be followed by a written notice.

An NOV may also contain specific actions for the user to complete such as conducting additional sampling, monitoring, or reporting, or applying for an industrial discharge permit or permit renewal.

2. Noncompliance Fees. Manteca has the authority to assess fees for the reimbursement of costs accrued by Manteca as a result of a violation by a user.

a. Sampling and Inspection Fees. The assistant director of public works may assess fees to the user for additional sampling, inspection, monitoring, or the installation of Manteca equipment on the user's premises to sample or monitor a discharge.

b. Damage Fee. The assistant director of public works may also assess damage fees to recover costs for damage to the water pollution control system, Manteca, or the environment as a result of a discharge violation.

c. Permit Violation Fee. The assistant director of public works may assess a permit violation fee to recover costs for fines assessed to Manteca as a result of a violation of its NPDES permit or any other federal, California state, or local permit. The assistant director of public works also may include reimbursement of costs accrued by Manteca for additional sampling, inspection, environmental clean up, lab fees, and any other costs incurred by Manteca as a result of the permit violation. These costs may be included as part of the Permit Violation Fee and Damage Fee which may be assessed to the user, if the discharge violation caused, singly or in combination with other discharges, Manteca to violate its permit. This includes an increase in the order of magnitude of the Manteca permit violation.

3. Suspend Service. Manteca has the authority to suspend service to any user found in violation of this chapter, the industrial discharge permit, California state and/or federal regulations, or the local limits.

The director of public works or his or her agent may also suspend service in instances when a user refuses

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Manteca staff entry to the user's premises for inspection, monitoring, or sampling purposes or to abate a perceived illegal discharge. The suspension of service may remain in force until the user allows entry to the premises.

4. Administrative Order. Manteca has the authority to issue an administrative order to bring a user into compliance. An administrative order maybe either a cease and desist order, show cause order, or compliance order. The filing of an administrative order is under the discretion of the director and/or assistant director of public works and is considered to be an intermediate step to enforcing compliance.

5. Annual Publication of SNC Dischargers. In order to comply with federal Pretreatment Regulations, 40 CFR 403.8(F)(2)(g), and to encourage users to remain in compliance, Manteca shall annually publish a list of all users which were in significant noncompliance (SNC) at any time in the past twelve months. This public notification shall be in the largest daily newspaper published in the service area.

6. Other Noncompliance Penalties. The following enforcement measures will be used in instances of serious noncompliance, usually resulting in extreme damage to the water pollution control system, or from fraudulent practices, criminal noncompliance, violation of an administrative order, violation of a compliance schedule, or negligent or intentional discharge of waste which causes a threat to the health and/or safety of the public, Manteca personnel, or the environment.

a. Terminate Service. Waste discharge service to the water pollution control system may be terminated, by disconnection of a user's sewer connection, upon written notice by the director of public works or his or her agent for any of the following reasons:

i. Violation of an administrative order;

ii. Refusal to cooperate with Manteca staff or comply with Manteca policies;

iii. Refusal to allow Manteca staff reasonable access to a premise for purposes of inspection, monitoring, or abating an illegal discharge;

iv. Fraudulent actions relating to reporting, self-monitoring, or Manteca sampling or inspection; or

v. One or more serious violations which endanger the health and/or safety of the public or Manteca personnel or which endangers the water pollution control system and/or the environment.

b. Pursuit of Criminal Prosecution. Where Manteca or its director of public works determines that a criminal violation of this chapter has occurred, Manteca may pursue criminal prosecution, pursuant to provisions of the federal Clean Water Act and California Government Code Sections 54725 and 54739. For each violation the offender may receive thirty days in jail or a fine of one thousand dollars or both. A violation may be recorded for each instance of non-compliance and for each day the noncompliance occurred.

c. Pursuit of Civil Action. Where deemed appropriate by the director of public works and the City Attorney, Manteca will pursue civil action. Actions taken may include, but are not limited to: civil suits for damage to the water pollution control system, injunctive relief, and/or civil penalties. Civil actions may be pursued on a strict liability basis, regardless of intent, and shall include reimbursement for all costs incurred by Manteca, including costs for repair, administrative costs, and a penalty of twenty-five thousand dollars per day for each violation pursuant to California Government Code 54740.

B. Costs for Enforcement Actions. All costs accrued by Manteca to undertake enforcement actions shall be paid by the user in violation. These costs include, but are not limited to, all fees described in Section 13.020.090(A)(2) of this chapter, attorney's fees, and fees associated with termination of service. All such fees are payable to Manteca and are in addition to any costs accrued by member jurisdictions. All such fees are due and payable upon receipt of notice. Delinquent fees will result in delinquent charges and/or enforcement actions, as described in Section 13.020.050(D) of this chapter.

C. Emergency Powers. The director of public works or his or her agent shall have full power and authority to take any necessary precautions and measures to protect the water pollution control system, POTW personnel, public, and the environment from endangerment or threat of endangerment, or any condition that is likely to result in a discharge which presents an imminent hazard to the public health, safety, or welfare; or which, either singly or by interaction with other discharges, is an imminent hazard to the water pollution control system, places Manteca in violation of its NPDES permit or any other California state or federal law or permits. The available precautionary measures include suspension of wastewater treatment and collection services and/or an industrial discharge permit, issuance of a cease and desist

order, and/or any of the following: decontamination, sewer closure, packaging, diking, and transportation of materials, in order to protect life or property, or to prevent further damage to the environment of the water pollution control system. In pursuit of such precautionary measures, Manteca personnel or any agent of the city of Manteca shall have immediate access to the premises. In addition, the director of public works or his or her agent shall have the authority to prohibit approach to the scene of such an emergency any vehicle, vessel, or thing, and all persons not specifically employed in the correction of the emergency condition or the preservation of life or property in the vicinity thereof.

Any user receiving cease and desist order or requested to suspend discharge to the water pollution control system from or by Manteca shall immediately cease or suspend the discharge or contribution to the water pollution control system. In the event a user fails to voluntarily comply with the requirements of the cease and desist order or suspension of service, the director of public works shall take such steps as deemed necessary to halt the discharge or contribution; including severance of the user's connection to the water pollution control system, to prevent or minimize damage to the POTW or endangerment to the public, the POTW, or the environment.

In addition to any enforcement actions issued to the user, the user shall submit a detailed written report of the emergency condition to the director of public works within fifteen days of the occurrence. The detailed report shall describe the cause(s) of the emergency event or harmful contribution and the measures which have been taken to prevent any future or repeated occurrence.

D. Disclosure of Information. All users are responsible for notifying Manteca of known violations of this chapter and/or the industrial discharge permit when they occur. In the event of a spill, accidental discharge, bypass of the pretreatment system, or the imminent danger of same, which may endanger the health or safety of Manteca staff, the public, or the environment is present, the user must immediately notify the Manteca director of public works or his or her agent by a phone call or in person. Dischargers must also notify Manteca of any changes to their operations which may change the quantity or quality of their discharge, prior to the change. Failure to notify Manteca of a violation, spill, bypass or accidental discharge is a violation of this chapter. (Ord. 1275 § 2 (part), 2004)

13.20.100 Hearings and appeals.

A. Any user, permit applicant, or permittee, found in violation of this chapter or the industrial discharge permit, or adversely affected by a decision, action, or determination of the director of public works, his or her agent, or Manteca interpreting or implementing this chapter or in any permit enforcement action issued herein, may file a written request for reconsideration of the decision, action, or determination within ten working days of notification of said decision, action, or determination. The written request for reconsideration shall detail facts supporting the user's request, and such facts must include a statement listing all relevant facts which must be considered, including such facts that may not have been known or available to Manteca at the date of such decision, action, or determination.

B. The assistant director of public works shall render decision in writing on the request for reconsideration within ten working days of receiving such request. If the decision on the request for reconsideration still is unacceptable to the user, the user may file a request for appeal to the director of public works, within ten working days of notice of the assistant director's decision. When a written request for appeal has been received and logged with the director of public works, the director shall schedule a hearing within forty-five days from receipt of the request for appeal and the director of public works shall make a final ruling on the assistant director's decision within ninety days from receiving the request for appeal.

C. Except where deemed appropriate by the director of public works, this reconsideration and appeal process described in this section of this chapter shall not halt or delay any enforcement action taken by Manteca.

D. Manteca reserves the authority to designate a hearing officer to hear all testimony presented for a hearing or appeal. (Ord. 1275 § 2 (part), 2004)

13.20.110 Severability.

If any provision, paragraph, word, section or article of this chapter in invalidated by any court of competent jurisdiction, the remaining provision, paragraphs, words, sections and chapters shall not be affected and shall continue in full force and effect. (Ord. 1275 § 2 (part), 2004)

13.20.110 - Fats, Oils and Grease (FOG) Control.

(A) Findings. The City of Manteca finds that, in order to provide for the public health and welfare, and to comply with the laws and regulations of the State of California, State Water Resources Control Board Order No. 2006-0003-DWQ Statewide General Waste Discharge Requirements for Sanitary Sewer Systems and amendments thereto, and the United States Government, it is necessary to set uniform requirements for all users of the city's sanitary sewer system to include, but not limited to, the following:

1. To establish the appropriate authority for the city to condition or deny discharges to the city sewer system;

2. To prevent the introduction of excessive amounts of grease into the city sewer system that may cause a Sanitary Sewer Overflow (SSO) to occur;

3. To prevent the clogging or blocking of the city sewer lines due to grease buildup causing backup and flooding of streets, residences, and commercial buildings;

4. To implement a procedure to recover the costs incurred in cleaning and maintenance of sewer lines and the disposal of grease blockages;

5. To implement a procedure to recover costs for any liability incurred by the city for damage caused by grease blockages resulting in the flooding of streets, residences or commercial buildings;

6. To establish requirements to install grease removal devices (such as traps or interceptors), design standards for the removal devices, maintenance requirements, BMP requirements, record keeping and reporting requirements. Additionally, to establish enforcement procedures for violations of any part or requirement of this chapter; and

7. To establish the authority for the city to carry out routine and non-routine monitoring (sampling and inspections) of the grease traps and the Food Service Establishments.

(B) Applicability. The terms and conditions of this chapter shall apply to all Food Service Establishments (FSEs) to include restaurants, cafeterias, food preparation facilities, convenience stores preparing fast foods for sale; grocery stores providing cooked foods for sale; and other food preparation facilities.

(C) Definitions.

"City" means the city of Manteca, California, employees of the city, or an authorized agent of the city.

"Discharger" means the Food Service Establishments that is discharging gray water to the city sewer system.

"Food Service Establishments" or "FSEs" means any business which prepares and/or packages food or beverages for sale or consumption, on- or off-site, with the exception of private residences. Food service facilities shall include, but are not limited to, food courts,

food manufacturers with an average daily discharge volume of twenty-five thousand (25,000) gallons per day or less, food packagers, restaurants, grocery stores, bakeries, lounges, hospitals, hotels, nursing homes, churches, schools, and all other food service facilities not listed in this chapter.

"Garbage disposal" means a device which shreds or grinds up waste materials into smaller portions for discharge into the city's sanitary sewer system.

"Gray water" means all of the liquid contained in a grease interceptor that lies below the floating grease layer and above the food solids layer.

"Grease" means a material either liquid or solid, composed primarily of fats, oils and grease from animal or vegetable sources. The terms "fats, oils, and grease (FOG)," "oil and grease" or "oil and grease substances" shall all be included within this definition.

"Grease interceptor" means a device located underground and outside of the Food Service Establishment designed to collect, contain or remove food wastes and grease from the wastestream while allowing the balance of the liquid wastes (gray water) to discharge to the wastewater collection system by gravity. Interceptors shall have at least one inspection hatch on the top surface to facilitate inspection, cleaning and maintenance.

"Grease trap" means a device located in a Food Service Establishments or under a sink designed to collect, contain, or remove food wastes and grease from the wastestream while allowing the balance of the liquid waste (gray water) to discharge to the wastewater collection system by gravity. Traps shall have a removable lid on the top surface to facilitate inspection, cleaning and maintenance.

"Grease trap service company" means a person, or company, who provides maintenance services for grease traps and interceptors. Maintenance services to include cleaning, minor repairs, grease and solids removal from the interceptor, and transport of the removed material to an appropriate recycling or disposal facility.

"Sanitary Sewer Overflows (SSOs)" means overflows from sanitary sewer systems of domestic wastewater, as well as industrial and commercial wastewater, depending on the pattern of land uses in the area served by the sanitary sewer system. SSOs often contain high levels of suspended solids, pathogenic organisms, toxic pollutants, nutrients, oxygen-demanding organic compounds, oil and grease and other pollutants. SSOs may cause a public nuisance, particularly when raw untreated wastewater is discharged to areas with high public exposure, such as streets or surface waters used for drinking, fishing, or body contact recreation. SSOs may pollute surface or ground waters, threaten public health, adversely affect aquatic life, and impair the recreational use and aesthetic enjoyment of surface waters. Any overflow, spill, release, discharge or diversion of untreated or partially treated wastewater from a sanitary sewer system.

SSOs include:

(i) Overflows or releases of untreated or partially treated wastewater that

reach waters of the United States;

(ii) Overflows or releases of untreated or partially treated wastewater that do not reach waters of the United States; and

(iii) Wastewater backups into buildings and on private property that are caused by blockages or flow conditions within the publicly owned portion of a sanitary sewer system.

"Waste grease" means fats, oils, and grease that can be collected following use and prior to discharge to the sewer or interceptor. Waste grease is collected from pans, deep fat fryers and cooking grills.

(D) Grease Interceptor/Trap Required.

1. Grease interceptors and/or traps shall be provided by the facility owner, when, in the opinion of the city, they are necessary to prevent grease in excessive amounts from entering the sanitary sewer system. All interceptors shall be of a type and capacity approved by the city building division and shall be located as to be easily and safely accessible for cleaning and inspection. All prospective grease trap users must provide manufacturer's capacity data and an estimate of the product rate at the facility that is within the capacity of the grease trap to be approved by the building permit department.

2. Existing Facilities. For the purposes of sizing and installation of grease interceptors/traps, all food service facilities existing within the city's sewer system service area, whether within, or without, the city limits, prior to the effective date of the ordinance codified in this chapter shall be allowed to operate and maintain existing grease interceptors/traps provided their grease interceptors or grease traps are in efficient operating conditions.

On or after the effective date of the ordinance codified in this chapter, the city may require an existing food service facility to install, operate, and maintain a new grease interceptor or trap that complies with the requirements of this chapter or to modify, repair, or replace any noncompliant interceptor or trap within ninety (90) days of written notification by the city when any one or more of the following conditions exist:

a. The facility is found to be contributing grease and oil in quantities sufficient to cause line stoppages or necessitates increased maintenance on the wastewater collection system.

b. The facility does not have a grease interceptor or trap.

c. The facility has an undersized, nonrepairable or defective grease interceptor or trap.

d. Remodeling of the food preparation or kitchen waste plumbing system is performed which requires a building permit to be issued by the city.

e. The existing facility is sold or undergoes a change of ownership.

f. The existing facility does not have plumbing connections to a grease interceptor or trap in compliance with the requirements of this chapter, or current building codes.

3. New Facilities or New Interceptor Installations. Grease interceptors or traps shall be located in the Food Service Establishment's lateral sewer line between all fixtures which may introduce grease into the sewer system and the connection to the city's wastewater collections system. If dishwashers are connected to the grease interceptor, the interceptor must be properly designed to contain and cool the dishwasher discharge to prevent the hot water from causing carry through of the grease. Garbage disposals and restrooms should not be plumbed to the grease interceptor. Automatic hood washers, floor drains in food preparation and storage areas should be plumbed to the grease interceptor. Sanitary facilities (restrooms) shall not be plumbed to the grease interceptor under any circumstance.

4. The use of a grease trap, in-place of a grease interceptor will only be authorized for those facilities that do not operate a deep fat fryer, a cooking grill and conducts minimal dishwashing.

(E) Maintenance of Grease Interceptor/Trap Required.

1. All grease interceptors and grease traps shall be continuously maintained in satisfactory and effective operational condition by the discharger at the discharger's expense. Typically maintenance consists of the removal of floatable solids and settleable solids collected in the grease interceptor/trap; and the cleaning of the walls and piping.

2. Routine Maintenance Schedules. The discharger is responsible for establishing a routine maintenance schedule that includes the routine removal of floatable and settleable solids and cleaning of the interceptors/traps. The maintenance frequency should be such that the interceptor/trap does not allow fats, grease, oils, and food solids from leaving the interceptor and entering the city sewer collection system. The amount of time between pumping and cleaning services is dependent on the volume of wastes discharged, the volume of the interceptor/trap, and the physical integrity of the interceptor/trap structures and piping. It is the discharger's responsibility that the interceptors/traps are routinely inspected and repaired as needed.

3. Record Keeping Requirements.

a. The discharger is responsible for maintaining appropriate maintenance records that documents the routine pumping, cleaning, and repairs made to interceptors and traps. Where the discharger hires a grease trap service company to clean the interceptor/trap and remove and dispose of the accumulated grease and solids, a copy of the pumping manifest or billing must be retained with the maintenance records. All maintenance records should include at a minimum the following information:

i. Name of facility;

ii. Date service performed;

iii. Total volume of the interceptor/trap;

iv. Total volume of material removed from the interceptor/trap;

v. List of all deficiencies identified from an inspection of the empty interceptor/trap;

vi. Name of the grease trap service company;

vii. Address of the grease trap service company;

viii. Name and address of final disposal site;

ix. Signature of the grease trap service company employee performing the work; and

x. Signature of the discharger's employee observing and accepting the services.

4. Record Retention. All grease interceptor/trap maintenance records shall be retained for a period of not less than three years. These records shall be retained at the Food Service Establishment and shall be made available for inspection by the city.

(F) Disposal of Wastes from Interceptors and Traps. Storage, handling, transportation and disposal of all wastes from interceptors/traps shall be performed in accordance with applicable federal, state, and local regulations that pertain to the type and/or class of waste. Materials removed from waste interceptors/traps must be disposed of at legally designated locations for those specific type wastes. Materials removed from waste interceptors/traps shall not be discharged to the city sanitary sewers or storm drains.

(G) Collection, Storage, and Disposal of Waste Grease and Solids. Dischargers are encouraged to collect excess oil and grease from deep fat fryers, pots and pans prior to washing. This waste grease and oil should be collected and stored in appropriate containers that are appropriated labeled. The collected waste grease and oil should be collected by a waste grease service company for disposal. In no case shall the discharger dispose of deep fat fryer oils and other collected waste greases and oils by discharge to the grease interceptor/trap to the city sewer system.

(H) Clean up of Spilled Grease and Oil. The discharger shall clean up all spilled grease and oil using appropriate tools, including a mop and bucket. Bucket contents may be discharged to the grease interceptor/trap, and solid greases and oils that can be manually picked up should be held in the waste grease collection containers for final disposal. In no instance shall spilled grease and oils be washed to the stormwater drains. In the event that the city is required to clean up a grease and oil spill generated by a discharger, the city is authorized to assess cost recovery fees to the discharger for all costs associated with the clean up.

(I) Use of Chemicals and Other Additives. The use of chemicals, emulsifying agents, enzymes, microorganisms, and/or other additives that are added to the grease interceptors/traps to reduce or eliminate the pumping and cleaning of the interceptor/trap is

prohibited. Dischargers currently using a chemical or other additive must halt such use immediately on the effective date of the ordinance codified in this chapter.

(J) Right of Access. The city, employees of the city, or authorized agents of the city, have the authority to enter the property of the discharger to conduct inspections of the entire facility, including the interceptors, traps, cooking and storage areas, restrooms, offices, service areas, and other areas of the facility. The city is also authorized to collect samples of any wastestream, including the discharge from the facility and the interceptors and traps. The city may obtain search warrants for inspection and sampling purposes. Failure to grant access may result in the suspension of sewer and water services provided by the city.

(K) Enforcement. Failure to comply with the provisions of this chapter is considered a misdemeanor and subject to enforcement actions under the city codes. In addition, to these misdemeanor enforcement actions the city is authorized to take the following actions to achieve compliance to the city chapter.

1. Mandatory Interceptor/Trap Service. The city may issue an order requiring the discharger to conduct interceptor/trap maintenance services within a mandatory time period. The cost of the services shall be the direct responsibility of the discharger.

2. Mandatory Interceptor/Trap Service Schedule. The city may impose a mandatory pumping and cleaning schedule to assure the proper maintenance of an interceptor not properly maintained by the discharger. The cost of the services shall be the direct responsibility of the discharger. Mandatory service schedules may cover a time period of up to three years.

3. Cost Recovery. The city may assess the discharger the amount of those expenditures made by the city to clean up or prevent sewer blockages and overflows caused by the discharge from a Food Service Establishment.

4. Administrative Fines. The city may assess fines to the discharger, not to exceed one thousand dollars ($1,000.00) per day per violation, for violations of the city chapter.

a. Unpaid charges, fines, and penalties shall, after sixty (60) calendar days, be assessed an additional penalty of twenty-five percent (25%) of the unpaid balance, and interest shall accrue thereafter at a rate of one percent per month. A lien against the user’s property will be sought for unpaid charges, fines and penalties.

b. Users desiring to dispute such fines must file a written request for the city to reconsider the fine along with full payment of the fine amount within thirty (30) days of being notified of the fine. Where a request has merit, the city may convene a hearing on the matter. In the event the user’s appeal is successful, the payment, together with any interest accruing thereto, shall be returned to the user. The city may add the costs of preparing administrative enforcement actions, such as notices and orders, to the fine.

c. Issuance of an administrative fine shall not be a bar against, or a prerequisite for, taking any other action against the user.

d. Wastewater Discharge Permit Issuance. The city may issue wastewater discharge permits to Food Service Establishments either on a case-by-case basis or as part of a general program. The authority and requirements established by this Industrial Waste Ordinance shall apply to all such wastewater discharge permits issued under this section.

4. Emergency Suspensions. The city may immediately suspend a discharge and/or water services, after informal notice to the discharger, whenever such suspension is necessary to stop an actual or threatened discharge which reasonably appears to discharge to the waters of the United States or cause an imminent or substantial endangerment to the health or welfare of persons.

13.020.110 – Severability

(a) If any provision, paragraph, word, section, or article of this Waste Ordinance in invalidated by any court of competent jurisdiction, the remaining provision, paragraphs, words, sections, and chapters shall not be affected and shall continue in full force and effect.

SECTION III: EFFECTIVE DATE:

This Ordinance shall become effective 30 days from adoption.

SECTION IV: PUBLICATION:

Within fifteen (15) days after the adoption of this Ordinance, the City Clerk shall cause a copy of this Ordinance to be published once in the Manteca Bulletin, a newspaper of general circulation, along with a notice setting forth the date of adoption and the title of this Ordinance.

DATED: September 20, 2004

AYES: Councilmembers DeBrum, Harris, Hernandez, Snyder and Weatherford

NOES: None

ABSTAIN: None

ABSENT: None

WILLIE W. WEATHERFORD
MAYOR

ATTEST:

JOANN TILTON, CMC
CITY CLERK

CERTIFICATE

I, JOANN TILTON, CITY CLERK of the City of Manteca. do hereby certify that Ordinance No. 1274 was INTRODUCED at a regular meeting of the City Council of the City of Manteca on the 7th day of September, 2004 and was PASSED AND ADOPTED at an adjourned regular meeting of said Council on the 20th day of September, 2004.

JOANN TILTON, CMC
CITY CLERK

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Chapter 13.24 SEPTIC TANK CLEANING

13.24.010 Purpose.

The purpose of this chapter and of the receiving station service fees and charges prescribed under this chapter is to regulate the discharge of domestic septic tank cleanings, portable toilet wastes, leach pit and cesspool contents into the receiving station facilities at the city wastewater control facility and to derive revenue which shall be used only for the acquisition, construction, reconstruction, maintenance and operation of the city wastewater control facility receiving station and sewage treatment plant facilities. (Prior code § 14-24)

13.24.020 Permit—Required.

No person shall deliver or discharge domestic septic tank cleanings into the city wastewater control facility receiving station facilities approved for such delivery and discharge, unless such person has a valid and subsisting receiving station use permit ("permit" in this chapter) issued by the city pursuant to the provision of this chapter. (Prior code § 14-25)

13.24.030 Permit—Issuance.

A. No person shall be issued a permit under this chapter to use the receiving station facilities to deliver and discharge domestic septic tank cleanings unless such person has filed with and furnished to the city's department of public works the following:

1. An application on a form provided;
2. The cash or corporate surety bond in the sum of one thousand dollars described in Section 13.24.050;
3. The insurance policies and/or certificates required by this chapter; and
4. Evidence of current unrevoked registration with the San Joaquin local health district under Chapter 6 of Division 20 of the California Health and Safety Code authorizing such person to engage in the business of disposing of the cleanings of domestic septic tanks.

B. Upon receipt thereof, the city's public works department shall issue such permit to the applicant. (Prior code § 14-26)

13.24.040 Permit—Nontransferable.

A permit issued under this chapter is personal to the applicant to whom it is issued and is not subject to transfer or assignment. (Prior code § 14-27)

13.24.050 Permit—Suspension—Revocation.

A. The director of public works or his or her authorized deputy may, upon reasonable notice and hearing, suspend or revoke any permit issued under this chapter if he or she finds and determines that any person:

1. Has submitted a permit application that is false in any material respect; or
2. Has failed to maintain in full force and effect, the bonds or insurance required under this chapter; or
3. Has personally or through an employee or other person engaged to do so, delivered or discharged any substances other than the cleanings of domestic septic tanks, etc., into the receiving station facilities or has delivered or discharged therein any substances prohibited from discharge into the city's sanitary sewer system under the provisions of Ordinance No. 435 or this chapter; or
4. Has disposed of any sanitary sewage or waste in an unlawful manner anywhere within the service area; or
5. Has violated any state, county or city law or regulation regarding the hauling of sanitary sewage, including

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liquid wastes; or

6. Has failed to maintain an unrevoked registration for disposition of septic tank cleanings under California Health and Safety Code Section 25000 et seq., where required to dispose of such cleanings under this chapter;

7. Has failed to conform to any provision of the ordinance required to be complied with by him or her; or

8. Has failed to pay, before delinquency, any fee or charge due under this chapter.

B. If the director determines by reason of emergency circumstances that the immediate preservation of the public health and safety require that such permit be suspended immediately and without prior hearing, he or she may do so; provided, however, that he or she shall make written finding as to the emergency circumstances which justify such immediate action and forthwith give to permittee written notice thereof of the time, not exceeding fifteen days, when the director will conduct a hearing to determine whether such suspension shall be continued and/or the permit shall be revoked.

C. Notice of any proceeding under this chapter shall be served personally upon the permittee or by registered mail addressed to permittee as may be known to the director of public works. (Prior code § 14-41)

13.24.060 Bond—Required.

A. No person shall deliver or discharge the cleanings of domestic septic tanks into the city wastewater control facility receiving station facilities unless such person maintains in full force and effect a cash bond or a corporate surety bond in the sum of one thousand dollars in form approved by the city attorney, conditioned upon the faithful performance by the permittee under this chapter.

B. The condition of the bond shall be that the amount thereof shall be paid to the city if the permittee does any of the following:

1. Delivers or discharges any substance other than the cleanings of domestic septic tanks, etc., into the city wastewater control facility receiving station facilities; or

2. Discharges therein any of those substances which, by Ordinance No.435 are prohibited from discharge into the city's sanitary sewer system (referred to in this chapter as "prohibited substances"); or

3. Dispose of sewage or wastes in an unlawful manner within the service area of the receiving station; or

4. Is delinquent in paying for charges and fees billed by the director of finance under this chapter; or

5. Otherwise fails to comply with the provisions of this chapter.

C. Upon payment of any sum to city under such bond, the permittee shall immediately furnish and file with the city such cash surety bonds as may again equal the total amount of the bond required under this chapter.

D. No interest shall be paid by the city or permittee on any cash bond deposited. (Prior code § 14-28)

13.24.070 Bond—Remedy not exclusive.

The remedies providing for satisfaction of this chapter are cumulative and not exclusive, and are in addition to any other remedies to which the city may be lawfully entitled. Each person shall remain personally liable for any obligation or liability incurred in operations to the extent that bond proceeds are insufficient to satisfy the same. (Prior code § 14-29)

13.24.080 Insurance.

A. No person shall deliver or discharge the cleanings of domestic septic tanks, etc., into the city wastewater control facility receiving station facilities unless such person, at his or her sole cost and expense, maintains in full force and effect the following policies:

1. Public liability and property damage insurance insuring such person against claims for personal injury and property damage, (including motor vehicle coverage) which may arise by reason of the nature of the work or from the operations conducted by such person, his or her officers, employees, and all other persons engaged to conduct such operations by this chapter.

2. A separate policy or policies naming the city and their officers and employees as sole insureds, insuring

against all operations conducted by, for or on behalf of such person, and insuring against the omissions and supervisory acts of the city, their officers and employees with respect to the operations; the policy shall provide or contain an endorsement that the coverage afforded thereby shall be primary coverage to the full extent of liability stated in the declarations, and that if the city or its officers or employees have other insurance against the loss covered by the policy, such other insurance shall be excess insurance only.

B. Each such policy shall provide coverage in the following minimum amounts: for personal injury, including death, one hundred thousand dollars per person, three hundred thousand dollars for more than one person, per occurrence; property damage fifty thousand dollars on account of any one occurrence, with an aggregate limit of not less than two hundred thousand dollars for any policy year.

C. Each such policy shall bear an endorsement precluding cancellation or reduction in coverage unless, not less than ten days prior thereto, written notice is given by the insurer to the: City Clerk, City Hall, 1001 West Center Street, Manteca, California 95336.

D. The permittee shall cause to be filed with the city clerk a certificate of insurance issued by the insurer evidencing the policy required under subdivision 1 of subsection A of this section, and the original policy required under subdivision 2 of subsection A of this section. Not less than ten days prior to the effective date of cancellation, expiration or other termination of each such policy, the permittee shall cause replacement coverage to be filed with the license collector.

E. The city clerk shall file all certificates and insurance policies received under this chapter. (Prior code § 14-30)

13.24.090 Charges—Fees.

A. The following charges and fees shall be required to be paid for the delivery and discharge of wastes as set forth in the city wastewater control facility receiving station facilities: For each load collected and delivered to the receiving station the charge is four dollars per thousand gallons or part thereof. Only wastes collected from within the county of San Joaquin shall be discharged to the receiving station.

B. Said charges and fees may be changed by city council resolution. (Prior code § 14-31)

13.24.100 Source certification.

No person shall be permitted to deliver or discharge materials at the receiving station without delivering to the director of public works or his or her representatives, prior to such delivery or discharge, written certification of the source of collection of the material on a form approved by the director of public works. The source certification form shall note the date and time of collection, the city and street address of the property from which the materials were collected, and shall bear the signature of the owner or occupant of the property. (Prior code § 14-32)

13.24.110 Improper discharge.

No person shall deliver or discharge into the receiving station any industrial waste nor any substances whose discharge into the city's sanitary sewer system is prohibited under Ordinance No. 435 notwithstanding that they may constitute the cleaning of domestic septic tanks, etc. (Prior code § 14-33)

13.24.120 Sludge and solids prohibited.

No person shall deliver or discharge into the receiving station facilities any sludge or solids of sewage treatment plants or water treatment plants from within or from outside the county of San Joaquin. (Prior code § 14-34)

13.24.130 Monitoring wastes.

A. The city shall have the right by and through its officers, employees or other persons engaged by the city to do so, to take such samples of materials delivered by any person into the receiving station facilities as the city in its sole discretion may deem appropriate to obtain a representation sample of each delivery's contents. Such sample may be taken prior to, during, or after any such delivery and discharge. Without being limited thereto, results of analysis made

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of such samples at the city wastewater control facility laboratory may be used to determine permittee's conformance with the requirements of this chapter. By acceptance of the permit issued hereunder, the permittee consents and agrees that any such samples may be so taken and used.

B. In the event the city determines that any such delivery contains substances not permitted to be delivered or discharged under this chapter, the permittee shall forthwith comply with the city's order or direction that they not be so delivered or discharged. (Prior code § 14-35)

13.24.140 Records—Billing.

A record of deliveries of the cleanings of domestic septic tanks, etc. shall be made at the time of each delivery to the receiving station and shall be signed by or on behalf of the permittee. Within fifteen days after the close of each calendar month, the director of finance shall prepare and mail an invoice to each permittee for fees and charges incurred by such permittee during such calendar month. (Prior code § 14-36)

13.24.150 Payment—Delinquency.

Fees and charges for the cleanings of domestic septic tanks, etc., delivered and discharged into the receiving station facilities shall be paid by the permittee at the office of the director of finance, City Hall, Manteca, California or at such other place as the director may provide. Such fees and charges are immediately due and payable upon the deposit of an invoice therefor in the United States mail; they are delinquent if payment is not received by the director of finance on or before the fortieth day immediately following the date when due and payable. (Prior code § 14-37)

13.24.160 Rules and regulations promulgation.

The director of public works is authorized to adopt rules, regulations and procedures relating to the operation of the receiving station, to establish a schedule of service and to provide a safe, efficient and sanitary use of the receiving station facilities and to implement the provisions of this chapter. The director may deny or suspend the use of receiving station facilities to any person who fails to comply with such rules, regulations and procedures. (Prior code § 14-38)

13.24.170 Compliance.

It is unlawful for any person to not comply with any written rule, regulation or procedure adopted by the director of public works pursuant to this chapter which relates to the delivery or discharge of wastes into receiving station facilities of the city wastewater control facility. (Prior code § 14-39)

13.24.180 Hauling vehicles identification.

Access to and use of receiving station facilities shall be granted only to vehicles bearing, in four-inch-high letters on both sides of the hauling vehicle, the name and address of the holder of a permit issued under this chapter and the vehicle load capacity. A copy of the city receiving station use permit as provided by the city must accompany the truck. (Prior code § 14-40)

13.24.190 Director's decision.

After any hearing required under this chapter, the director of public works shall make a written decision setting forth his or her findings and his or her action thereon. A copy of the decision shall be served upon permittee in the manner provided for notice of hearings; the decision is final in ten days after service. (Prior code § 14-42)

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Chapter 13.28 STORM WATER MANAGEMENT AND DISCHARGES

13.28.010 Purpose.

The purpose of this chapter is to establish minimum storm water management requirements and controls to protect and safeguard the general health, safety and welfare of the public residing in watersheds within the city of Manteca. This chapter seeks to meet that purpose through the following objectives:

A. Minimize increases in storm water runoff from any development in order to reduce flooding, siltation and stream bank erosion and maintain the integrity of drainage channels;

B. Minimize increases in non-point source pollution caused by storm water runoff from development that would otherwise degrade local water quality;

C. Minimize the total annual volume of surface water runoff that flows from any specific site during and following development to not exceed the pre-development hydrologic regime to the maximum extent practicable; and

D. Reduce storm water runoff rates and volumes, soil erosion and non-point source pollution wherever possible, through storm water management controls and to ensure that these management controls are properly maintained and pose no threat to public safety. (Ord. 1253 § 1, 2004)

13.28.020 Definitions.

For purposes of this chapter the following terms have the following meanings:

"Accelerated erosion" means erosion caused by development activities that exceeds the natural processes by which the surface of the land is worn away by the action of water, wind or chemical action.

"Best management practices" or "BMPs" means activities, practices, facilities and/or procedures that when implemented to their maximum efficiency will prevent or reduce pollutants in discharges and any program, technology, process, siting criteria, operational methods or measures or engineered systems that when implemented prevent, control, remove or reduce pollution. Examples of BMPs may include: public education and outreach, proper planning of development projects, proper cleaning of catch basin inlets and proper sludge or waste-handling and disposal, among others.

"Building" means any structure, either temporary or permanent, having walls and a roof, designed for the shelter of any person, animal or property and occupying more than one hundred square feet of area.

"Channel" means a natural or artificial watercourse with a definite bed and banks that conducts continuously or periodically flowing water.

"City" means the city of Manteca.

"Detention" means the temporary storage of storm runoff in a storm water management practice with the goals of controlling peak discharge rates and providing gravity settling of pollutants.

"Developer" means a person who undertakes land disturbance activities.

"Development" means any construction, rehabilitation, redevelopment or reconstruction of any public or private residential project (whether single-family, multi-unit or planned unit development); industrial, commercial, retail and other non-residential projects, including public agency projects: or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity or original purposes of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

"Director" means the director of the city of Manteca's department of public works.

"Erosion and sediment control plan" means a plan that is designed to minimize the accelerated erosion and sediment runoff at a site during construction activities.

"Hazardous material" means any material that, because of its quantity, concentration or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.

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"Hazardous waste" means any hazardous waste having the characteristics identified under or listed pursuant to Section 6921 of Title 42 of the United States Code, but not including any waste the regulation of which has been suspended under the Solid Waste Disposal Act (42 U.S.C. Sec. 6901 et seq.) by act of Congress.

"Illegal discharges" means any discharge to the MS4 system that is prohibited under local, state or federal statutes, chapters, codes or regulations. This includes all non-storm water discharges except discharges pursuant to a separate NPDES permit and discharges that are exempted or conditionally exempted in accordance with State Water Resources Control Board Water Quality Order No. 2003-0005-DWD, National Pollution Discharge Elimination System (NPDES) General Permit No. CAS 000004, Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (General Permit).

"Illicit connections" means any human-made conveyance that is connected to the MS4 system without a permit, excluding roof drains and other similar types of connections. Examples include channels, pipelines, conduits, inlets or outlets that are connected directly to the MS4 system.

"Infiltration" means the process of percolating storm water into the subsoil.

"Maintenance agreement" means a legally recorded document that acts as a property deed restriction and which provides for long-term maintenance of storm water management practices.

"Material" means any substance including but not limited to: garbage and debris; lawn clippings, leaves and other vegetation; biological and fecal waste; sediment and sludge; oil and grease; gasoline; paints, solvents, cleaners and any fluid or solid containing chemicals.

"Municipal separate storm sewer system" or "MS4" means streets, gutters, conduits, natural or artificial drains, channels and watercourses or other facilities that are owned, operated, maintained or controlled by the city and used for the purpose of collecting, storing, transporting or disposing of storm water.

"Non-point source pollution" means pollution from any source other than from any discernible, confined and discrete conveyances and includes but is not limited to pollutants from agricultural, mining, construction, subsurface disposal and urban runoff sources.

"NPDES permit" means a National Pollutant Discharge Elimination System (NPDES) Permit administered by the State of California, through its various regional water quality control boards.

"Person" means any natural person, corporation, association, partnership or other entity.

"Pollutant" means those "pollutants" defined in Section 502(6) of the Federal Clean Water Act (33 U.S.C. § 1362(6)) or incorporated into California Water Code § 13373. Examples of pollutants include but are not limited to the following:

1. Commercial and industrial waste such as fuels, solvents, detergents, plastic pellets, hazardous substances, fertilizers, pesticides, slag, ash and sludge;

2. Metals such as cadmium, lead, zinc, copper, silver, nickel and chromium and non-metals such as phosphorus and arsenic;

3. Petroleum hydrocarbons such as fuels, lubricants, surfactants, waste oils, solvents, coolants and grease);

4. Excessive eroded soils, sediment and particulate materials in amounts which may adversely affect the beneficial use of the receiving waters, flora or fauna of the state;

5. Animal wastes such as discharge from confinement facilities, kennels, pens, recreational facilities, stables and show facilities; and

6. Substances having characteristics such as pH less than six or greater than nine or unusual coloration or turbidity or excessive levels of fecal coliform, fecal streptococcus or enterococcus.

The term "pollutant" shall not include uncontaminated storm water, potable water or reclaimed water generated by a lawfully permitted water treatment facility.

The term "pollutant" also shall not include any substance identified in this definition if, through compliance with the best management practices ("BMPs") available, the discharge of such substance has been reduced or eliminated to the maximum extent practicable. In an enforcement action, the burden shall be on the person who is the subject of such action to establish the reduction or elimination of the discharge to the maximum extent practicable through compliance with the available BMPs.

"Redevelopment" means any land disturbing activity occurring on existing developed property.

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"SSJID shared facilities" means facilities owned by the South San Joaquin Irrigation District (SSJID) that are also used by the city of Manteca for storm drainage.

"Spill" means to cause, allow or permit the flowing, running or falling, especially in an accidental manner, of any liquid, semi-liquid or solid substance or material.

"Storm water management" means the use of structural or non-structural practices that are designed to reduce storm water runoff pollutant loads, discharge volumes and/or peak flow discharge rates.

"Storm water runoff" means water flow on the surface of the ground as the result of precipitation.

"Urban runoff" means any flow of water originating from urban areas including but not limited to rain, irrigation, wash water and air conditioning condensate.

"Watercourse" means a permanent or intermittent stream or other body of water, either natural or man-made, which gathers or carries surface water. (Ord. 1253 § 1, 2004)

13.28.030 Prohibition of illegal discharges.

No person shall discharge, permit to be discharged or cause to be discharged any materials including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards into either any part of the MS4 or any part of a water course.

A. It is prohibited to throw, deposit, place, leave, maintain, keep or permit to be thrown, deposited, placed, left, maintained or kept any refuse, rubbish, garbage or any other discarded or abandoned objects, articles or accumulations in or upon any street, alley, sidewalk, storm drain, inlet, catch basin conduit or drainage structure, business place or upon any public or private plot of land in the city, so that the same might be or become a pollutant. No person shall throw or deposit litter in any fountain, pond, lake, stream or other body of water within the city. This subsection shall not apply to refuse, rubbish or garbage deposited in containers, bags or other appropriate receptacles which are placed in designated locations for regular solid waste pick up and disposal.

B. It is prohibited to intentionally dispose of leaves, dirt or other landscape debris into the MS4.

C. No person shall discharge or allow the discharge of any of the following types of non-storm water discharges into the MS4, unless done pursuant to the terms and conditions of a separate NPDES permit or pursuant to an exemption issued by either the Central Valley Regional Water Quality Control Board ("regional board") or the State Water Resources Control Board:

1. The discharge of untreated wash waters when gas stations, auto repair garages or other type of automotive service facilities are cleaned;

2. The discharge of untreated waste water from mobile auto washing, steam cleaning, mobile carpet cleaning and other such mobile commercial and industrial operations;

3. To the maximum extent practicable, discharges from areas where repair of machinery and equipment, including motor vehicles, which are visibly leaking oil, fluid or antifreeze, is undertaken;

4. Discharges of untreated runoff from storage areas of materials containing grease, oil or other hazardous substances and uncovered receptacles containing hazardous materials;

5. Discharges of commercial/municipal swimming pool filter backwash;

6. Discharges of untreated runoff from the washing of toxic materials from paved or unpaved areas; provided, however, that non-industrial and non-commercial activities which incidentally generate urban runoff, such as the hosing of sidewalks and the non-commercial hand-washing of cars, shall be excluded from this prohibition;

7. To the maximum extent practicable, discharges from washing impervious surfaces in industrial/commercial areas which results in a discharge of untreated runoff, unless specifically required by state's, city's or San Joaquin County's health and safety codes or permitted under a separate NPDES permit;

8. Discharges from the washing out of concrete trucks;

9. Discharges of any pesticide, fungicide or herbicide banned by the United States Environmental Protection Agency ("USEPA") or the California Department of Pesticide Regulation; or

10. The disposal of hazardous wastes into trash containers used for municipal trash disposal, where such disposal causes or threatens to cause a direct or indirect discharge to the MS4.

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(Ord. 1253 § 1, 2004)

13.28.035 Exceptions to discharge prohibitions.

The following discharges are excepted from the prohibitions set forth under Section 12.28.030:

A. Discharges from the following activities will not be considered a source of pollutants to the MS4 system and to waters of the United States when properly managed to ensure that no potential pollutants are present and therefore they shall not be considered illegal discharges unless determined to cause a violation of the provisions of the Porter-Cologne Act, Clean Water Act or this chapter: water line flushing, landscape irrigation, diverted stream flows, rising groundwater, uncontaminated groundwater infiltration (as defined at 40 CFR 35.2005(20)) to the MS4 system, uncontaminated pumped groundwater, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges and discharges or flows from fire fighting activities.

B. The prohibition shall not apply to any non-storm water discharge permitted under an NPDES permit, waiver or waste discharge order issued to the discharger and administered by the State of California under the authority of the USEPA, provided that the discharger is in full compliance with all requirements of the permit, waiver or order and other applicable laws and regulations and provided that written approval has been granted by the city for any discharge to the MS4.

C. The prohibition shall not apply to irrigation and drainage waters under control of the South San Joaquin Irrigation District (SSJID) that are being transported by SSJID shared facilities.

D. With written concurrence of the Regional Board, the city may exempt in writing other non-storm water discharges which are neither a source of pollutants to the MS4 system nor waters of the United States. (Ord. 1253 § 1, 2004)

13.28.040 Prohibition of illicit connections.

A. The construction, use, maintenance or continued existence of illicit connections to the MS4 system is prohibited.

B. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection. (Ord. 1253 § 1, 2004)

13.28.050 Waste disposal prohibitions.

No person shall throw, deposit, leave, maintain, keep or permit to be thrown, deposited, left or maintained in or upon any public or private property, driveway, parking area, street, alley, sidewalk, component of the MS4 system or water of the United States any refuse, rubbish, garbage, litter or other discarded or abandoned objects, articles and accumulations, so that the same may cause or contribute to pollution. Wastes deposited in streets in proper waste receptacles for the purposes of collection are exempted from this prohibition. (Ord. 1253 § 1, 2004)

13.28.060 Discharges in violation of industrial or construction activity NPDES storm water discharge permit.

A. Any person subject to an industrial NPDES storm water discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the director upon inspection of the facility, during any enforcement proceeding or action or for any other reasonable cause.

B. Any person subject to a construction activity NPDES storm water discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the director prior to or as a condition of a subdivision map, site plan, building permit or development or improvement plan; upon inspection of the facility; during any enforcement proceeding or action; or for any other reasonable cause. Prior to issuance of a construction permit a copy of the Notice of Intent (NOI) and the Storm Water Pollution Prevention Plan (SWPPP) shall be submitted to the city. (Ord. 1253 § 1, 2004)

13.28.070 Requirement to prevent, control and reduce storm water pollutants. ATTACHMENT 2

A. Authorization to Adopt and Impose Best Management Practices (BMP). The city will adopt requirements identifying best management practices for any activity, operation or facility which may cause or contribute to pollution or contamination of storm water, the MS4 system or waters of the United States as a separate BMP Guidance Series. Where best management practice requirements are promulgated by the city or any federal, state of California or regional agency for any activity, operation or facility which would otherwise cause the discharge of pollutants to the MS4 system or water of the United States, every person undertaking such activity or operation or owning or operating such facility shall comply with such requirements.

B. New Development and Redevelopment. The city may adopt requirements identifying appropriate design standards and best management practices to control the volume, rate and potential pollutant load of storm water runoff from new development and redevelopment projects as may be appropriate to minimize the generation, transport and discharge of pollutants. The city shall incorporate such requirements in any land use entitlement and construction or building-related permit to be issued relative to such development or redevelopment. The owner and developer shall comply with the terms, provisions and conditions of such land use entitlements and building permits as required in this chapter.

C. Responsibility to Implement Best Management Practices. Notwithstanding the presence or absence of requirements promulgated pursuant to subsections A and B, any person engaged in activities or operations or owning facilities or property which will or may result in pollutants entering storm water. The MS4 system or waters of the United States shall implement best management practices to the extent they are technologically achievable to prevent and reduce such pollutants. The owner or operator of a commercial or industrial establishment shall provide reasonable protection from accidental discharge of prohibited materials or other wastes into the MS4 or watercourses. facilities to prevent accidental discharge of prohibited materials or other wastes shall be provided and maintained at the owner or operator's expense. Best management practices required by the city can be obtained from the public works department by requesting the BMP manual appropriate to a commercial or industrial activity from the BMP Guidance Series.

D. Maintenance Agreements. All structural and non-structural permanent storm water BMPs not in the control of the city shall have an enforceable maintenance agreement to ensure the system functions as designed. The agreement shall include any and all maintenance easements required to access and inspect the storm water BMPs and to perform routine maintenance as required. Such agreements shall specify the parties responsible for the proper maintenance of all storm water BMPs. (Ord. 1253 § 1, 2004)

13.28.080 Landscaping and stabilization requirements.

Any area of land, not covered by an impervious surface, from which the natural vegetative cover has been either partially or wholly cleared or removed by development activities shall be landscaped within ten days from the substantial completion of such clearing and construction. No person shall use or otherwise employ impervious material, such as plastic, placed under decorative rock, bark or other landscape covers in meeting the landscaping requirements under this section. Backyards of residential single-family dwellings which would otherwise be covered by this section are exempt where storm water is contained on the property. (Ord. 1253 § 1, 2004)

13.28.090 Requirement to monitor and analyze.

The director may require by written notice that any person engaged in any activity and/or owning or operating any facility which may cause or contribute to storm water pollution, illegal discharges and/or non-storm water discharges to the MS4 or to the waters of the United States is to undertake at said person's expense such monitoring and analyses and to furnish such reports to the city as the director shall deem necessary for determining that person's compliance with this chapter. (Ord. 1253 § 1, 2004)

13.28.100 Spill prevention and response plan.

Any person subject to an Industrial NPDES storm water discharge permit shall maintain a spill prevention and response plan as part of their Storm Water Pollution Prevention Plan (SWPPP). The methods, procedures, mechanisms and facilities established and utilized for the purpose of preventing accidental discharges or spills of materials with pollution potential shall be provided and maintained at the owner's or user's own cost and expense. The SWPPP shall outline the user's spill

prevention and response procedure, describe the nature and location of any chemicals stored on the user's premises and shall contain procedures for immediately notifying the city and preventing adverse impacts of any discharge of chemicals, substances or materials. (Ord. 1253 § 1, 2004)

13.28.110 Prohibition of spills.

No person shall allow a spill to discharge into the MS4 or any watercourse. (Ord. 1253 § 1, 2004)

13.28.120 Notification of spills.

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into storm water, the MS4 or water of the United States from said facility, said person shall take all necessary steps to ensure the discovery, containment and cleanup of such release. In the event that a responsible person becomes aware of a release of hazardous materials, they shall immediately notify emergency response officials of the release via emergency dispatch services (i.e., by calling 911). In the event of a release of non-hazardous materials, the responsible person shall notify the city's public works department in person, by phone or facsimile not later than five p.m. of the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the city's public works department within three business days of the phone notice, lithe discharge of hazardous materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years. (Ord. 1253 § 1, 2004)

13.28.130 Authority to inspect.

Whenever necessary to make an inspection to enforce any provision of this chapter or whenever the director has cause to believe that there exists or potentially exists, in or upon any premises within the city, any condition which constitutes a violation of this chapter, the director is authorized to enter such premises at all reasonable times for the purpose of inspecting said premises. The director is further authorized to inspect and copy all records at a facility which are related to storm water compliance. In the event that the owner or occupant of the premises refuses to allow either the director or persons authorized by the director to enter said premises for the purposes of conducting an inspection authorized by this chapter after the director or a person authorized by the director has asked the owner or occupant of said property to enter thereon for the purposes authorized by this chapter, the city may seek the assistance of a court of competent jurisdiction in order to facilitate the purposes of this section. (Ord. 1253 § 1, 2004)

13.28.140 Authority to sample, establish sampling devices, test and photograph.

During any inspection as provided herein, the director may take any samples, perform any testing deemed necessary and take photographs to aid in the pursuit of the inquiry or to record site activities. (Ord. 1253 § 1, 2004)

13.28.150 Notice of violation.

Whenever the director finds that a person has violated or otherwise failed to meet a requirement of this chapter, the director may order a person to comply with this chapter by either personally serving that person with a written notice or by sending written notice to that person by certified mail. Such notice may require without limitation:

A. The performance of monitoring, analyses and reporting;

B. The elimination of illicit connections or discharges;

C. That violating discharges, practices or operations shall cease and desist;

D. The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property;

E. Payment of a fine to cover administrative and remediation costs; and/or

ATTACHMENT 2

F. The implementation of source control or treatment BMPs.

If abatement of a violation and/or restoration of affected property is required, the notice shall set forth a deadline by which such remediation or restoration shall be completed. Said notice shall further advise that, if the violator fails to complete the remediation or restoration described in the written notice provided for under Section 13.28.150 within the time provided for therein, the city or a contractor designated by the director shall complete the work specified in the notice, and the city shall charge all expenses related to the city or contractor's performance of said work to the responsible person as provided for under Section 13.28.180. (Ord. 1253 § 1, 2004)

13.28.160 Appeal.

Notwithstanding the provisions of Section 13.28.190, any person receiving a notice of violation under Section 13.28.150 may appeal the director's determination to the city manager. The notice of appeal must be received by the city manager within five days from the date of the notice of violation. Hearing on the appeal before the city manager or his or her designee shall take place within fifteen days from the date of city's receipt of the notice of appeal. The decision of the city manager or designee shall be final. (Ord. 1253 § 1, 2004)

13.28.170 Abatement by city.

If the violation has not been corrected pursuant to the requirements set forth in the notice of violation or, in the event of an appeal under Section 13.28.160, within ten days of the decision of the city manager upholding the decision of the director, then the city or a contractor designated by the director shall enter upon the subject private property and is authorized to take any and all measures necessary to abate the violation and/or restore the property. It is unlawful for any person, owner, agent or person in possession of any premises to refuse to allow the city or designated contractor to enter upon the premises for the purposes set forth above. (Ord. 1253 § 1, 2004)

13.28.180 Charging cost of abatement/liens.

Within thirty days after abatement of the nuisance by city, the director shall notify the property owner of the property of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment with the city clerk within fifteen days. The city clerk shall set the matter for public hearing by the city council. The decision of the city council shall be set forth by resolution and shall be final.

If the amount due is not paid within ten days of the decision of the city council or the expiration of the time in which to file an appeal under this section, the charges shall become a special assessment against the property and shall constitute a lien on the property for the amount of the assessment. A copy of the resolution shall be turned over to the county auditor so that the auditor may enter the amounts of the assessment against the parcel as it appears on the current assessment roll, and the tax collector shall include the amount of the assessment on the bill for taxes levied against the parcel of land. (Ord. 1253 § 1, 2004)

13.28.190 Urgency abatement.

The director is authorized to require the immediate abatement of any violation of this chapter that constitutes an immediate threat to the health, safety or well-being of the public. If any such violation is not abated immediately as directed by the director, the city is authorized to enter onto private property and to take any and all measures required to remediate the violation. Any expense related to such remediation undertaken by the city shall be fully reimbursed by the property owner and/or responsible party. Any relief obtained under this section shall not prevent city from seeking other and further relief authorized under this chapter. (Ord. 1253 § 1, 2004)

13.28.200 Violations.

It is unlawful for any person to violate any provision or fail to comply with any of the requirements of this chapter. A violation of or failure to comply with any of the requirements of this chapter shall constitute a misdemeanor and shall be punishable as set forth in California Penal Code Section 19. (Ord. 1253 § 1, 2004)

ATTACHMENT 2

13.28.205 Strict liability.

By securing a permit from the city of Manteca for development, encroachment, or the construction of a work improvement the permittee shall be strictly liable, in any criminal proceeding, for allowing or failing to prevent a violation of this chapter by the permittee, its employees, subcontractors or material men.

In any prosecution for a violation of this chapter against a permittee based on the act or omissions of an employee, subcontractor, or material men it shall only be required that it be shown that the permittee was issued a development, encroachment, or construction permit and that a violation of this chapter occurred at the site for which a permit was issued. (Ord. 1293 § I, 2005)

13.28.210 Compensatory action.

In lieu of enforcement proceedings, penalties and remedies authorized by this chapter, the director may impose upon a violator alternative compensatory action, such as storm drain stenciling, attendance at compliance workshops, creek cleanup, etc. (Ord. 1253 § 1, 2004)

13.28.220 Violations deemed a public nuisance.

In addition to the enforcement processes and penalties herein before provided, any condition caused or permitted to exist in violation of any of the provisions of this chapter is a threat to public health, safety and welfare, is declared and deemed a nuisance and may be summarily abated or restored by the city at the violator's expense, and/or a civil action to abate, enjoin or otherwise compel the cessation of such nuisance may be taken by the city. (Ord. 1253 § 1, 2004)

13.28.230 Acts potentially resulting in violation of Clean Water Act and/or California Porter-Cologne Act.

Any person who violates any provision of this chapter or any provision of any requirement issued pursuant to this chapter, may also be in violation of the Clean Water Act and/or the Porter-Cologne Act and may be subject to the sanctions of those acts, including civil and criminal penalties. Any enforcement action authorized under this chapter shall also include written notice to the violator of such potential liability. (Ord. 1253 § 1, 2004)

ATTACHMENT 2

Chapter 15.12 PLUMBING CODE

15.12.010 Adoption.

That certain document, one copy of which is on file in the office of the city clerk of the city of Manteca, being marked and designated as the 2013 California Plumbing Code, California Code of Regulations, Title 24, Part 5, as published by the International Association of Plumbing and Mechanical Officials, as now existing, or hereafter amended, regulating and governing the conditions of all properties, buildings, and structures; by providing the standards for facilities and other physical things and conditions essential to ensure that structures are safe, sanitary, and fit for occupancy and use; and the condemnation of such structures; providing for the issuance of permits and collection of fees therefor; and providing penalties for the violation thereof; and each and all of the regulations, provisions, penalties, conditions, and terms of said 2013 California Plumbing Code on file in office of the city clerk of the city of Manteca is hereby referred to, adopted as the plumbing code of the city of Manteca. (Ord. 1525 § 2, 2013)

15.12.020 Enforcement.

California Code of Regulations, Title 24, Part 5, and all other applicable codes shall be enforced by the building official. The building official may appoint inspectors, plans examiners, technicians, officers and other employees. The building official may deputize such employees of the building department or other employees of the city of Manteca as necessary and these employees shall have the duties and powers as delegated by the building official to carry out the functions of the enforcement agency in accordance with California Code of Regulations, Title 24, Part 2, Section 103. The building official shall have the power to render interpretations of this code and to adopt and enforce rules and regulations supplemental to this code as may be deemed necessary in order to clarify the application of the provisions of this code. Such interpretations, rules, regulations, and policies shall be in conformity with the intent and purpose of this code. The building official may authorize the San Joaquin County health department as the city designated enforcement authority. See Section 15.04.020 for definitions of “building official” and “deputize.” (Ord. 1525 § 2, 2013)

15.12.030 Dangerous and insanitary construction—Nuisance.

A. Any portion of a plumbing system found by the administrative authority to be insanitary as defined in the California Plumbing Code is declared to be a nuisance.

B. 1. Whenever brought to the attention of the department having jurisdiction that any insanitary conditions exist or that any construction or work regulated by this code is dangerous, unsafe, insanitary, a nuisance or a menace to life, health or property or otherwise in violation of this code, the department may request an investigation by the administrative authority who, upon determining such information to be fact, shall order any person, firm or corporation using or maintaining any such condition or responsible for the use of maintenance thereof to discontinue the use or maintenance thereof or to repair, alter, change, remove or demolish same for the proper protection of life, health or property and in the case of any gas piping or gas appliance may order any person, firm or corporation supplying gas to such piping or appliance to discontinue supplying gas thereto until such piping or appliance is made safe to life, health or property.

2. Every such order shall be in writing, addressed to the owner, agent or person responsible for the premises in which such condition exists and shall specify the date or time for compliance with such order.

C. Refusal, failure or neglect to comply with any such notice or order shall be considered a violation of this code.

D. When any plumbing system is maintained in violation of this code and in violation of any notice issued pursuant to the provisions of this section or where a nuisance exists in any building or on a lot on which a building is situated, the administrative authority may institute any appropriate action or proceeding in any court of competent jurisdiction to prevent, restrain, correct or abate the violation or nuisance. (Ord. 1525 § 2, 2013)

ATTACHMENT 2

15.12.040 Appendix Chapter 1, Section 103.4.1.

Section 103.4.1 Fees is amended to read as follows:

Permit fees for each permit shall be paid as set forth in Resolution No. R2010-149 or by a determination by the Building Official of the estimated reasonable cost of service.

(Ord. 1525 § 2, 2013)

15.12.050 Board of appeals.

Whenever the building official shall disapprove an application or refuse to grant a permit applied for, or when it is claimed that the provisions of the code do not apply or that the true intent and meaning of the code have been misconstrued and wrongly interpreted, the applicant or any person directly and adversely affected thereby, or the authorized agent of either of said parties, may appeal from the decision of the building official to the building board of appeals of the city of Manteca within thirty days from the date of said decision, and the said board of appeals may, after a hearing, affirm, reverse, or modify said decision of the building official.

The building board of appeals shall have no authority relative to the interpretation of the administrative provisions of the California Plumbing Code nor shall the board be empowered to waive any requirements of the California Plumbing Code.

The appeal shall be made in writing and the appellant or his or her representative may appeal in person and may introduce evidence to support his or her claim(s). (Ord. 1525 § 2, 2013)

15.12.060 Appendix Chapter 1, Section 102.4.

Chapter 1, Section 102.4 of the California Plumbing Code is amended to read as follows:

Section 102.4 Violations and Penalties.

A. It is unlawful for any person, firm or corporation to erect, construct, enlarge, alter, repair, move, improve, remove, convert or demolish, equip, use, occupy or maintain any building or structure or cause or permit the same to be done in violation of this code.

Any person who shall violate any of the provisions of the code hereby adopted or fail to comply therewith, or who shall violate or fail to comply with any order made thereunder, or who shall build in violation of any detailed statement of specifications or plans submitted and approved thereunder, or any certificates or permit issued thereunder, and from which no appeal has been taken, or who shall fail to comply with such an order as affirmed or modified by the City Council, Building Board of Appeals or a court of competent jurisdiction, within the time fixed herein, shall severally for each and every violation and noncompliance respectively, be guilty of a misdemeanor, punishable by a fine of not more than $1,000.00 or by imprisonment in the City Jail of the City of Manteca, or the County Jail of the County of San Joaquin for not more than six months or by both such fine and imprisonment. The imposition of one penalty for any violation shall not excuse the violation or permit it to continue, and all such persons shall be required to correct or remedy such violations or defects within a reasonable time, and when not otherwise specified, each ten days that prohibited conditions are maintained shall constitute a separate offense.

B. The issuance or granting of a permit or approval of plans and specifications shall not be deemed to be a permit for, or an approval of, any violation of any of the provisions of this code, or any applicable provision of state law. No permit presuming to give authority to violate or cancel the provisions of this code shall be valid, except insofar as work or use which it authorizes is lawful.

C. The issuance of a permit upon plans and specifications shall not prevent the City Building Official from thereafter requiring the correction of errors in the plans and specifications or from preventing construction operations being carried on thereunder when in violation of this code, or any other applicable provision of state law.

(Ord. 1525 § 2, 2013)

ATTACHMENT 2

Appendix C

Sample Documentation

ATTACHMENT 2

LIFT STATION LOG

DATE	WORK PERFORMED	INITIALS

Week: _____

SEWER LIFT STATION ROUTINE CHECK LIST

	Hrs: Pump 1	Hrs: Pump 2	Hrs: Pump 3	Wet Pit Cond ?	Exercise Gate valves	Check - Valves	Pumps greased	Lights working	Air Filters Changed	Sump Pumps Working	Date:	Initials
Airport/Daniels												
Antigua												
Bella Vista												
Chadwick U5												
Curran Grove												
Eckert												
Fishback												
Frito Lay												
Roberts Estates												
Tara Park												
Union Rd												
Villa Ticino												
Woodbridge												
Woodward Park												

GC-good cond.	Y-yes
HG-heavy grease	N-no
MG-medium grease	N/A-not applicable
LG-light grease	

ATTACHMENT 2

C.2

City of Manteca, WQCF

Manhole - Routine Inspection Checklist

MANHOLE ID _____ LOCATION _____ MONTH _____ YEAR _____

SERVICE REQUIRED	DATE	INITIAL	RESULT / COMMENTS
CHECK CONDITION OF THE FRAME			
CHECK FOR EVIDENCE OF SURCHARGE			
CHECK FOR OFFSET OR MISALIGNMENTS			
CHECK FOR EVIDENCE OF INFILTRATION AND/OR INFLOW			
CHECK FOR PRESENCE OF CORROSION			
CHECK FOR ACCUMULATIONS OF GREASE, DEBRIS, OR GRIT			
CHECK WASTEWATER FLOW CHARACTERISTICS (FLOWING FREELY OR BACKED UP)			

IS REPAIR OF THE MANHOLE NECESSARY? ☐YES ☐NO

COMMENTS:

IS CLEANING OF THE MANHOLE NECESSARY? ☐YES ☐NO

COMMENTS:

ADDITIONAL COMMENTS:

C.2

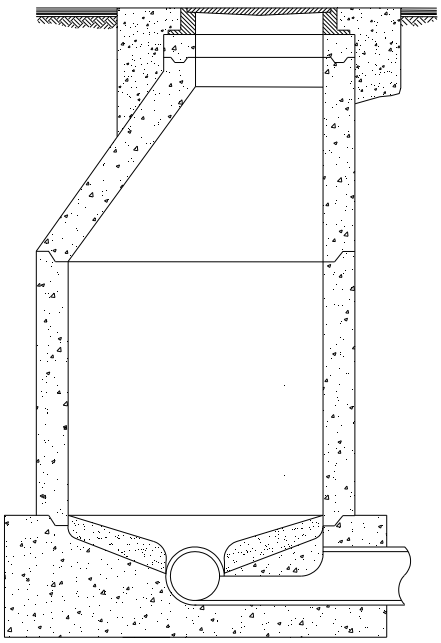
City of Manteca, WQCF

Manhole - Routine Inspection Checklist

MANHOLE ID _____

PHOTO OF MANHOLE:

MANHOLE DEFECTS: (MARK LOCATIONS AND DEGREE OF CRACKS, MISALIGNMENTS, I&I, CORROSION, ETC.)



C.3

City of Manteca, WQCF

Air Release Valve - Routine Inspection Checklist

ARV ID _____ LOCATION _____ MONTH _____ YEAR _____

SERVICE REQUIRED	DATE	INITIAL	RESULT / COMMENTS
CHECK CONDITION OF THE ARV ASSEMBLY			
CHECK FOR EVIDENCE OF LEAKING			
VERIFY THAT VALVE BETWEEN ARV AND THE PIPE IS OPEN			
CHECK FOR PRESENCE OF CORROSION			
CHECK FOR ACCUMULATIONS OF DEBRIS ON ARV ASSEMBLY			
DATE THE ARV BACK-FLUSHED			

IS REPAIR OF THE AIR RELEASE VALVE ASSEMBLY NECESSARY? ☐YES ☐NO

COMMENTS:

IS REPLACEMENT OF THE AIR RELEASE VALVE NECESSARY? ☐YES ☐NO

COMMENTS:

ADDITIONAL COMMENTS:

C.4

City of Manteca, WQCF

Pipeline - Routine Inspection Checklist

PIPELINE ID _____ LOCATION _____ MONTH _____ YEAR _____

SERVICE REQUIRED	DATE	INITIAL	RESULT / COMMENTS
CHECK CONDITION OF THE PIPE			
CHECK FOR EVIDENCE OF LEAKING			
CHECK FOR OFFSET OR MISALIGNMENTS			
CHECK FOR EVIDENCE OF INFILTRATION AND/OR INFLOW			
CHECK FOR PRESENCE OF CORROSION			
CHECK FOR ACCUMULATIONS OF GREASE, DEBRIS, OR GRIT			
CHECK WASTEWATER FLOW CHARACTERISTICS (FLOWING FREELY OR BACKED UP)			

IS REPAIR OF THE PIPELINE NECESSARY? ☐YES ☐NO

COMMENTS:

IS CLEANING OF THE PIPELINE NECESSARY? ☐YES ☐NO

COMMENTS:

ADDITIONAL COMMENTS:

ATTACHMENT 2

Appendix D

Figures

Woodbridge Park
Chadwick U5
Northgate Park
Assieh Development
MUSD
Villa Ticino
Fishback
Wastewater Quality Control Facility
Roberts Estates
River Outfall
Tara Park
WOODWARD & GALLERIA
Bella Vista
Frito Lay
Curran Grove
Garden Gate
Woodward Park
Evans
Solera
Galla

Legend

- Flushing Station
- Lift Station
- Lift Station - Private
- Siphon
- Sanitary Sewer - Air Release Valve
- Sanitary Sewer - Cleanout
- Sanitary Sewer - Lamp Hole
- Sanitary Sewer - Manholes
- Sanitary Sewer - Force Main, Abandoned
- Sanitary Sewer - Force Main
- Sanitary Sewer - Gravity Main, Abandoned
- Sanitary Sewer - Gravity Main
- Sanitary Sewer - Gravity Main, Private
- Blind Areas
- North Manteca Sewer Shed
- Central Manteca Sewer Shed
- South Manteca Sewer Shed
- City Boundary

N

0 1,500 3,000
Feet

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

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Kennedy/Jenks Consultants

City of Manteca
Sewer System Management Plan

Existing Sewer Collection System

K/J 1970006.00
October 2019

Figure 1-1

ATTACHMENT 2

Woodbridge Park
Chadwick U5
Northgate Park
Assieh Development
MUSD
Villa Ticino
Fishback
Wastewater Quality Control Facility
Roberts Estates
River Outfall
Tara Park
WOODWARD & GALLERIA
Bella Vista
Garden Gate
Curran Grove
Eckert
Frito Lay
Woodward Park
Evans
Solera

Legend

Sewer Spill Location

- Category 1
- Category 2
- Category 3

Wastewater Facilities

- Flushing Station
- Lift Station
- Lift Station - Private
- Siphon
- Sanitary Sewer - Manholes
- Sanitary Sewer - Force Main, Abandoned
- Sanitary Sewer - Force Main
- Sanitary Sewer - Gravity Main, Abandoned
- Sanitary Sewer - Gravity Main
- Sanitary Sewer - Gravity Main, Private
- Blind Areas
- North Manteca Sewer Shed
- Central Manteca Sewer Shed
- South Manteca Sewer Shed
- City Boundary

N

0 1,500 3,000
Feet

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

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Kennedy/Jenks Consultants

City of Manteca
Sewer System Management Plan

Sewer Overflows By Location

K/J 1970006.00
October 2019

Figure 2-1

Woodbridge Park
Northgate Park
Chadwick U5
Assieh Development
MUSD
Villa Ticino
962 Alameda St
357 Charles St
Union Road
Fishback
Garden Gate
Curran Grove
Eckert
Frito Lay
Wastewater Quality Control Facility
Roberts Estates
Airport/Daniels
Tara Park
Bella Vista
Antigua
Woodward Park

Legend

- Lift Station
- Lift Station - Private
- Siphon
- Sanitary Sewer - Air Release Valve
- Sanitary Sewer - Manhole
- Sanitary Sewer - Lamp Holes
- Sanitary Sewer - Clean Outs
- Sanitary Sewer - Lamp Holes Private
- Sanitary Sewer - Clean Outs Private
- Sanitary Sewer - Force Main
- Sanitary Sewer - Gravity Main
- Sanitary Sewer - Gravity Private
- Sanitary Sewer - Gravity Abandoned
- Blind Areas
- North Manteca Sewer Shed
- Central Manteca Sewer Shed
- South Manteca Sewer Shed
- City Boundary

N

0 1,500 3,000
Feet

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

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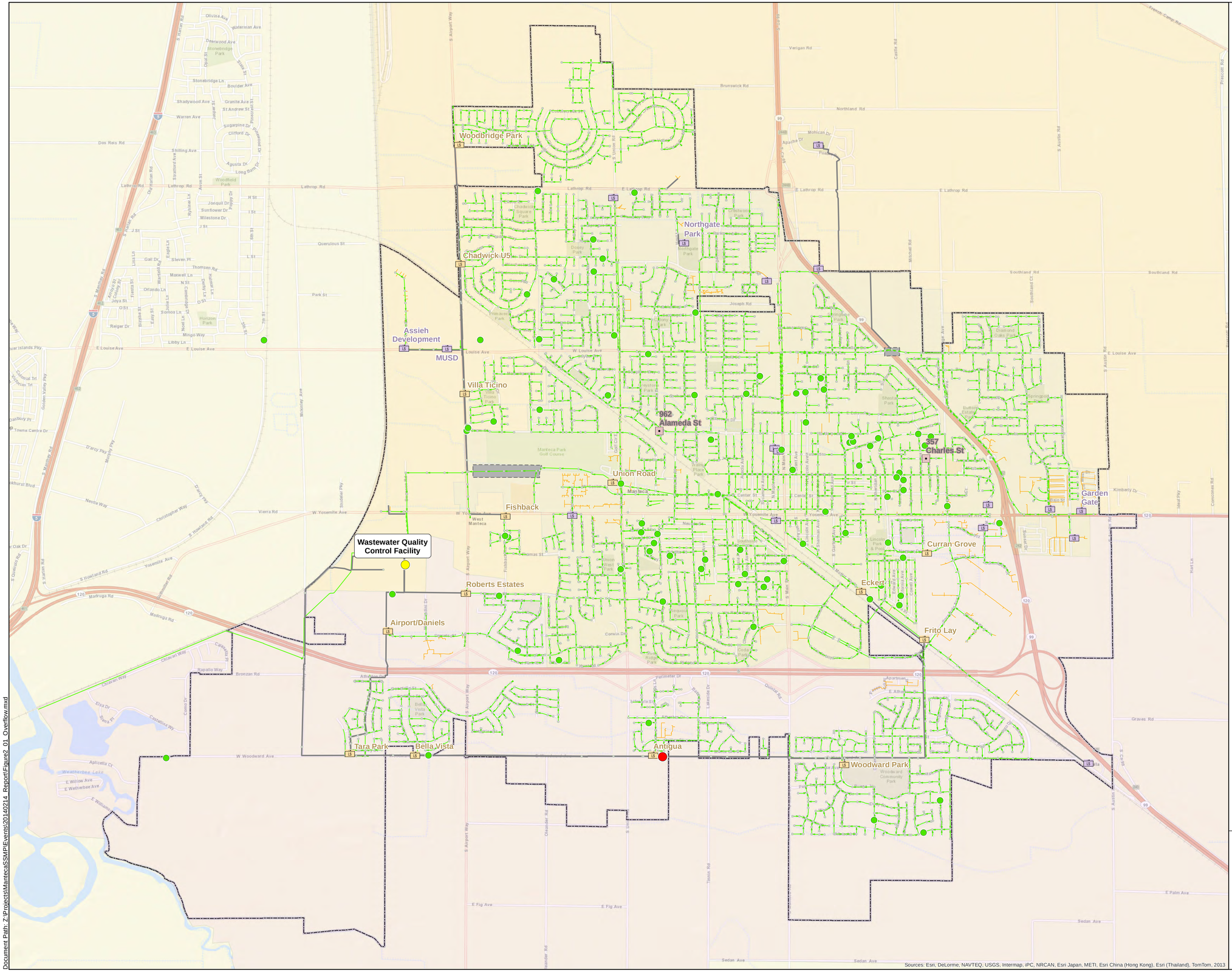
Kennedy/Jenks Consultants

City of Manteca
Sewer System Management Plan

Existing Sewer Collection System

K/J 1270003.00
April 2014

Figure 1-1



Legend

Sewer Spill Location

- Category 1
- Category 2
- Category 3
- Lift Station
- Lift Station - Private
- Siphon
- Manhole
- Sanitary Sewer - Force Main
- Sanitary Sewer - Gravity Main
- Sanitary Sewer - Gravity Private
- Sanitary Sewer - Gravity Abandoned
- Blind Areas
- North Manteca Sewer Shed
- Central Manteca Sewer Shed
- South Manteca Sewer Shed
- City Boundary

N

0 1,500 3,000

Feet

Kennedy/Jenks Consultants

City of Manteca
Sewer System Management Plan

Sewer Overflows By Location

K/J 1270003.00
April 2014

Figure 2-1

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ATTACHMENT 2

Appendix E

Program Audit

Manteca SSMP Program Audit

Date: mm/dd/yyyy
Date of last SSMP Program Audit: mm/dd/yyyy

Audit Team:

1. Public Works Deputy Director - Engineering – INSERT NAME
2. WQCF Superintendent– INSERT NAME
3. Collection System Supervisor – INSERT NAME
4. Maintenance Supervisor – INSERT NAME
5. Other(s) – INSERT NAME

Summary

The purpose of this Audit is to document the identified areas of strength and deficiencies in the management, operation and maintenance of the sewer collection system for YYYY – YYYY. This review is separated into two sections: Section 1 - Monitoring and Measurement, and Section 2 - SSMP Compliance and Effectiveness. This review is completed as part of the monitoring measurement, program modifications and audit process as described in SSMP Sections 9 and 10, respectively.

Section 1 – Monitoring and Measurement

This section includes collecting and summarizing the necessary data to evaluate the performance of the collection system based on the key performance indicators presented in Section 9 of the SSMP and listed below:

- Number of SSOs
    i. Per year
    ii. Dry weather
    iii. Per year by cause
- Annual miles of sewer flushing/cleaning
- Actual versus scheduled cleaning
- Annual miles of CCTV inspection
- System rehabilitation and repairs made
- Annual record of pump station maintenance work orders

1.1 Number of SSOs

The City's SSOs are summarized in Tables 1, 2, and 3 and Figures A1 and A2 for years YYYY to YYYY and are illustrated in the corresponding Figure 2-1 in Appendix D.

Table 1: Sanitary Sewer Overflow (SSO) Description and Corrective Action Taken

SSO ID # CIWQS	Category	Year	Appearance Point	Spill Volume (gal)	Spill Volume Recovered (gal)	Spill Volume to Reach Surface Water	Cause of SSO	Corrective Action Taken

Table 2: Number of SSOs and Spill Volumes for YYYY-YYYY

Year	Category 1	Category 2	Category 3	Total SSOs	Dry Weather SSO	Total Spill Volume (gal)	Total Recovered (gal)	Total Volume to Reach Surface Waters

Note:

(a) Dry weather months are July, August and September

Figure A1: Number of SSOs by Year

[Please Note: Figure A1 will be developed based on the data populated in Table 2 above. An example is provided below based on the 2007-2013 data.]

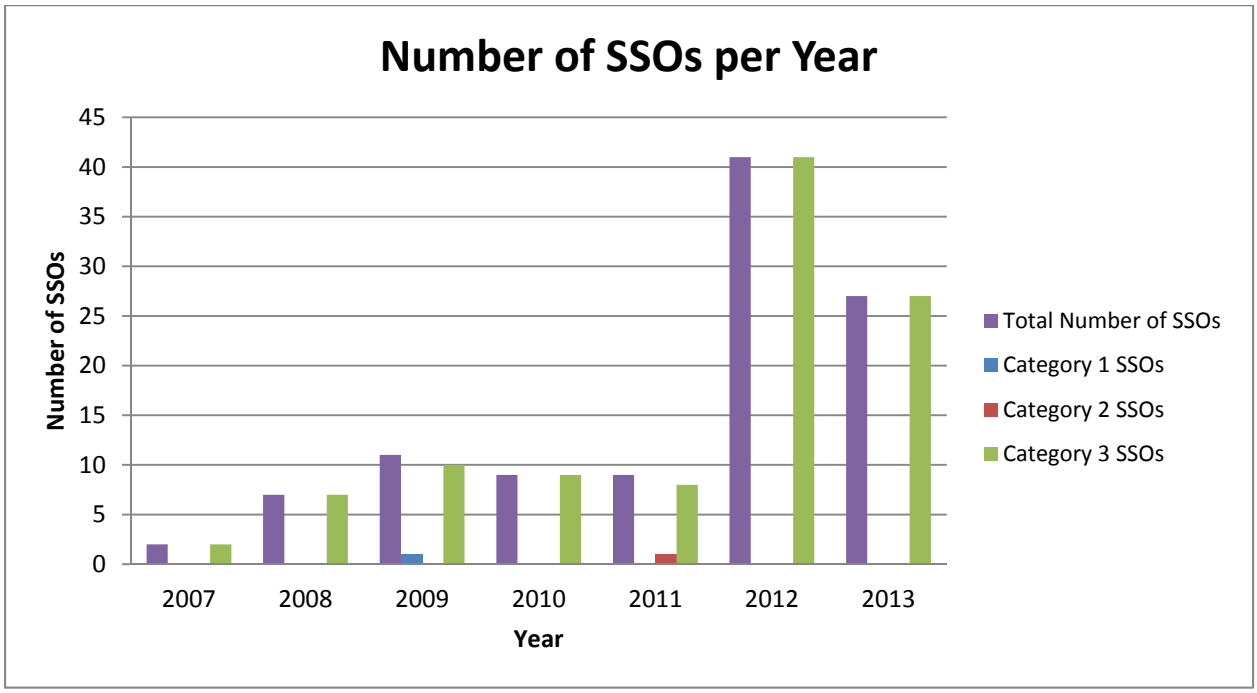
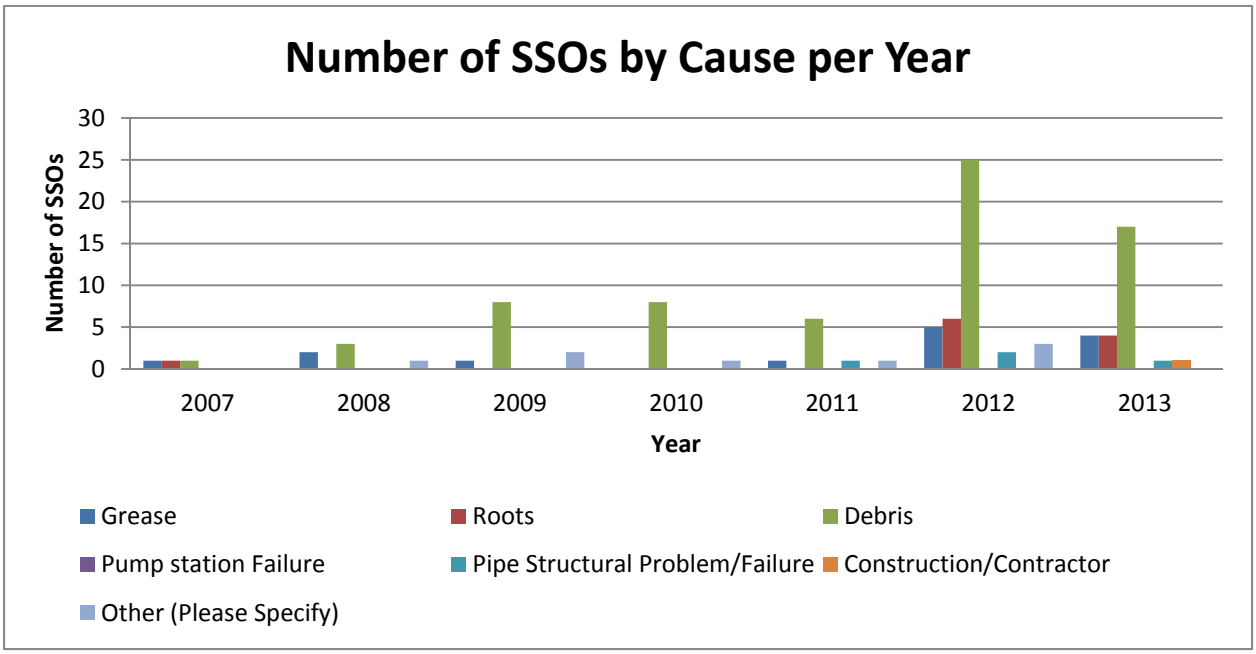


Table 3: Summary of SSOs by Cause for YYYY-YYYY

Cause	Year	SSO Category 1	2	3	PSLD	Total SSOs
Grease						
Roots						
Debris						
Pump station Failure						
Pipe Structural Problem/Failure						
Construction/Contractor						
Other (Please Specify)						

Figure A2: Number of SSOs by Cause per Year

[Please Note: Figure A2 will be developed based on the data populated in Table 3 above. An example is provided below based on the 2007-2013 data.]



Another metric for the City is to evaluate the locations of the SSOs. Figure 2-1 found in Appendix D shows the historical SSOs by location including by category.

1.2 Summary of Preventative Maintenance

Tables 4 and 5 provides a summary of the City's preventative maintenance activities with respect to the sewer system.

Table 4: Annual Summary Sewer Flushing and CCTV and Manhole Inspections

Year	Linear Feet of Collection System Flushed/Cleaned	Linear Feet of Collection System CCTV	Number of Manholes Inspected

Table 5: Lift Station Inspections

Lift Station Name	Number of Times Inspected YYYY	YYYY	YYYY	YYYY	Number of SSOs Caused by Pump Station Failure for YYYY - YYYY

Provide narrative explanation with respect to sewer flushing and CCTV maintenance program, manhole and lift station inspections. Is the City maintenance goals; what were actual vs. scheduled? Is the City seeing any correlation with reduction in SSOs? Provide explanation for trends (i.e. reduction in linear feet of CCTV due to reduction in staffing, equipment failure or out to maintenance, etc.).

1.3 Sewer System Repairs

Provide a description of additions and improvements made to the sanitary sewer collection system; also a narrative explanation as to how these were discovered (during preventative maintenance, SSO, complaint, etc.) or if they were planned CIP projects. This will be beneficial for SSMP effectiveness evaluation.

1.3.1 Pipeline

Table 6: Annual Summary of Pipeline Repairs

Year	Total Number of Repairs	Number of Preventative Maintenance Repairs	Brief Description of Repairs Made

1.3.2 Manholes

Table 7: Annual Summary of Manhole Rehabilitation and Repairs

Year	Number of Manholes Rehabilitations	Number of Manhole Repairs	Number of Preventative Repairs

1.3.3 Pump station Maintenance Work Orders

Table 8: Annual Summary of Pump Station Maintenance Repairs

Year	Total Number of Repairs	Number of Preventative Maintenance Repairs	Brief Description of Repairs Made

1.3.4 Sewer System additions and Improvements for years YYYY - YYYY

Description of additions and improvements planned for the upcoming reporting year.

1.4 FOG Program

Year	Number of Inspections	Number of Violations	Number of SSOs Caused by FOG	Education Outreach Activities Implemented

Section 2 – SSMP Compliance and Effectiveness

SSMP Element	SSMP Compliance (In compliance, Not in Compliance, N/A provide justification)	How SSMP element is being implemented? (narrative explanation)	Effectiveness of implementing SSMP element (i.e. what is working well, what needs improvement)	Identified Deficiencies, issues that may lead to non-compliance, areas of non-compliance	Corrective Actions for identified deficiencies (smaller incremental steps that can be implemented before next audit)
Goal/Organization					
Legal Authority					
Operation and Maintenance Program					
Design and Performance Provisions					
Overflow Emergency Response Plan					
System Evaluation and Capacity Assurance Plan					
Monitoring, Measurement, and Program Modifications					
SSMP Internal Program Audits					
Communication Program					

Questions to address if applicable in table:

1. Corrective actions planned before your next SSMP Internal Program Audit to address the top 10 SSO causes experienced since your last SSMP Internal Program Audit

2. Describe top three challenges the City faces and corresponding initiative(s) to be implemented before your next SSMP Internal Program Audit to better operate, maintain and manage the sanitary sewer system

3. Describe challenges and the plan's effectiveness at communication with the public on development, implementation and performance of its SSMP.

Appendix F

Glossary of Terms

APPENDIX F

GLOSSARY OF TERMS

Category 1 – Discharges of untreated or partially treated wastewater of any volume resulting from an enrollee's sanitary sewer system failure or flow condition that:

Reach surface water and/or reach a drainage channel tributary to a surface water; or

Reach a Municipal Separate Storm Sewer System (MS4) and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly. Any volume of wastewater not recovered from the MS4 is considered to have reached surface water unless the storm drain system discharges to a dedicated storm water or groundwater infiltration basin (e.g., infiltration pit, percolation pond).

Category 2 – Discharges of untreated or partially treated wastewater of 1,000 gallons or greater resulting from an enrollee's sanitary sewer system failure or flow condition that do not reach surface water, a drainage channel, or a MS4 unless the entire SSO discharged to the storm drain system is fully recovered and disposed of properly.

Category 3 – All other discharges of untreated or partially treated wastewater resulting from an enrollee's sanitary sewer system failure or flow condition.

CIWQS – The California Integrated Water Quality System (CIWQS) is a computer system used by the State and Regional Water Quality Control Boards to track information about places of environmental interest, manage permits and other orders, track inspections, and manage violations and enforcement activities. CIWQS also allows online submittal of information by Permittees within certain programs and makes data available to the public through reports.

Enrollee – A public entity that owns or operates a sanitary sewer system and has submitted a complete and approved application for coverage under Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (WQO No. 2006-0003-DWQ)

Event ID – A unique identifier assigned by the CIWQS SSO Database to each reported SSO or private lateral sewage discharge.

Lateral (Service Lateral) – The segment of pipe which connects a private home, building, or development to the publicly owned sewer main. The responsibility for maintaining a lateral can be solely that of the sewerage agency or private property owner; or it can be shared between the two parties. Local communities and land ownership dictate lateral responsibility and the basis for a shared arrangement, if it applies. See Lower Lateral and Upper Lateral for more detailed definitions.

Lower Lateral – That portion of a lateral usually from the property line or easement line to the sewer main. Sewer agencies are typically not be responsible for maintenance of this portion of the lateral. The lower lateral is typically owned and maintained by the property owner of the property it serves.

Miles of Private Laterals – Amount of private laterals tributary to an Enrollee's sanitary sewer system, which private property owners are responsible for maintaining, expressed in miles.

Nuisance – California Water Code section 13050, subdivision (m), defines nuisance as anything which meets all of the following requirements:

a. Is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property.

b. Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal.

c. Occurs during, or as a result of, the treatment or disposal of wastes.

PACP – Pipeline Assessment Certification Program as prescribed by the National Association of Sewer Service Companies (NASSC)

Percent Reached Surface Water – Volume of sewage discharged from an SSO or PLSD that reached surface water divided by the total volume of the SSO or PLSD.

Percent Recovered – Volume of the SSO or PLSD that was captured and returned to the sanitary sewer system or private lateral divided by the total volume of the SSO or PLSD.

Private Lateral – Privately owned lateral.

Private Lateral Sewage Discharge (PLSD) – Discharges of untreated or partially treated wastewater resulting from blockages or other problems within a privately owned sewer lateral connected to the enrollee's sanitary sewer system or from other private sewer assets. PLSDs that the enrollee becomes aware of may be voluntarily reported to the California Integrated Water Quality System (CIWQS) Online SSO Database.

Sanitary Sewer Overflow (SSO) – Any overflow, spill, release, discharge or diversion of untreated or partially treated wastewater from a sanitary sewer system. SSOs include:

i. Overflows or releases of untreated or partially treated wastewater that reach waters of the United States;

ii. Overflows or releases of untreated or partially treated wastewater that do not reach waters of the United States; and

iii. Wastewater backups into buildings and on private property that are caused by blockages or flow conditions within the publicly owned portion of a sanitary sewer system.

Sanitary Sewer System – For the purposes of the SSS WDRs, any system of pipes, pump stations, sewer lines, or other conveyances, upstream of a wastewater treatment plant head works which is comprised of more than one mile of pipes and sewer lines, used to collect and convey wastewater to a publicly owned treatment facility.

Satellite Collection System – The portion, if any, of a sanitary sewer system owned or operated by a different public agency than the agency that owns and operates the wastewater treatment facility to which the sanitary sewer system is tributary.

Service Lateral – See Lateral definition.

Spill – Generic term referring to any sewage discharge (i.e., SSO or private lateral sewage discharge) resulting from a failure in a sanitary sewer system or privately owned lateral or other private sewer system asset.

SSO Database (SSO Reporting System or CIWQS) – Online reporting system developed, hosted, and maintained by the State Water Resources Control Board for compliance with the Monitoring and Reporting Program contained in the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (WQO No. 2006-0003-DWQ).

Total Volume Reached Surface Water – Amount of sewage discharged from a sanitary sewer system or private lateral or other private sewer system asset that reaches a surface water.

Total Volume Recovered – Amount of sewage discharged that was captured and returned to the sanitary sewer system or private sewer system asset.

Untreated or Partially Treated Wastewater – Any volume of waste discharged from the sanitary sewer system upstream of a wastewater treatment plant headworks.

Upper Lateral – Portion of a lateral usually from the building foundation to the property line or easement line where it is connected to the Lower Lateral. Sewer agencies usually do not own and maintain this portion of a Lateral. That responsibility is usually with the owner of the property the lateral serves.

WDID – Waste Discharge Identification number which is a unique identifier assigned by the State Water Resources Control Board to each Enrollee for regulatory record and data management purposes.

APPENDIX B

City of Manteca Sewer Flow Monitoring and Inflow/Infiltration Study (V&A Consulting Engineers, 2022)

ATTACHMENT 2

City of Manteca

Sanitary Sewer Flow Monitoring and Inflow/Infiltration Study 2022





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Draft Report Date: 8/4/2022
Final Report Date: 11/16/2022

Prepared by:

V&A consulting engineers

V&A Project No. 21-0295

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Abbreviations and Acronyms

Abbreviations/Acronyms	Definition
ADWF	Average Dry Weather Flow
CCTV	Closed-Circuit Television
CO	Carbon Monoxide
DIA.	Diameter
d/D	Depth/Diameter Ratio
FPS	Feet/Second
FT.	Feet
FM	Flow Monitor
GPD	Gallons per Day
GWI	Groundwater Infiltration
H_2S	Hydrogen Sulfide
IN.	Inch
I/I	Inflow and Infiltration
IDM	Inch-Diameter Mile
IDW	Inverse Distance Weighting
LEL	Lower Explosive Limit
MAX.	Maximum
MGD	Million Gallons per Day
MIN.	Minimum
NOAA	National Oceanic and Atmospheric Administration
N/A	Not applicable
PF	Peaking Factor
PS	Pump Station
PWS	Personal Weather Station
Q	Flow Rate
QAQC	Quality Assurance Quality Control
RDI	Rainfall-Dependent Infiltration
RG	Rain Gauge
V&A	V&A Consulting Engineers, Inc.
WEF	Water Environment Federation
WRCC	Western Regional Climate Center
WU	Weather Underground

Terms and Definitions

Term	Definition
Average dry weather flow (ADWF)	The average flow rate or pattern from days without noticeable inflow or infiltration response. ADWF usage patterns for weekdays and weekends differ and must be computed separately. ADWF is expressed as a numeric average and may include the influence of normal groundwater infiltration (not related to a rain event).
Basin	Sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. Also refers to the ground surface area near and enclosed by pipelines. A basin may refer to the entire collection system upstream from a flow meter or exclude separately monitored basins upstream.
Depth/diameter (*d*/*D*) ratio	Depth of water in a pipe as a fraction of the pipe's diameter. A measure of the fullness of the pipe used in the capacity analysis.
Design storm	A theoretical storm event of a given duration and intensity that aligns with historical frequency records of rainfall events. For example, a 10-year, 24-hour design storm is a storm event wherein the volume of rain that falls in a 24-hour period would historically occur once every 10 years. Design storm events are used to predict I/I response and are useful for modeling how a collection system will react to a given set of storm event scenarios.
Infiltration and inflow	**Infiltration and inflow (I/I)** rates are calculated by subtracting the ADWF flow curve from the instantaneous flow measurements taken during and after a storm event. Flow in excess of the baseline consists of inflow, rainfall-responsive infiltration, and rainfall-dependent infiltration. **Combined I/I** is the total sum in gallons of additional flow attributable to a storm event.
Infiltration, groundwater	**Groundwater infiltration (GWI)** is groundwater that enters the collection system through pipe defects. GWI depends on the depth of the groundwater table above the pipelines as well as the percentage of the system that is submerged. The variation of groundwater levels and subsequent groundwater infiltration rates are seasonal by nature. On a day-to-day basis, groundwater infiltration rates are relatively steady and will not fluctuate greatly.
Infiltration, rainfall-dependent	**Rainfall-dependent infiltration (RDI)** is similar to groundwater infiltration but occurs as a result of storm water. The storm water percolates into the soil, submerges more of the pipe system, and enters through pipe defects. RDI is the slowest component of storm-related infiltration and inflow, beginning gradually and often lasting 24 hours or longer. The response time depends on the soil permeability and saturation levels.
Inflow	Inflow is defined as water discharged into the sewer system, including private sewer laterals, from direct connections such as downspouts, yard, and area drains, holes in manhole covers, cross-connections from storm drains, or catch basins. Inflow creates a peak flow problem in the sewer system and often dictates the required capacity of downstream pipes and transport facilities to carry these peak instantaneous flows. Overflows are often attributable to high inflow rates.

Peak Wet Weather Flow	The highest daily flow during and immediately after a significant storm event. Includes sanitary flow, infiltration, and inflow.
Peaking factor (PF)	PF is the ratio of peak measured flow to average dry weather flow. This ratio expresses the degree of fluctuation in flow rate over the monitoring period and is used in the capacity analysis.
Surcharge	When the flow level is higher than the crown of the pipe, then the pipeline is said to be in a **surcharged** condition. The pipeline is surcharged when the *d/D* ratio is greater than 1.0.
Synthetic hydrograph	A set of algorithms has been developed to approximate the actual I/I hydrograph. The synthetic hydrograph is developed strictly using rainfall data and response parameters representing response time, recession coefficient and soil saturation.

Executive Summary

Scope and Purpose

V&A Consulting Engineers (V&A) has completed sanitary sewer flow monitoring and rainfall monitoring with inflow and infiltration (I/I) analysis within the City of Manteca (City) collection system. Flow and rainfall monitoring was performed for over two (2) months, from March 18, 2022, to May 19, 2022. Open-channel flow monitoring was performed at 18 sites. There were three general purposes of this study.

1. Establish the baseline sanitary sewer flows at the flow monitoring sites
2. Establish the peak flow condition during the rainfall events and estimate available sewer capacity.
3. Quantify inflow/ infiltration (I/I) at the applicable flow monitoring sites.

Monitoring Sites

The flow monitoring site locations were selected and approved by Stantec and the City of Manteca and are listed in Table ES-1 and shown in Figure ES-1.

Table ES-1. List of Monitoring Sites

Monitoring Site	Manhole No.	Monitored Pipe	Measured Pipe Diameter (in)	Location
Site 1	1266	North Inlet	12	Airport Way, north of Northgate Dr.
Site 2	2281	East Inlet	15	Intersection of Airport Way and Northgate Dr.
Site 3	0348	East Inlet	15	W. Center St. just west of train tracks @ Rose Ln.
Site 4	2372	South Outlet	18	E. Woodward Ave. east of Buena Vista Dr.
Site 5	3748	Northeast Inlet	18	Industrial Park Dr., southwest of Moffat Blvd.
Site 6	0389	North Inlet	21	Intersection of W. Louise Ave. and N. Union Rd.
Site 7	3097	East Inlet	24	Wawona St. @ Sequoia Elementary School parking lot
Site 8	5029	East Inlet	17.5	Intersection of Springfield Dr and Columbus Dr.
Site 9	2650	East Inlet	27	Woodward Ave. east of Bridewell Ave.

Monitoring Site	Manhole No.	Monitored Pipe	Measured Pipe Diameter (in)	Location
Site 10	0551	North Inlet	30	N. Union Rd. south of W. Alameda St.
Site 11	3166	South Inlet	30	N. Union Rd. north of W. Yosemite Ave.
Site 12	3102	North Inlet	12	W. Louise Ave. at Tidewater Park Trail
Site 13	3346	North Inlet	30	Intersection of Airport Way and Daisywood Dr.
Site 14	5147	South Inlet	48	East parking lot of Great Wolf Lodge, alongside Entertainment Way
Site 15	1227	North Inlet	54	Swanson Rd, north of W. Yosemite Ave.
Site 16	3117	East Inlet	15	Daniels St, east of Entertainment Way.
Site 17	3346	East Inlet	40	Intersection of Airport Way and Daisywood Dr.
Site 18	0383	East Inlet	21	E. Louise Ave., east of Souza Blvd.

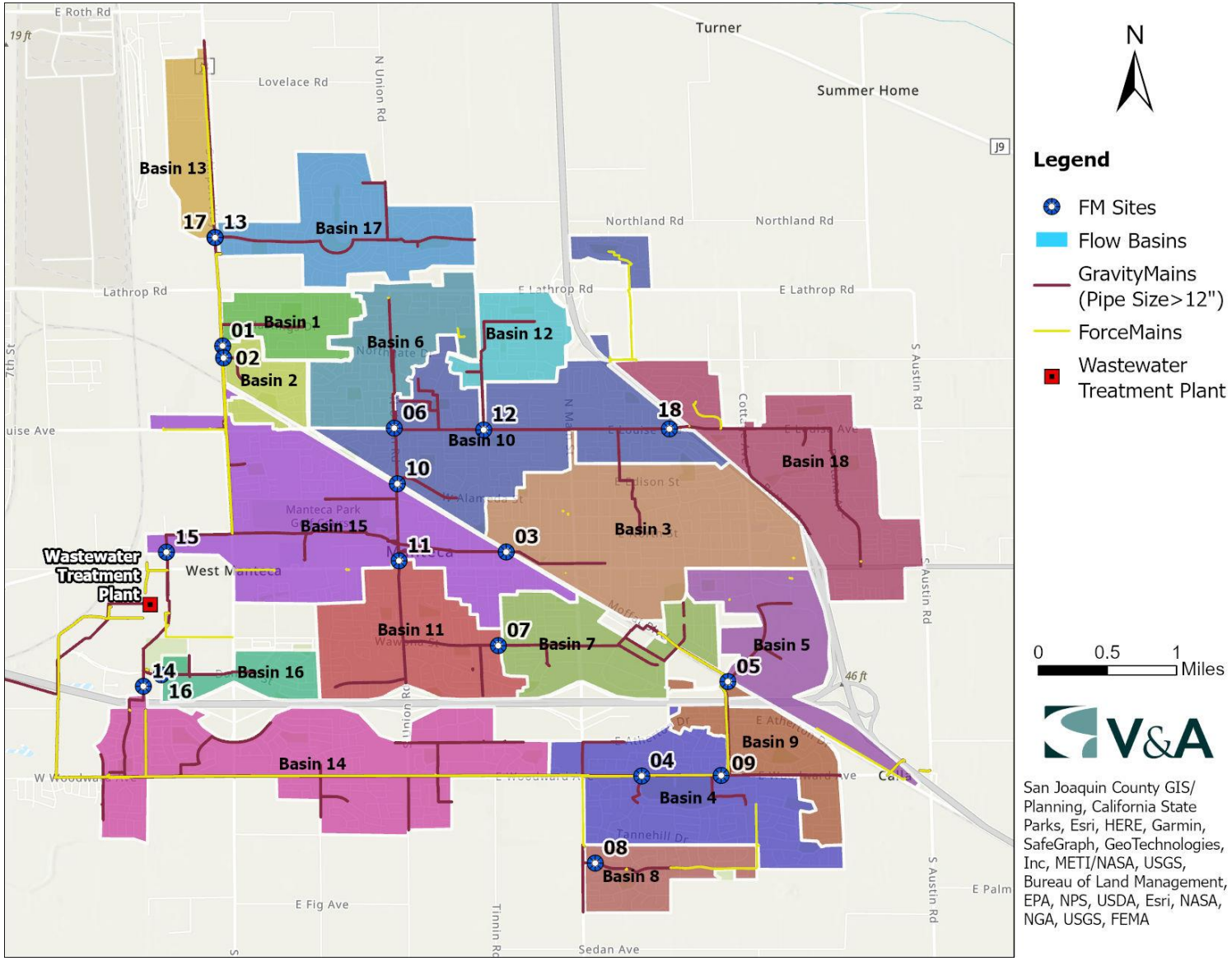


Figure ES-1. Map of Flow Monitoring Sites and Basins

Rainfall Monitoring

The cumulative precipitation over the flow monitoring period was **40%** of the historical average. One rainfall event was defined as shown in Figure ES-2, noting the following items:

- Event 1 from March 27 – 28, 2022 contained the bulk of the rainfall during the monitoring period. On average, approximately 0.72 inch of rain fell.
- Despite the relatively small rainfall amount, numerous sites showed inflow responses. Please see Section 3.3.2 for the Inflow results.

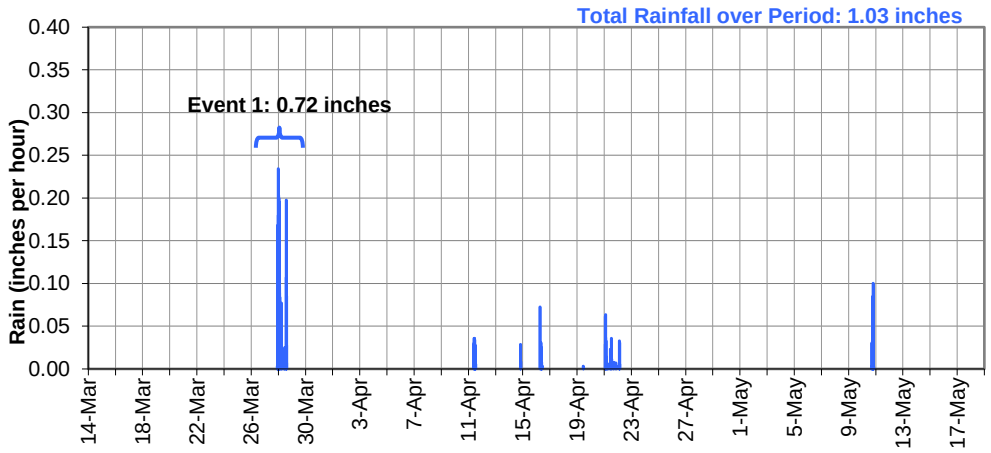


Figure ES-2. Rainfall Over Monitoring Period – Triangulated to City Centroid

Site Flow Monitoring and Capacity Results

Peak measured flows, and the hydraulic grade line data (flow depths) are essential to understanding the capacity limitations of a collection system. The following capacity analyses terms are defined as follows:

- Peaking Factor: Peaking factor is defined as the peak measured flow divided by the average dry weather flow (ADWF). Peaking factors are influenced by many factors, including size and topography of the tributary area, flow attenuation, flow restrictions, characteristics of I/I entering the collection system, and hydraulic features such as pump stations.
- For this report, peaking factors are reported, and PF >5 are highlighted in ***RED***[1]; however, the City should refer to City standards when evaluating peaking factors. Peaking factor data should be used at the discretion of the City Engineer.
- **d/D Ratio**: The d/D ratio is the peak measured depth of flow (d) divided by the pipe diameter (D). The d/D ratio for each site was computed based on the maximum depth of flow for the study. Standards for d/D ratio vary from agency to agency, but typically range between d/D ≤ 0.5 and d/D ≤ 0.75

[1] WEF Manual of Practice FD-6 and ASCE Manual No. 62 suggests typical peaking factor ratios range between 3 and 4, with higher values possibly indicative of pronounced I/I flows.

- For this report, d/D ratios > 0.75 are highlighted in ***RED***; however, the City should refer to City standards when evaluating d/D ratios, to be used at the discretion of the City Engineer.

Table ES-2 summarizes the peak recorded flows, levels, d/D ratios, and peaking factors per site during the flow monitoring period. Capacity analysis data is presented on a site-by-site basis and represents the hydraulic conditions only at the site locations; hydraulic conditions in other areas of the collection system will differ. Figure ES-3 shows a schematic diagram of the peak measured flows with peak flow levels.

Table ES-2. Capacity Analysis Summary

Monitoring Site	ADWF (MGD)	Peak Measured Flow (MGD)	Peaking Factor	Pipe Diameter, *D (IN)*	Peak Measured Depth	*Max d/D Ratio*	Surcharge above pipe crown (FT)
Site 1	0.12	0.31	2.5	12	18.1	***1.51***	***0.51***
Site 2	0.09	0.33	3.5	15	18.2	***1.21***	***0.27***
Site 3	0.25	0.48	1.9	15	9.2	0.62	
Site 4	0.61	2.60	4.2	18	32.6	***1.81***	***1.22***
Site 5	0.05	0.17	3.7	18	3.0	0.17	
Site 6	0.15	2.06	***14.2***	21	8.1	0.39	
Site 7	0.16	0.58	3.7	24	4.6	0.19	
Site 8	0.09	0.21	2.2	17.5	3.4	0.19	
Site 9	0.37	0.97	2.6	27	9.3	0.34	
Site 10	1.50	5.33	3.6	30	42.7	***1.42***	***1.06***
Site 11	0.53	2.33	4.4	30	80.1	***2.67***	***4.17***
Site 12	0.11	0.44	4.0	12	4.4	0.37	
Site 13	0.002	0.20	***84.2***	30	2.9	0.10	
Site 14	1.31	2.24	1.7	48	18.2	0.38	
Site 15	3.29	6.11	1.9	54	30.6	0.57	
Site 16	0.09	0.31	3.3	15	5.6	0.37	
Site 17	0.23	1.03	4.5	40	10.1	0.25	
Site 18	0.40	0.79	2.0	21	8.2	0.39	

The following capacity analysis results are noted:

- Peaking Factors:
  - Sites 6 and 13 had peaking factors over 5.
  - The peaking factor of Site 6 was due to one dumping event during the flow monitoring period.
  - The peaking factor of Site 13 may be skewed high due to low ADWF numbers.
- d/D Ratio:
  - Sites 1, 2, 4, 10, and 11 surcharged during the study.
  - Site 11 surcharged 4.17 feet above the pipe crown.

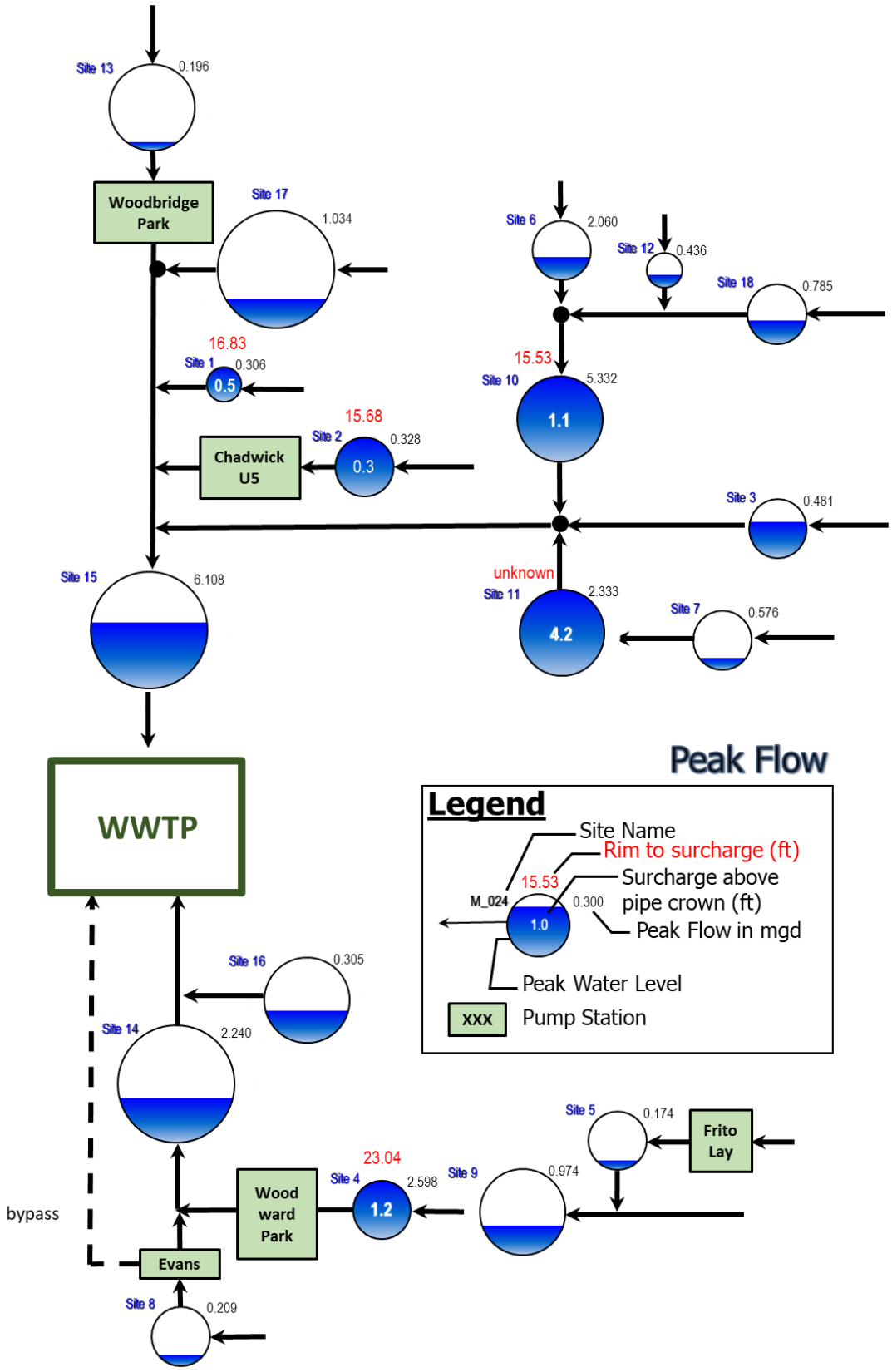


Figure ES-3. Peak Measured Flow (Flow Schematic)

Infiltration and Inflow Analysis

Flow monitoring basins are localized areas of a sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. The basin refers to the ground surface area near and enclosed by the pipelines. A basin may refer to the entire collection system upstream from a flow meter or may exclude separately monitored basins upstream. I/I analysis in this report will be conducted on a basin-by-basin basis. For this study, subtraction of flows was required to isolate the drainage areas of some flow monitoring basins. The flow monitoring basins and basin isolation equations used to define the limits of the basin boundaries are listed in Table ES-3.

Table ES-3. Basin Flow Isolation Summary

Basins	Flow Isolation Calculation	Basin Acre
Basin 1	= Q_1	207
Basin 2	= Q_2	150
Basin 3	= Q_3	892
Basin 4	= $Q_4 - Q_9$	646
Basin 5	= Q_5	427
Basin 6	= Q_6	416
Basin 7	= Q_7	426
Basin 8	= Q_8	228
Basin 9	= Q_9	290
Basin 10	= $Q_{10}-(Q_6+Q_{12}+Q_{18})$	968
Basin 11	= $Q_{11}-Q_7$	533
Basin 12	= Q_{12}	228
Basin 13	= Q_{13}	209
Basin 14	= $Q_{14}-(Q_8+Q_4)$	992
Basin 15	= $Q_{15}-(Q_1+Q_2+Q_3+Q_{17}+Q_{13}+Q_{10}+Q_{11})$	1020
Basin 16	= Q_{16}	162
Basin 17	= Q_{17}	517
Basin 18	= Q_{18}	749

Table ES-4. I/I Analysis Summary

Monitoring Basin	ADWF (mgd)	Peak Inflow Rate (mgd)	Combined I/I (gallons)	Overall Inflow Rank	Overall Combined I/I Rank
Basin 1	0.124	0.041	Negligible	9	8
Basin 2	0.093	0.033	Negligible	8	8
Basin 3	0.253	0.262	30,500	5	5
Basin 4	0.241	*n/a*	n/a	*n/a*	*n/a*
Basin 5	0.048	*n/a*	n/a	*n/a*	*n/a*
Basin 6	0.145	0.223	34,700	2	4
Basin 7	0.155	0.476	58,900	1	1
Basin 8	0.094	0.028	Negligible	12	8
Basin 9	0.326	0.187	49,400	4	3
Basin 10	0.849	0.297	138,500	6	2
Basin 11	0.372	0.053	11,700	13	7
Basin 12	0.110	0.036	Negligible	10	8
Basin 13	0.002	*n/a*	n/a	*n/a*	*n/a*
Basin 14	0.599	*n/a*	n/a	*n/a*	*n/a*
Basin 15	0.562	*n/a*	n/a	*n/a*	*n/a*
Basin 16	0.092	0.029	Negligible	10	8
Basin 17	0.232	0.143	Negligible	6	8
Basin 18	0.396	0.365	34,700	3	6

The following inflow/infiltration analysis results are noted:

- Basins 4, 5, 13, and 14 were excluded from the I/I analysis because they are either 1) they are under the influence of a pump station or 2) they showed little I/I response. Basin 15 was also excluded because most of the peak I/I response were from upstream basins.
- Basins 1, 2, 8, 12, 16, and 17 showed a negligible amount of combined I/I, thus were ranked lowest for combined I/I.
- **Inflow:** Respectively, Basins 7, 6, and 18 had the highest weighted, normalized peak I/I rates, an indicator of high inflow upstream from the flow monitoring basin. Basin 7's peak I/I was higher than the other basins, making it a priority if peak I/I is important for the City.
- **Combined I/I:** Respectively, Basins 7, 10, and 9 had the highest weighted, normalized combined rates, an indicator of high combined I/I upstream from the flow monitoring basin.
- **Groundwater Infiltration**: No evidence of GWI was found in any basin

Figure ES-4 to Figure ES-5 summarize the I/I results.

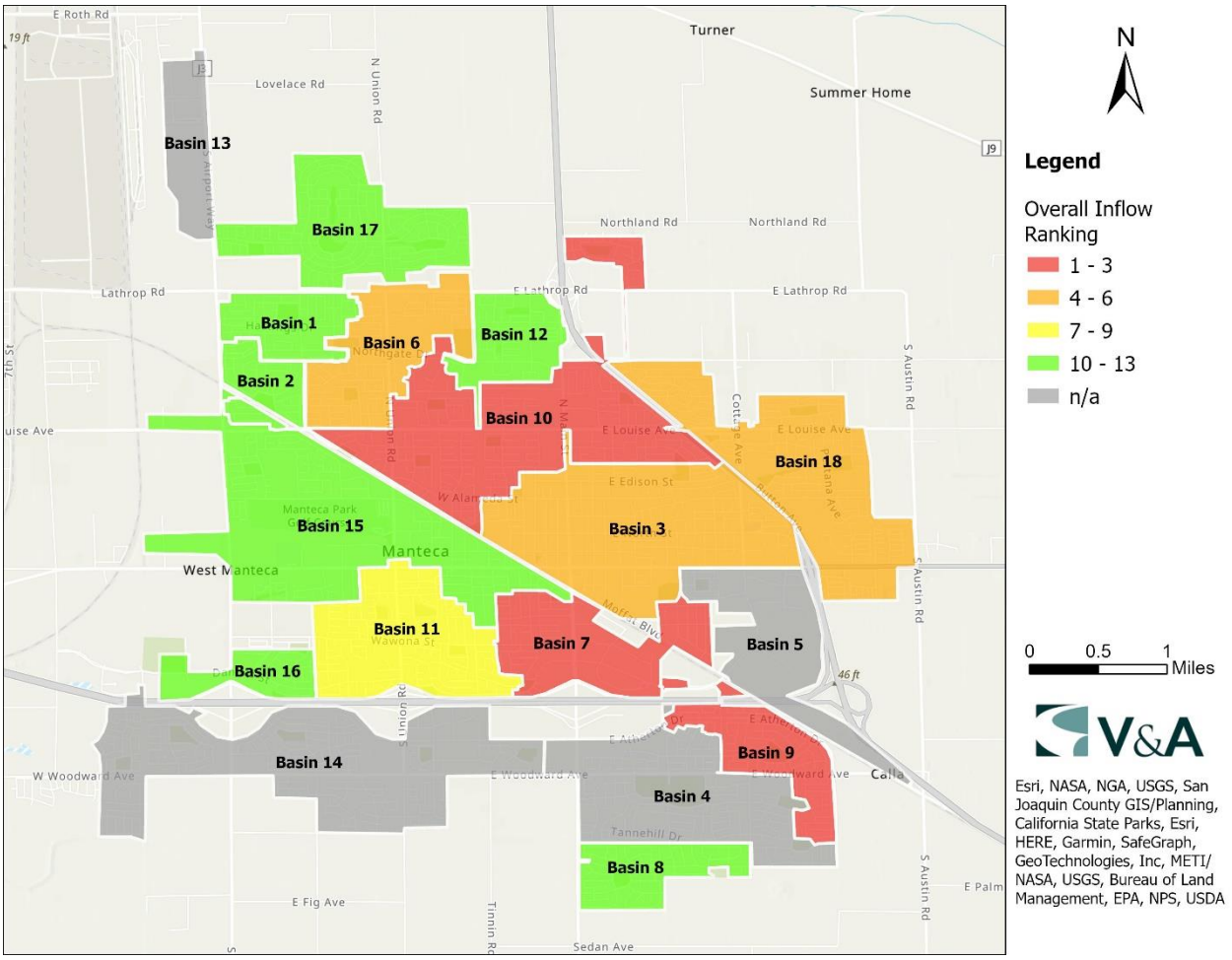


Figure ES-4. Overall Inflow Ranking

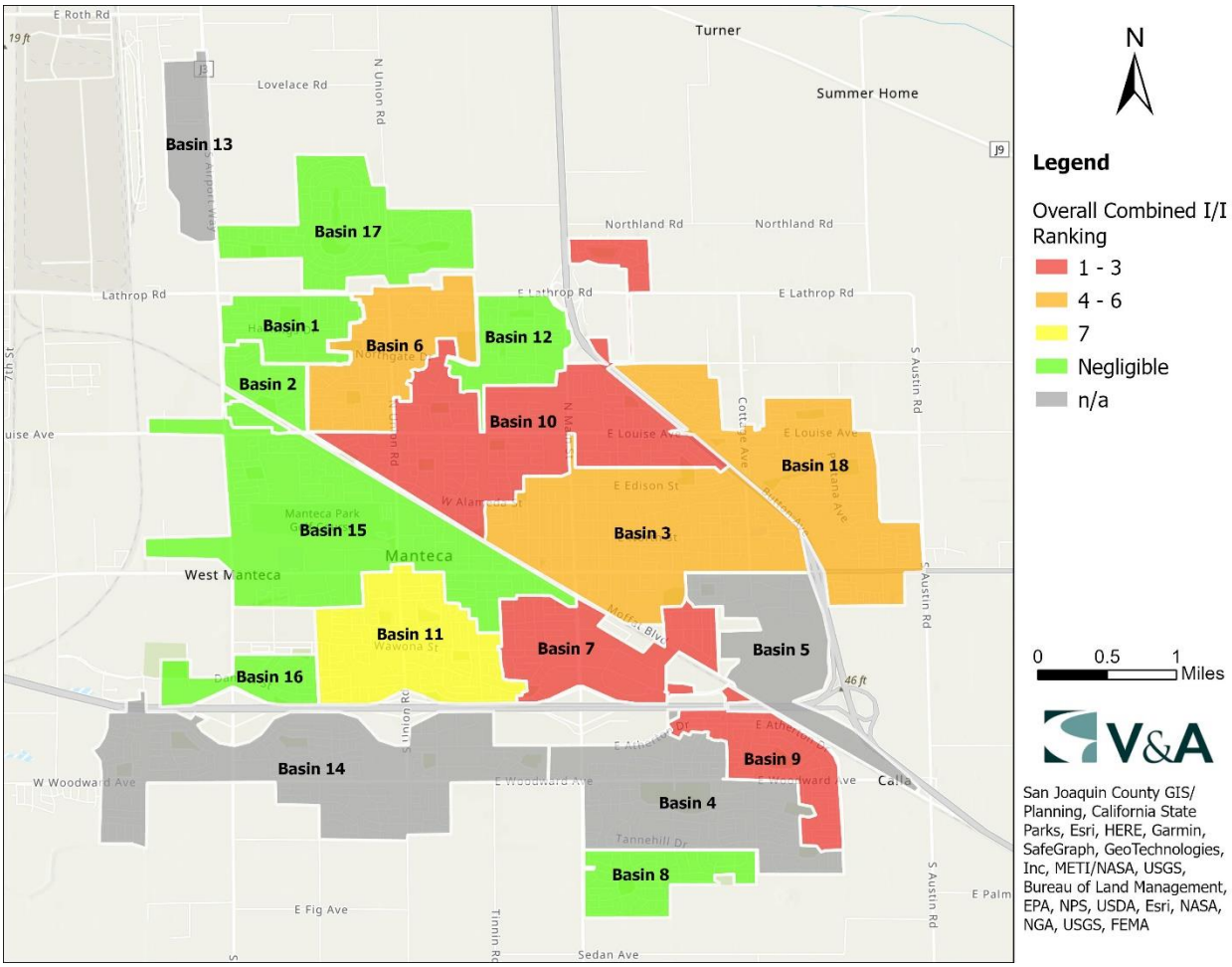


Figure ES-5. Overall Combined I/I Ranking

Recommendations

V&A advises that future I/I reduction plans consider the following recommendations:

1. **Master Plan and Model Implementation**: This study focuses on inflow and infiltration generation; the study results can be used to update the master plan and compare it with previous model assumptions and flow monitoring results.
    a. **Verify Interconnections and Overflows**: understanding the interconnections and overflows can help with the master plan, basin isolation, and I/I analysis.
2. **Capacity Analysis**: Five sites surcharged during the monitoring period, and four sites (sites 1,4,10, and 11) exceeded more than 0.5 feet about the pipe crown. Global capacity constraints will be addressed in the updated master plan. The following possible capacity concerns are noted:
    a. no site exceeded 0.5 d/D average dry weather level.
    b. 0.5 inch of sediment was found in site 9, and five (5) inches was found in site 11.
    c. Sites 1, 2, 4, 10, and 11 surcharged during this study. Among them, Site 11 had a high surcharge of 4.17 feet above the pipe crown. This is partially due to the high amount of sedimentation discovered inside the pipe. The surcharges did not always occur during wet weather.
    d. Site 4 was a smaller diameter (18-inches) compared to upstream Site 9 (27-inches) and acted as a bottleneck.
3. **Determine I/I Reduction Program**: The City should examine its I/I reduction needs to determine its needs and goals for a future I/I reduction program.
    a. if peak flows, sanitary sewer overflows, and pipeline capacity issues are of greater concern, then priority can be given to investigating and reducing sources of inflow within the basins with the greatest inflow problems. The highest inflow occurred within Basins 7, 6, and 18, where Basin 7's peak I/I was higher than the other basins, making it a priority if peak I/I is important for the City.
    b. if total infiltration and general pipeline deterioration are of greater concern, then the program can be weighted to investigate and reduce sources of infiltration within the basins with the greatest infiltration problems. The highest combined I/I occurred in Basins 7, 10, and 9. Additionally, no basin showed evidence of excessive GWI.
4. **I/I Investigation Methods**: Potential I/I investigation methods include the following:
    a. smoke testing.
    b. mini-basin flow monitoring.
    c. night-time reconnaissance work to (1) investigate and determine direct point sources of inflow, and (2) determine the areas and/or pipe reaches responsible for high levels of infiltration contribution.
    d. CCTV inspection.
5. **I/I Reduction Cost Effective Analysis**: The City should conduct a study to determine which is more cost-effective: (1) locating the sources of inflow/infiltration and systematically rehabilitating or replacing the faulty pipelines; or (2) continued treatment of the additional rainfall dependent I/I flow.

1 Introduction

1.1 Scope and Purpose

V&A Consulting Engineers (V&A) was retained by Stantec and has completed sanitary sewer flow monitoring and rainfall monitoring with inflow and infiltration (I/I) analysis within the City of Manteca (City) collection system. Flow and rainfall monitoring was performed for over two (2) months, from March 18, 2022, to May 19, 2022. Open-channel flow monitoring was performed at 18 sites. There were three general purposes of this study.

1. Establish the baseline sanitary sewer flows at the flow monitoring sites
2. Establish the peak flow condition during the rainfall events and estimate available sewer capacity.
3. Quantify inflow/ infiltration (I/I) at the applicable flow monitoring sites.

1.2 Flow Monitoring Sites

Flow monitoring sites are defined as the manholes where flow monitors are secured and the pipelines in which flow sensors are placed. Capacity analysis and flow rate information are presented on a site-by-site basis.

The flow monitoring sites were selected and approved by Stantec and the City of Manteca. Information regarding the flow monitoring locations is listed in Table 1-1 and illustrated in Figure-1-1. Detailed descriptions of the individual flow monitoring sites, including photographs, are included in Appendix A.

Table 1-1. List of Monitoring Locations

Monitoring Site	Manhole No.	Monitored Pipe	Measured Pipe Diameter (in)	Location
Site 1	1266	North Inlet	12	Airport Way, north of Northgate Dr.
Site 2	2281	East Inlet	15	Intersection of Airport Way and Northgate Dr.
Site 3	0348	East Inlet	15	W. Center St. just west of train tracks @ Rose Ln.
Site 4	2372	South Outlet	18	E. Woodward Ave. east of Buena Vista Dr.
Site 5	3748	Northeast Inlet	18	Industrial Park Dr., southwest of Moffat Blvd.
Site 6	0389	North Inlet	21	Intersection of W. Louise Ave. and N. Union Rd.
Site 7	3097	East Inlet	24	Wawona St. @ Sequoia Elementary School parking lot
Site 8	5029	East Inlet	17.5	Intersection of Springfield Dr and Columbus Dr.
Site 9	2650	East Inlet	27	Woodward Ave. east of Bridewell Ave.
Site 10	0551	North Inlet	30	N. Union Rd. south of W. Alameda St.

Monitoring Site	Manhole No.	Monitored Pipe	Measured Pipe Diameter (in)	Location
Site 11	3166	South Inlet	30	N. Union Rd. north of W. Yosemite Ave.
Site 12	3102	North Inlet	12	W. Louise Ave. at Tidewater Park Trail
Site 13	3346	North Inlet	30	Intersection of Airport Way and Daisywood Dr.
Site 14	5147	South Inlet	48	East parking lot of Great Wolf Lodge, alongside Entertainment Way
Site 15	1227	North Inlet	54	Swanson Rd, north of W. Yosemite Ave.
Site 16	3117	East Inlet	15	Daniels St, east of Entertainment Way.
Site 17	3346	East Inlet	40	Intersection of Airport Way and Daisywood Dr.
Site 18	0383	East Inlet	21	E. Louise Ave., east of Souza Blvd.

1.3 Flow Monitoring Basins

Flow monitoring site data may include the flows of one or many drainage basins. Flow monitoring basins are localized areas of a sanitary sewer collection system upstream of a given location (often a flow meter), including all pipelines, inlets, and appurtenances. The basin refers to the ground surface area near and enclosed by the pipelines. A basin may refer to the entire collection system upstream from a flow meter or may exclude separately monitored basins upstream, requiring basin isolation (subtraction of upstream flows). The I/I analysis results will be presented on an isolated basin basis. The basins, basin attributes, and basin isolation equations are listed in Table 1-2. Flow site locations in relation to the drainage basins are also shown in Figure-1-1.

Table 1-2. Isolated Flow Monitoring Basin Characteristics

Basins	Flow Isolation Calculation	Basin Acre
Basin 1	= Q_1	207
Basin 2	= Q_2	150
Basin 3	= Q_3	892
Basin 4	= $Q_4 - Q_9$	646
Basin 5	= Q_5	427
Basin 6	= Q_6	416
Basin 7	= Q_7	426
Basin 8	= Q_8	228
Basin 9	= Q_9	290
Basin 10	= $Q_{10}-(Q_6+Q_{12}+Q_{18})$	968
Basin 11	= $Q_{11}-Q_7$	533
Basin 12	= Q_{12}	228
Basin 13	= Q_{13}	209
Basin 14	= $Q_{14}-(Q_8+Q_4)$	992
Basin 15	= $Q_{15}-(Q_1+Q_2+Q_3+Q_{17}+Q_{13}+Q_{10}+Q_{11})$	1020
Basin 16	= Q_{16}	162
Basin 17	= Q_{17}	517
Basin 18	= Q_{18}	749

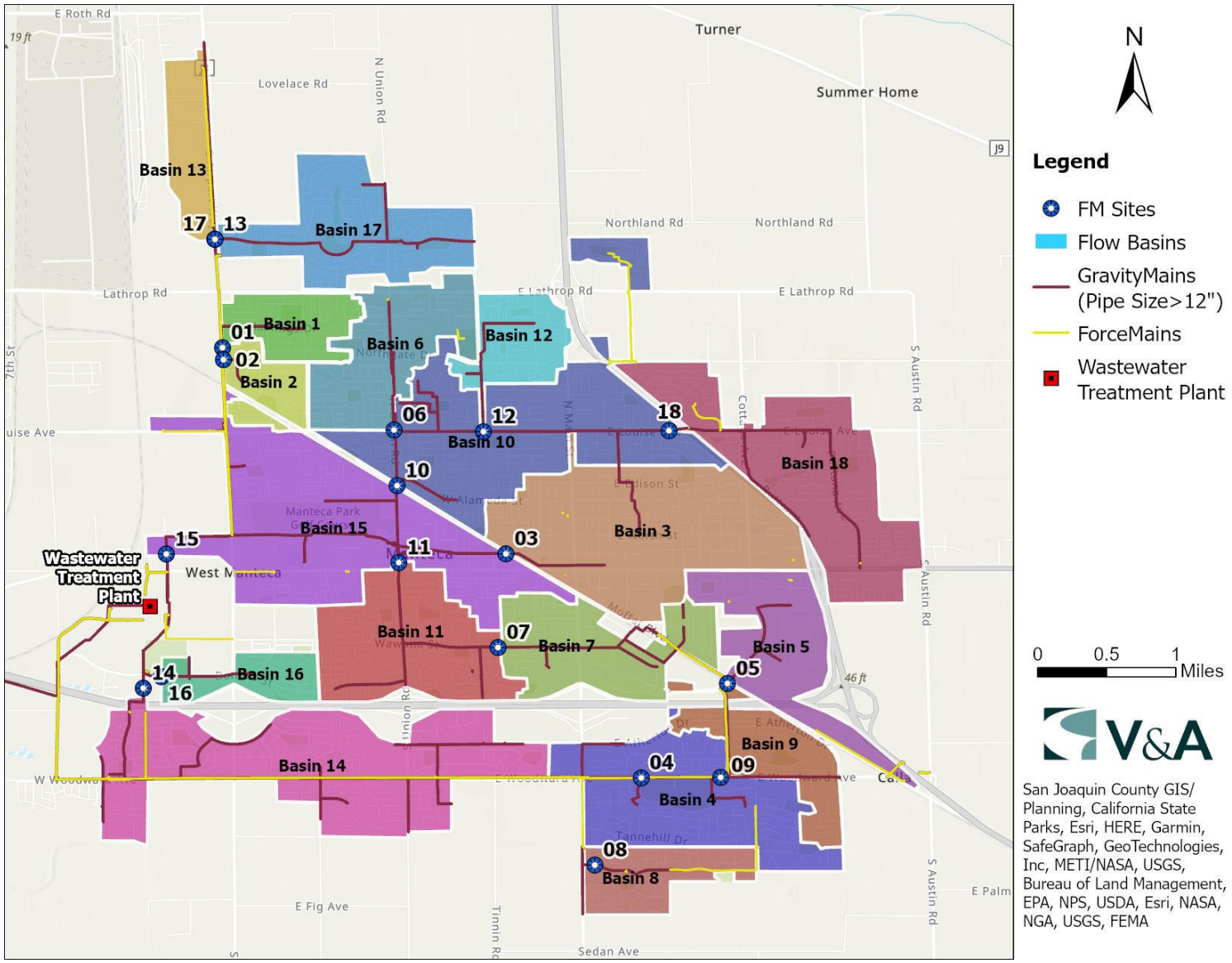


Figure-1-1. Map of Flow Monitoring Sites and Basins

2 Methods and Procedures

2.1 Confined Space Entry

A confined space (Photo 2-1) is defined as any space that is large enough and so configured that a person can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for continuous employee occupancy. In general, the atmosphere must be constantly monitored for sufficient levels of oxygen (19.5% to 23.5%) and the presence of hydrogen sulfide (H_2S) gas, carbon monoxide (CO) gas, and lower explosive limit (LEL) levels. A typical confined space entry crew has members with OSHA-defined responsibilities of Entrant, Attendant, and Supervisor. The Entrant is the individual performing the work. He or she is equipped with the necessary personal protective equipment needed to perform the job safely, including a personal four-gas monitor (Photo 2-2). If it is not possible to maintain line-of-sight with the Entrant, then more Entrants are required until line-of-sight can be maintained. The Attendant is responsible for maintaining contact with the Entrants to monitor the atmosphere using another four-gas monitor and maintaining records of all Entrants if there is more than one. The Supervisor is responsible for developing a safe work plan for the job at hand before entering.



Photo 2-1. Confined Space Entry



Photo 2-2. Typical Personal Four-Gas Monitor

2.2 Flow Meter Installation

V&A installed ISCO 2150 area-velocity flow meters for temporary monitoring within the collection system. ISCO 2150 meters use submerged sensors with a pressure transducer to collect depth readings and an ultrasonic Doppler sensor to determine the average fluid velocity. The ultrasonic sensor emits high-frequency sound waves, which are reflected by air bubbles and suspended particles in the flow. The sensor receives the reflected signal and determines the Doppler frequency shift, which indicates the estimated average flow velocity. The sensor is typically mounted at a manhole inlet to take

advantage of smoother upstream flow conditions. The sensor may be offset to one side of the pipe to lessen the chances of fouling and sedimentation where these problems are expected to occur. Manual level and velocity measurements were taken during the installation of the flow meters, and again when they were removed, and compared to simultaneous level and velocity readings from the flow meters to ensure proper calibration and accuracy. Figure 2-1 shows a typical installation for a flow meter with a submerged sensor.

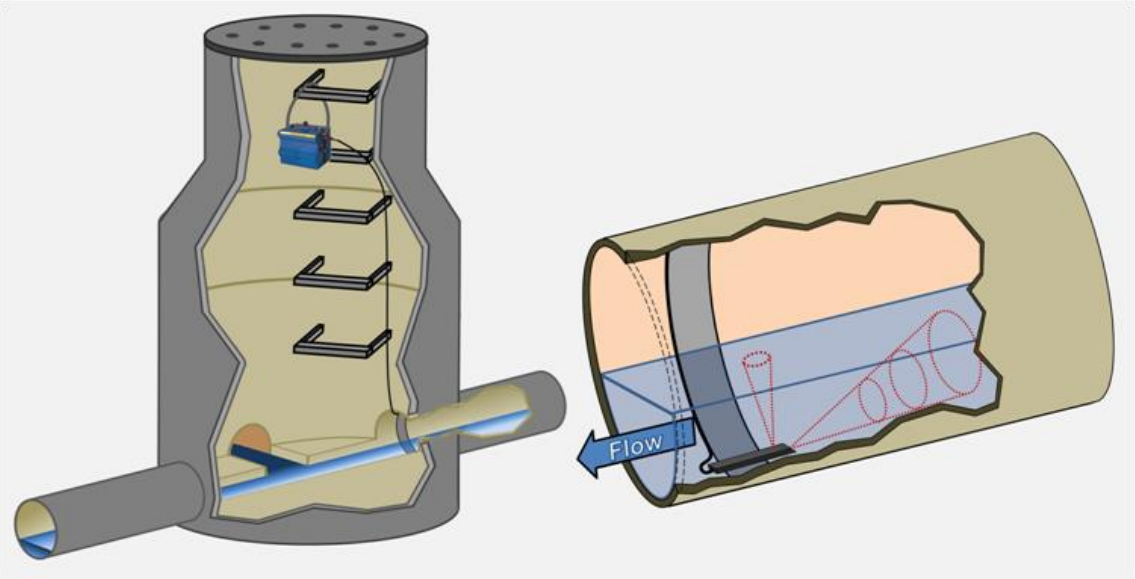


Figure 2-1. Typical Installation for ISCO 2150 Flow Meter with Submerged Sensor

2.3 Flow Calculation

Data retrieved from the flow meters is placed into a spreadsheet program for analysis. Data analysis includes comparison to field calibration measurements as well as necessary geometric adjustments as required for sediment (sediment reduces the pipe's wetted cross-sectional area available to carry flow). Area-velocity flow metering uses the continuity equation:

$$Q = v \cdot A = v \cdot (A_T - A_S)$$

where Q: volume flow rate

v: average velocity as determined by the ultrasonic sensor

A: cross-sectional area available to carry the flow

A_T: total cross-sectional area with both wastewater and sediment

A_S: cross-sectional area of sediment

For circular pipe:

$$A_T = \left[\frac{D^2}{4}\cos^{-1}\left(1-\frac{2d_W}{D}\right)\right]-\left[\left(\frac{D}{2}-d_W\right)\left(\frac{D}{2}\right)\sin\left(\cos^{-1}\left(1-\frac{2d_W}{D}\right)\right)\right]$$

$$A_S = \left[\frac{D^2}{4}\cos^{-1}\left(1-\frac{2d_S}{D}\right)\right]-\left[\left(\frac{D}{2}-d_S\right)\left(\frac{D}{2}\right)\sin\left(\cos^{-1}\left(1-\frac{2d_S}{D}\right)\right)\right]$$

where d_W: distance between wastewater level and pipe invert

d_S: depth of sediment

D: pipe diameter

2.4 Measurement Error and Uncertainty

For traditional engineering applications, measurement "error" is explained as a difference between a computed, estimated, or measured value and the generally accepted true or theoretically correct value. It can also be thought of as a difference between the desired and the actual performance of equipment. For equipment, an error is usually expressed as a percentage relative to accuracy (i.e., "…the velocity sensor has an accuracy of ±2% of the reading…").

However, for this study and flow monitoring applications, the cause of the measurement difference is important, and a distinction will be made between the equipment not performing to industry standards ("error") and expected inaccuracies ("uncertainty") associated with monitoring technology limitations.

Gauging **"error"** occurs when the equipment is not performing to industry standards. This can occur as a result of the following common categories of conditions that can be encountered at a wastewater monitoring site.

- Malfunctioning equipment (i.e., a sensor is damaged, battery life ends, or a desiccant canister becomes saturated)
- Improper equipment choice or maintenance (i.e., the selected gauging equipment technologies are incompatible with hydraulic conditions within the sewer, or excessive gravel deposits are allowed to accumulate around the sensors without being removed)
- Improper equipment calibration (i.e., depth and/or velocity measurements are incorrectly taken within the sewer, or equipment is allowed to drift out of calibration)
- Field conditions within the sewer (i.e., foaming at the water surface that "blinds" an ultrasonic depth sensor, or toilet paper catching and accumulating on a combination sensor, blinding the acoustic Doppler velocity meter)

For flow monitoring applications, gauging **"uncertainty"** is used to describe and quantify the expected inaccuracies that result from the limitations of the technologies that utilize indirect measurements to quantify wastewater flow.

It is important to try and install flow meters in "ideal" flow conditions. Ideal flow conditions are generally defined as laminar flow in a straight-through, constant-slope pipeline with no disturbances (elbows, tees, hydraulic shifts, etc.) 10 diameters upstream and five (5) diameters downstream from the flow monitoring location. If ideal flow conditions are met, then an expected uncertainty of final flow

calculation from an open-channel flow meter may be approximately ±5%. In many situations, ideal flow conditions cannot be met, and uncertainties increase.

2.4.1 Flow Addition versus Flow Subtraction

Due to the uncertainties involved in subtracting flows of similar magnitudes, the addition of flows at multiple monitoring sites is usually preferred over subtraction of flows. Subtraction becomes an issue especially when the flow difference from the subtraction falls within the measurement uncertainty range of the two larger flow data sets (i.e., subtracting a large flow from another large flow to obtain a small difference).

This concept is best demonstrated by the following example:

Meter A measures 2.00 MGD of flow and has an expected uncertainty of ±5%, thus the uncertainty range of the flow measurement is ±0.10 MGD.

Meter B measures 2.50 MGD of flow and has an expected uncertainty of ±6%, thus the uncertainty range of the flow measurement is ±0.15 MGD.

Meter C measures 0.50 MGD of flow and has an expected uncertainty of ±8%, thus the uncertainty range of the flow measurement is ±0.04 MGD.

- Scenario 1 – Flow Addition
  - Meter A + Meter B = 2.00 MGD (±0.10) + 2.50 MGD (±0.15) = 4.50 MGD (±0.25)
  - Overall uncertainty = ±0.25 / 4.50 = ±5.6%
  - For flow addition, the final uncertainty is essentially a weighted average of the component uncertainties.

- Scenario 2 – Flow Subtraction, Large Flow less Small Flow
  - Meter B - Meter C = 2.50 MGD (±0.15) - 0.50 MGD (±0.04) = 2.00 MGD (±0.19)
  - Overall uncertainty = ±0.19 / 2.00 = ±9.5%
  - For flow subtraction, the final uncertainty will always be greater than the component uncertainties.
  - When subtracting a small flow from a large flow, the resulting uncertainties can still be manageable.

- Scenario 3 – Flow Subtraction, Large Flow less a similarly Large Flow
  - Meter B - Meter A = 2.50 MGD (±0.15) – 2.00 MGD (±0.10) = 0.50 MGD (±0.25)
  - Overall uncertainty = ±0.25 / 0.50 = ±50%
  - When subtracting similarly sized flow rates, the resulting uncertainties may not be manageable. In this example, uncertainty of ±50% may be considered unacceptable for confident analyses.

Scenario 3 is a very “real-world” situation. The uncertainties for Meter A and Meter B are extremely reasonable (indeed, most flow monitoring service providers would be extremely pleased with true meter uncertainties of ±5% to ±6%). However, the reality of the math is clear, and the above example demonstrates the concept of flow subtraction and compounding or inflating uncertainty ranges.

The following points are emphasized concerning the items of this section:

- For subtraction of flows, the overall uncertainty can be an inflated value that far exceeds the component uncertainties.
- The smaller the resultant flow from the subtraction equation, the larger the percentage uncertainty.
- Whenever possible, basins flows should be directly measured, rather than calculated as subtraction of two or more flow meters.
- If flow subtraction cannot be avoided, it is better to have the magnitudes of the component flows be as dissimilar as possible.

2.5 Average Dry Weather Flow Determination

For this study, four distinct average dry weather flow curves were established for each site location:

- Mondays – Thursdays
- Fridays
- Saturdays
- Sundays

Flows for many sites differ on Friday evenings compared to Mondays through Thursdays. Starting around seven (7) pm, the flows are often decreased (compared to Monday through Thursday). Similarly, flow patterns for Saturday and Sunday were also separated due to their unique evening flow pattern. This type of differentiation can be important when determining I/I response, especially if a rain event occurs on a Friday, Saturday, or Sunday evening.

Figure 2-2 illustrates varying flow patterns for Site 1 within a typical dry week.

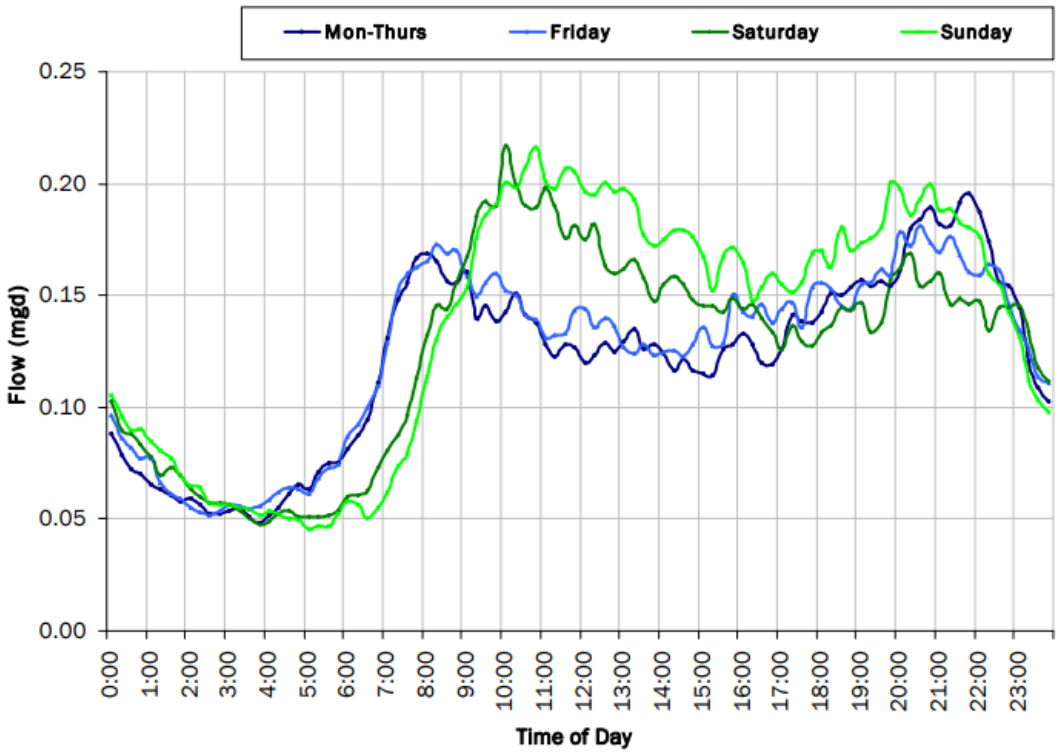


Figure 2-2. ADWF Diurnal Flow Patterns for Site 1

ADWF curves are taken from "Dry Days" when RDI had the least impact on the baseline flow. The overall average dry weather flow (ADWF) is calculated using the following equation:

$$ADWF = \left(ADWF_{Mon-Thu} \times \frac{4}{7} \right) + \left(ADWF_{Fri} \times \frac{1}{7} \right) + \left(ADWF_{Sat} \times \frac{1}{7} \right) + \left(ADWF_{Sun} \times \frac{1}{7} \right)$$

2.6 Flow Attenuation

Flow attenuation in a sewer collection system is the natural process of the reduction of the peak flow rate through redistribution of the same volume of flow over a longer period of time. This occurs as a result of friction (resistance), internal storage, and diffusion along the sewer pipes. Fluids are constantly working towards equilibrium. For example, a volume of fluid poured into a static vessel with no outside turbulence will eventually stabilize to a static state, with a smooth fluid surface without peaks and valleys. Attenuation within a sanitary sewer collection system is based upon this concept. A flow profile with a strong peak will tend to stabilize towards equilibrium, as shown in Figure 2-3.

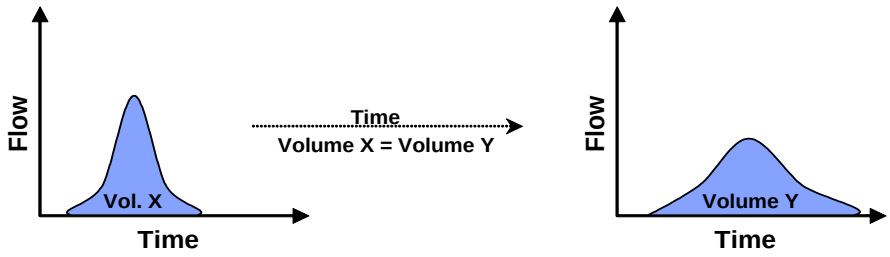


Figure 2-3. Attenuation Illustration

Within a sanitary sewer collection system, each individual basin will have a specific flow profile. As the flows from the basins combine within the trunk sewer lines, the peaks from each basin will not necessarily coincide at the same time, and peak flows may attenuate prior to reaching the treatment facility due to the length and time of travel through the trunk sewers. The sum of the peak flows of the individual basins within a collection system will usually be greater than the peak flows observed at the treatment facility.

2.7 Inflow / Infiltration Analysis: Definitions and Identification

Inflow and infiltration (I/I) consist of stormwater and groundwater that enters the sewer system through pipe defects and improper storm drainage connections and is defined as follows:

- **Inflow**: Stormwater inflow is defined as water discharged into the sewer system, including private sewer laterals, from direct connections such as downspouts, yard and area drains, holes in manhole covers, cross-connections from storm drains, or catch basins.
- **Infiltration**: Infiltration is defined as water entering the sanitary sewer system through defects in pipes, pipe joints, and manhole walls, which may include cracks, offset joints, root intrusion points, and broken pipes.

Figure 2-4 illustrates the possible sources and components of I/I.

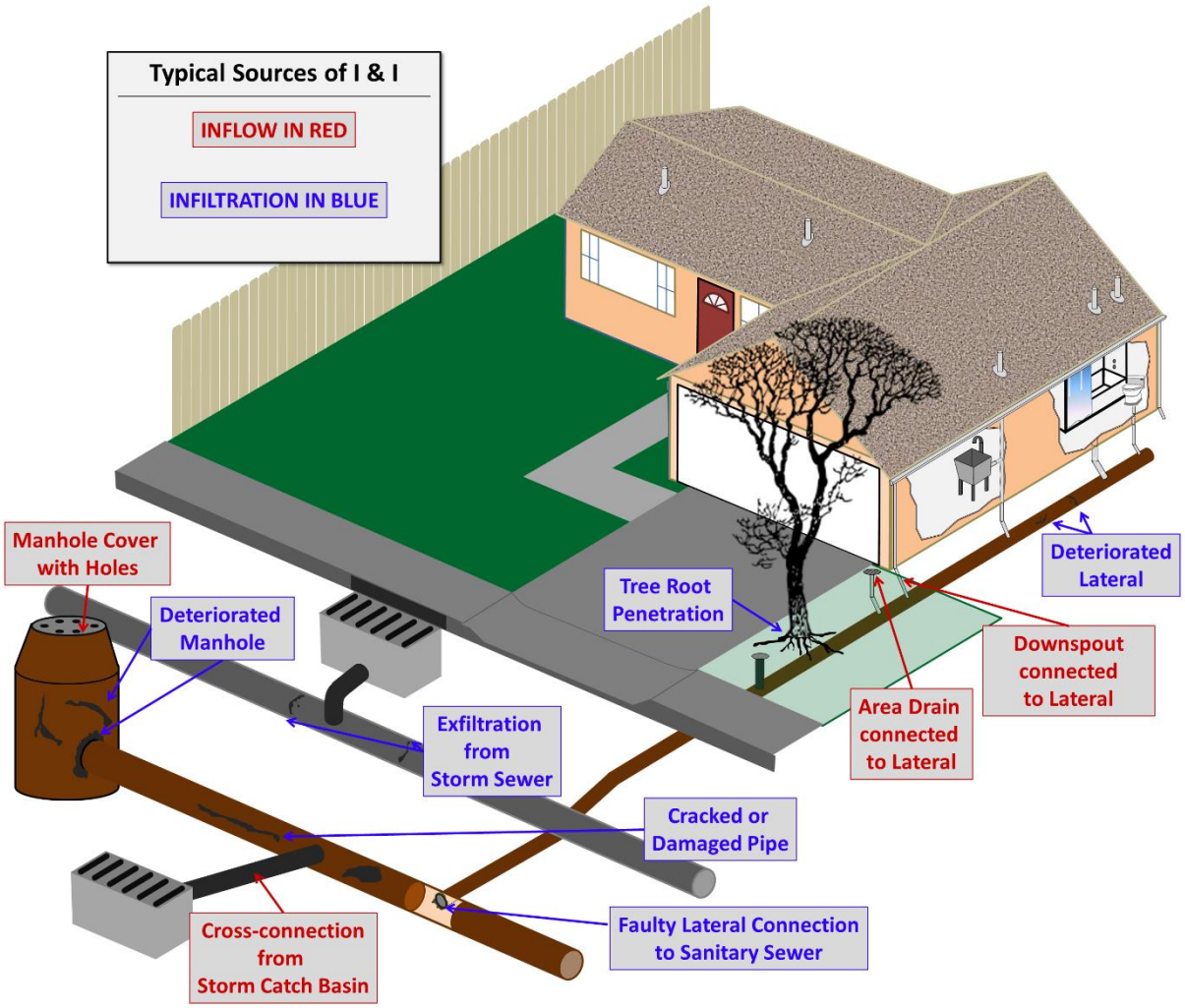


Figure 2-4. Typical Sources of Infiltration and Inflow

2.7.1 Infiltration Components

Infiltration can be further subdivided into components as follows:

- **Groundwater Infiltration**: Groundwater infiltration depends on the depth of the groundwater table above the pipelines as well as the percentage of the system submerged. The variation of groundwater levels and subsequent groundwater infiltration rates are seasonal by nature. On a day-to-day basis, groundwater infiltration rates are relatively steady and will not fluctuate greatly.
- **Rainfall-Dependent Infiltration**: This component occurs as a result of stormwater and enters the sewer system through pipe defects, as with groundwater infiltration. The stormwater first percolates directly into the soil and then migrates to an infiltration point. Typically, the time of concentration for rainfall-related infiltration maybe 24 hours or longer, but this depends on the soil permeability and saturation levels.
- **Rainfall-Responsive Infiltration** is stormwater that enters the collection system indirectly through pipe defects, but normally in sewers constructed close to the ground surface such as private

laterals. Rainfall-responsive infiltration is independent of the groundwater table and reaches defective sewers via the pipe trench in which the sewer is constructed, particularly if the pipe is placed in impermeable soil and is bedded and backfilled with granular material. In this case, the pipe trench serves as a conduit similar to a French drain, conveying storm drainage to defective joints and other openings in the system. This type of infiltration can have a quick response and graphically can look very similar to inflow.

2.7.2 Impact and Cost of Source Detection and Removal

- Inflow:
  - Impact: Inflow creates a peak flow problem in the sewer system and often dictates the required capacity of downstream pipes and transport facilities to carry these peak instantaneous flows. Because the response and magnitude of inflow are tied closely to the intensity of the storm event, the short-term peak instantaneous flows may result in surcharging and overflows within a collection system. Severe inflow may result in sewage dilution, resulting in upsetting the biological treatment (secondary treatment) at the treatment facility.
  - Cost of Source Identification and Removal: Inflow locations are usually less difficult to find and less expensive to correct. These sources include direct and indirect cross-connections with storm drainage systems, roof downspouts, and various types of surface drains. Generally, the costs to identify and remove sources of inflow are low compared to potential benefits to public health and safety or the costs of building new facilities to convey and treat the resulting peak flows.
- Infiltration:
  - Impact: Infiltration typically creates long-term annual volumetric problems. The major impact is the cost of pumping and treating the additional volume of water, and of paying for treatment (for municipalities that are billed strictly on flow volume).
  - Cost of Source Detection and Removal: Infiltration sources are usually harder to find and more expensive to correct than inflow sources. Infiltration sources include defects in deteriorated sewer pipes or manholes that may be widespread throughout a sanitary sewer system.

2.7.3 Graphical Identification of I/I

Inflow is usually recognized graphically by large-magnitude, short-duration spikes immediately following a rain event. Infiltration is often recognized graphically by a gradual increase in flow after a wet-weather event. The increased flow typically sustains for a period after rainfall has stopped and then gradually drops off as soils become less saturated and as groundwater levels recede to normal levels. Real-time flows are plotted against ADWF to analyze the I/I response to rainfall events. Figure 2-5 illustrates a sample of how this analysis is conducted and some of the measurements that are used to distinguish infiltration and inflow. Similar graphs have been generated for the individual flow monitoring sites and can be found in Appendix A.

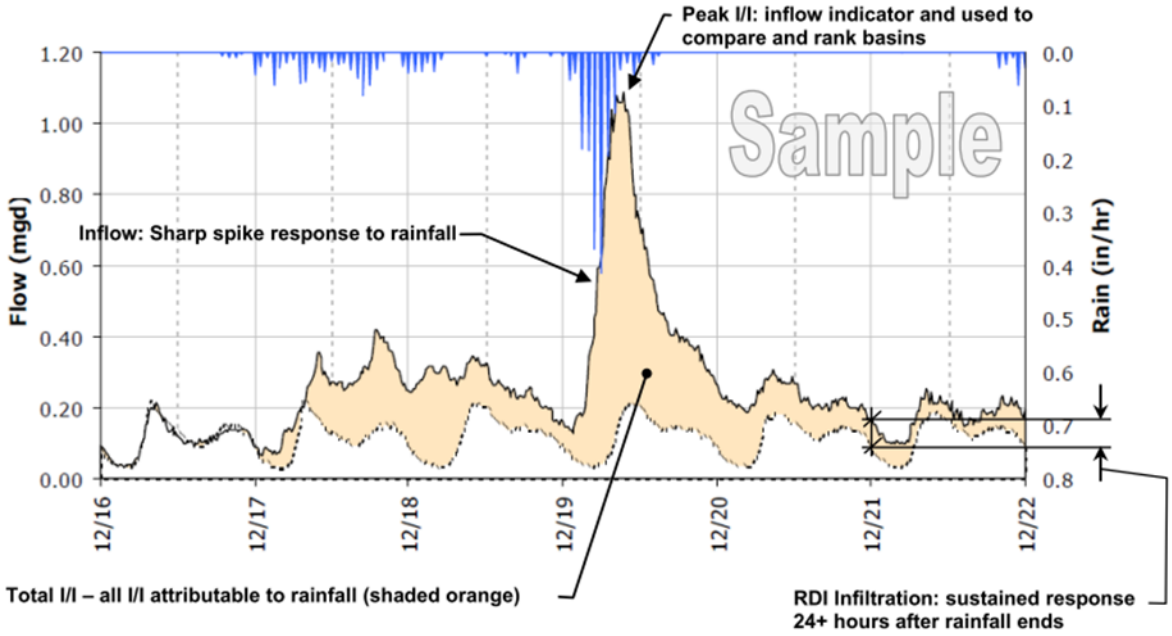


Figure 2-5. Sample Infiltration and Inflow Isolation Graph

2.7.4 Analysis Metrics

After differentiating I/I flows from ADWF flows, various calculations can be made to determine which I/I component (inflow or infiltration) is more prevalent at a particular site and to compare the relative magnitudes of the I/I components between drainage basins and between storm events:

- **Inflow – Peak I/I Flow Rate**: Inflow is characterized by sharp, direct spikes occurring during a rainfall event. Peak I/I rates are used for inflow analysis. 2
- **Groundwater Infiltration (GWI)**: GWI analysis is conducted by looking at minimum dry weather flow to average dry weather flow ratios and comparing them to established standards to quantify the rate of excess groundwater infiltration.
- **Rainfall-Dependent Infiltration (RDI)**: RDI Analysis is conducted by looking at the infiltration rates at set periods after the conclusion of a storm event. Depending on the particular collection system and the time required for flows to return to ADWF levels, different periods may be examined to determine the basins with the greatest or most sustained rainfall-dependent infiltration rates.
- **Combined I/I**: The combined inflow and infiltration are measured in gallons per site and storm event. Because it is based on combined I/I volume, it is used to identify the overall volumetric influence of I/I within the monitoring basin.

[2] I/I flow rate is the real time flow less the estimated average dry weather flow rate. It is an estimate of flows attributable to rainfall. By using peak measured flow rates (inclusive of ADWF), the I/I flow rate would be skewed higher or lower depending on whether the storm event I/I response occurs during low-flow or high-flow hours.

2.7.5 Normalization Methods

There are three ways to *normalize* the I/I analysis metrics for an "apples-to-apples" comparison among the different drainage basins:

- **per-ADWF**: The metric is divided by the established average dry weather flow rate and is typically expressed as a ratio. Peaking Factors are examples of using ADWF to normalize data from different sites.
- **per-IDM**: The metric is divided by the length of pipe (IDM [inch-diameter mile]) contained within the upstream basin. Final units typically are gallons per day (gpd) per IDM.
- **per-ACRE**: The metric is divided by the acreage of the upstream basin. Final units typically are gallons per day (gpd) per ACRE.

The infiltration and inflow indicators were normalized by the per-ADWF, and per-ACRE methods in this report, and these results will be shown in the following I/I analysis results sections. For basin rankings, the following weighting decisions are given:

- **per-ADWF:** It is noted that abnormal waste usage could result in low ADWF values, which could skew results and lead to possible misinterpretation of data. Per-ADWF values are known and valid and will be assigned 51% weighting towards final rankings.
- **per-ACRE:** Per-ACRE values are known and valid and will be assigned 49% weighting towards final rankings.

3 Results and Analysis

3.1 Rainfall Monitoring

3.1.1 Rain Gauge Locations

V&A analyzed rainfall data from a total of five publicly available private weather stations (PWS) on Weather Underground (WU)[3], allowing for solid coverage over the collection system which has a diverse range of topographical features. Figure 3-1 illustrates the locations and labeling convention used for the five rain gauges and their relation to the flow sites and basins.

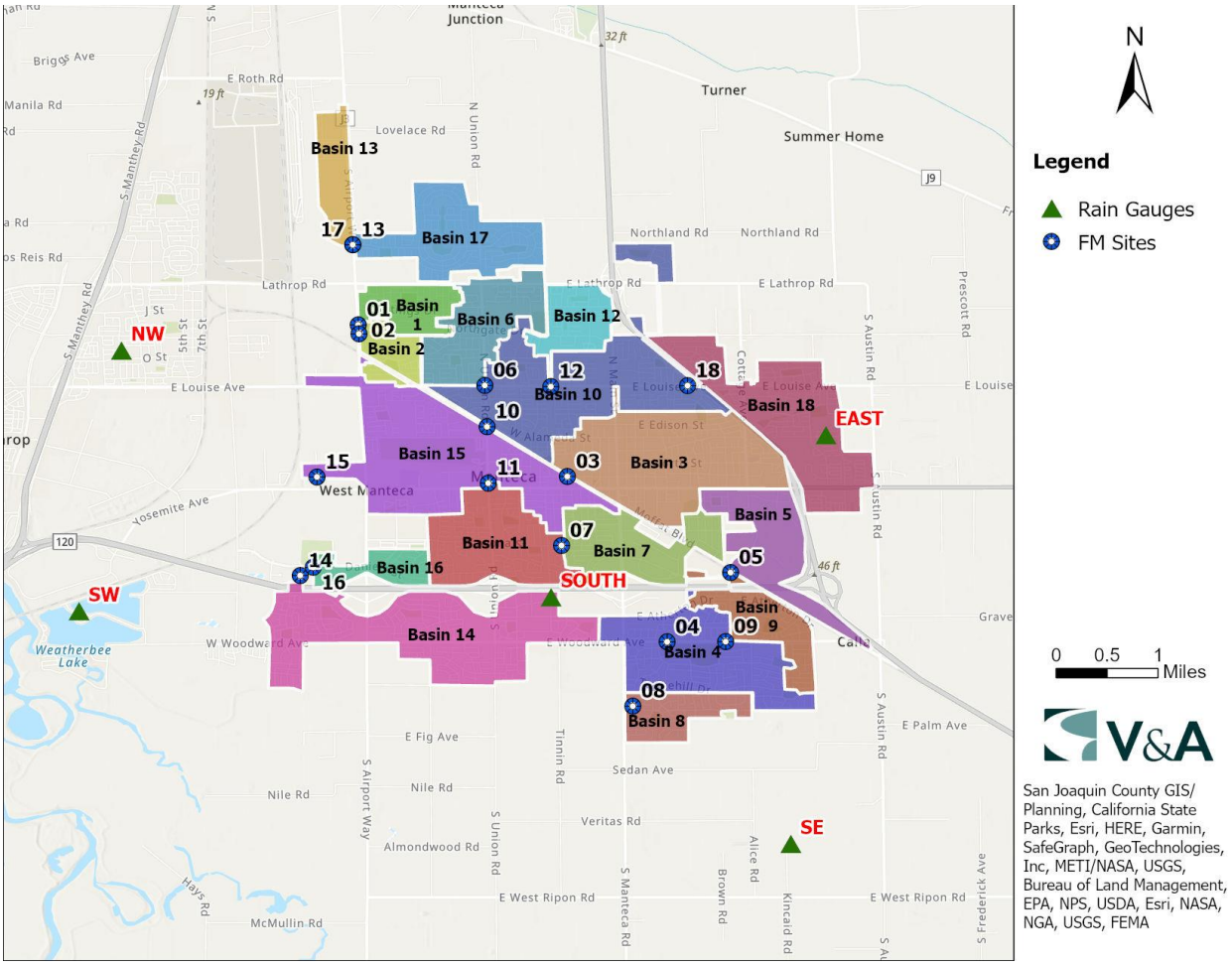


Figure 3-1. Location of Rain Gauges, Flow Sites and Basins

[3] Weather Underground (wunderground.com) collects data from 180,000+ weather stations across the country, including Automated Surface Observation System (ASOS) at airports, personal weather stations (PWS), and Meteorological Assimilation Data Ingest System (MADIS) managed by the National Oceanic and Atmospheric Administration (NOAA). While V&A has no direct control over the rain gauges, V&A performs additional QA/QC on the data to ensure its suitability for use.

3.1.2 Flow Study Rainfall Data

The one main rainfall event (3/27/22 – 3/28/22) that elicited a solid I/I response over the flow monitoring period is illustrated in Figure 3-2. It can be seen that the intensity of the identified rain event is much higher than other rain events during the study period.

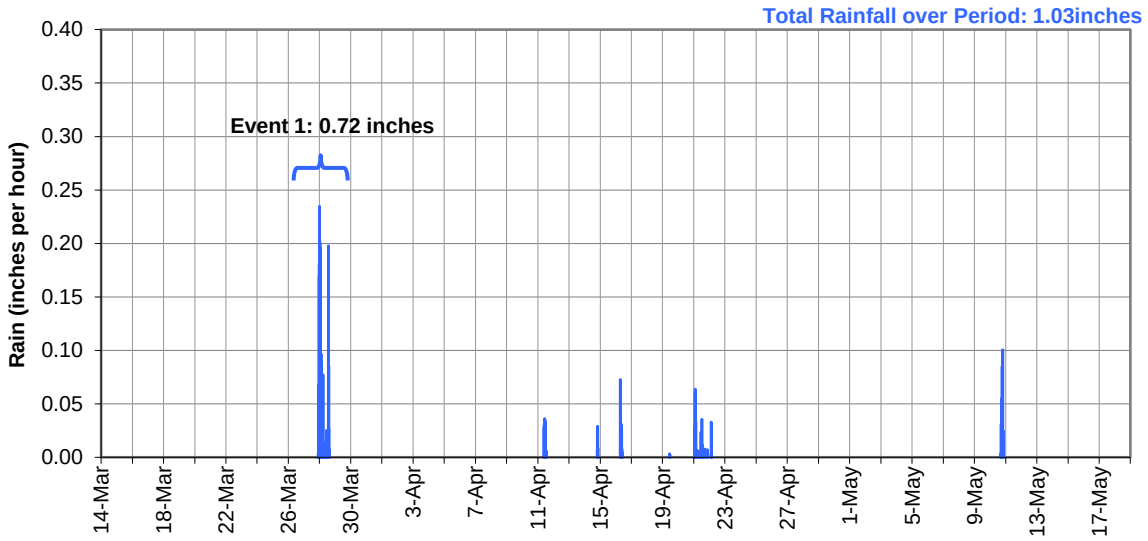


Figure 3-2. Rainfall Monitoring – Triangulated to City Hall of Manteca

Table 3-1 shows the precipitation of the identified rainfall event and whole monitoring period for each rain gauge. The data showed that intensity of rain event 1 is uniform across the region and its precipitation is about 60% of the total precipitation during the flow monitoring period.

Table 3-1. Summary of Rainfall Data

Rain Gauge	Rain Event 1 (in) (3/27/22 – 3/28/22)	Monitoring Period Total (in)
NW	0.71	1.17
EAST	0.61	0.94
SW	0.55	0.98
SOUTH	0.77	1.06
SE	0.76	1.06

Figure 3-3shows the rain accumulation plot of the period of rainfall, as well as the historical average rainfall,[4] triangulated to the City centroid during this project duration. The cumulative precipitation for the average of the rain gauges was **40%** of the historical precipitation for the duration of the flow monitoring.

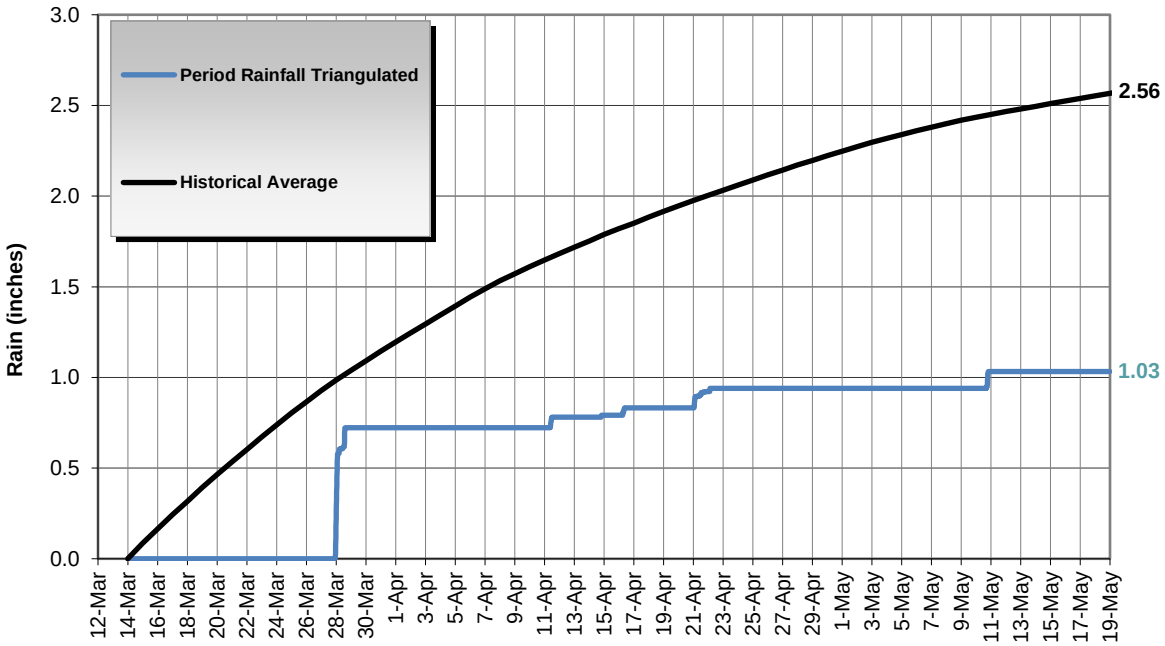


Figure 3-3. Rainfall Accumulation Plot –Rain Gauges triangulated to City Hall of Manteca

[4] Historical data taken from the WRCC (Station 44997 in Livermore): http://www.wrcc.dri.edu/summary/climsmnca.html

3.1.3 Regional Rainfall Event Classification

It is important to classify the relative size of a major storm event that occurs throughout a flow monitoring period[5]. Rainfall events are classified by intensity and duration. Based on historical data, frequency contour maps for storm events of given intensity and duration have been developed by the NOAA for all areas within the continental United States (Figure 3-4).

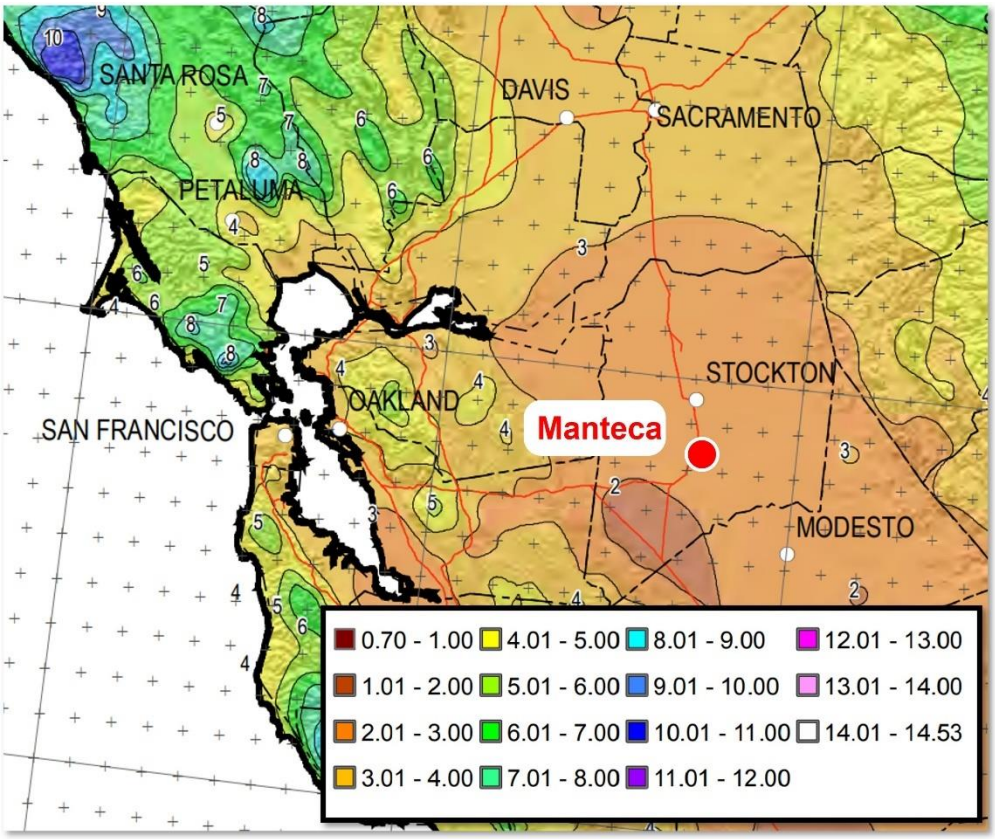


Figure 3-4. NOAA Northern California Rainfall Frequency Map

For example, the NOAA Rainfall Frequency Atlas[6] classifies a 10-year, 24-hour storm event at the rain gauge location NW as **2.19** inches. This means that in any given year, at this specific location, there is a 10% chance that 2.19 inches of rain will fall in any 24 hours.

From the NOAA frequency maps, for a specific latitude and longitude, the rainfall densities for period durations ranging from 1 hour to 20 days are known for rain events ranging from 1-year to 10-year intensities. These are plotted to develop a rain event frequency map specific to each rainfall monitoring site. Superimposing the peak measured densities for the rainfall events on the rain event frequency plot determines the classification of the rainfall event. Table 3-2 shows the peak classifications for each rain event at each rain gauge location. Figure 3-5 illustrates the rain event classification plot at gauge location Outer SSE as an example. The following items are noted:

[5] Sanitary sewers are often designed to withstand I/I contribution to sanitary flows for specific-sized "design" storm events.

[6] NOAA Western U.S. Precipitation Frequency Maps Atlas 14, Volume 6, 2011: ftp://hdsc.nws.noaa.gov/pub/hdsc/data/sw/ca10y24h.pdf

- Event 1 was classified as a <1-Yr rainfall event by the NW, EAST, and SW rain gauge, and it was classified as a 1-Yr, 3-Hour rain event by SOUTH and SE event.

Table 3-2. Rainfall Events Classification

Rain Gauge	Rain Event #1 Classification
NW	<1-Yr
EAST	<1-Yr
SW	<1-Yr
SOUTH	1-Yr, 3-Hour
SE	1-Yr, 3-Hour

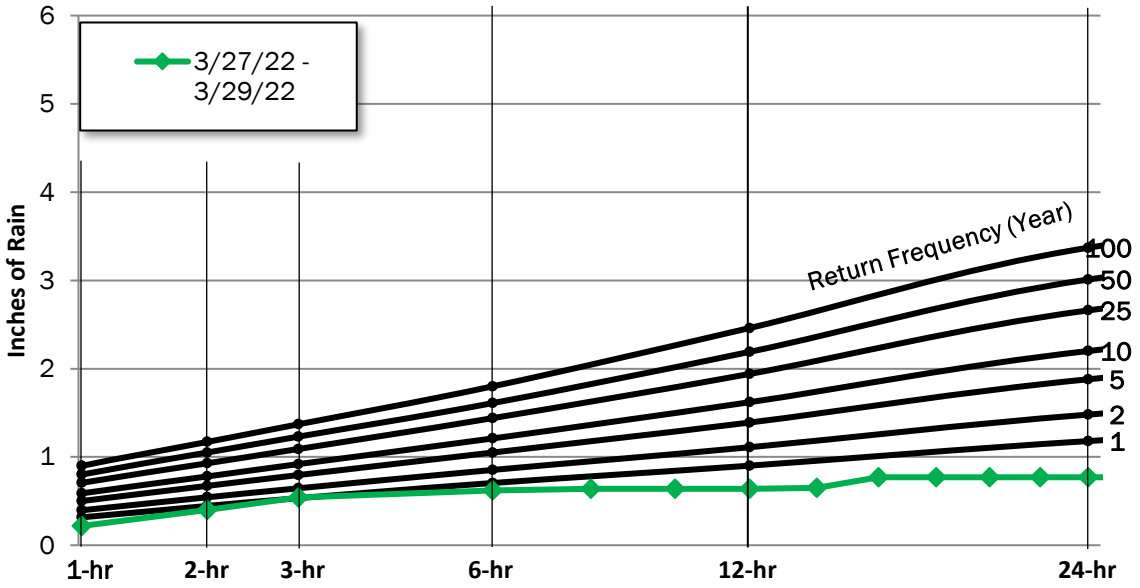


Figure 3-5. Rainfall Event Classification – 24-Hour Period (Rain Gauge South)

3.1.4 Rain Gauge Triangulation Distribution

The rainfall affecting the sanitary sewer collection system basins must be calculated based on the proximity to the rain gauge locations. The mean precipitation for each site's upstream basin was calculated by taking data from the rain gauges and using the inverse distance weighting (IDW) method. IDW is an interpolation method that assumes the influence of each rain gauge location diminishes with distance. The center of an upstream basin[7] is identified, and a weighted triangulated average is taken of the precipitation data from nearby rain gauge locations.

The IDW function is as follows:

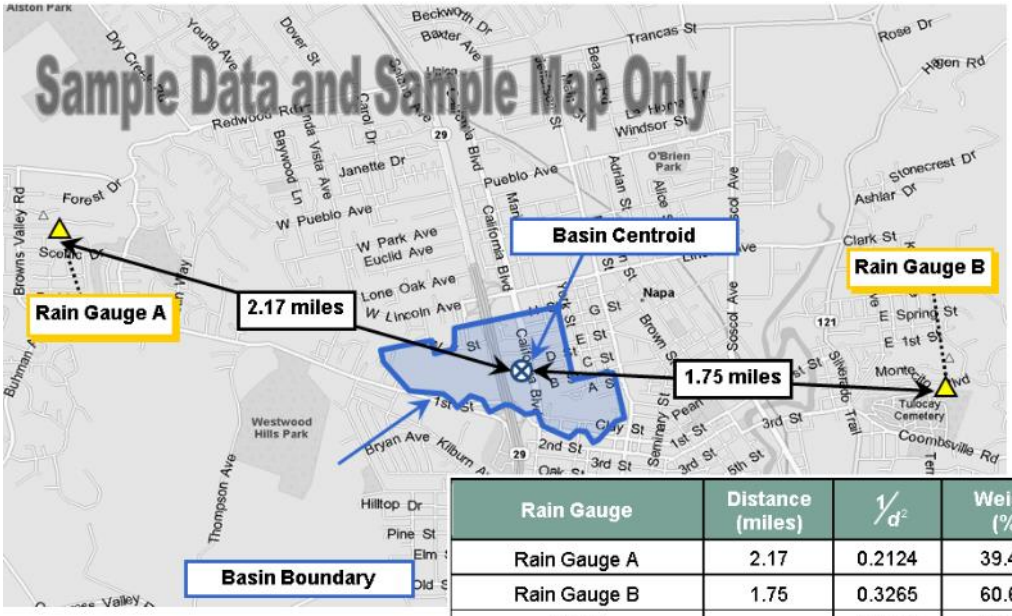
[7] Note that the full basin upstream of the site was used instead of the isolated basins as the rain data will be compared to the flow at each site

$$weight(d) = \frac{1/d^p}{\sum 1/d^p},$$

where: d = distance
p = power ($p > 0$)

The value of p is user-defined. The most common choice for hydrological studies of watershed areas is $p = 2$.

Figure 3-6 illustrates the IDW method with sample data. The rain gauge distribution as calculated for each flow monitoring basin is shown in Table 3-3.



Rain Gauge	Distance (miles)	$1/d^2$	Weight (%)
Rain Gauge A	2.17	0.2124	39.4%
Rain Gauge B	1.75	0.3265	60.6%
Totals		**0.5389**	**100%**

Figure 3-6. Rainfall Inverse Distance Weighting Method

Table 3-3. Rain Gauge Distribution per Monitoring Site

Monitoring Site	NW	EAST	SW	SOUTH	SE
Site 1	50.0%	21.8%	0.0%	28.2%	0.0%
Site 2	50.5%	18.6%	0.0%	30.9%	0.0%
Site 3	4.8%	59.8%	0.0%	35.4%	0.0%
Site 4	0.0%	36.6%	0.0%	46.3%	17.1%
Site 5	0.0%	68.6%	0.0%	31.4%	0.0%
Site 6	32.5%	32.4%	0.0%	35.2%	0.0%
Site 7	0.0%	18.5%	0.0%	81.5%	0.0%
Site 8	0.0%	0.0%	0.0%	51.6%	48.4%
Site 9	0.0%	54.1%	0.0%	35.7%	10.3%
Site 10	13.5%	59.8%	0.0%	26.7%	0.0%
Site 11	1.8%	11.2%	2.0%	85.0%	0.0%
Site 12	19.1%	48.6%	0.0%	32.3%	0.0%
Site 13	78.5%	21.5%	0.0%	0.0%	0.0%
Site 14	0.0%	19.3%	4.2%	60.7%	15.8%
Site 15	17.9%	39.4%	2.4%	40.2%	0.0%
Site 16	13.8%	8.2%	20.8%	57.2%	0.0%
Site 17	43.0%	29.8%	0.0%	27.2%	0.0%
Site 18	0.0%	99.0%	0.0%	1.0%	0.0%
System	12.7%	33.1%	3.2%	46.4%	4.5%

3.2 Flow Monitoring

3.2.1 Regarding Pump Stations

In this study, four sites were found to be under the influence of pump stations, Site 4, Site 5, Site 13, and Site 14. Figure 3-7 and Figure 3-8 showcased the pump station's influence and I/I during the rain event on Site 4 and Site 13 as an example. It can be observed that both sites exhibited significant flow spikes, however they are not related to the rain event. Given the purpose of this study, those two sites will be excluded from I/I analysis and ranking.

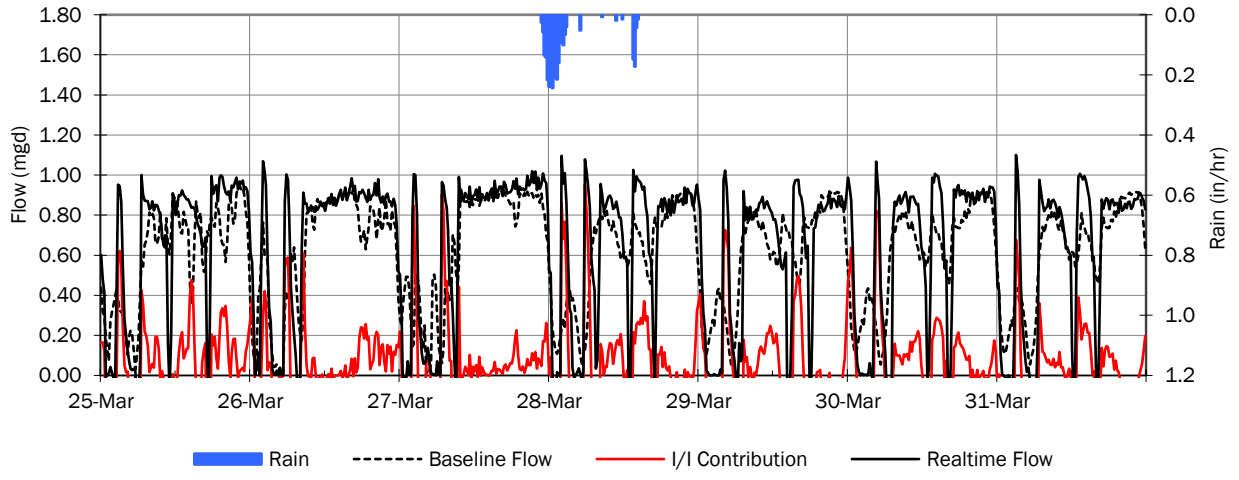


Figure 3-7. Flow and I/I, Site 4

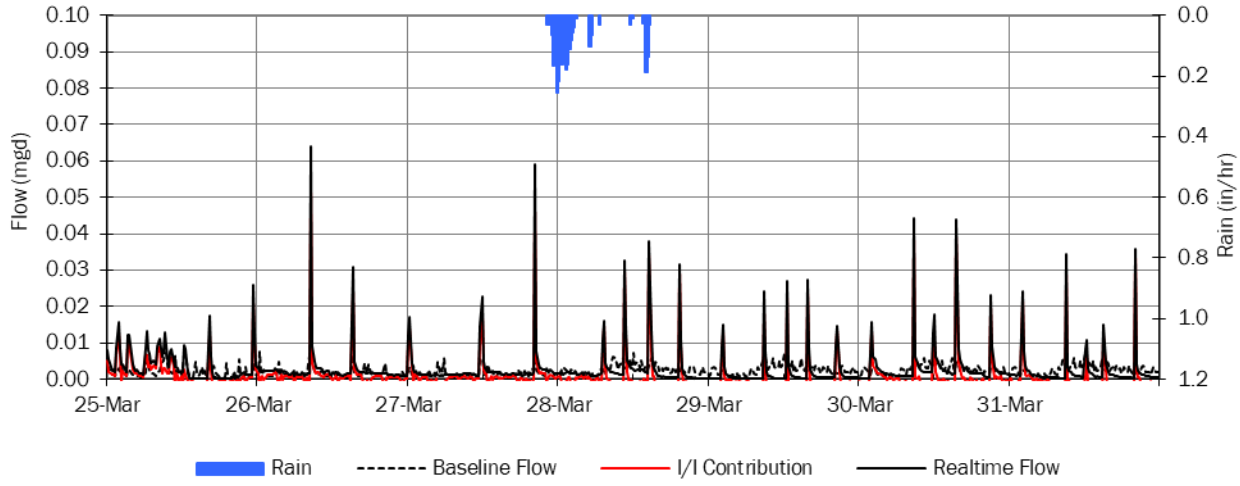


Figure 3-8. Flow and I/I, Site 13

3.2.2 Average Flow Analysis

Average dry weather flow (ADWF) curves were established during dry days when I/I had the least impact on the baseline flow. Table 3-4 summarizes the dry weather flow data measured for this study. ADWF curves for each site can be found in Appendix A. In Table 3-4, the observed sedimentation during site visit are highlighted in ***RED.*** The table provides the collection system flow at the flow monitoring sites when there is no influence from the rain. Figure 3-9 shows a flow schematic of the average.

Table 3-4. Dry Weather Flow

Monitored Site	Sediment (in.)	Average d/D Ratio	Mon-Thu ADWF (MGD)	Friday ADWF (MGD)	Saturday ADWF (MGD)	Sunday ADWF (MGD)	Overall ADWF (MGD)
Site 1	none	0.09	0.121	0.124	0.126	0.137	0.124
Site 2	none	0.10	0.091	0.089	0.095	0.100	0.093
Site 3	none	0.05	0.253	0.251	0.255	0.251	0.253
Site 4	none	0.04	0.606	0.606	0.624	0.651	0.615
Site 5	none	0.05	0.049	0.051	0.044	0.044	0.048
Site 6	none	0.06	0.136	0.154	0.159	0.160	0.145
Site 7	none	0.05	0.157	0.154	0.151	0.153	0.155
Site 8	none	0.06	0.092	0.091	0.097	0.107	0.094
Site 9	*0.5*	0.03	0.377	0.364	0.353	0.391	0.374
Site 10	none	0.07	1.481	1.466	1.521	1.593	1.501
Site 11	*5*	0.02	0.524	0.511	0.532	0.552	0.527
Site 12	none	0.12	0.109	0.106	0.109	0.117	0.110
Site 13	none	0.00	0.003	0.002	0.002	0.002	0.002
Site 14	none	0.02	1.286	1.264	1.335	1.413	1.308
Site 15	none	0.02	3.291	3.221	3.386	3.290	3.294
Site 16	none	0.04	0.087	0.088	0.105	0.105	0.092
Site 17	none	0.03	0.229	0.235	0.238	0.238	0.232
Site 18	none	0.05	0.388	0.387	0.407	0.425	0.396
System	n/a	n/a	4.664	4.574	4.826	4.807	4.695

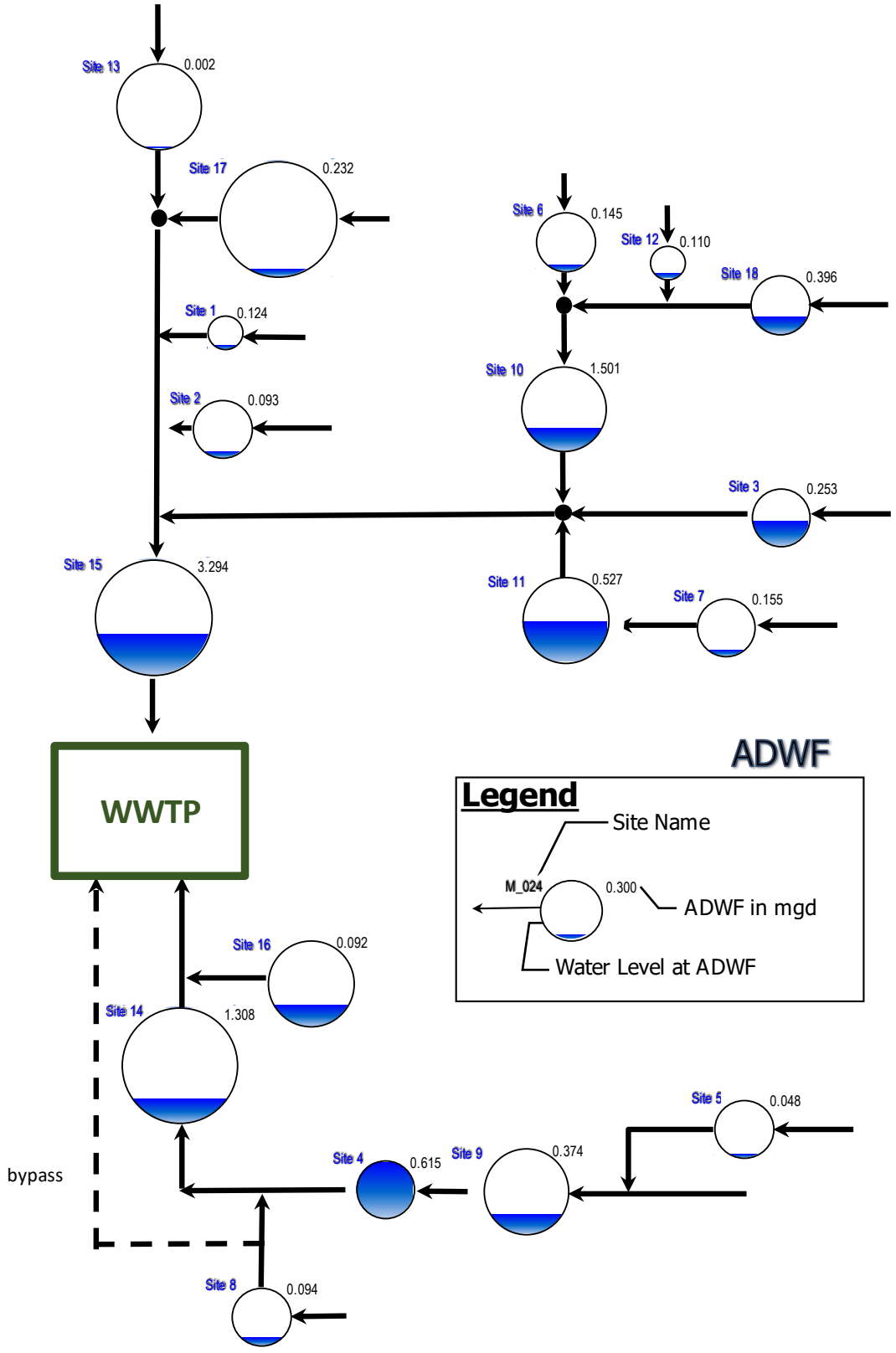


Figure 3-9. Average Dry Weather Flow (Flow Schematic)

3.2.3 Peak Measured Flows and Pipeline Capacity Analysis

Peak measured flows and the hydraulic grade line data (flow depths) are important to understanding the capacity limitations of a collection system. The peak flows and flow levels are the peak measurements as taken across the entirety of the flow monitoring period. Peak flows and levels may not correspond to a rainfall event or occur at the same time.

The following capacity analysis definitions will be used:

- **Peaking Factor (PF)** is defined as the peak measured flow divided by the average dry weather flow (ADWF). Peaking factors are influenced by many factors, including size and topography of the tributary area, flow attenuation, flow restrictions, characteristics of I/I entering the collection system, and hydraulic features such as pump stations.
  - For this report, peaking factors are reported, and PF > 5 are highlighted in ***RED***[8]; however, the City should refer to City standards when evaluating peaking factors. Peaking factor data should be used at the discretion of the City Engineer
- **d/D Ratio** is the peak measured depth of flow (d) divided by the pipe diameter (D). The d/D ratio for each site is computed based on the maximum depth of flow for the study. Standards for d/D ratio vary from agency to agency but typically range between d/D ≤ 0.5 and d/D ≤ 0.75
  - For this report, d/D ratios > 0.75 are highlighted in ***RED***; however, the City should refer to City standards when evaluating d/D ratios, to be used at the discretion of the City Engineer.

Table 3-5 summarizes the peak recorded flows, levels, *d/D* ratios, and peaking factors per site during the flow monitoring period. Results of note have been shaded in ***RED***. Capacity analysis data are presented on a site-by-site basis and represents the hydraulic conditions only at the site locations; hydraulic conditions in other areas of the collection system will differ.

Table 3-5. Capacity Analysis Summary

Monitoring Site	ADWF (MGD)	Peak Measured Flow (MGD)	Peaking Factor	Pipe Diameter, *D (IN)*	Peak Measured Depth	*Max d/D Ratio*	Surcharge above pipe crown (FT)	Rim Elev (FT) [A]	Invert Elev (FT) [A]	Rim to Invert (FT) [A]	Rim to Surcharge (FT) [A]
Site 1	0.12	0.31	2.5	12	18.1	***1.51***	***0.51***	23.3	4.96	18.34	16.83
Site 2	0.09	0.33	3.5	15	18.2	***1.21***	***0.27***	22.2	5	17.20	15.68
Site 3	0.25	0.48	1.9	15	9.2	0.62	-	35.7	0 (unk)	unk	-
Site 4	0.61	2.60	4.2	18	32.6	***1.81***	***1.22***	39.77	14.01	25.76	23.04
Site 5	0.05	0.17	3.7	18	3.0	0.17	-	39.91	23.38	16.53	-
Site 6	0.15	2.06	***14.2***	21	8.1	0.39	-	31.02	18.01	13.01	-
Site 7	0.16	0.58	3.7	24	4.6	0.19	-	34.81	18.6	16.21	-
Site 8	0.09	0.21	2.2	17.5	3.4	0.19	-	35.7	17.08	18.62	-
Site 9	0.37	0.97	2.6	27	9.3	0.34	-	42.22	15.85	26.37	-
Site 10	1.50	5.33	3.6	30	42.7	***1.42***	***1.06***	34.22	15.13	19.09	15.53
Site 11	0.53	2.33	4.4	30	80.1	***2.67***	***4.17***	28.84	0 (unk)	unk	-
Site 12	0.11	0.44	4.0	12	4.4	0.37	-	35.45	20.75	14.7	-
Site 13	0.002	0.20	***84.2***	30	2.9	0.10	-	23.89	5.26	18.63	-
Site 14	1.31	2.24	1.7	48	18.2	0.38	-	19.33	-2.67	22	-
Site 15	3.29	6.11	1.9	54	30.6	0.57	-	0 (unk)	0 (unk)	unk	-
Site 16	0.09	0.31	3.3	15	5.6	0.37	-	24.72	1.16	23.56	-
Site 17	0.23	1.03	4.5	40	10.1	0.25	-	23.89	3.86	20.03	-
Site 18	0.40	0.79	2.0	21	8.2	0.39	-	39.36	0 (unk)	unk	-

[A] *From City 's GIS*

Unk = unknown

The following capacity analysis results are noted:

- Peaking Factors:
  - Sites 6 and 13 had peaking factors over 5.
  - Site 6 peak level, velocity, and flow occurred during a dumping event prior to a rainfall event, perhaps due to an industrial sewer release (see Figure 3-10). It occurred only once during the flow monitoring period of over 2 months, and probably does not need further investigation.
  - The peaking factor of Site 13 may be skewed high due to low ADWF numbers.
- d/D Ratio:
  - Sites 1, 2, 4 10, and 11 surcharged during the study.
  - Site 11 surcharged 4.17 feet above the pipe crown.

Figure 3-11 and Figure 3-12 show bar graph summaries of the peaking factors and d/D ratios, respectively. Figure 3-13 shows the schematic diagram of the peak measured flows in each section with peak flow levels.

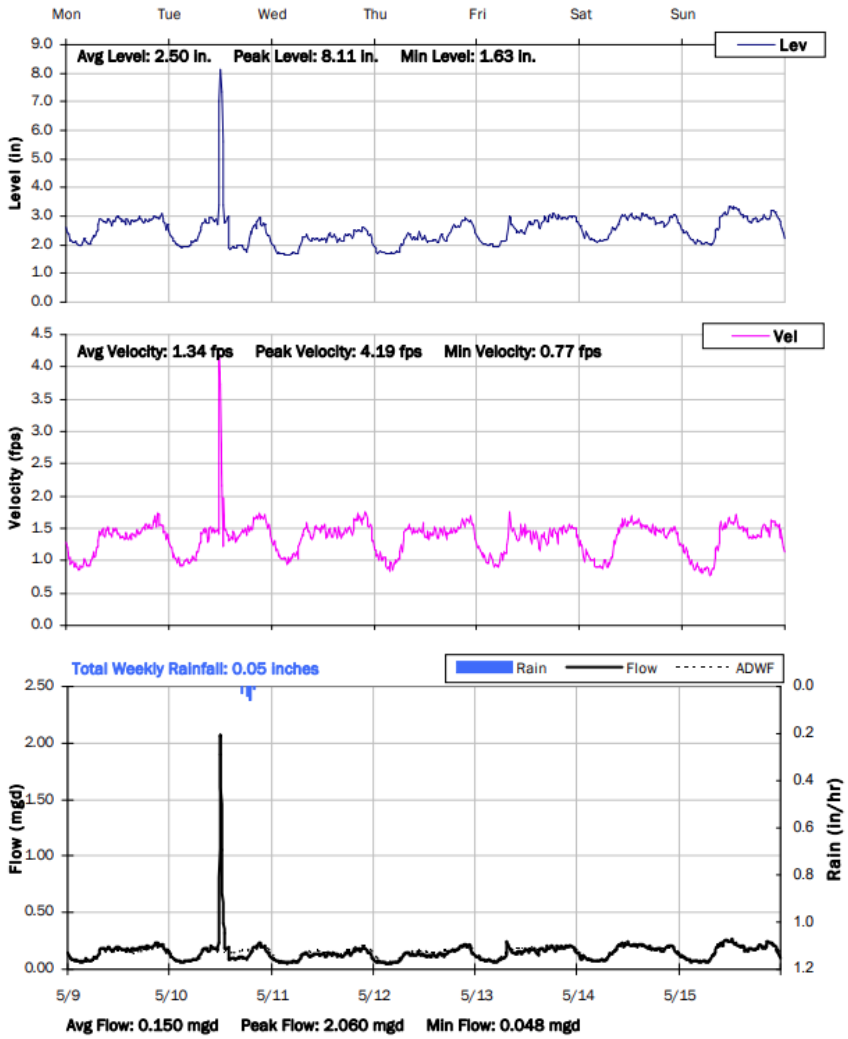


Figure 3-10. Site 6 Dumping Event

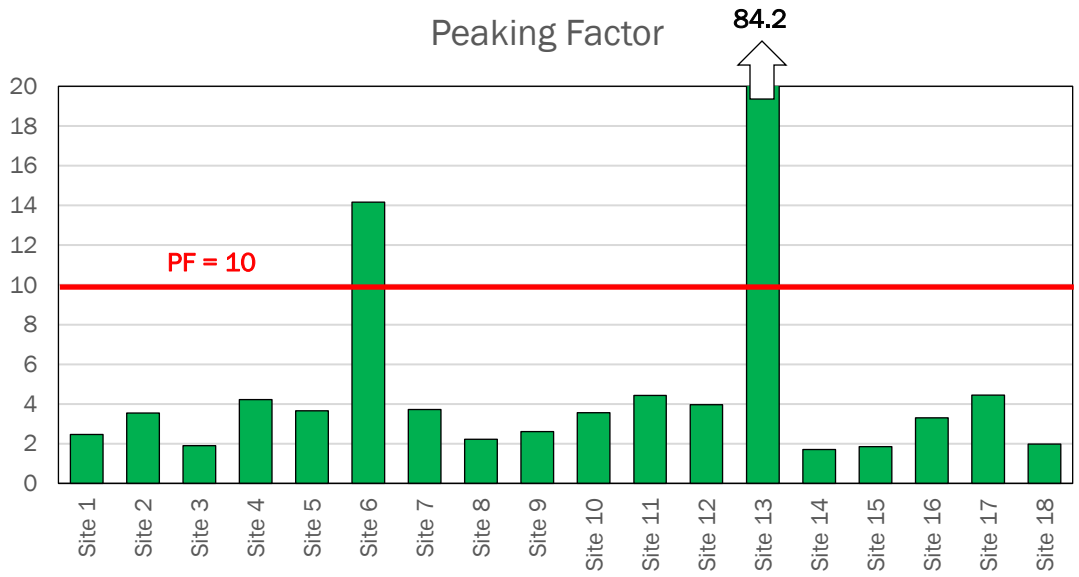


Figure 3-11. Peaking Factors

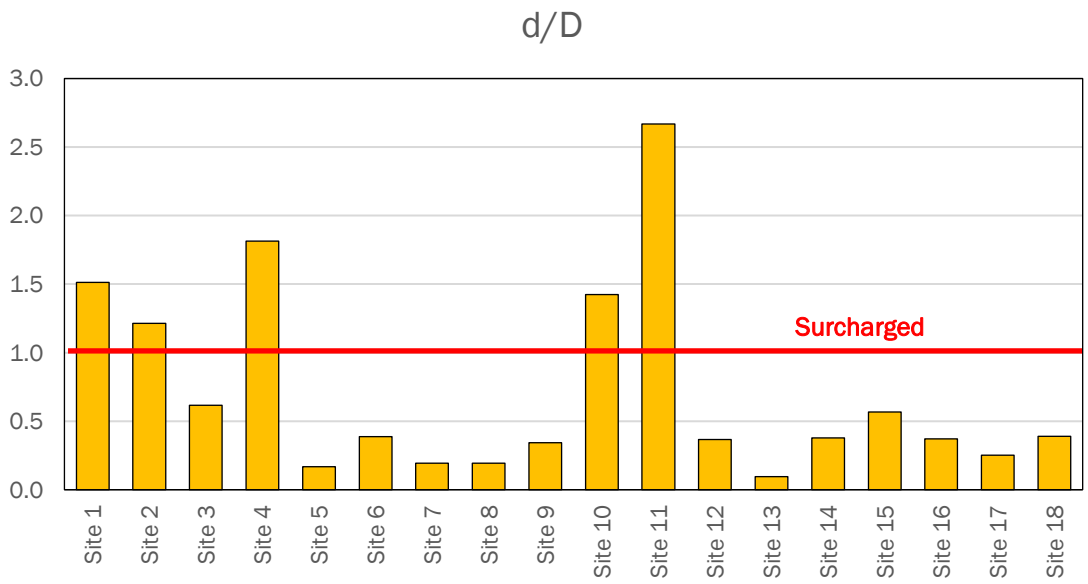


Figure 3-12. Capacity Summary: Max d/D Ratios

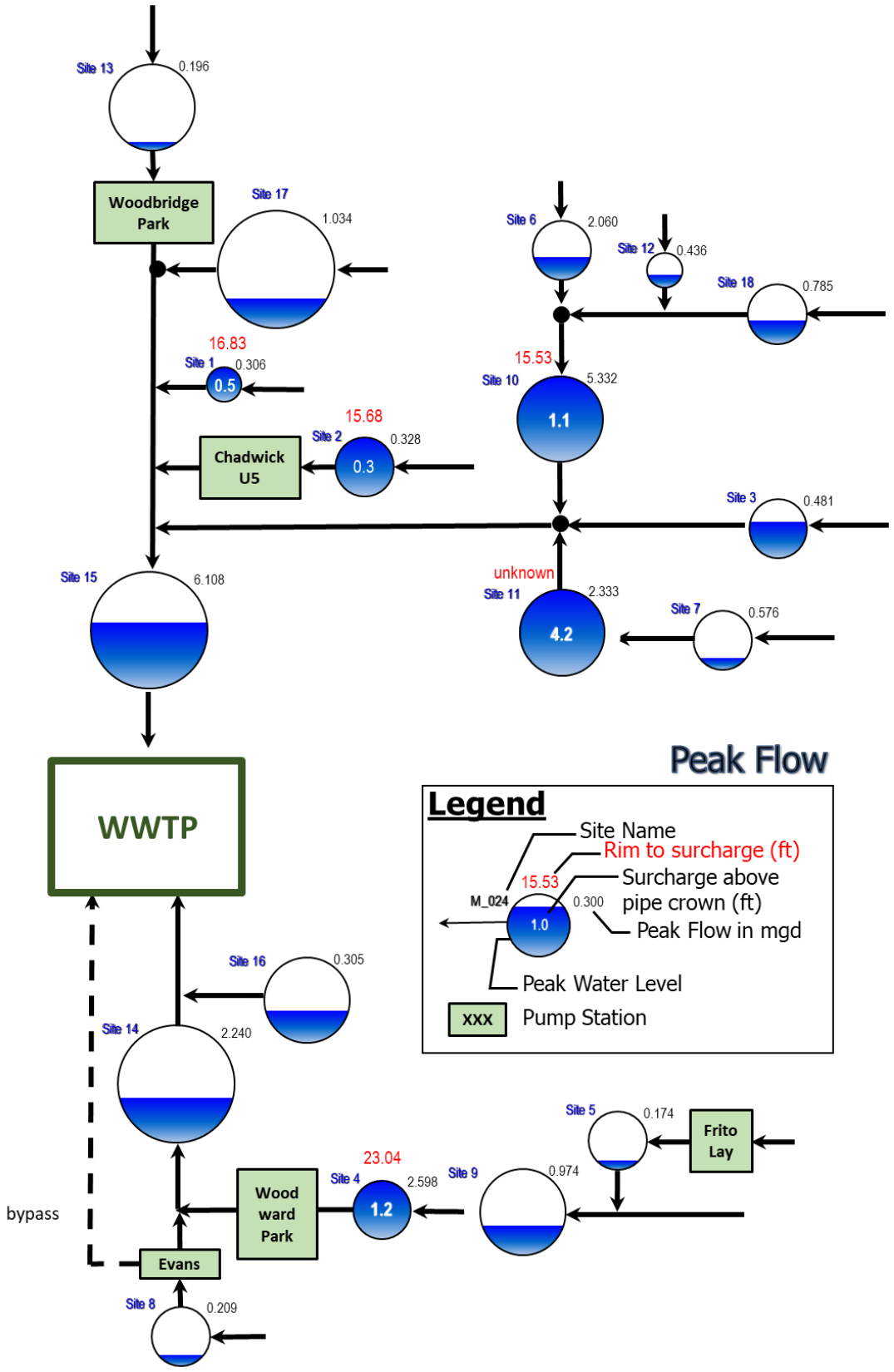


Figure 3-13. Peak Measured Flow (Flow Schematic)

3.3 Inflow and Infiltration

3.3.1 Preface

Items relevant to the analysis in this study are noted below and referenced in Figure 3-14:

I/I Isolation: The I/I flow rate is the real-time flow less the estimated average dry weather flow rate (shown below as the RED line).

Inflow: Inflow is usually recognized graphically by large-magnitude, short-duration spikes immediately following a rain event. The peak inflow rate is the highest spike in the isolated I/I hydrograph immediately following the evaluated rainfall event.

RDI: RDI is typically taken as the average I/I flow rate measured approximately 24 to 36 hours after the rainfall event has concluded. For this study, no significant RDI was detected. Taking Site 6, for example, the I/I dropped to zero immediately after the peak of the rain event (see Figure 3-14). This may be due to the low permeability of soil, which failed to hold water during the rain event. As a result, no RDI study was conducted for this report.

Combined I/I: the totalized volume (in gallons) of both inflow and RDI over the course of a rainfall event (shown below as the orange area).

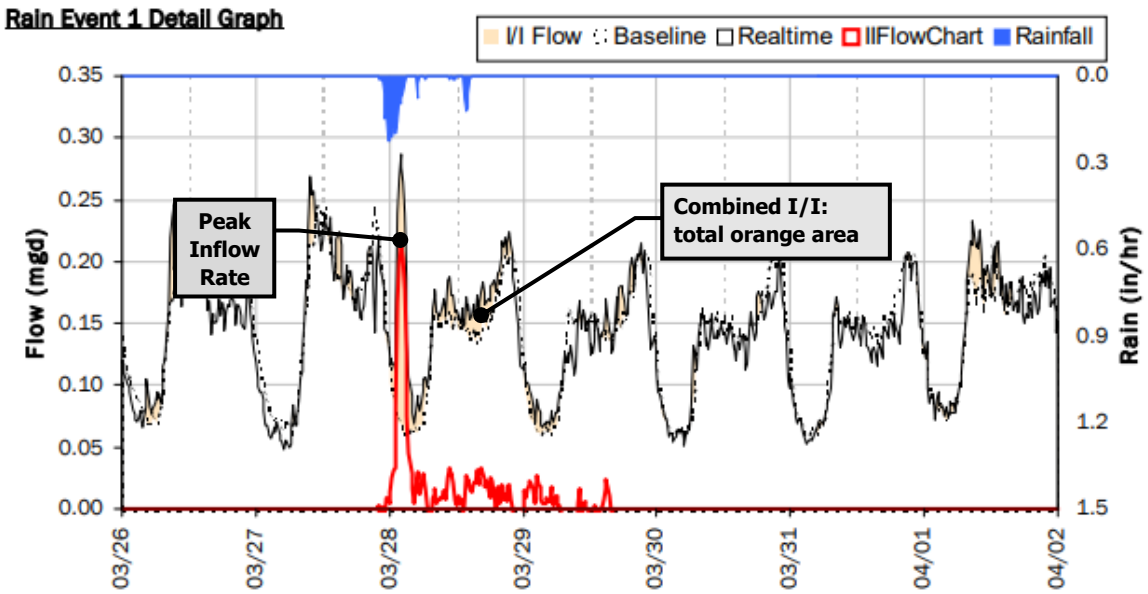


Figure 3-14. I/I Isolation, Site 6

3.3.2 Inflow Results Summary

Inflow is storm water discharged into the sewer system through direct connections such as downspouts, area drains, cross-connections to catch basins, etc. These sources transport rainwater directly into the sewer system, and the corresponding flow rates are tied closely to the intensity of the storm. This component of I/I often causes a peak flow problem in the sewer system and often dictates the required capacity of downstream pipes and transport facilities to carry these peak instantaneous flows.

Table 3-6 and Figure 3-15 summarizes the peak measured inflow and inflow analysis results for the relevant flow monitoring basins; the top 3 ranked basins have been shaded RED. Figure 3-16 shows a summary of the inflow analysis results per basin.

The following inflow results are noted:

- Basins 7, 6, and 18 had the highest weighted, normalized peak I/I rates, an indicator of high inflow upstream from the flow monitoring basin; where Basin 7's peak I/I was clearly higher than the other basins, making it a priority if peak I/I is important for the City.
- Basin 15 was excluded from the I/I analysis as most of its peak I/I response was from its upstream basins instead of the isolated basin. Basins 4, 5, 13 and 14 were also excluded due to the pump station influence.

Table 3-6. Results and Rankings of Inflow Analysis

Basins	Basin Acre	Basin ADWF (mgd)	Inflow Rate (mgd)	Peak I/I per Acre (gpd/Acre)	Peak I/I per ADWF Ratio	Overall Inflow Ranking
Basin 1	207	0.124	0.041	198	0.3	9
Basin 2	150	0.093	0.033	219	0.4	8
Basin 3	892	0.253	0.262	293	1.0	5
Basin 4	646	0.241	*n/a*	*n/a*	*n/a*	*n/a*
Basin 5	427	0.048	*n/a*	*n/a*	*n/a*	*n/a*
Basin 6	416	0.145	0.223	535	1.5	2
Basin 7	426	0.155	0.476	1,117	3.1	1
Basin 8	228	0.094	0.028	121	0.3	12
Basin 9	290	0.326	0.187	643	0.6	4
Basin 10	968	0.849	0.297	307	0.3	6
Basin 11	533	0.372	0.053	100	0.1	13
Basin 12	228	0.110	0.036	156	0.3	10
Basin 13	209	0.002	*n/a*	*n/a*	*n/a*	*n/a*
Basin 14	992	0.599	*n/a*	*n/a*	*n/a*	*n/a*
Basin 15	1020	0.562	*n/a*	*n/a*	*n/a*	*n/a*
Basin 16	162	0.092	0.029	176	0.3	10
Basin 17	517	0.232	0.143	276	0.6	6
Basin 18	749	0.396	0.365	487	0.9	3

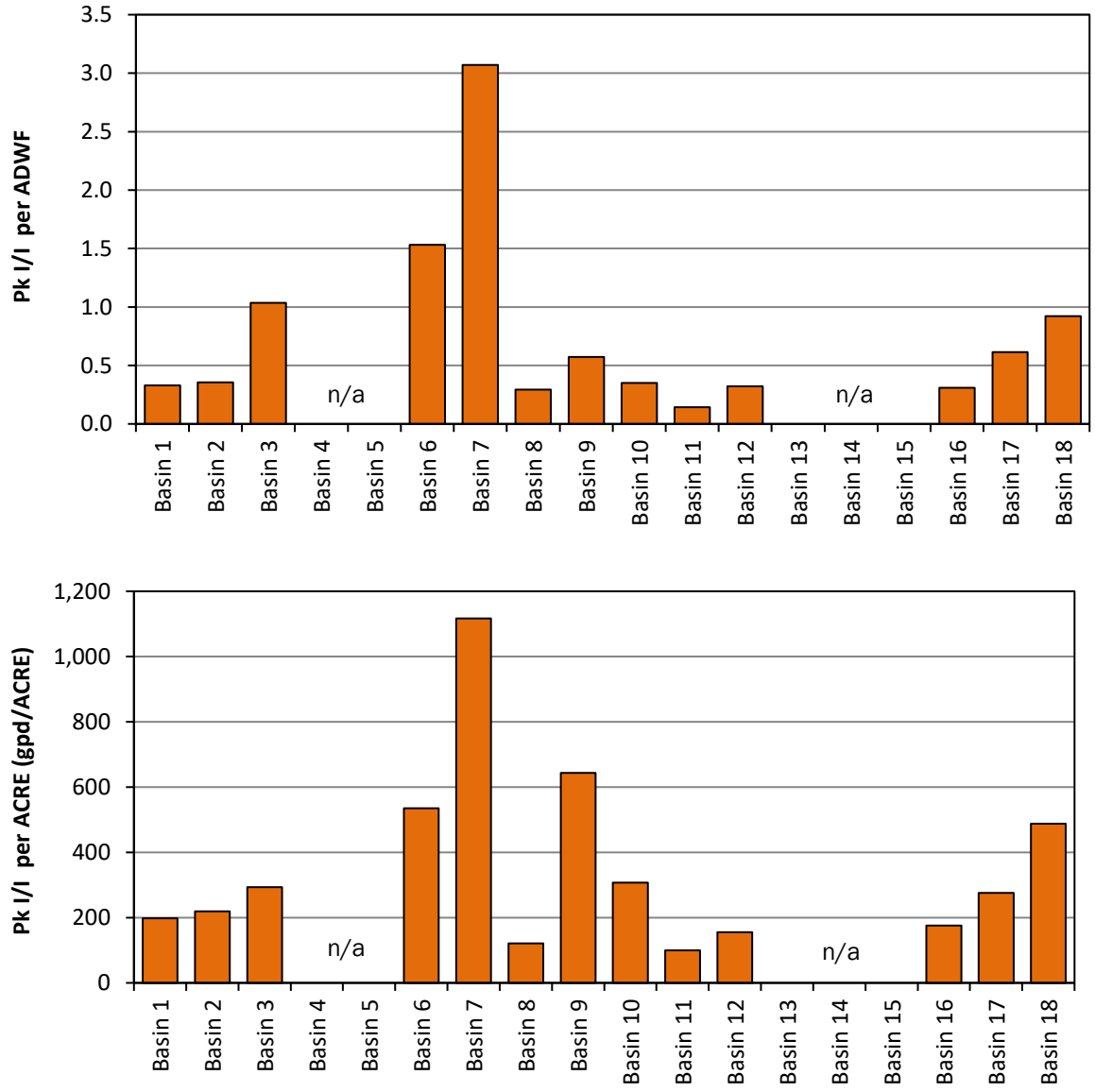


Figure 3-15. Bar Graph: Inflow Summary

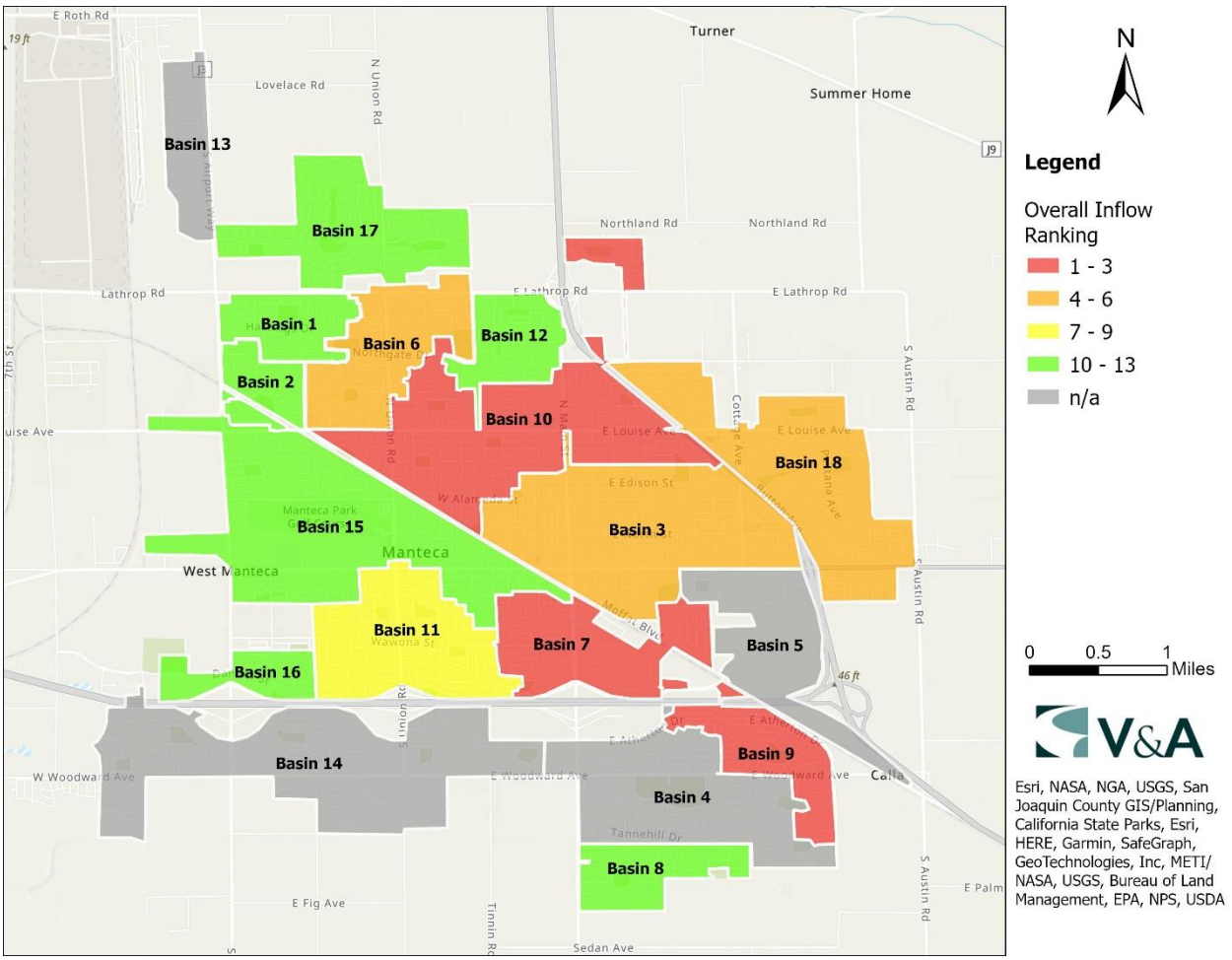


Figure 3-16. Overall Inflow Ranking

3.3.3 Combined I/I Results Summary

Combined I/I analysis considers the totalized volume (in gallons) of both inflow and rainfall-dependent infiltration throughout a storm event.

Table 3-7 and Figure 3-17 summarize the captured Total flow rates. The "Top 3" basins for each category have been shaded in RED. Figure 3-18 shows the results on a map.

The following combined I/I results are noted:

- Respectively in order, Basins 7, 10, and 9 had the highest weighted, normalized combined rates, an indicator of high combined I/I upstream from the flow monitoring basin.
- Respectively in order, Basin 15 was excluded from the I/I analysis as most of its I/I response was from its upstream basins instead of the isolated basin. Basins 4, 5, 13 and 14 were also excluded due to the pump station influence.
- Basins 1, 2, 8, 12, 16, and 17 showed a negligible amount of combined I/I. "Negligible" means not quantifiable compared to regular noise.

Table 3-7. Combined I/I Analysis Summary

Monitoring Basin	ADWF (mgd)	Basin Acreage	Combined I/I (gallons)	Combined I/I per-Acre (R-Value)	Combined I/I per-ADWF (MGal per in-Rain per MGD)	Overall Combined I/I Ranking
Basin 1	0.124	207	*Negligible*	*Negligible*	*Negligible*	8
Basin 2	0.093	150	*Negligible*	*Negligible*	*Negligible*	8
Basin 3	0.253	892	30,500	0.19%	0.18	5
Basin 4	0.241	646	*n/a*	*n/a*	*n/a*	*n/a*
Basin 5	0.048	427	*n/a*	*n/a*	*n/a*	*n/a*
Basin 6	0.145	416	34,700	0.44%	0.34	4
Basin 7	0.155	426	58,900	0.69%	0.51	1
Basin 8	0.094	228	*Negligible*	*Negligible*	*Negligible*	8
Basin 9	0.326	290	49,400	0.88%	0.21	3
Basin 10	0.849	968	138,500	0.76	0.24	2
Basin 11	0.372	533	11,700	0.11%	0.04	7
Basin 12	0.110	228	*Negligible*	*Negligible*	*Negligible*	8
Basin 13	0.002	209	*n/a*	*n/a*	*n/a*	*n/a*
Basin 14	0.599	992	*n/a*	*n/a*	*n/a*	*n/a*
Basin 15	0.562	1020	*n/a*	*n/a*	*n/a*	*n/a*
Basin 16	0.092	162	*Negligible*	*Negligible*	*Negligible*	8
Basin 17	0.232	517	*Negligible*	*Negligible*	*Negligible*	8
Basin 18	0.396	749	34,700	0.28%	0.14	6

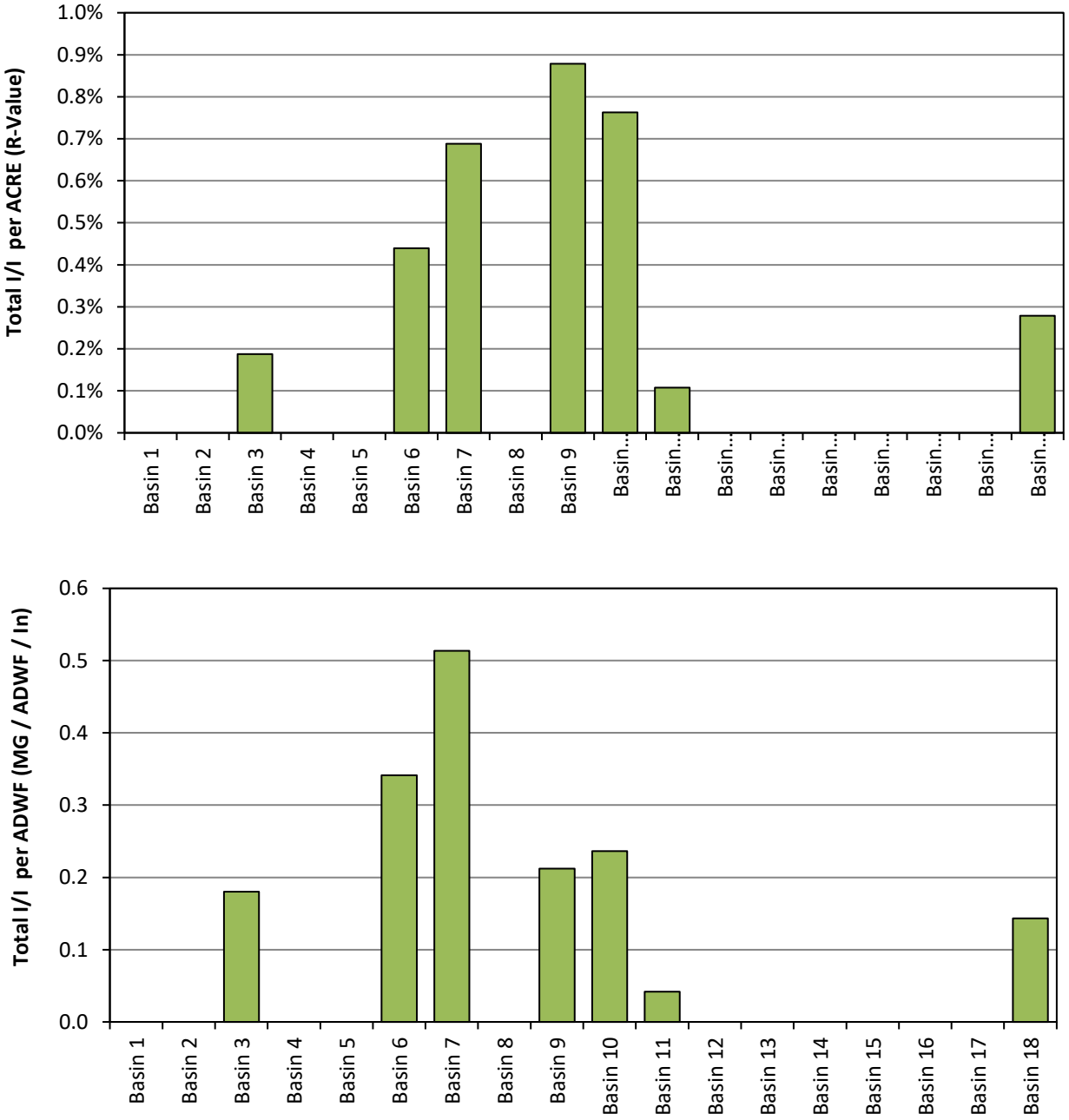


Figure 3-17. Bar Graphs: Combined I/I Analysis Summary

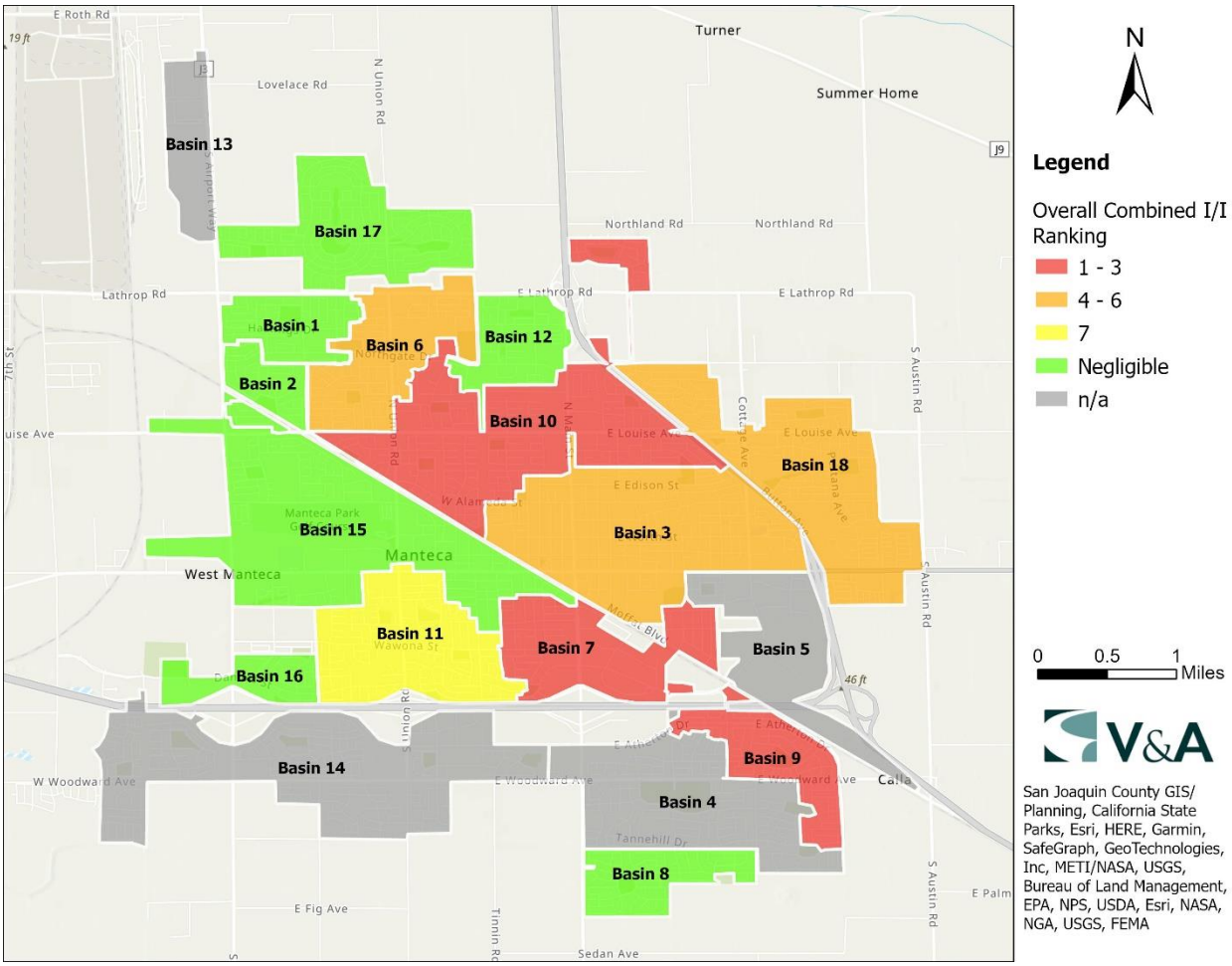


Figure 3-18. Overall Combined I/I Ranking

3.3.4 Groundwater Infiltration Results Summary

ADWF can be expected to have a predictable diurnal flow pattern. While each site is unique, experience has shown that, given a reasonable volume of flow and typical loading conditions, the daily flows fall into a predictable range when compared to the daily average flow. If a site has a large percentage of groundwater infiltration occurring during the periods of dry weather flow measurement, the amplitudes of the peak and low flows will be dampened[9].

It can be useful to compare the low-to-ADWF flow ratios for the flow monitoring sites. A site with abnormal ratios, and with no other reasons to suspect abnormal flow patterns (such as proximity to a pump station, treatment facilities, etc.), has a possibility of higher levels of groundwater infiltration in comparison to the rest of the collection system.

Figure 3-19 plots the low-to-ADWF flow ratios[10] against the ADWF flows for the relevant flow monitoring sites. The brown dashed line shows "typical" low-to-ADWF ratios per the Water Environment Federation (WEF). For this study, no basin showed evidence of ground water infiltration.

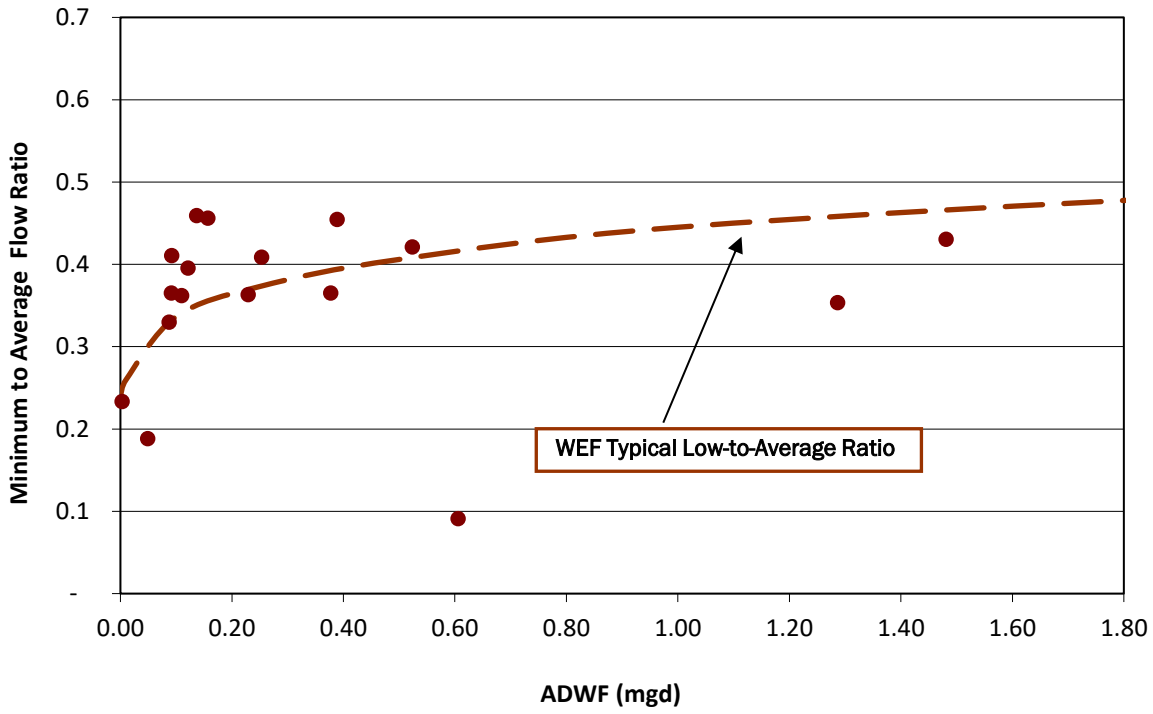


Figure 3-19. Minimum Flow Ratios vs ADWF[11]

[10] The Minimum to Average flow ratio is calculated by taking the minimum flow and dividing by the ADWF value (using the Mon-Thu ADWF curve).
[11] Due to attenuation, it should be expected that sites with larger flow volumes should not have quite the peak-to-average and low-to-average flow ratios as sites with lesser flow volumes. This is why the WEF typical trend line's slope is closer to 1.0 as the ADWF increases, as shown in the figure.

4 Recommendations

V&A advises that future I/I reduction plans consider the following recommendations:

1. **Master Plan and Model Implementation**: This study focuses on inflow and infiltration generation; the study results can be used to update the master plan and compare it with previous model assumptions and flow monitoring results.
    a. **Verify Interconnections and Overflows**: understanding the interconnections and overflows can help with the master plan, basin isolation, and I/I analysis.
2. **Capacity Analysis**: Five sites surcharged during the monitoring period, and four sites (sites 1,4,10, and 11) exceeded more than 0.5 feet about the pipe crown. Global capacity constraints will be addressed in the updated master plan. The following possible capacity concerns are noted:
    a. no site exceeded 0.5 d/D average dry weather level.
    b. 0.5 inch of sediment was found in site 9, and five (5) inches was found in site 11.
    c. Sites 1, 2, 4, 10, and 11 surcharged during this study. Among them, Site 11 had a high surcharge of 4.17 feet above the pipe crown. This is partially due to the high amount of sedimentation discovered inside the pipe. The surcharges did not always occur during wet weather.
    d. Site 4 was a smaller diameter (18-inches) compared to upstream Site 9 (27-inches) and acted as a bottleneck.
3. **Determine I/I Reduction Program**: The City should examine its I/I reduction needs to determine its needs and goals for a future I/I reduction program.
    a. If peak flows, sanitary sewer overflows, and pipeline capacity issues are of greater concern, then priority can be given to investigating and reducing sources of inflow within the basins with the greatest inflow problems. The highest inflow occurred within Basins 7, 6, and 18, where Basin 7's peak I/I was higher than the other basins, making it a priority if peak I/I is important for the City.
    b. If total infiltration and general pipeline deterioration are of greater concern, then the program can be weighted to investigate and reduce sources of infiltration within the basins with the greatest infiltration problems. The highest combined I/I occurred in Basins 7, 10, and 9. Additionally, no basin showed evidence of excessive GWI.
4. **I/I Investigation Methods**: Potential I/I investigation methods include the following:
    a. smoke testing.
    b. mini-basin flow monitoring.
    c. night-time reconnaissance work to (1) investigate and determine direct point sources of inflow, and (2) determine the areas and/or pipe reaches responsible for high levels of infiltration contribution.
    d. CCTV inspection.
5. **I/I Reduction Cost Effective Analysis**: The City should conduct a study to determine which is more cost-effective: (1) locating the sources of inflow/infiltration and systematically rehabilitating or replacing the faulty pipelines; or (2) continued treatment of the additional rainfall dependent I/I flow.

Appendix A
Flow Monitoring Sites: Data, Graphs, Information

Monitoring Site: Site 1

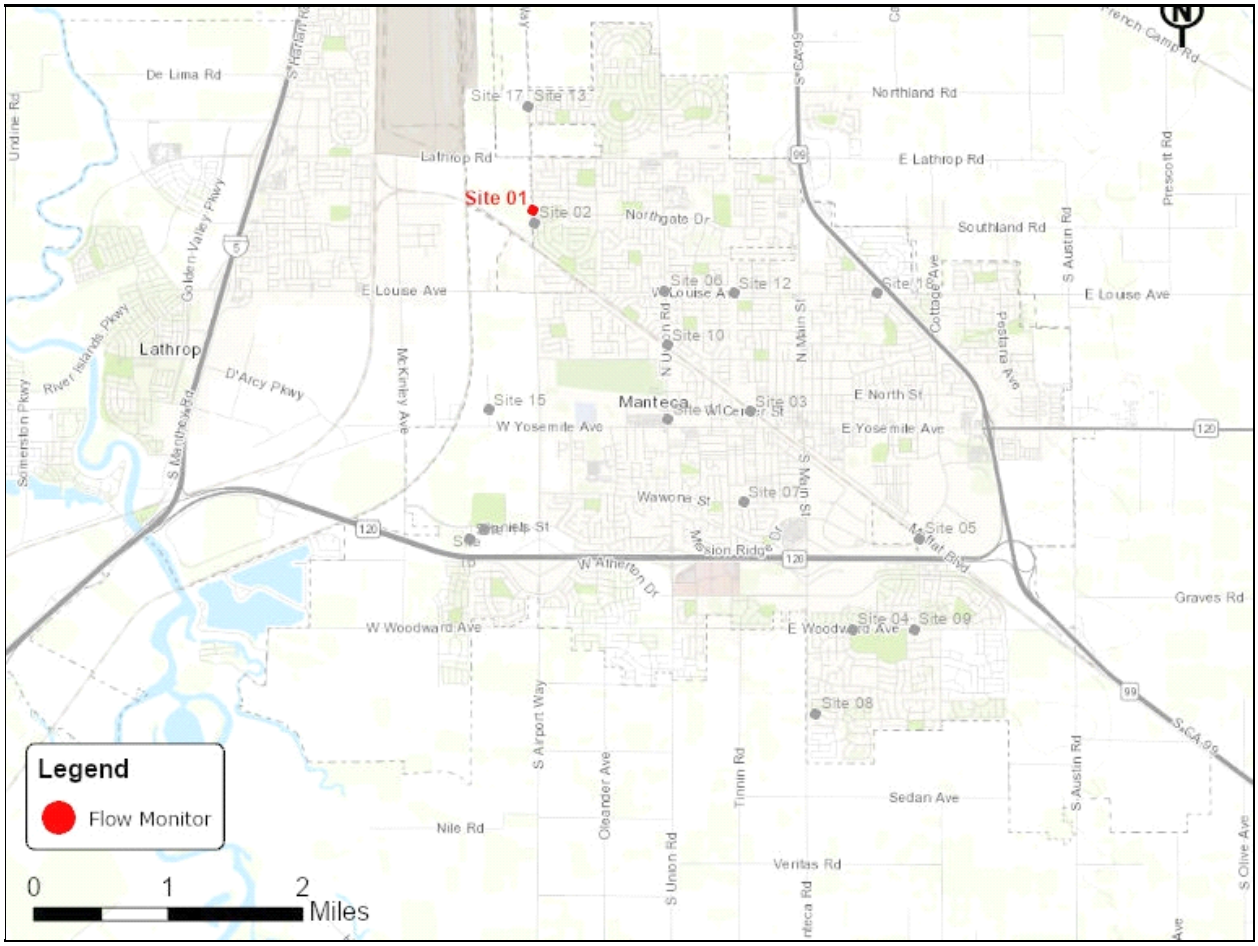
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: S. Airport Way North of Northgate Drive

Data Summary Report



Vicinity Map: Site 1

SITE 1

Additional Site Photos

Effluent Pipe



Monitored North Influent Pipe

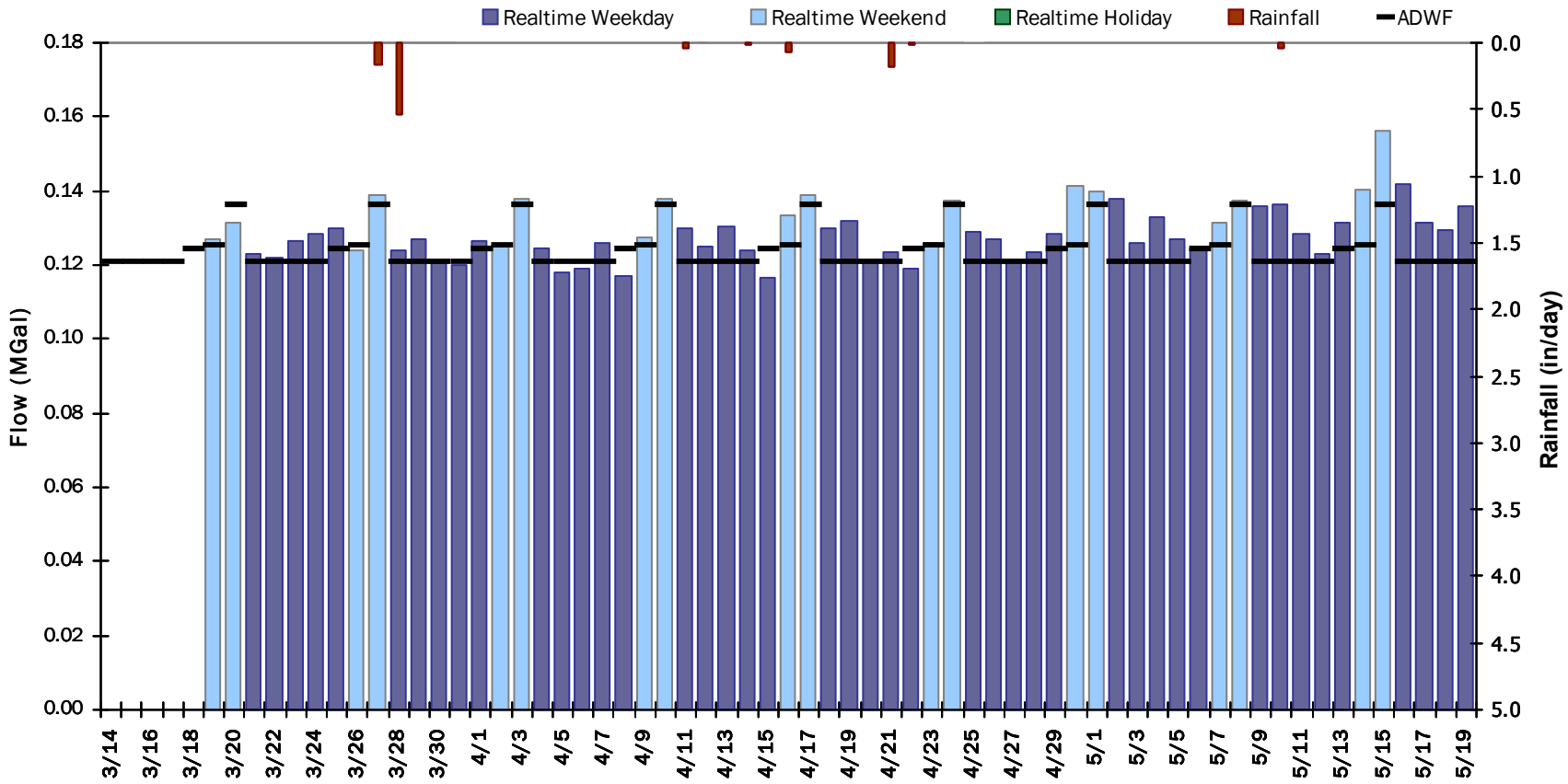


SITE 1

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.129 MGal Peak Daily Flow: 0.156 MGal Min Daily Flow: 0.117 MGal

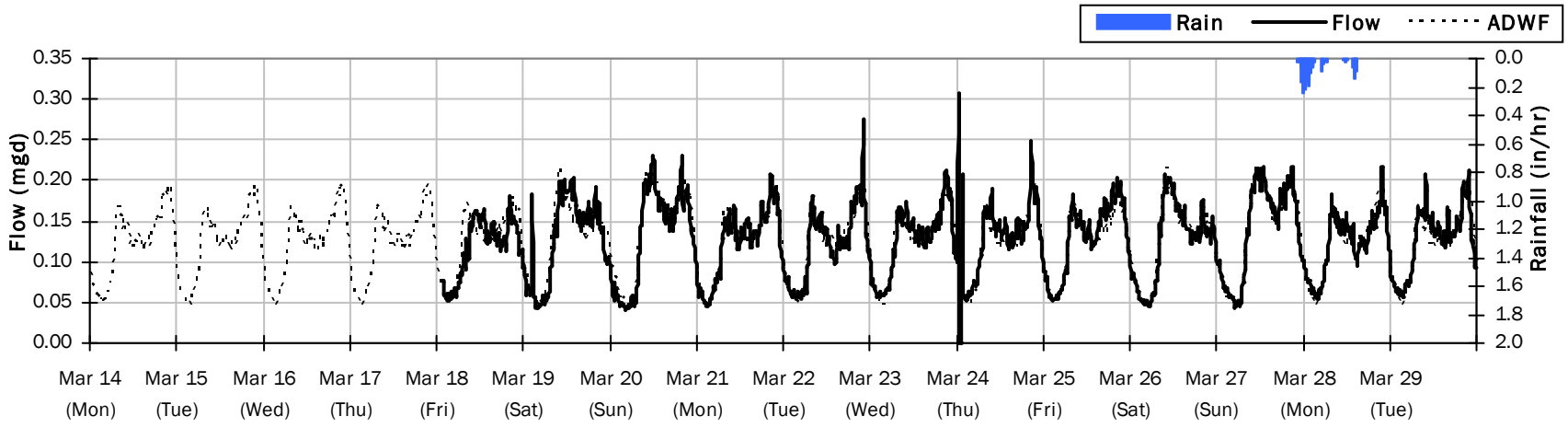
Total Rainfall: 1.07 inches

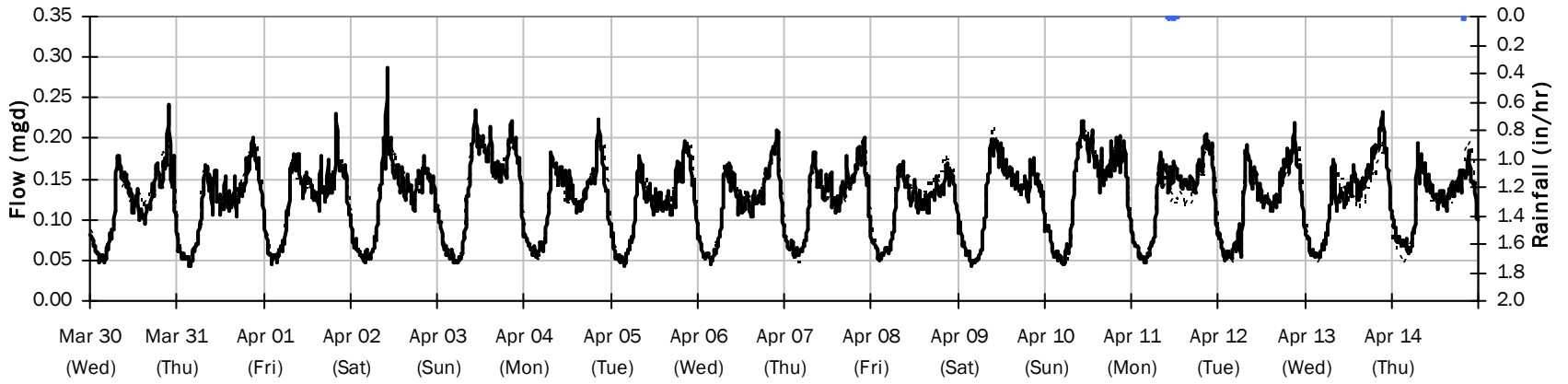


SITE 1

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.76 inches Period Avg Flow: 0.126 mgd Period Peak Flow: 0.306 mgd Period Min Flow: 0.000 mgd

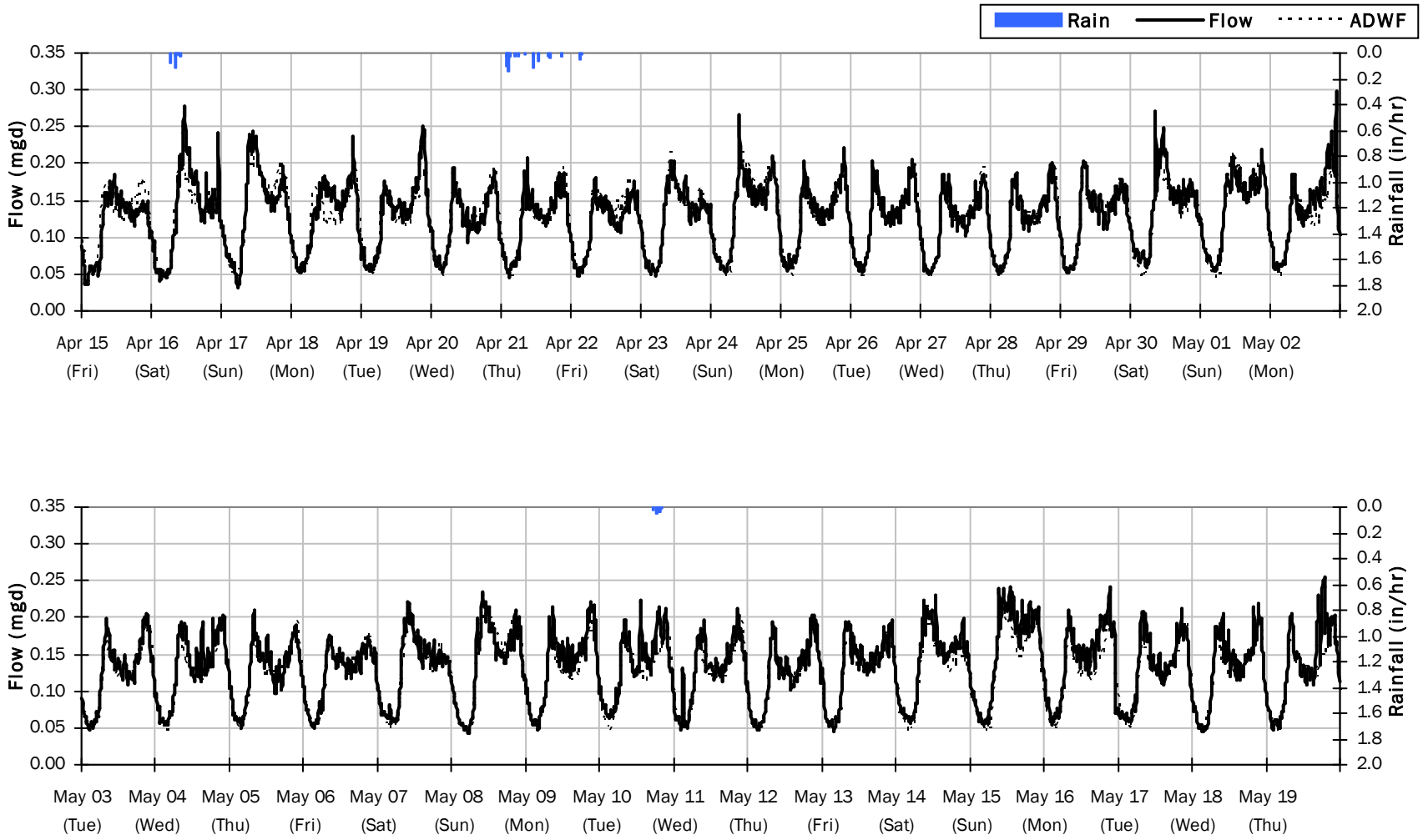




SITE 1

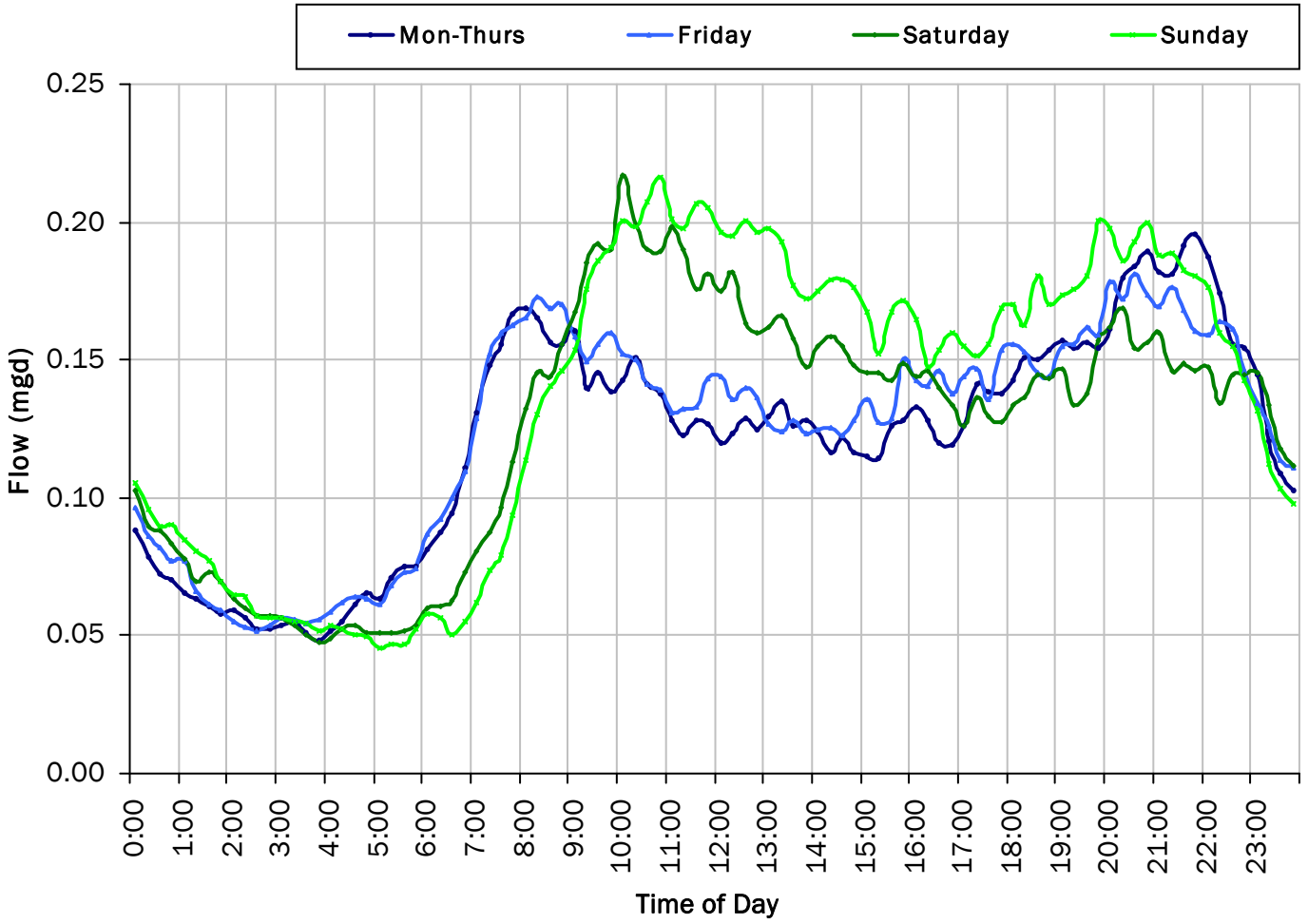
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.31 inches Period Avg Flow: 0.131 mgd Period Peak Flow: 0.298 mgd Period Min Flow: 0.032 mgd



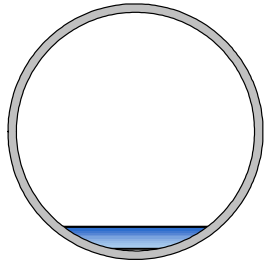
SITE 1

Average Dry Weather Flow Hydrographs



ADWF:

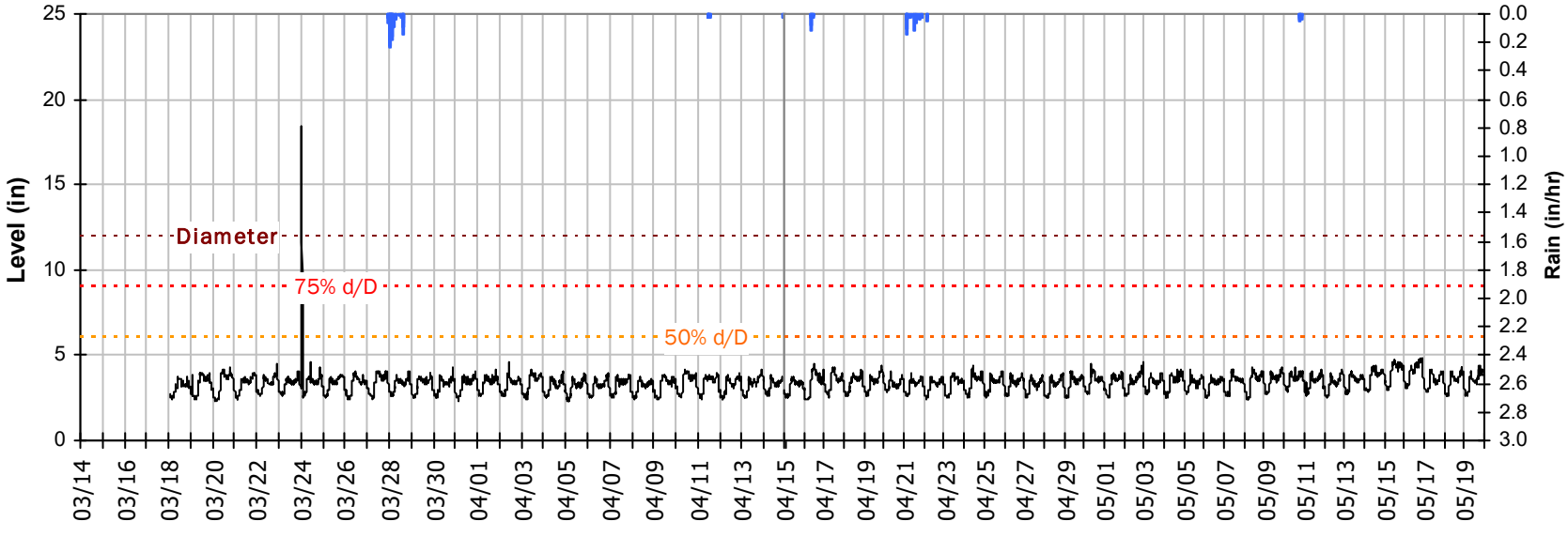
0.124 *mgd*

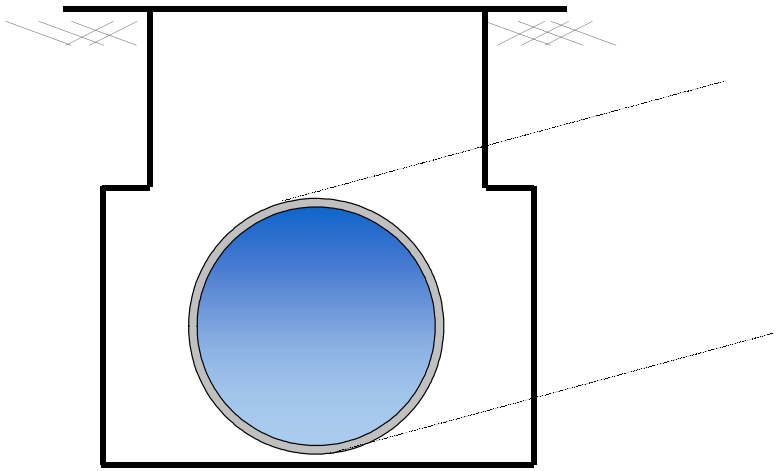


SITE 1

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period





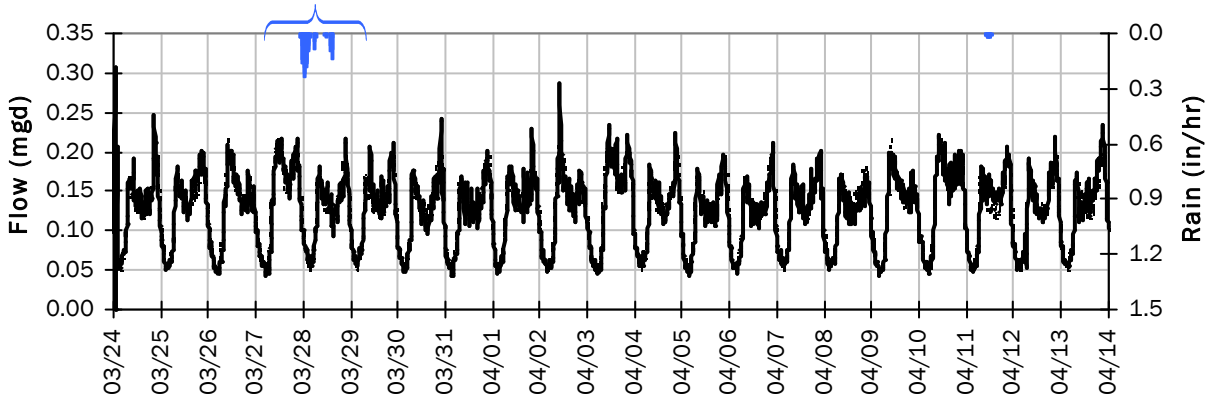
Pipe Diameter:	12	*inches*
Peak Measured Level:	18.1	*inches*
Peak d/D Ratio:	1.51	

Surcharged 6.1 inches over crown

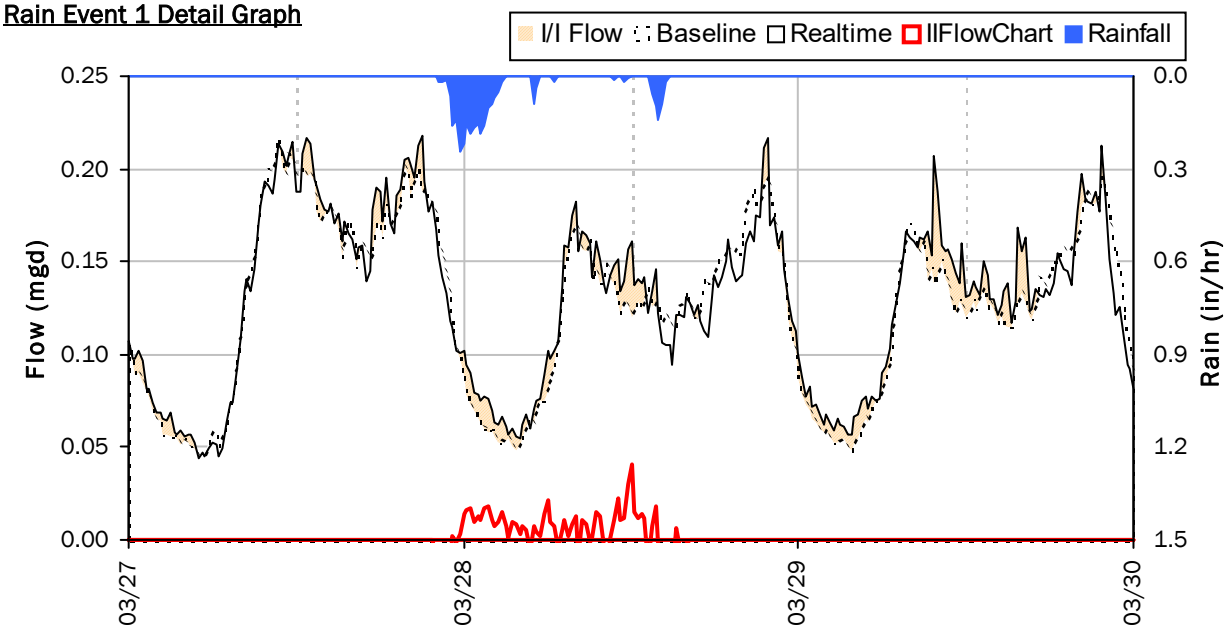
SITE 1
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period

Rain Event 1
Rainfall: 0.71 inches



Rain Event 1 Detail Graph



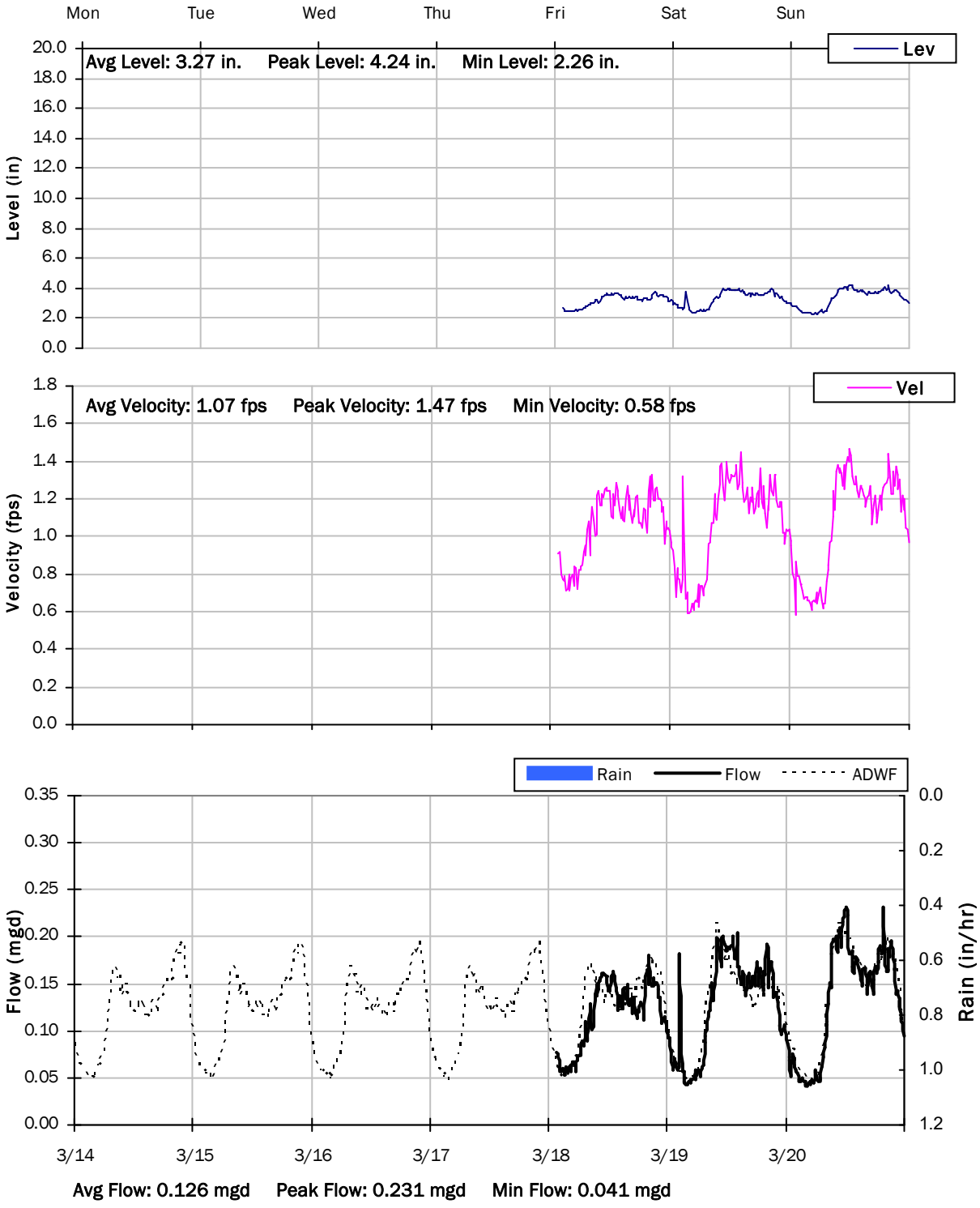
Storm Event I/I Analysis (Rain = 0.71 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.182 *mgd*	**Peak I/I Rate:**	0.041 *mgd*
PF:	1.46	**Total I/I:**	4,000 *gallons*
Peak Level:	3.82 *in*		
d/D Ratio:	0.32		

SITE 1

Weekly Level, Velocity and Flow Hydrographs

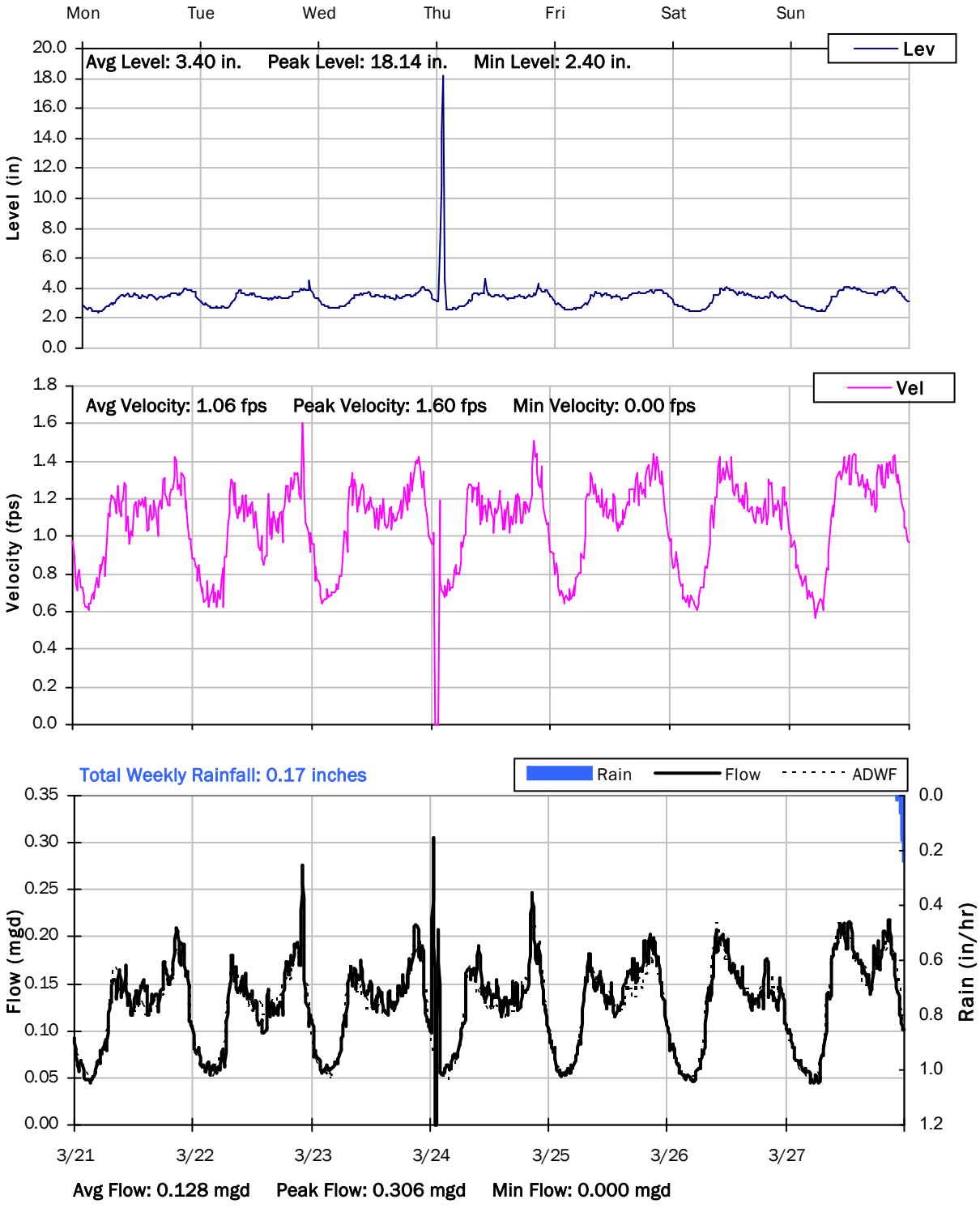
3/14/2022 to 3/21/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

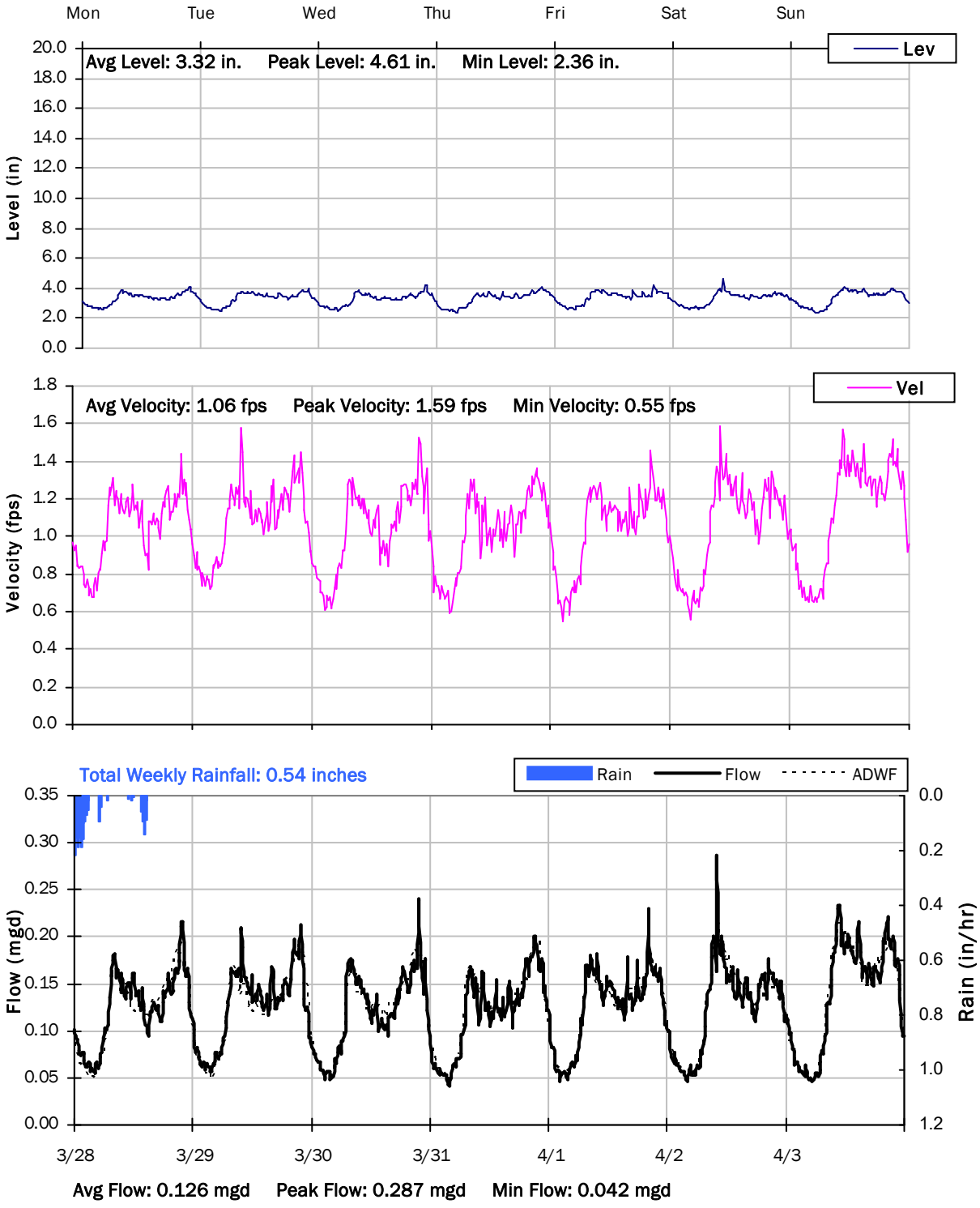
3/21/2022 to 3/28/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

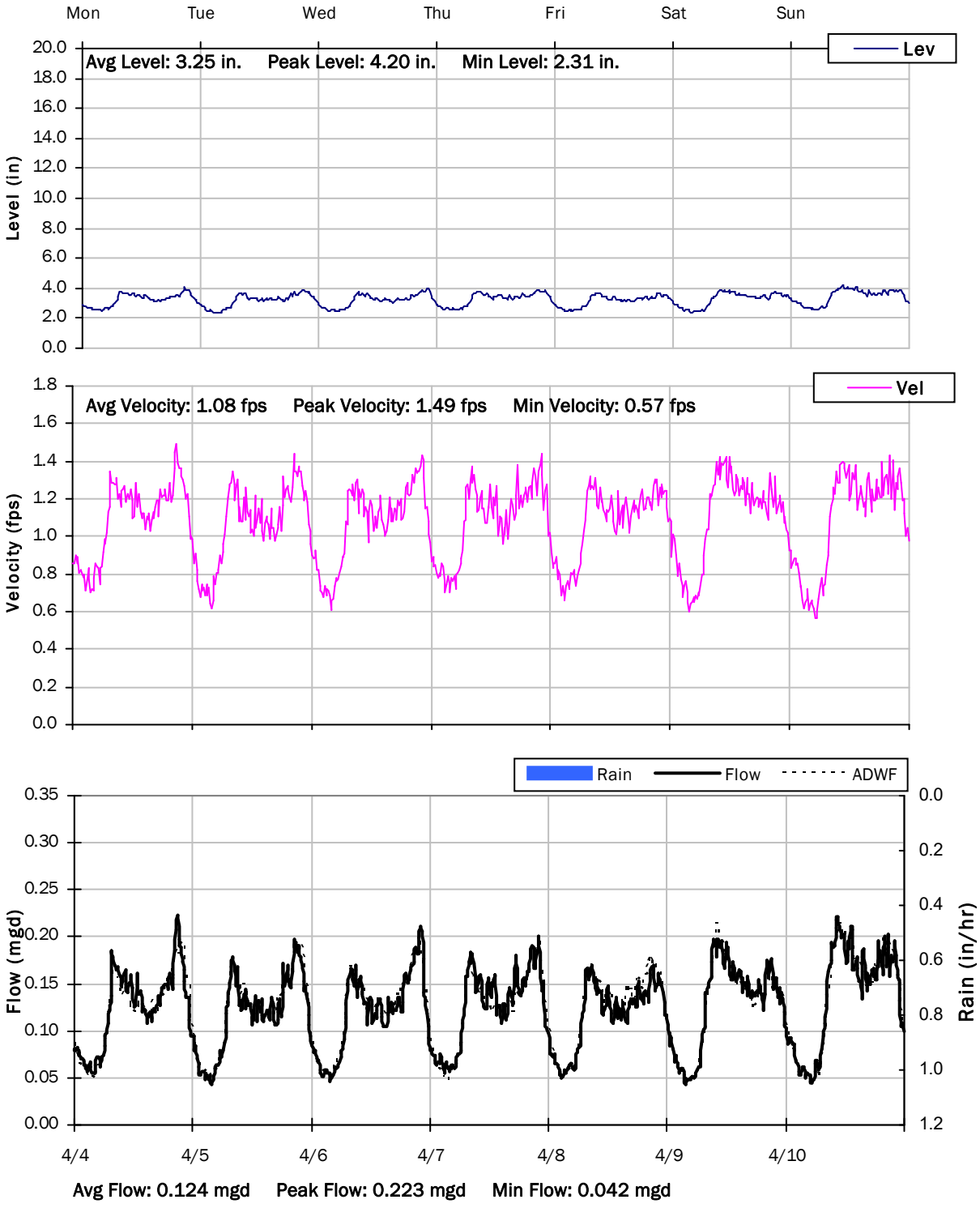
3/28/2022 to 4/4/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

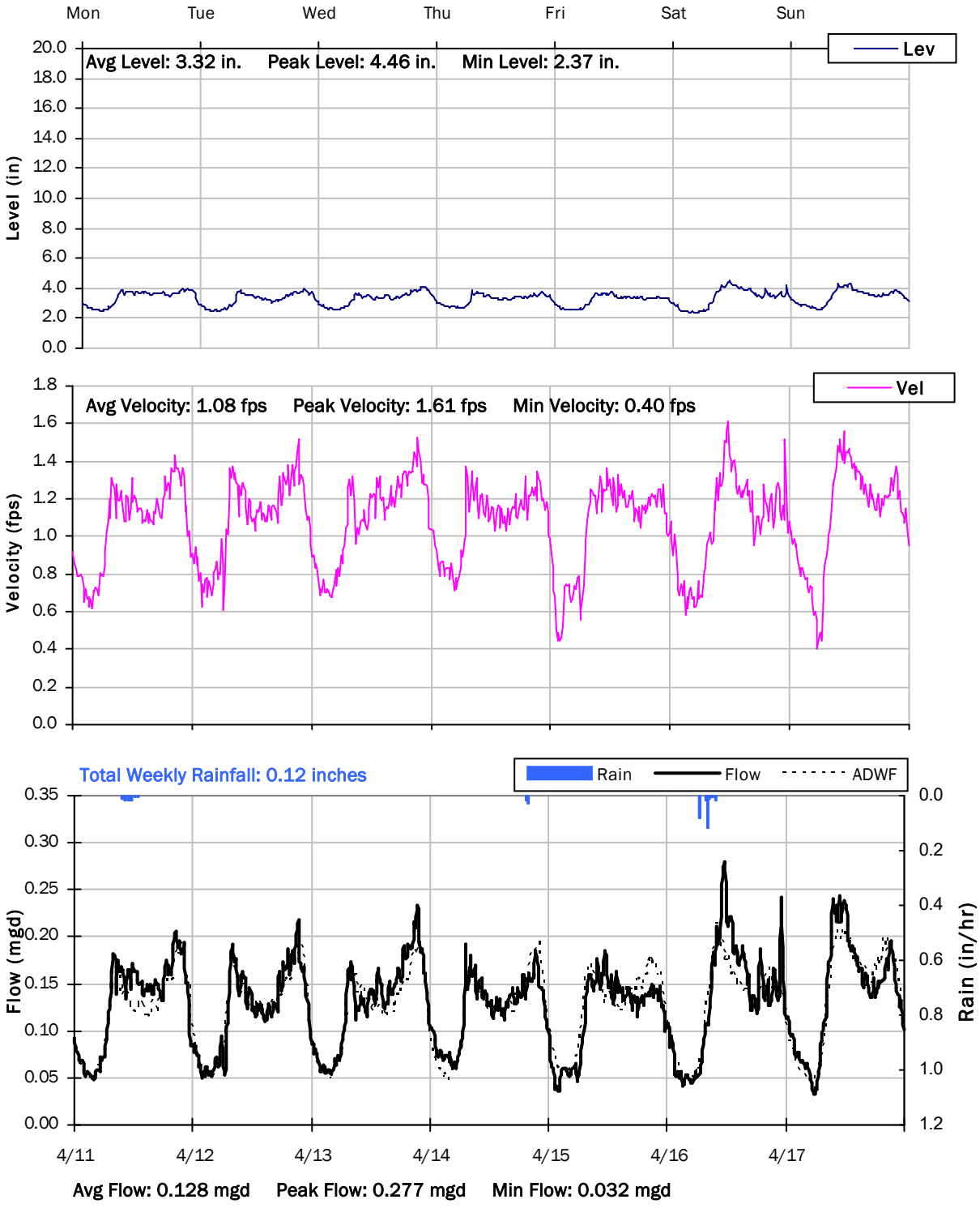
4/4/2022 to 4/11/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

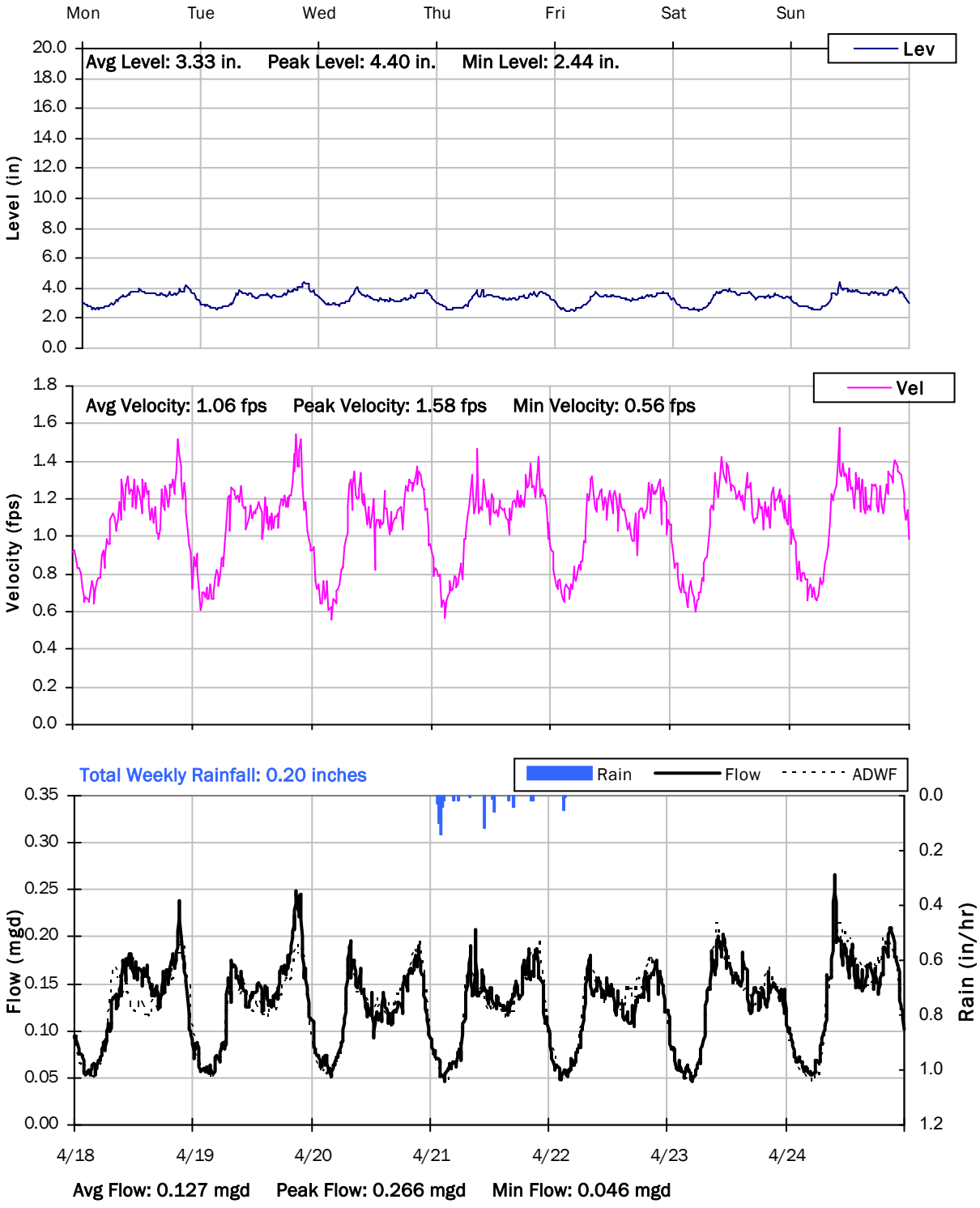
4/11/2022 to 4/18/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

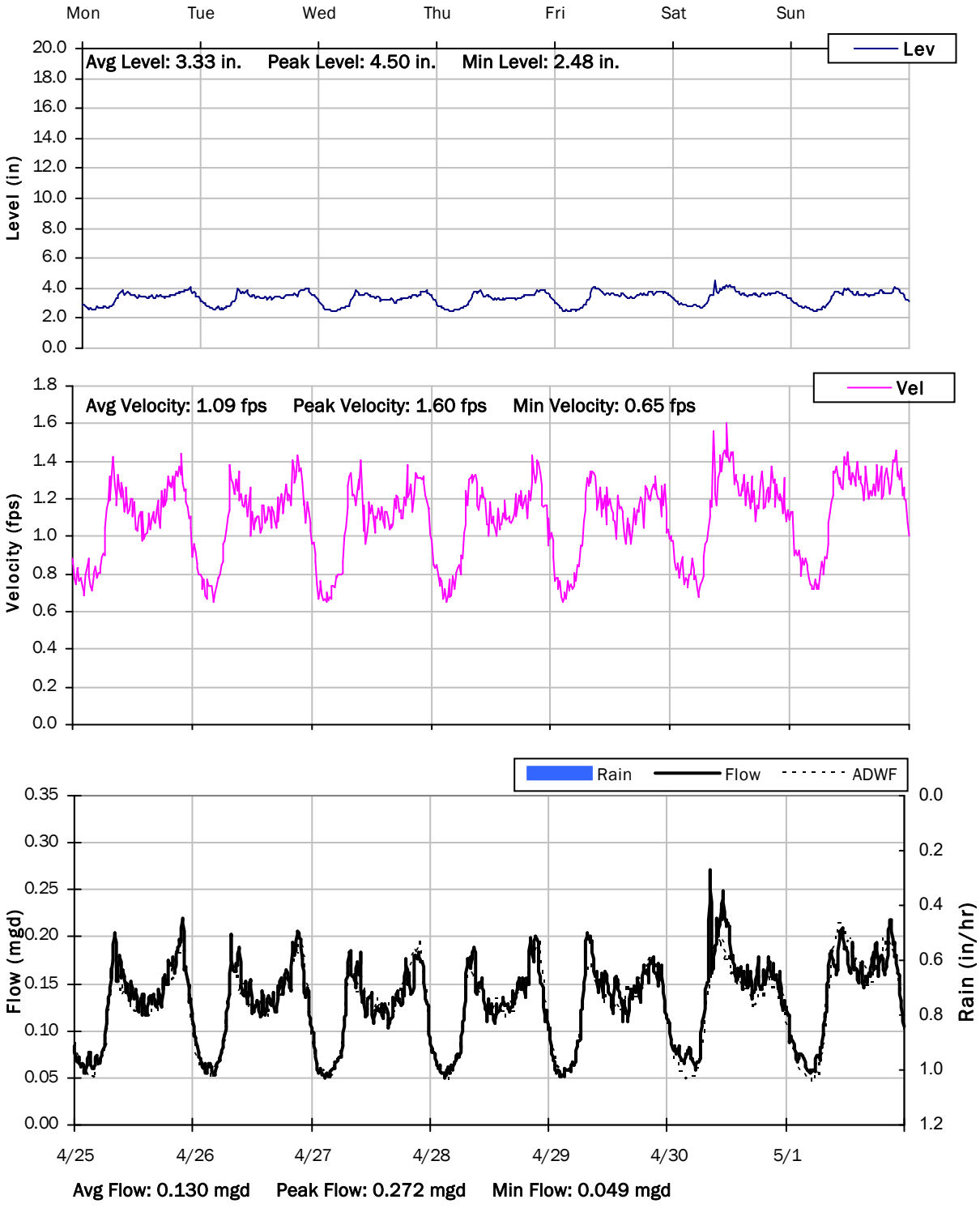
4/18/2022 to 4/25/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

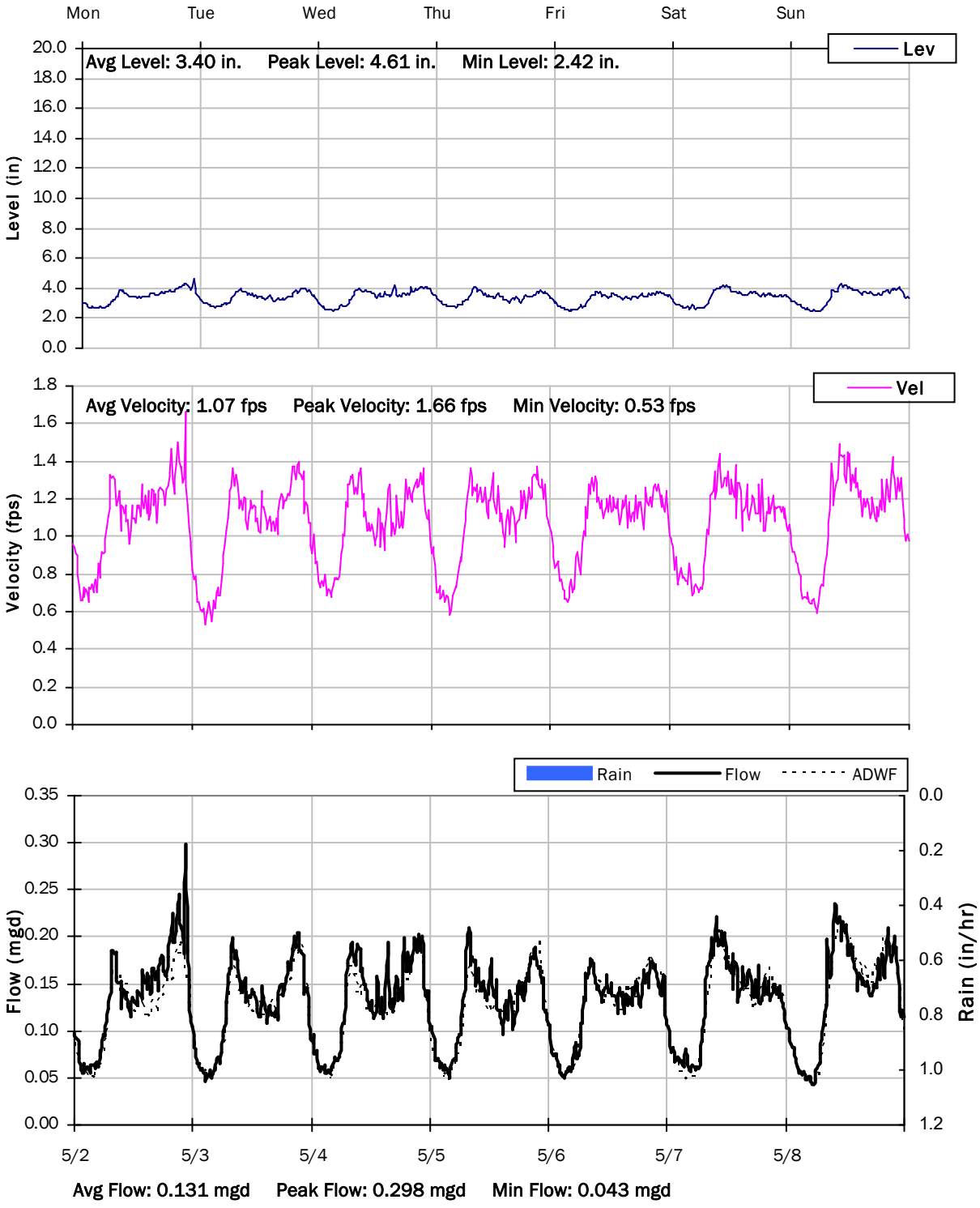
4/25/2022 to 5/2/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

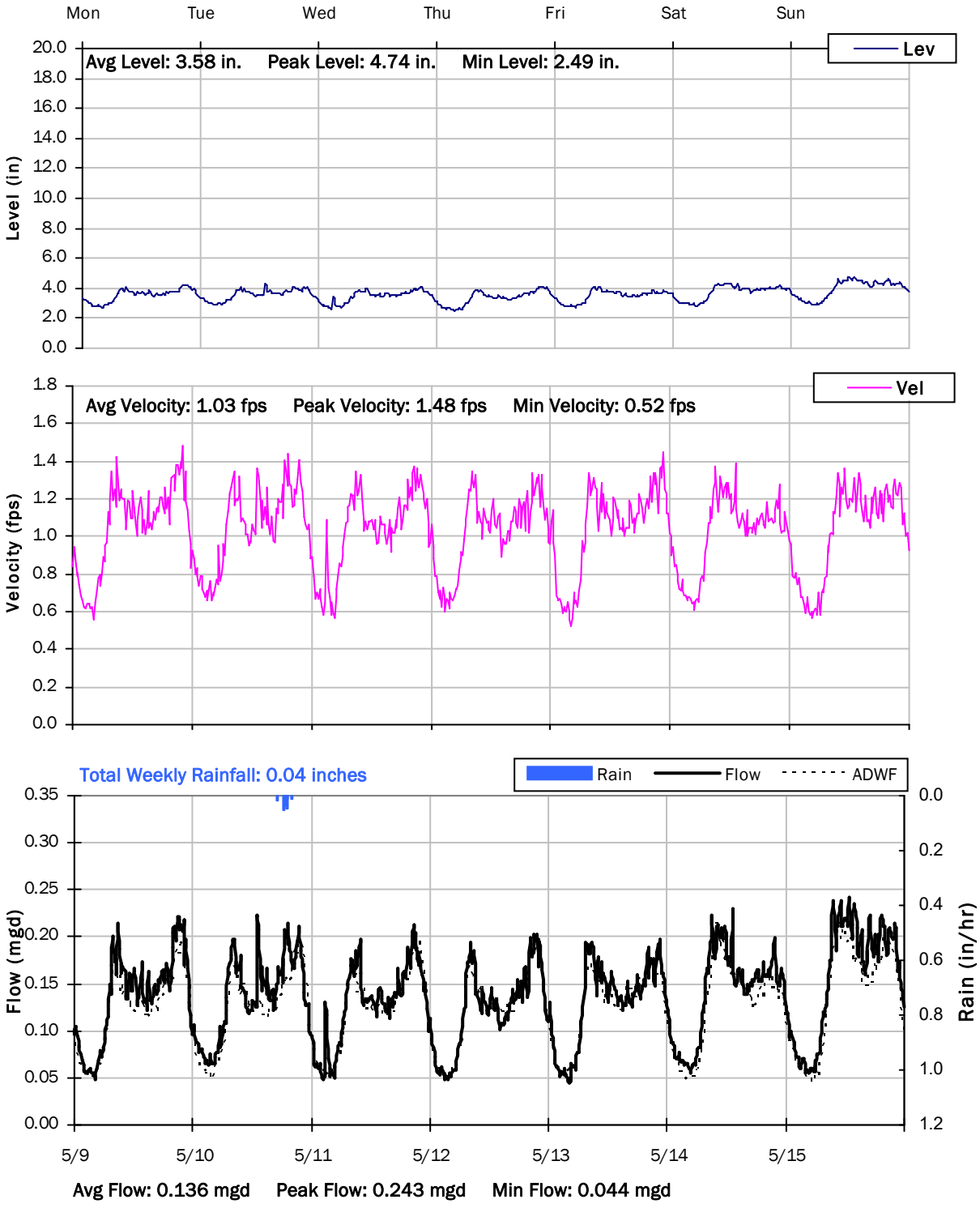
5/2/2022 to 5/9/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

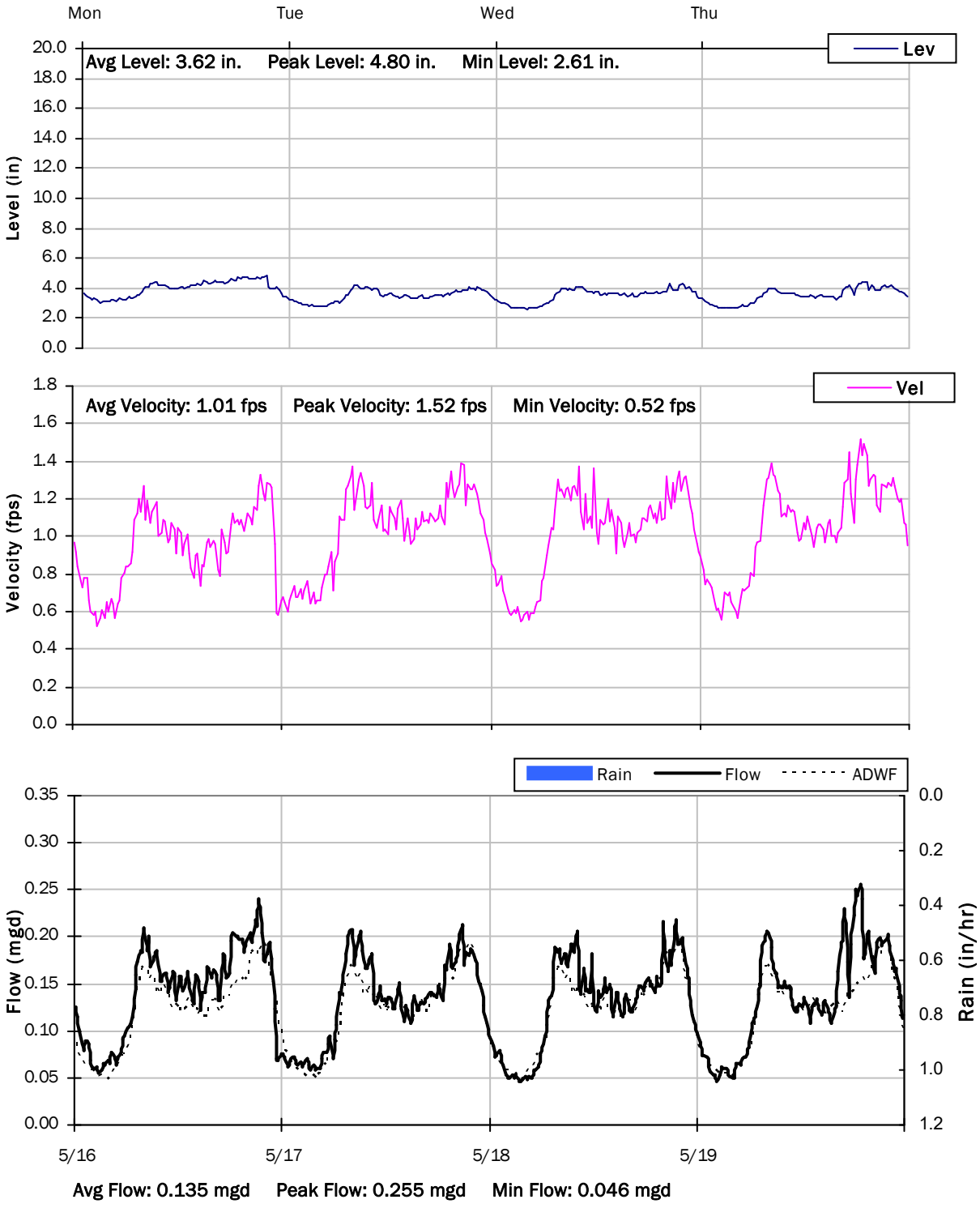
5/9/2022 to 5/16/2022



SITE 1

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 2

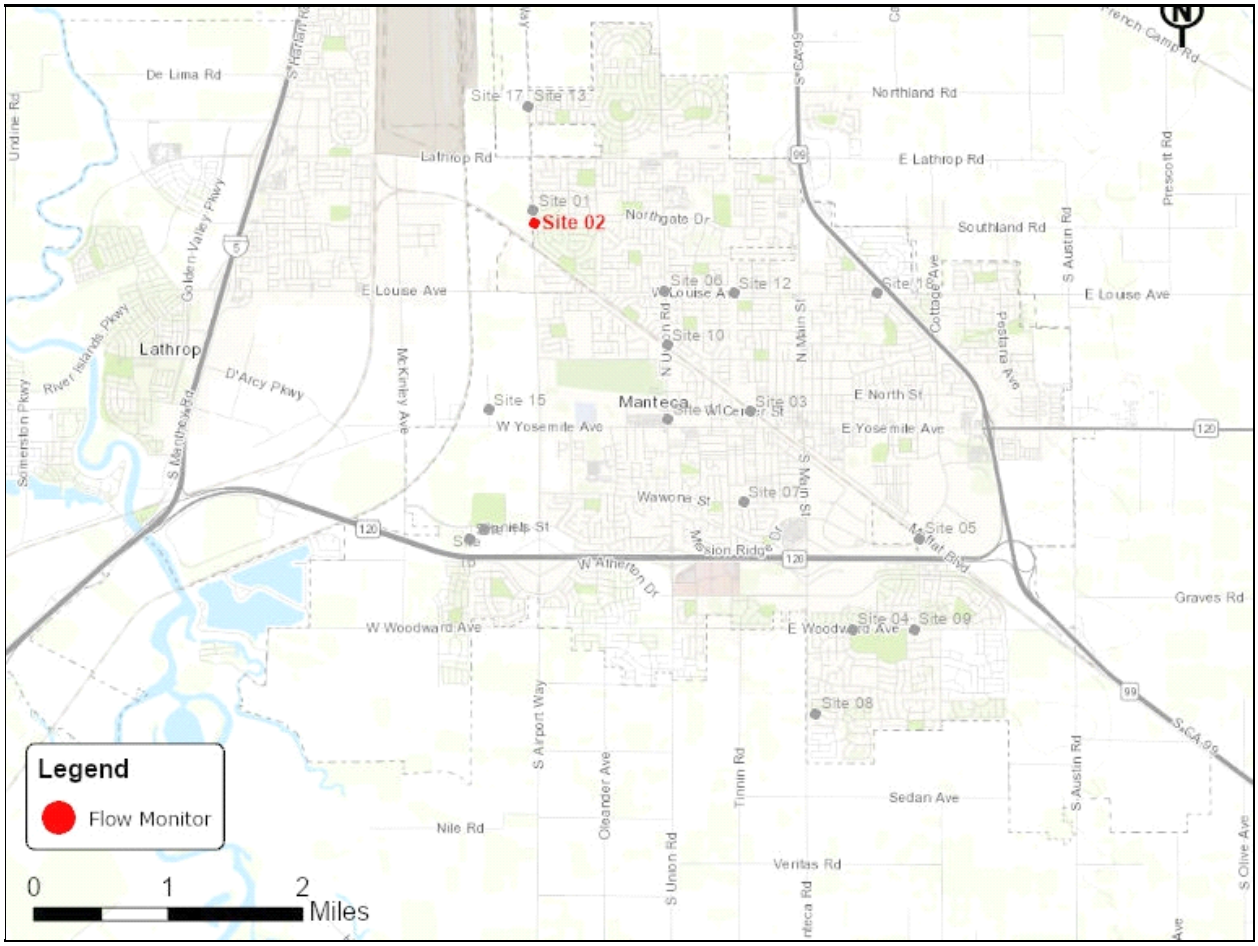
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: S. Airport Way at Northgate Drive

Data Summary Report



Vicinity Map: Site 2

SITE 2

Additional Site Photos

Effluent Pipe



Monitored East Influent Pipe

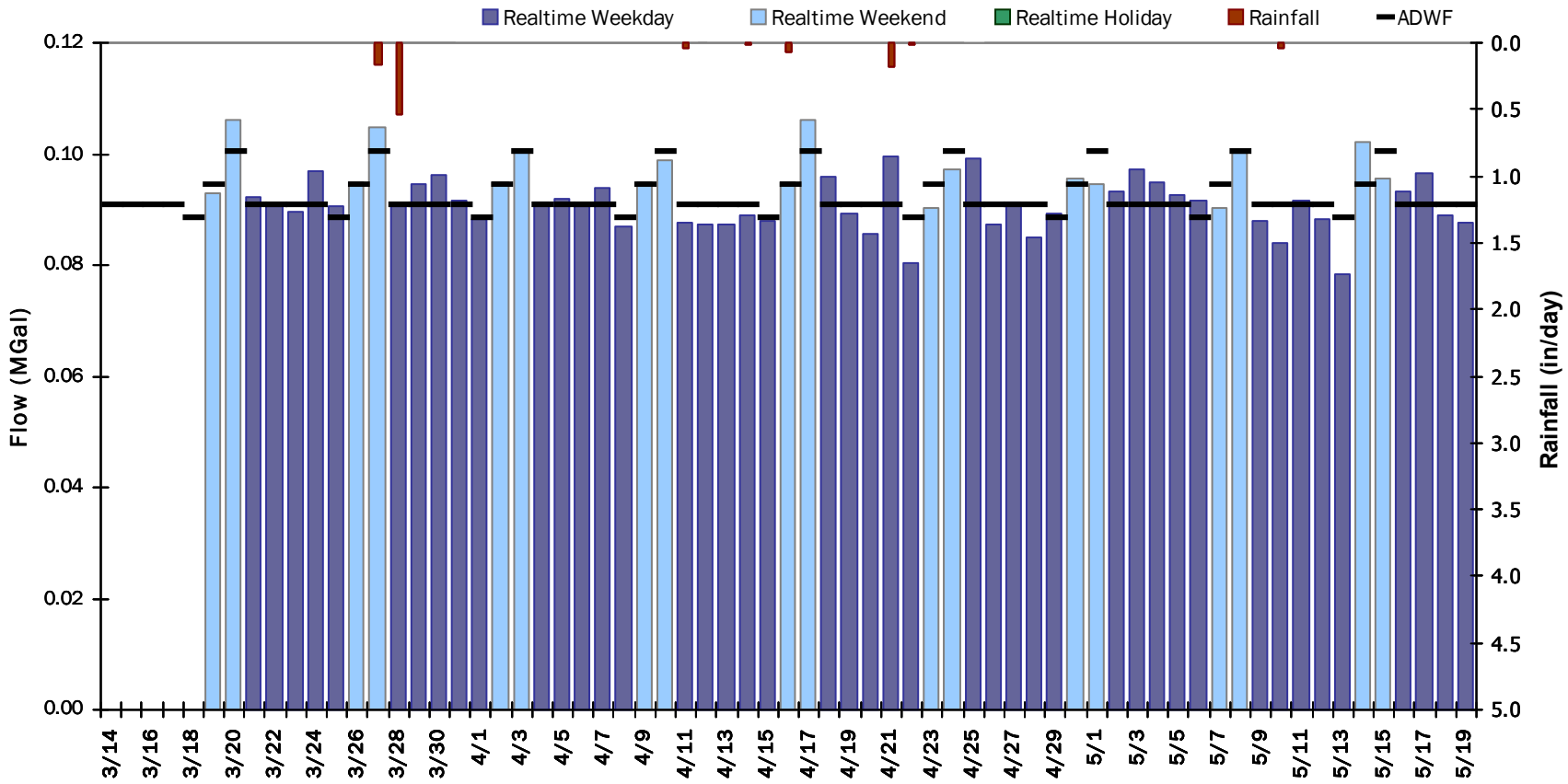


SITE 2

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.092 MGal Peak Daily Flow: 0.106 MGal Min Daily Flow: 0.078 MGal

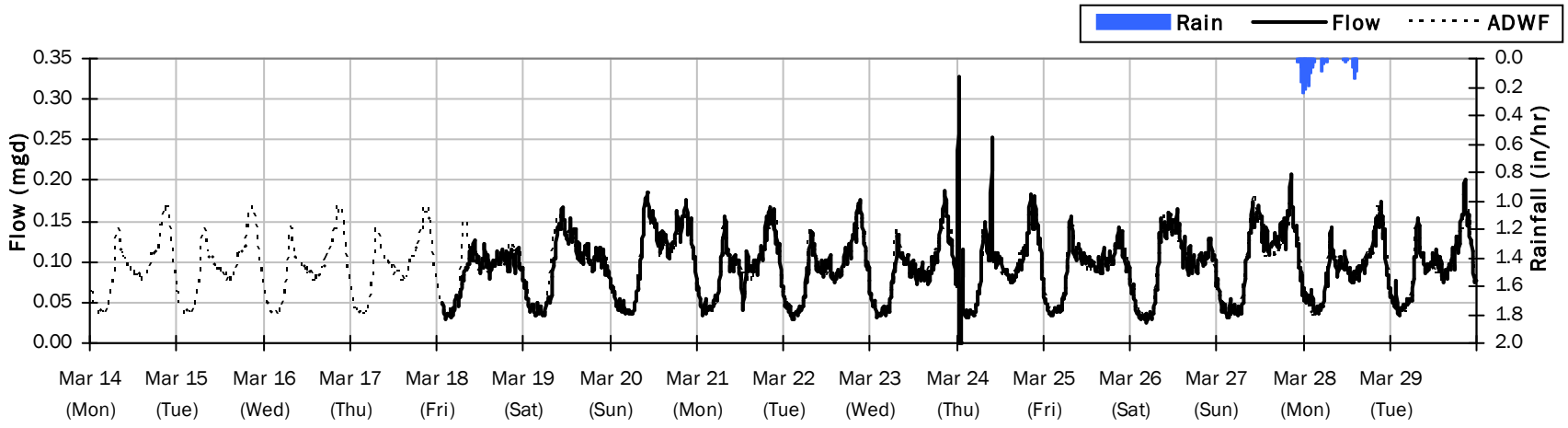
Total Rainfall: 1.07 inches

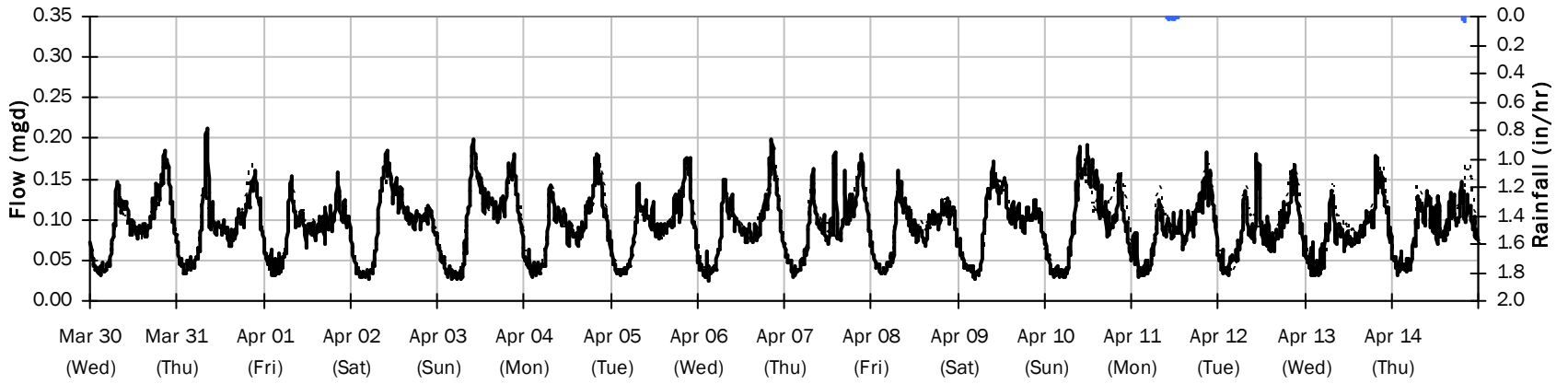


SITE 2

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.76 inches Period Avg Flow: 0.093 mgd Period Peak Flow: 0.328 mgd Period Min Flow: 0.000 mgd

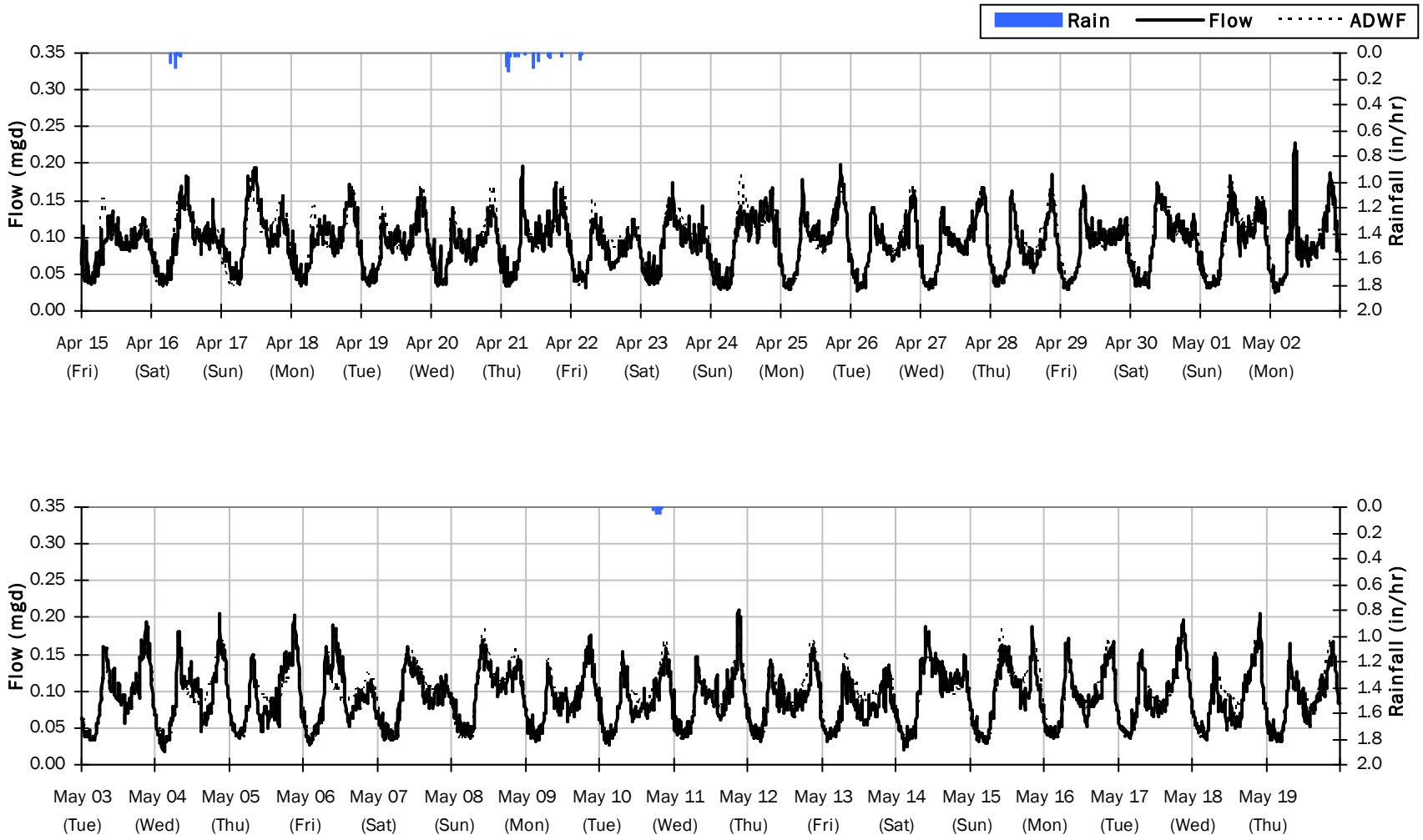




SITE 2

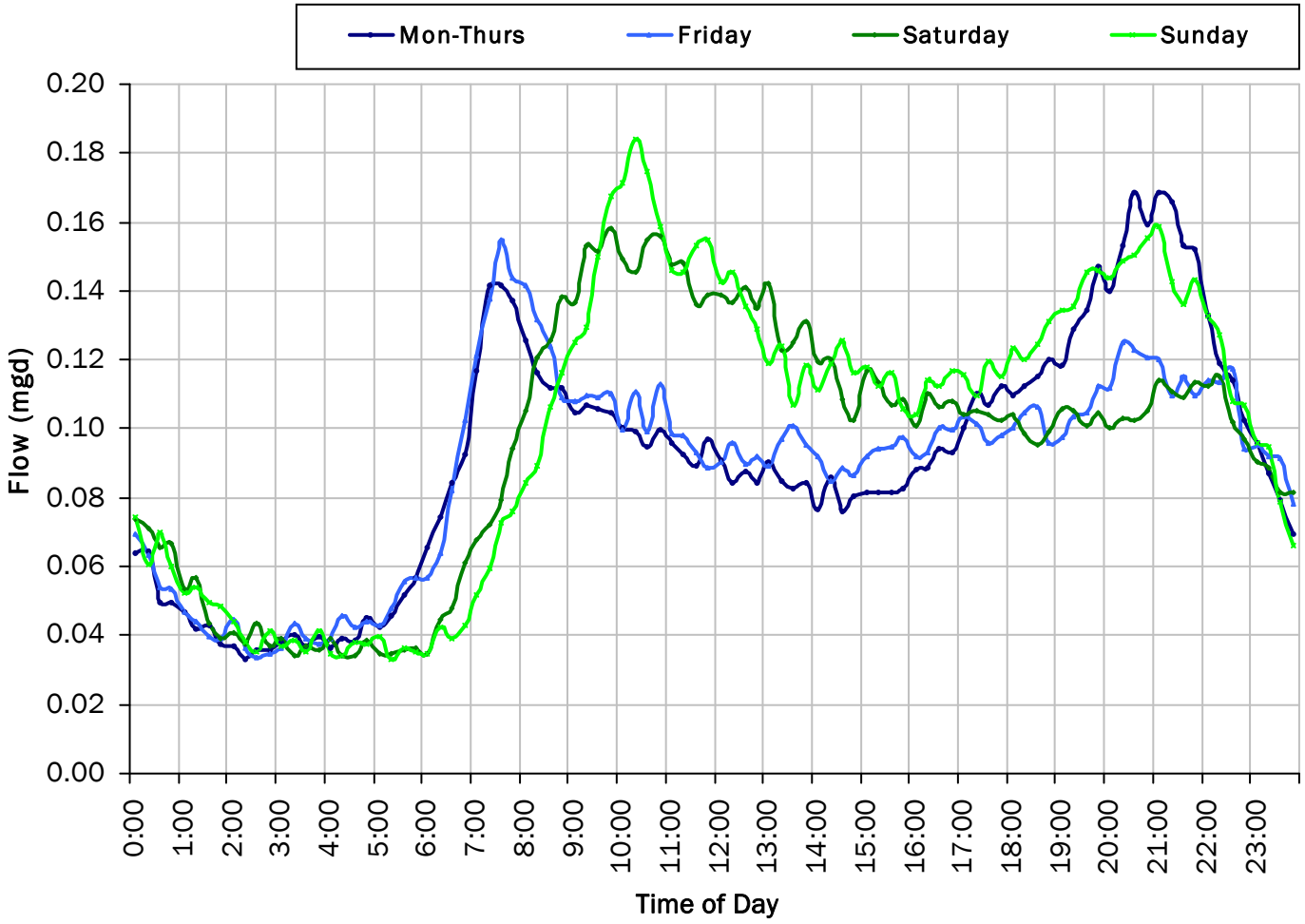
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.31 inches Period Avg Flow: 0.092 mgd Period Peak Flow: 0.228 mgd Period Min Flow: 0.018 mgd



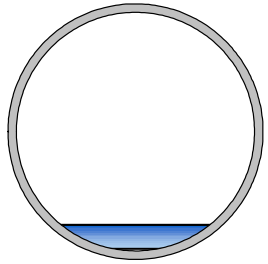
SITE 2

Average Dry Weather Flow Hydrographs



ADWF:

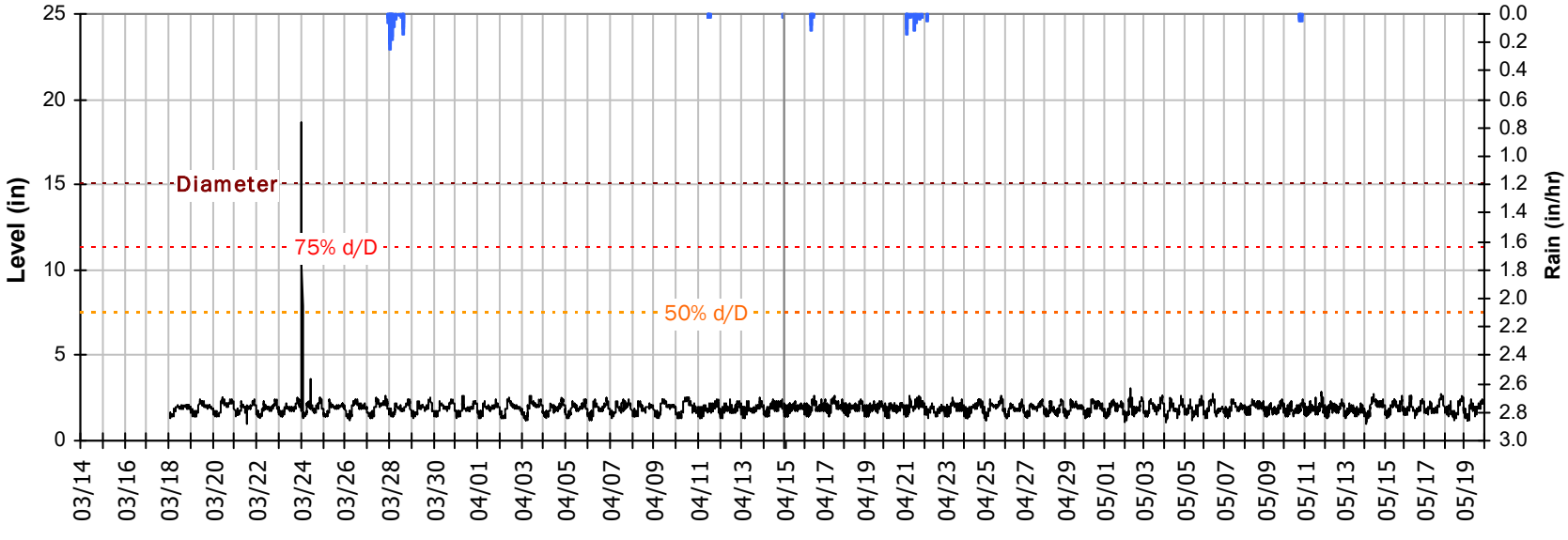
0.092 *mgd*

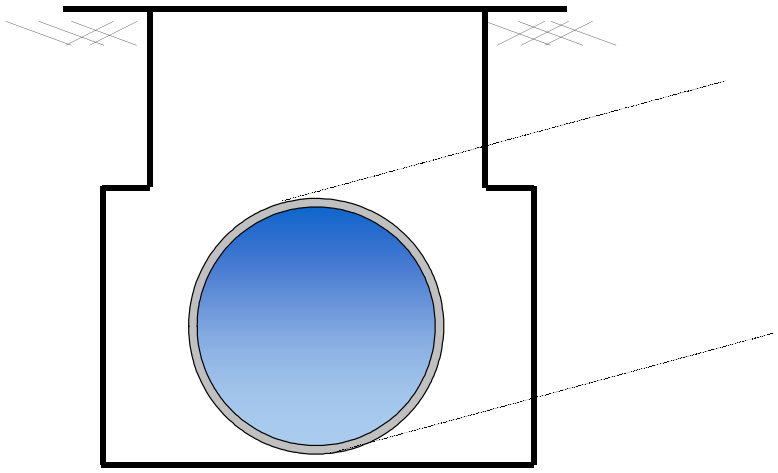


SITE 2

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period





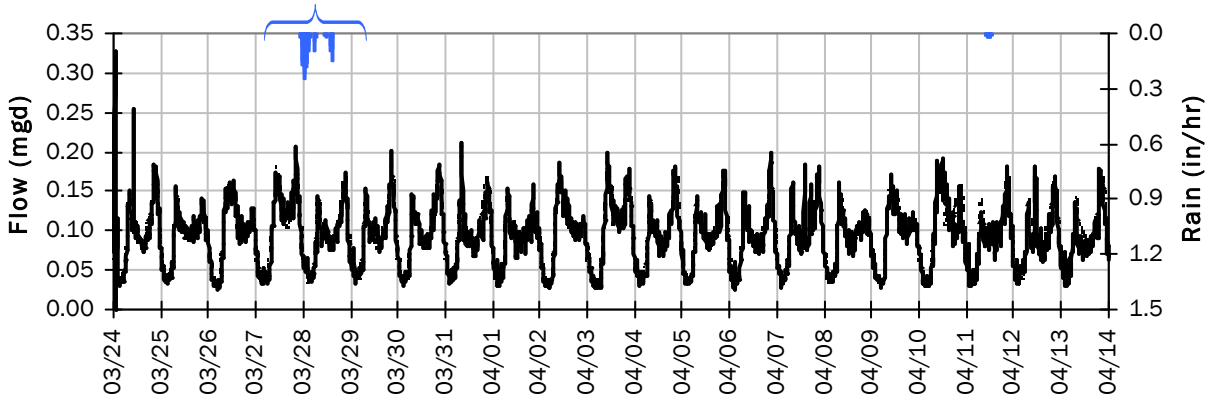
Pipe Diameter:	15	*inches*
Peak Measured Level:	18.2	*inches*
Peak d/D Ratio:	1.21	

Surcharged 3.2 inches over crown

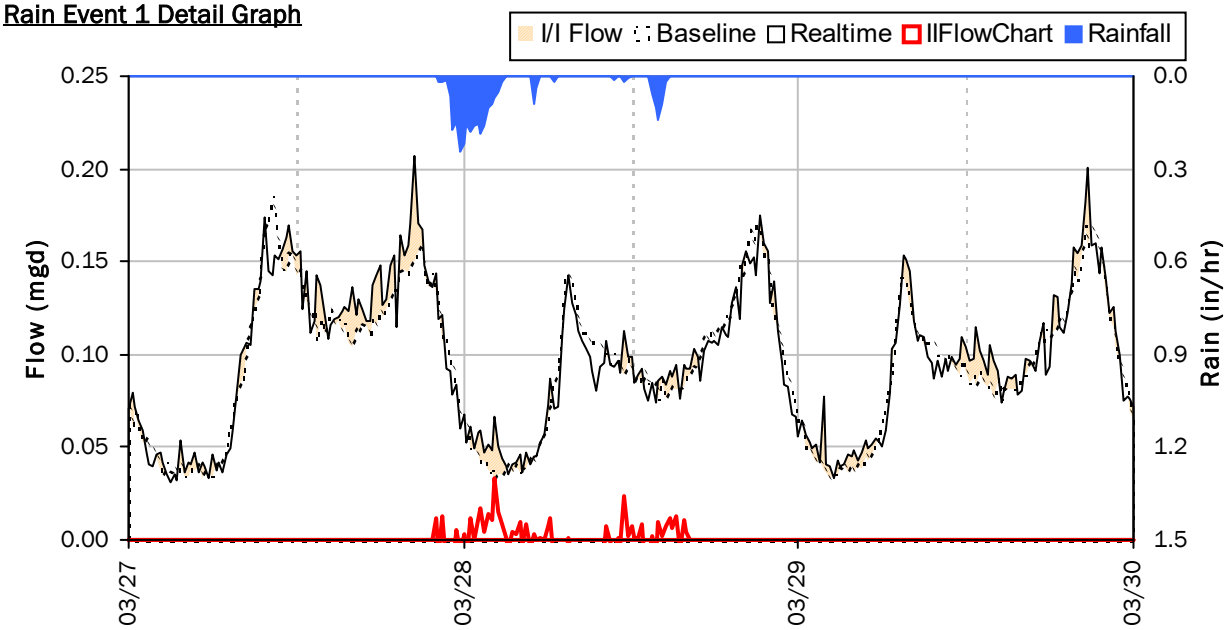
SITE 2
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period

Rain Event 1
Rainfall: 0.71 inches



Rain Event 1 Detail Graph



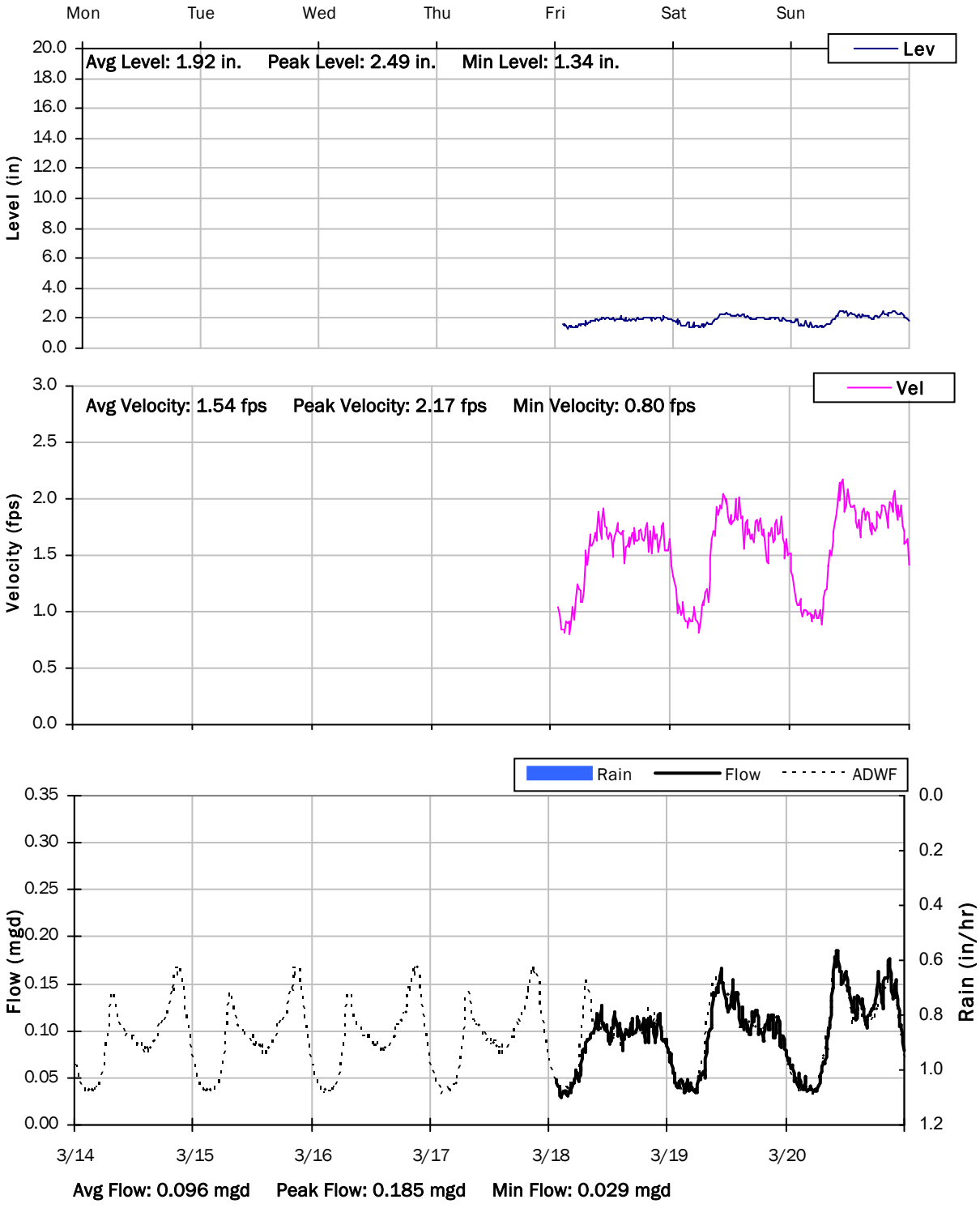
Storm Event I/I Analysis (Rain = 0.71 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.144 *mgd*	**Peak I/I Rate:**	0.033 *mgd*
PF:	1.56	**Total I/I:**	1,000 *gallons*
Peak Level:	2.28 *in*		
d/D Ratio:	0.15		

SITE 2

Weekly Level, Velocity and Flow Hydrographs

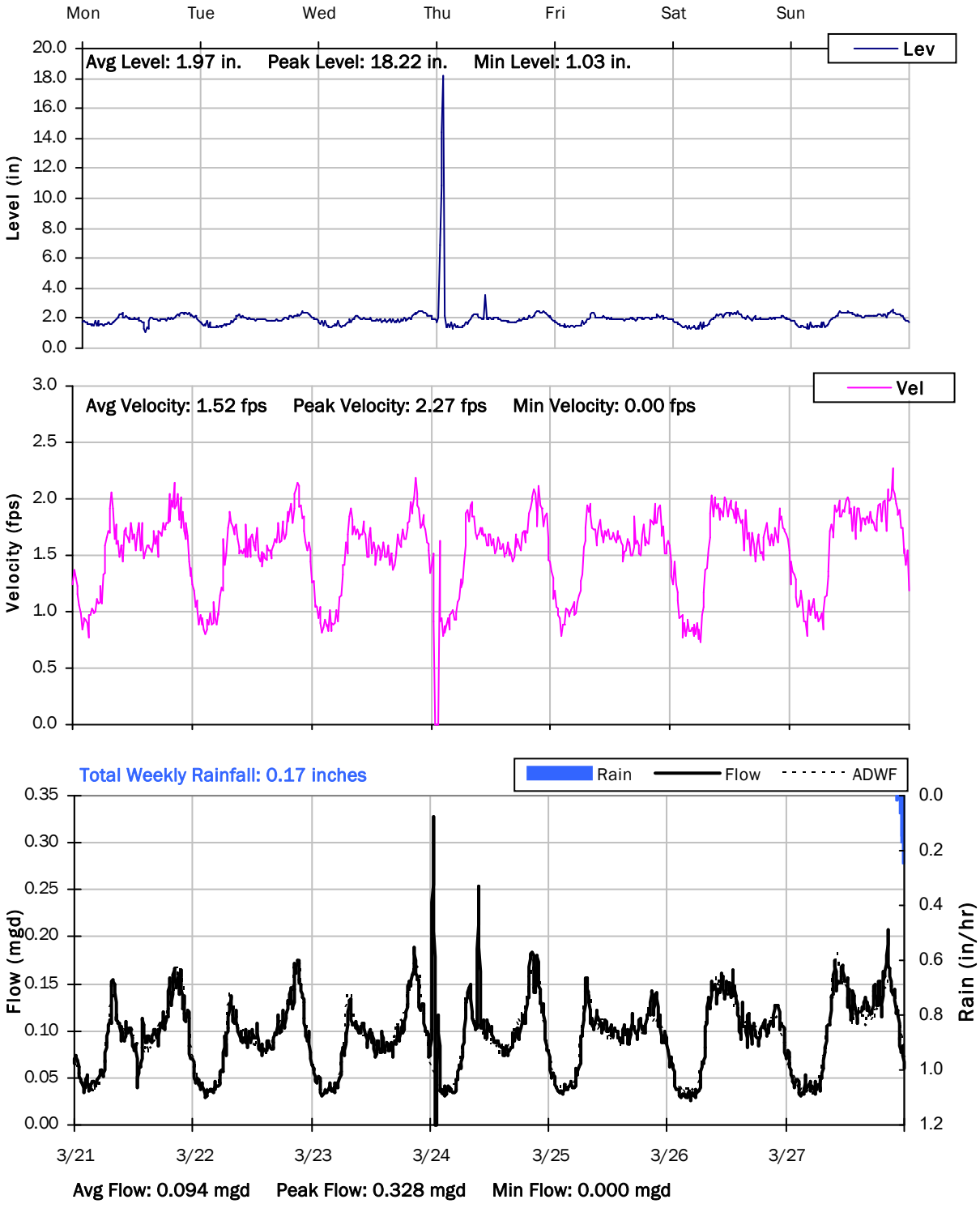
3/14/2022 to 3/21/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

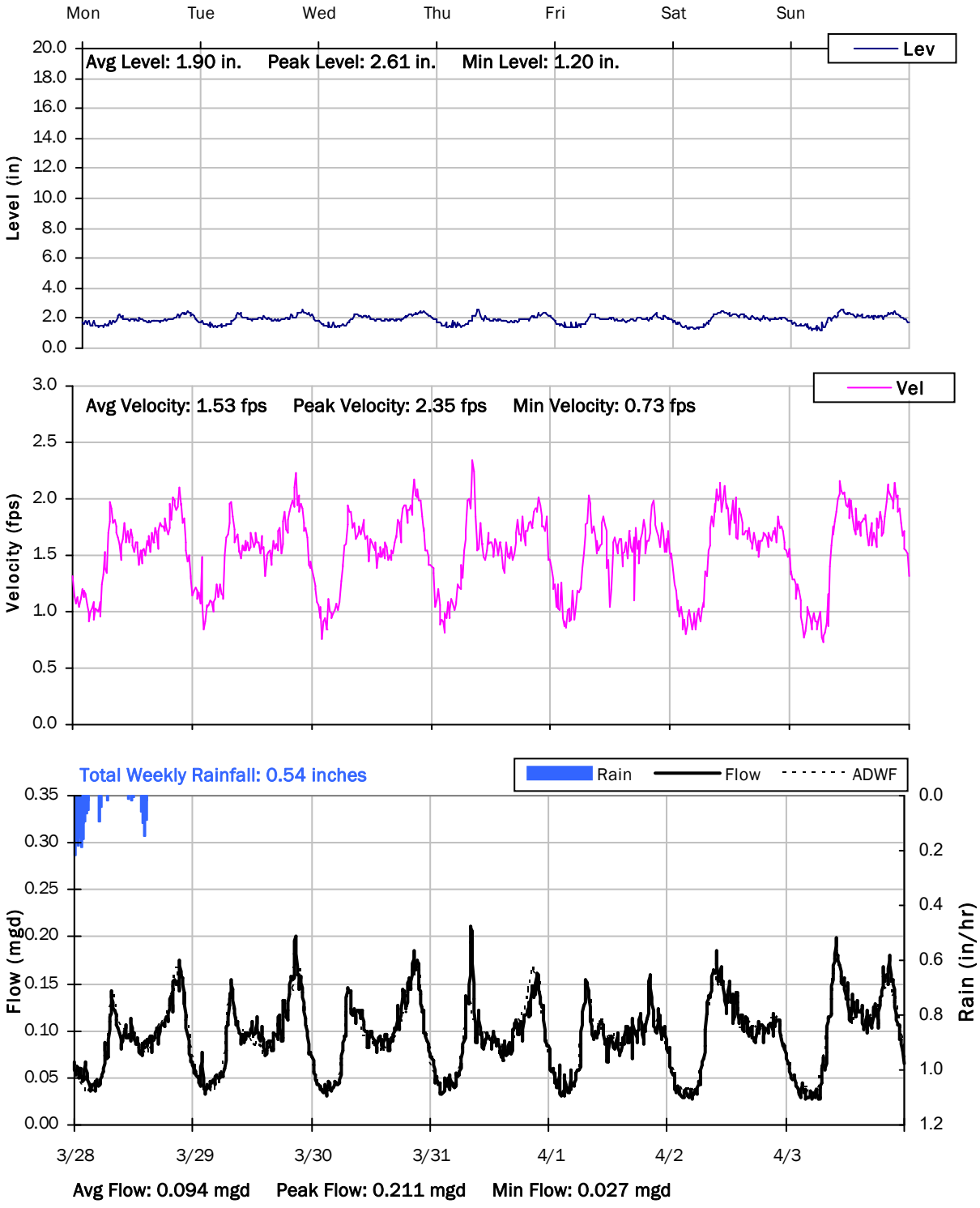
3/21/2022 to 3/28/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

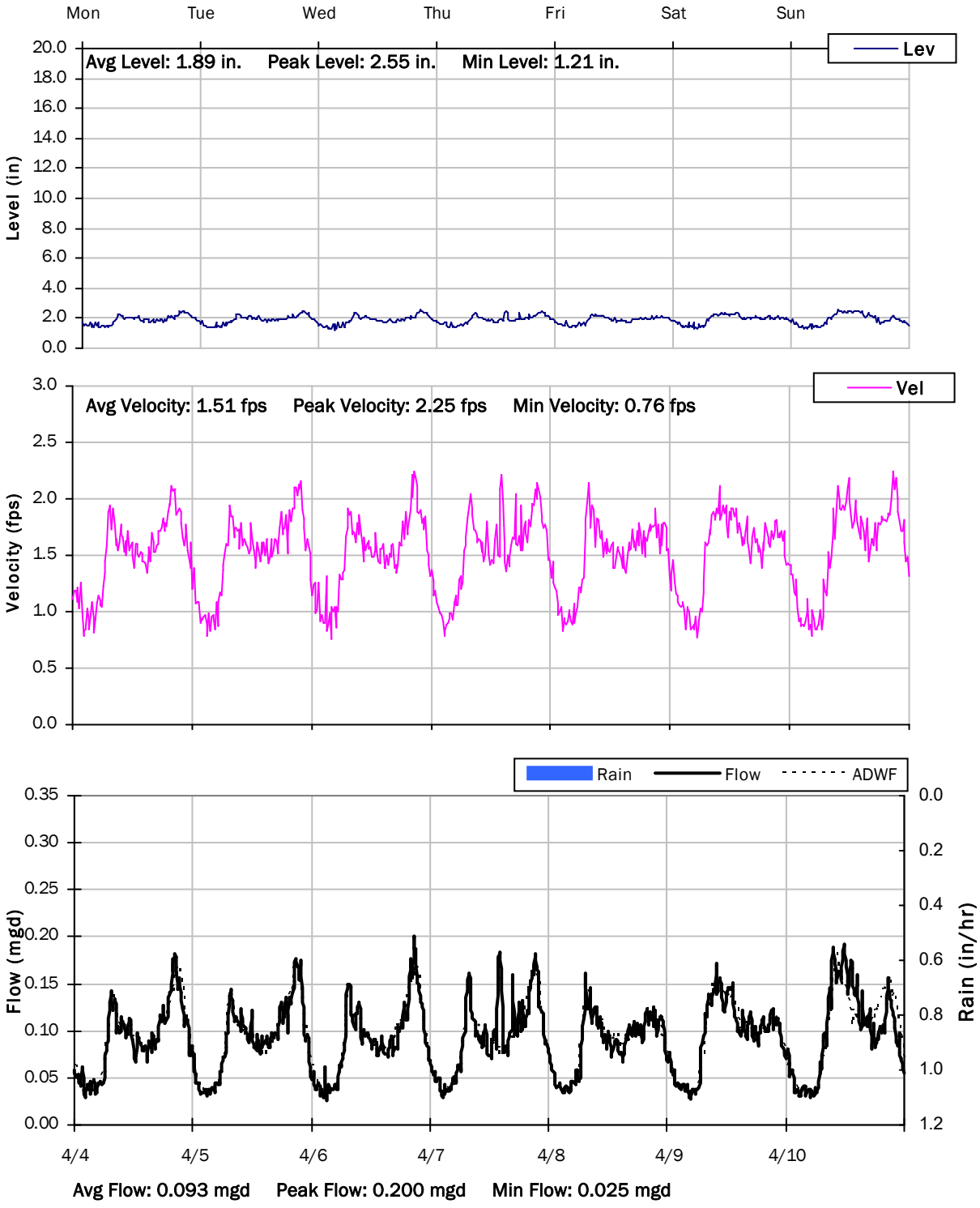
3/28/2022 to 4/4/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

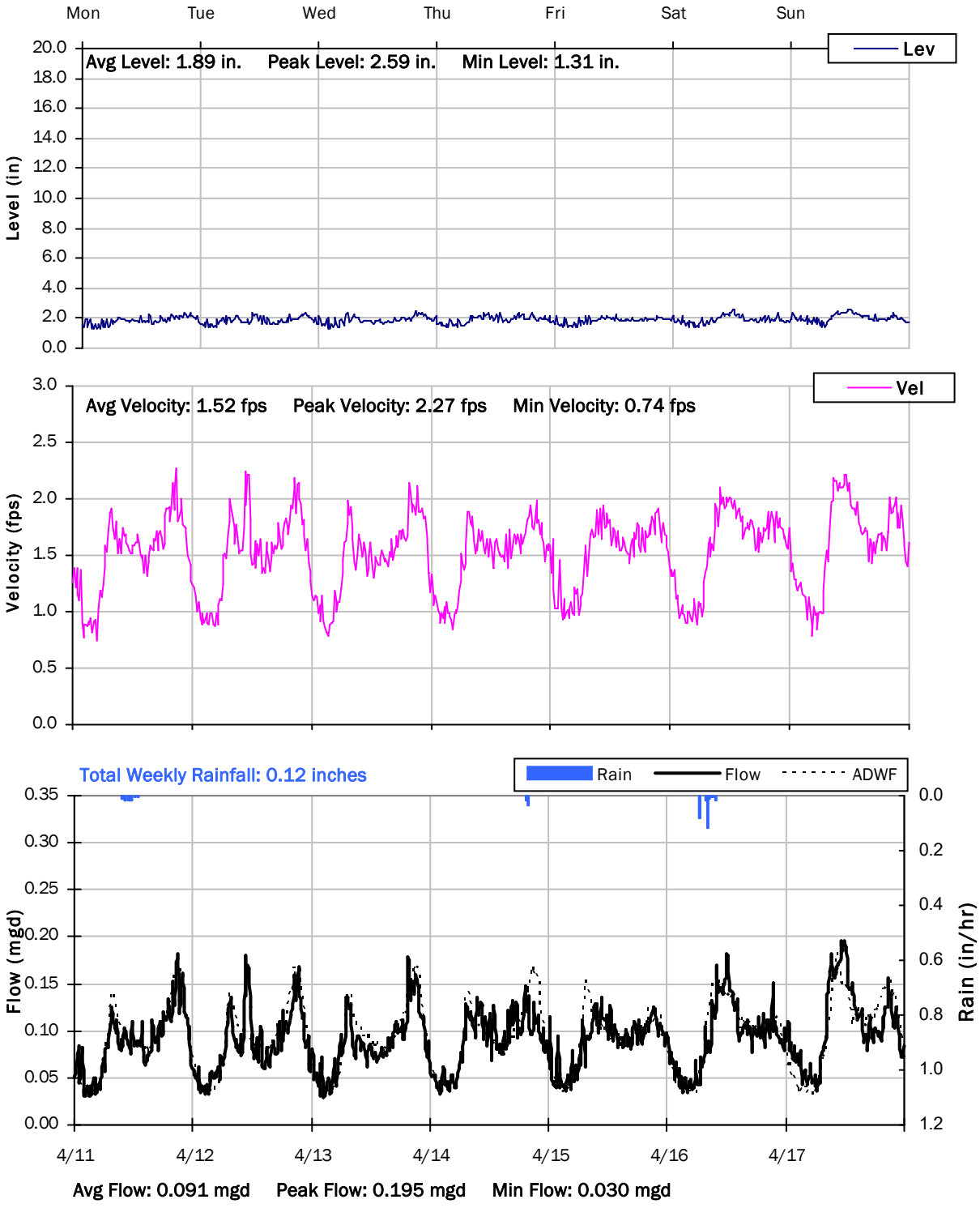
4/4/2022 to 4/11/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

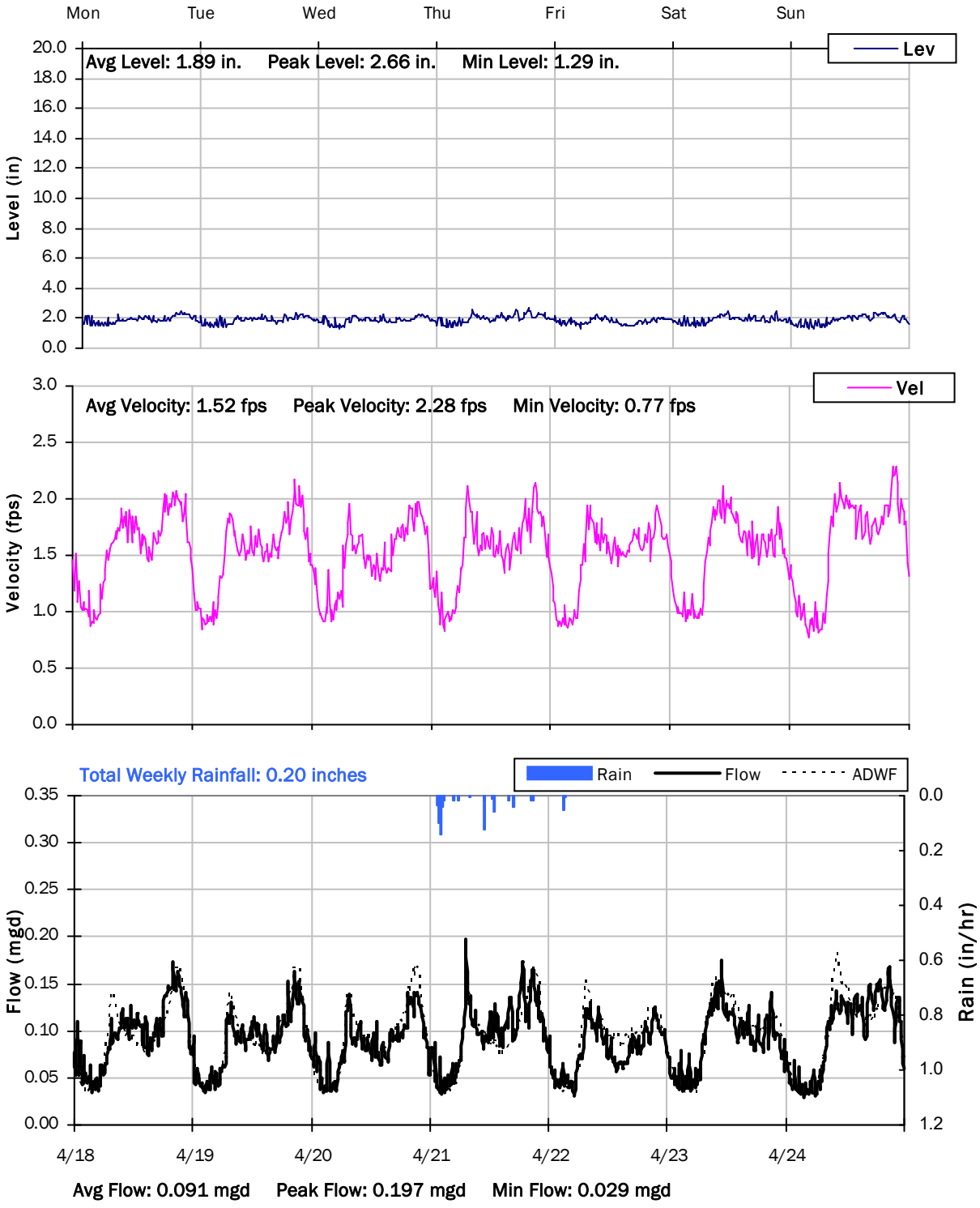
4/11/2022 to 4/18/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

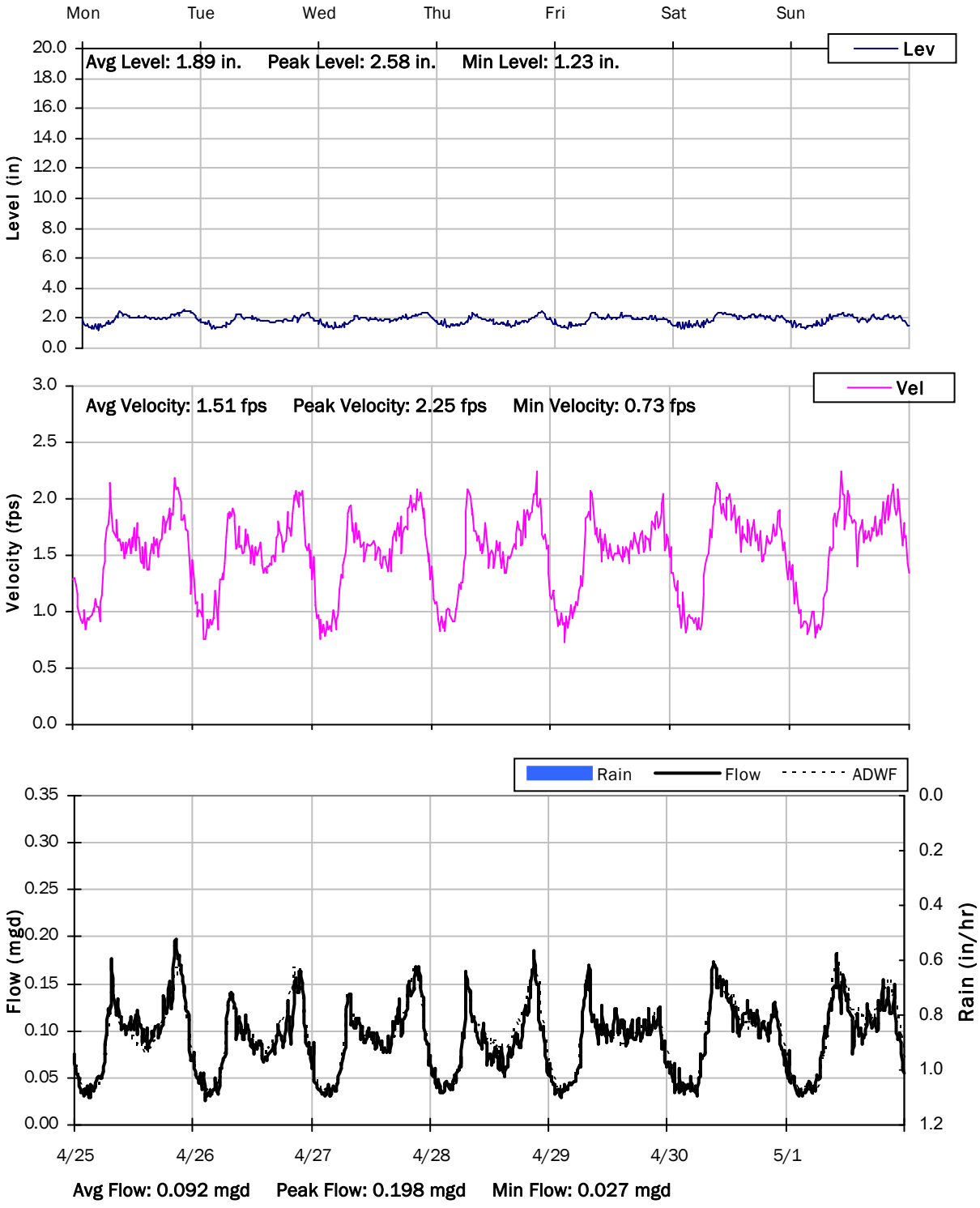
4/18/2022 to 4/25/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

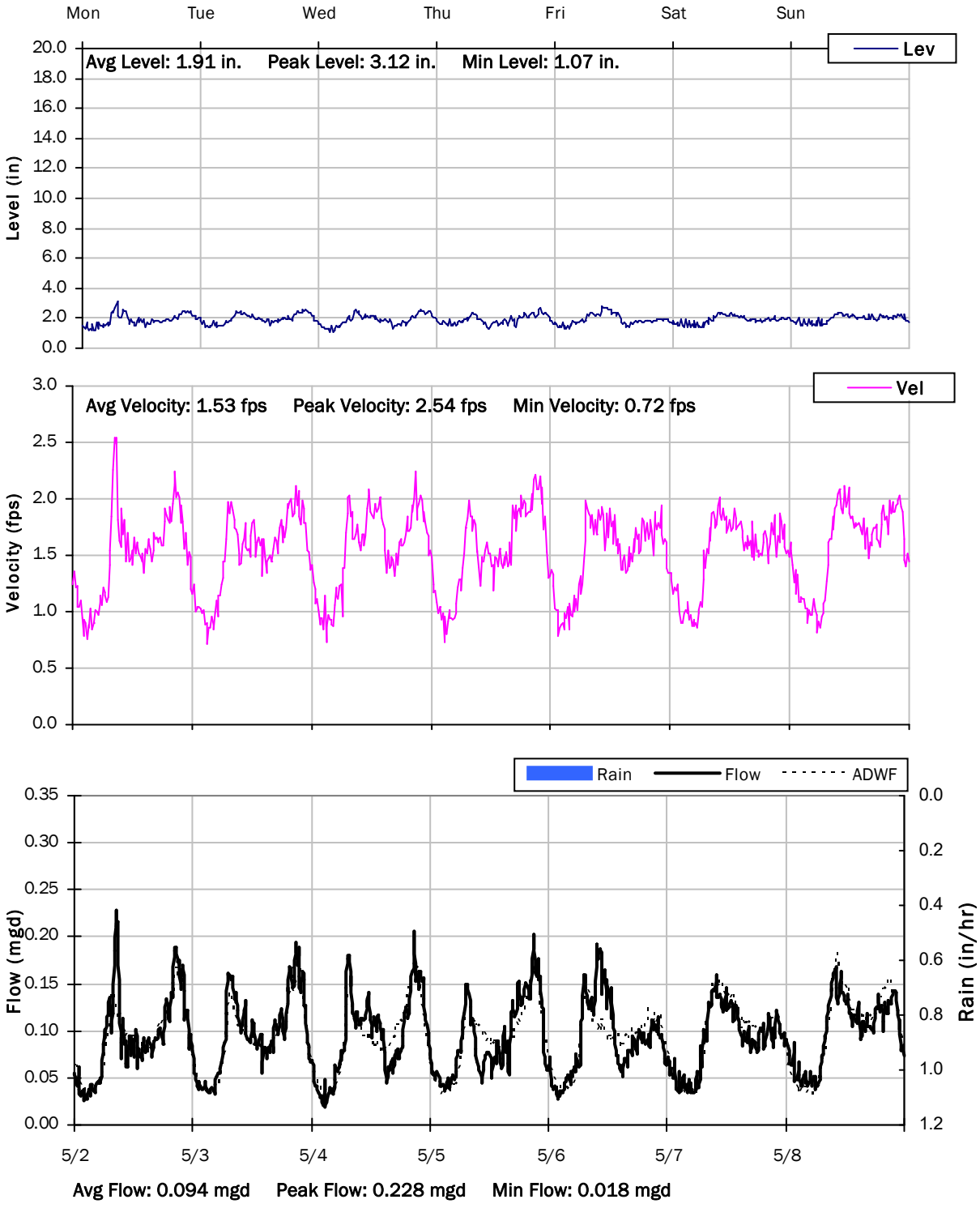
4/25/2022 to 5/2/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

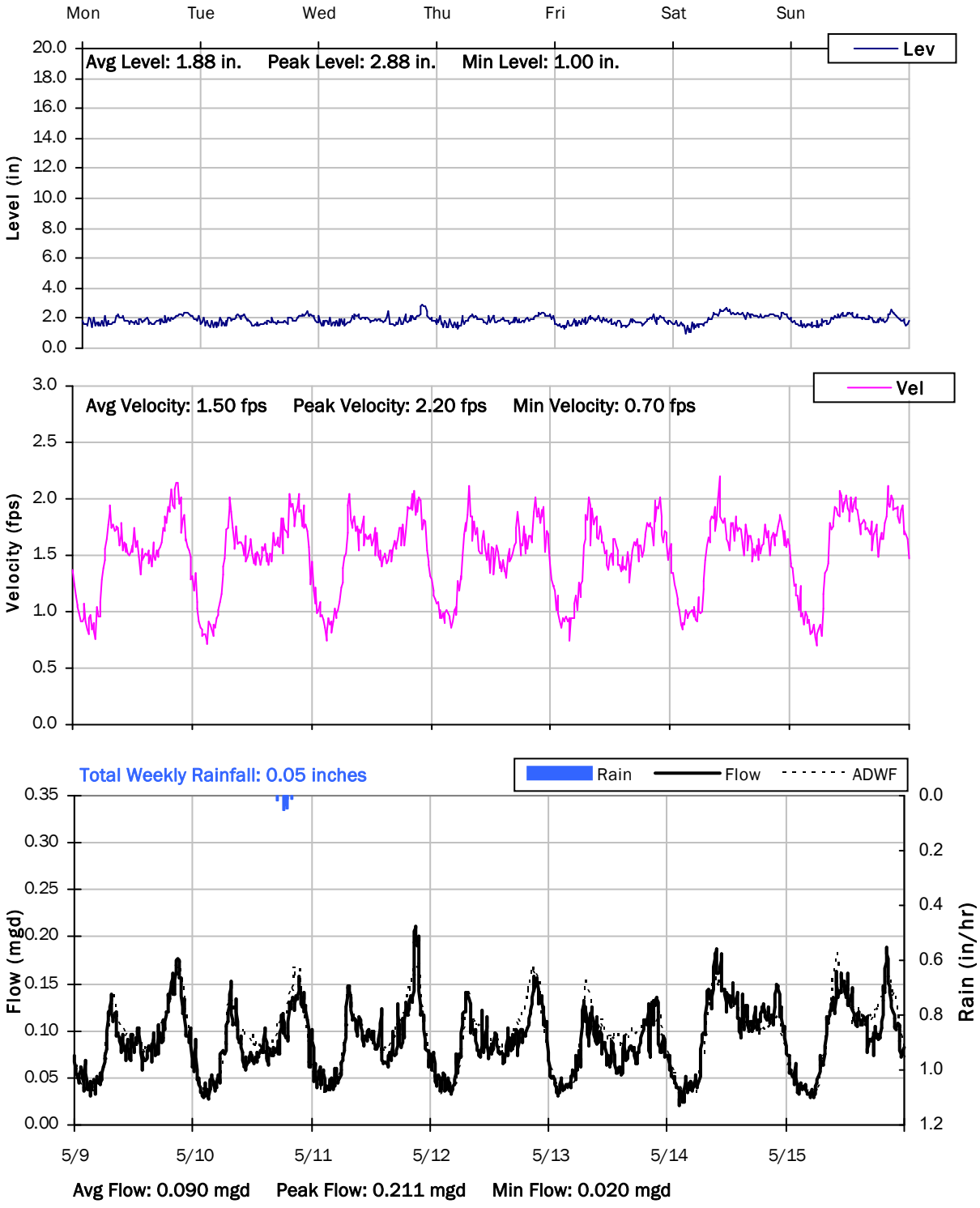
5/2/2022 to 5/9/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

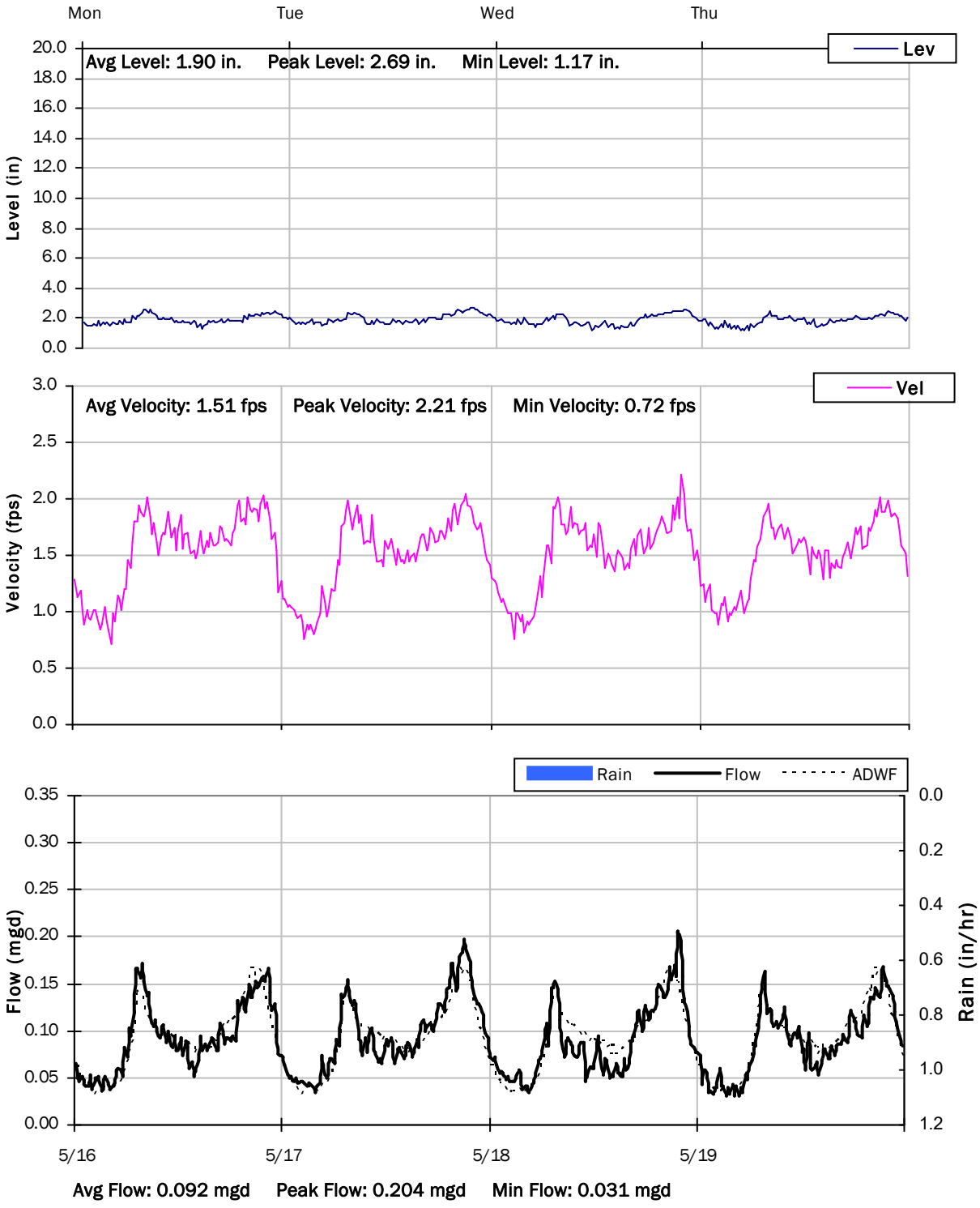
5/9/2022 to 5/16/2022



SITE 2

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 3

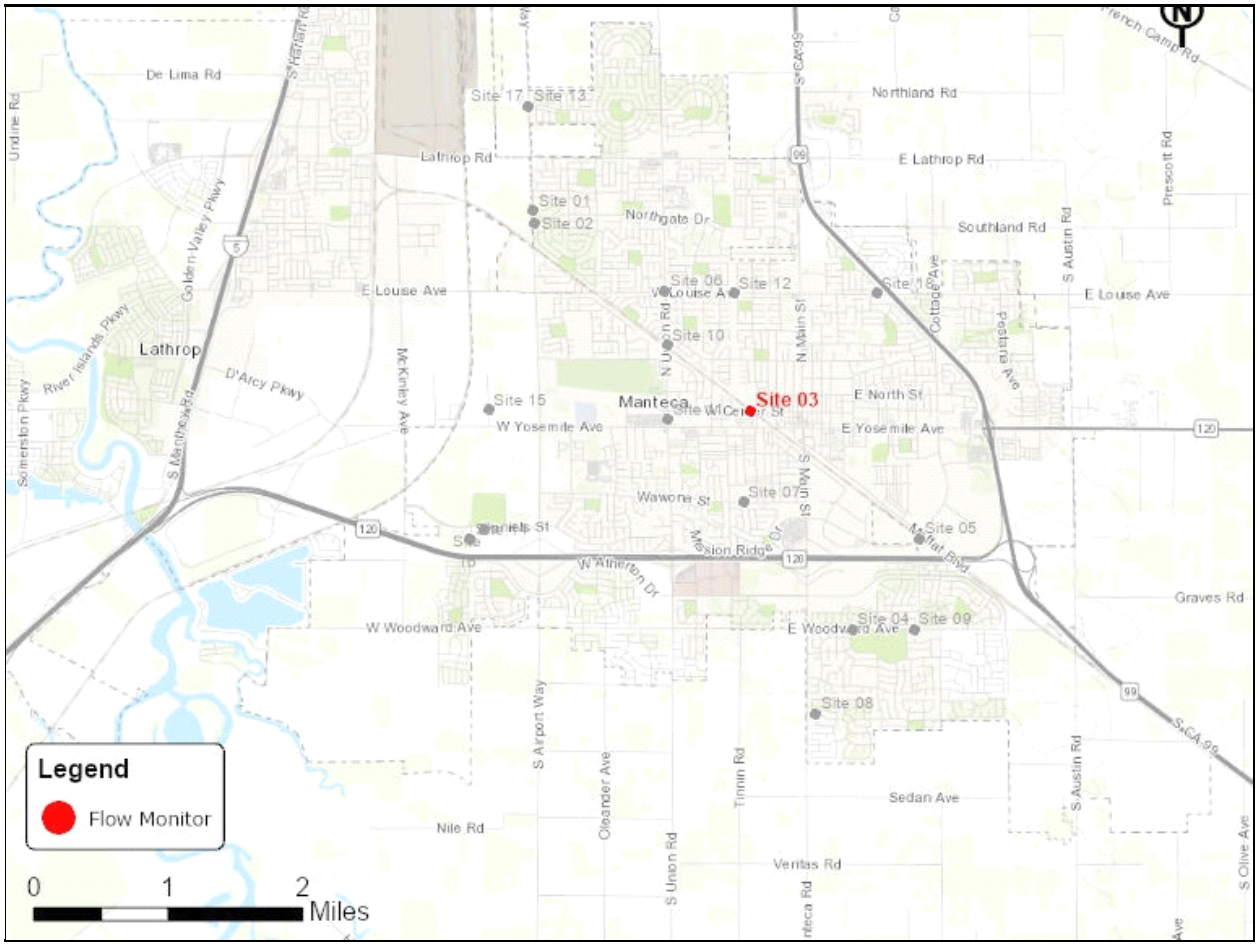
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: W. Center Street at Rose Lane

Data Summary Report



Vicinity Map: Site 3

SITE 3

Additional Site Photos

Effluent Pipe



Monitored East Influent Pipe



SITE 3

Additional Site Photos

Southeast Influent Pipe

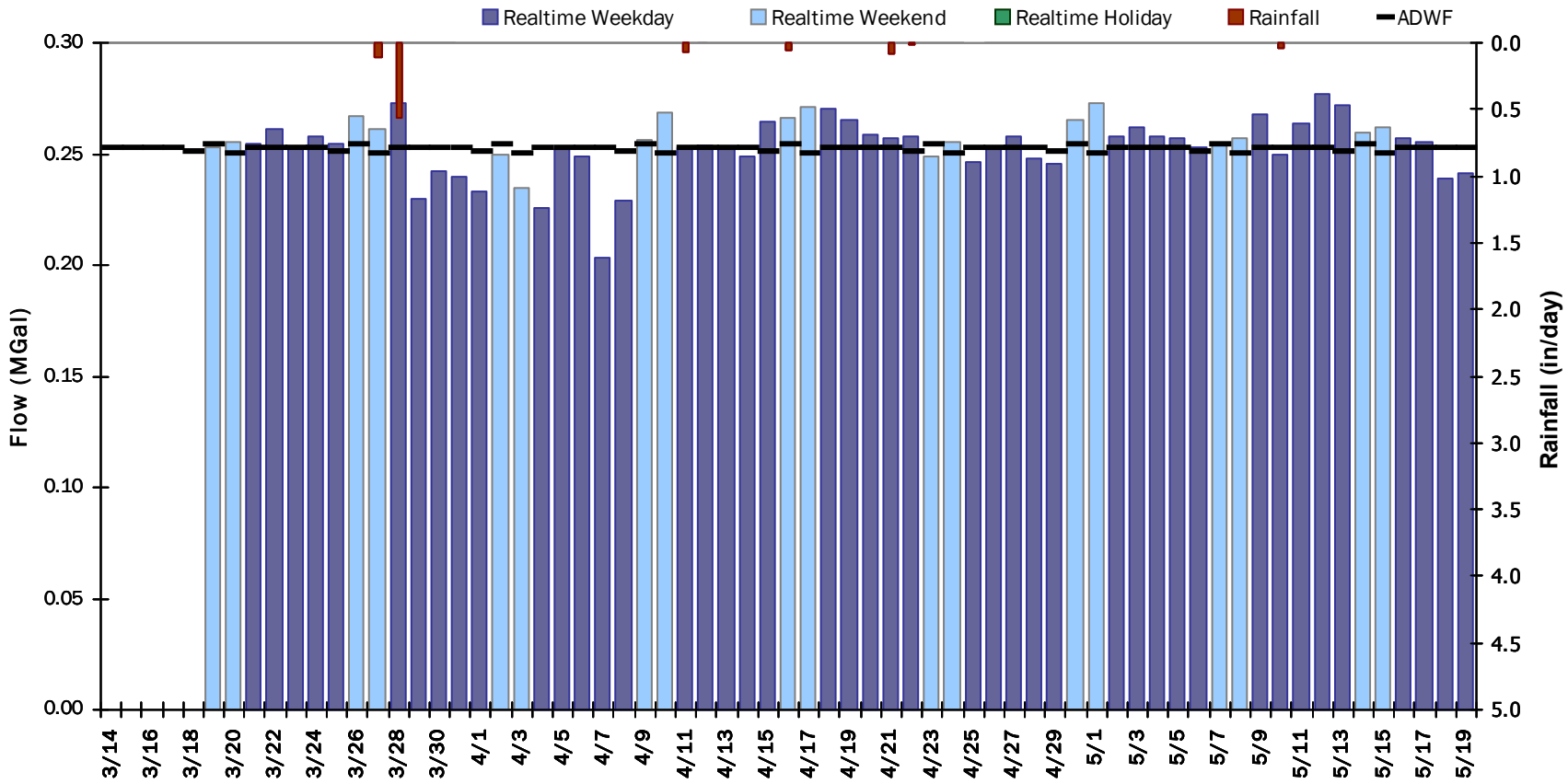


SITE 3

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.254 MGal Peak Daily Flow: 0.276 MGal Min Daily Flow: 0.203 MGal

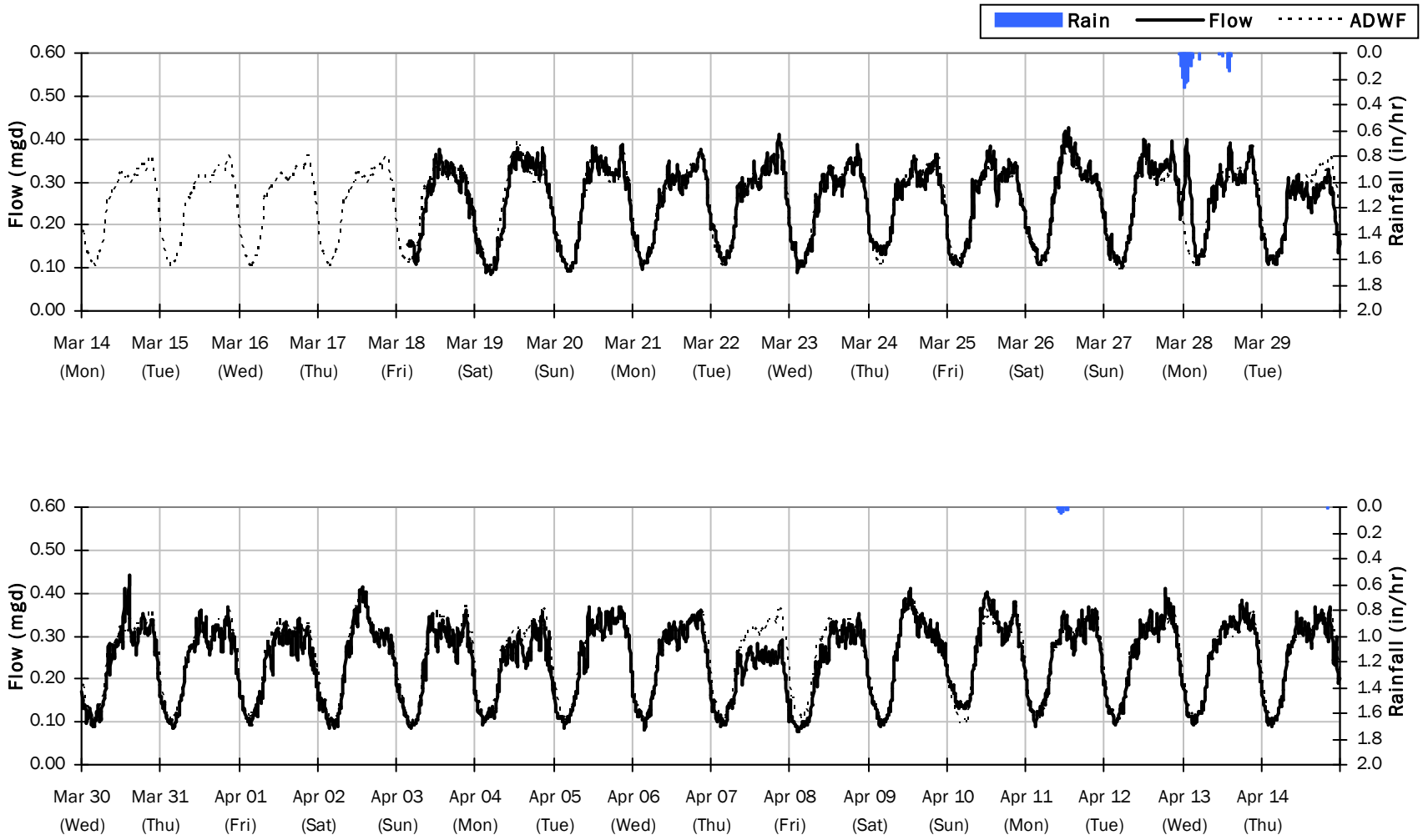
Total Rainfall: 0.93 inches



SITE 3

Flow Summary: 3/14/2022 to 4/14/2022

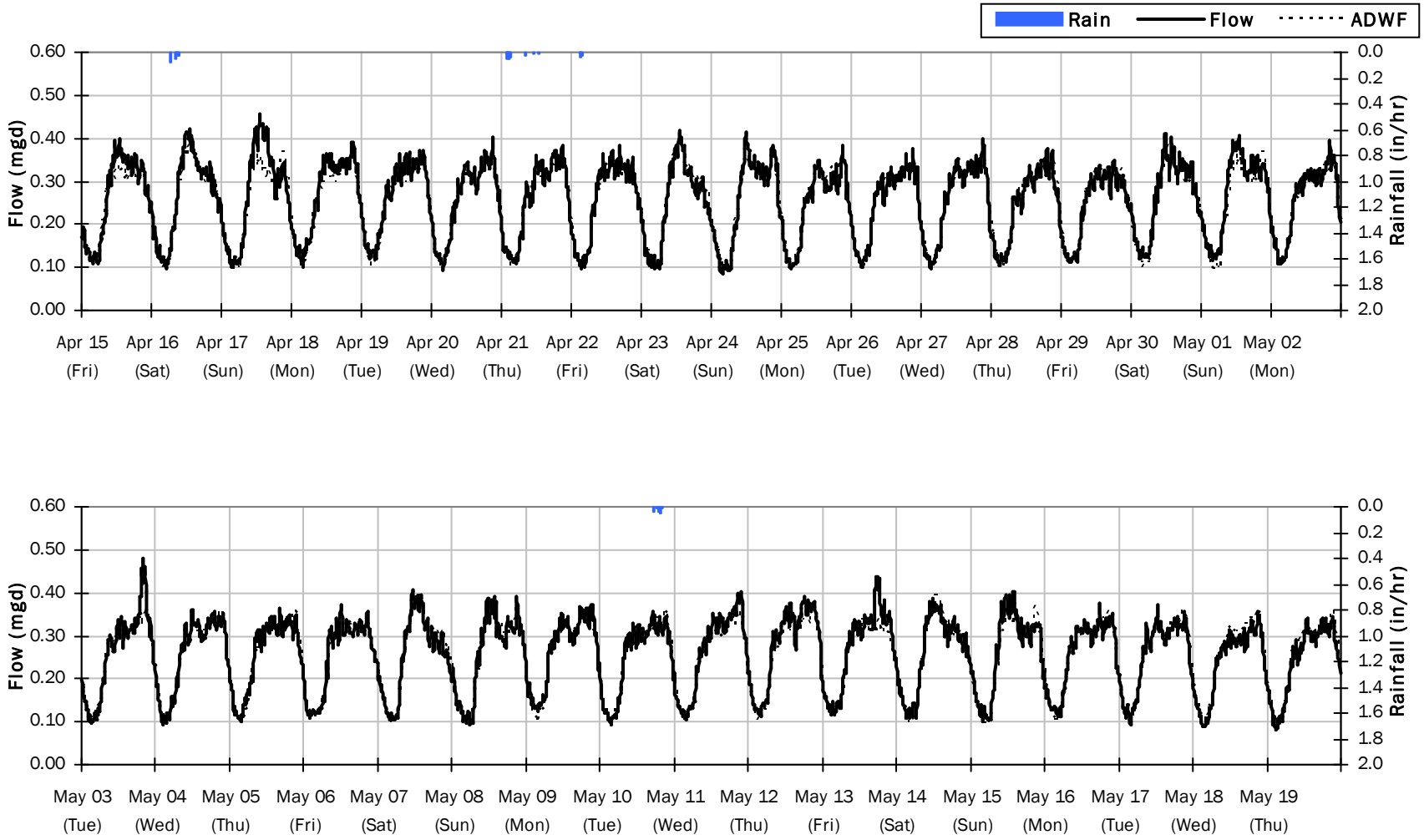
Period Rainfall: 0.74 inches Period Avg Flow: 0.249 mgd Period Peak Flow: 0.441 mgd Period Min Flow: 0.078 mgd



SITE 3

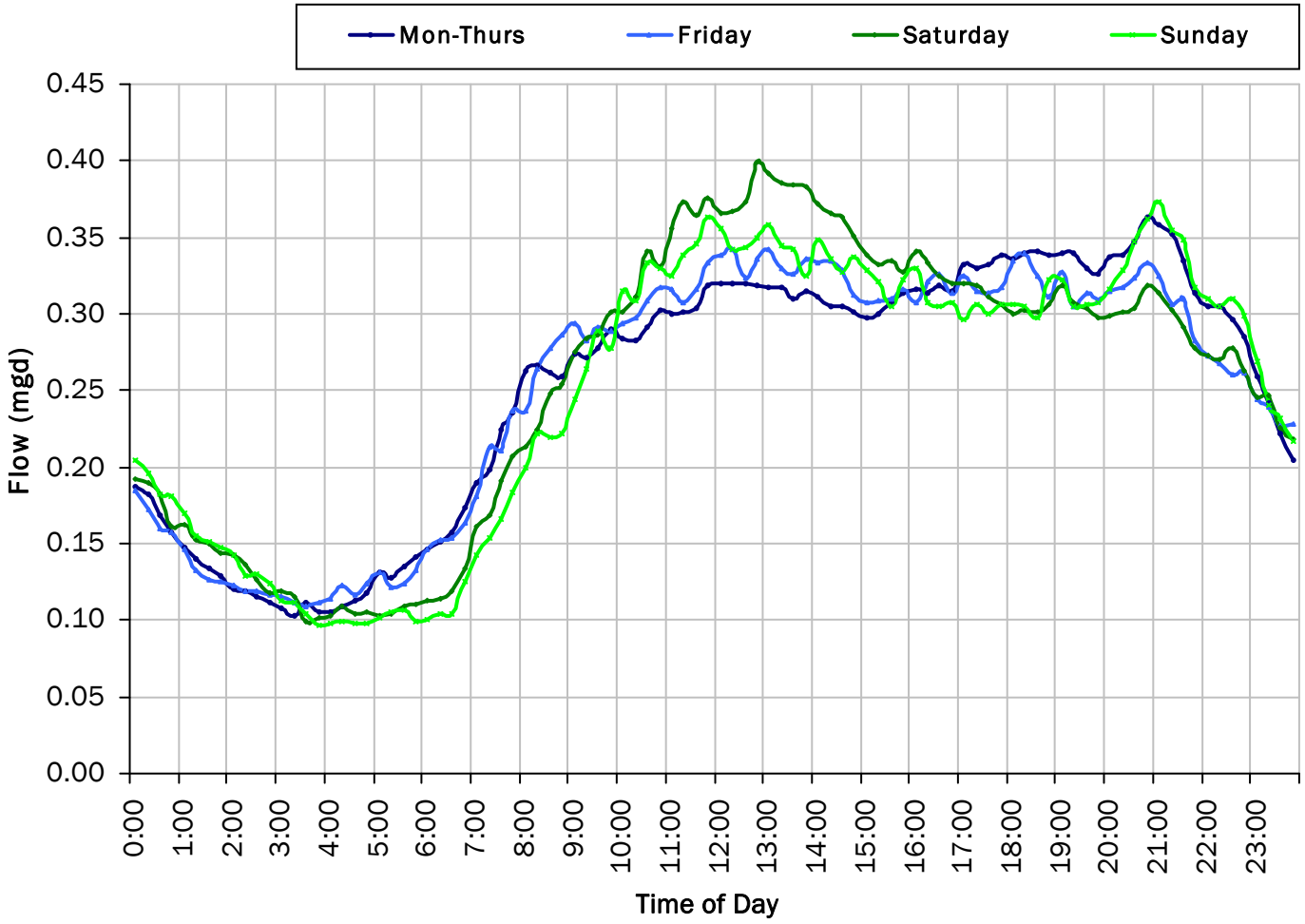
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.19 inches Period Avg Flow: 0.258 mgd Period Peak Flow: 0.481 mgd Period Min Flow: 0.082 mgd



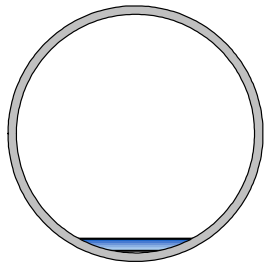
SITE 3

Average Dry Weather Flow Hydrographs



ADWF:

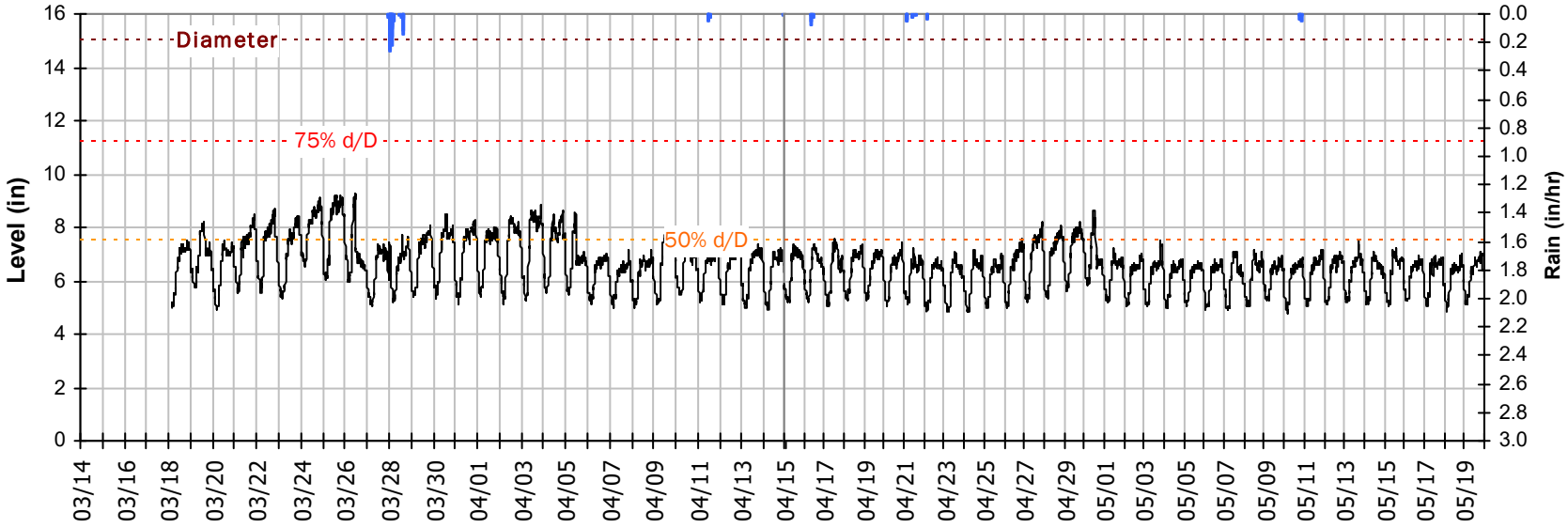
0.253 *mgd*

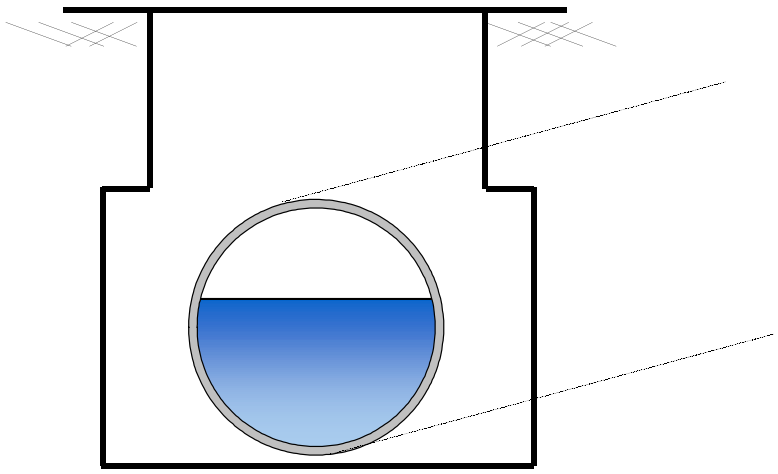


SITE 3

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

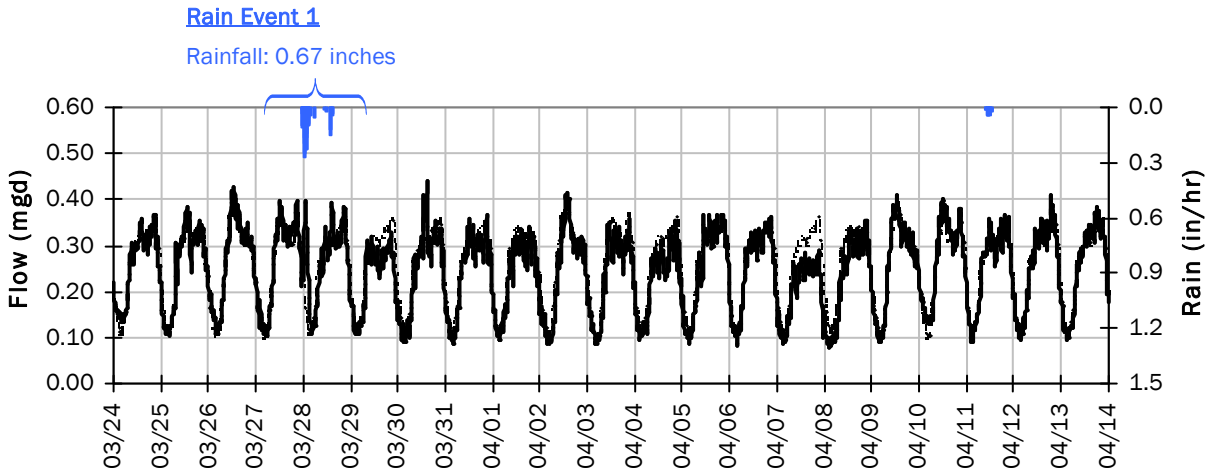




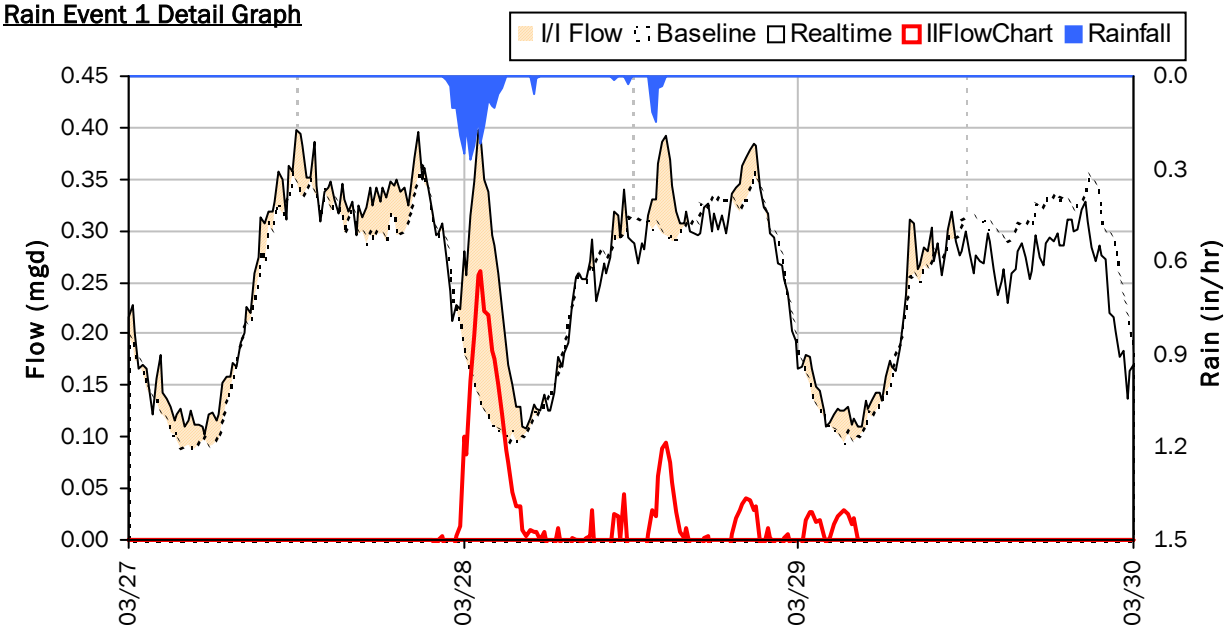
Pipe Diameter:	15	*inches*
Peak Measured Level:	9.24	*inches*
Peak d/D Ratio:	0.62	

SITE 3
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



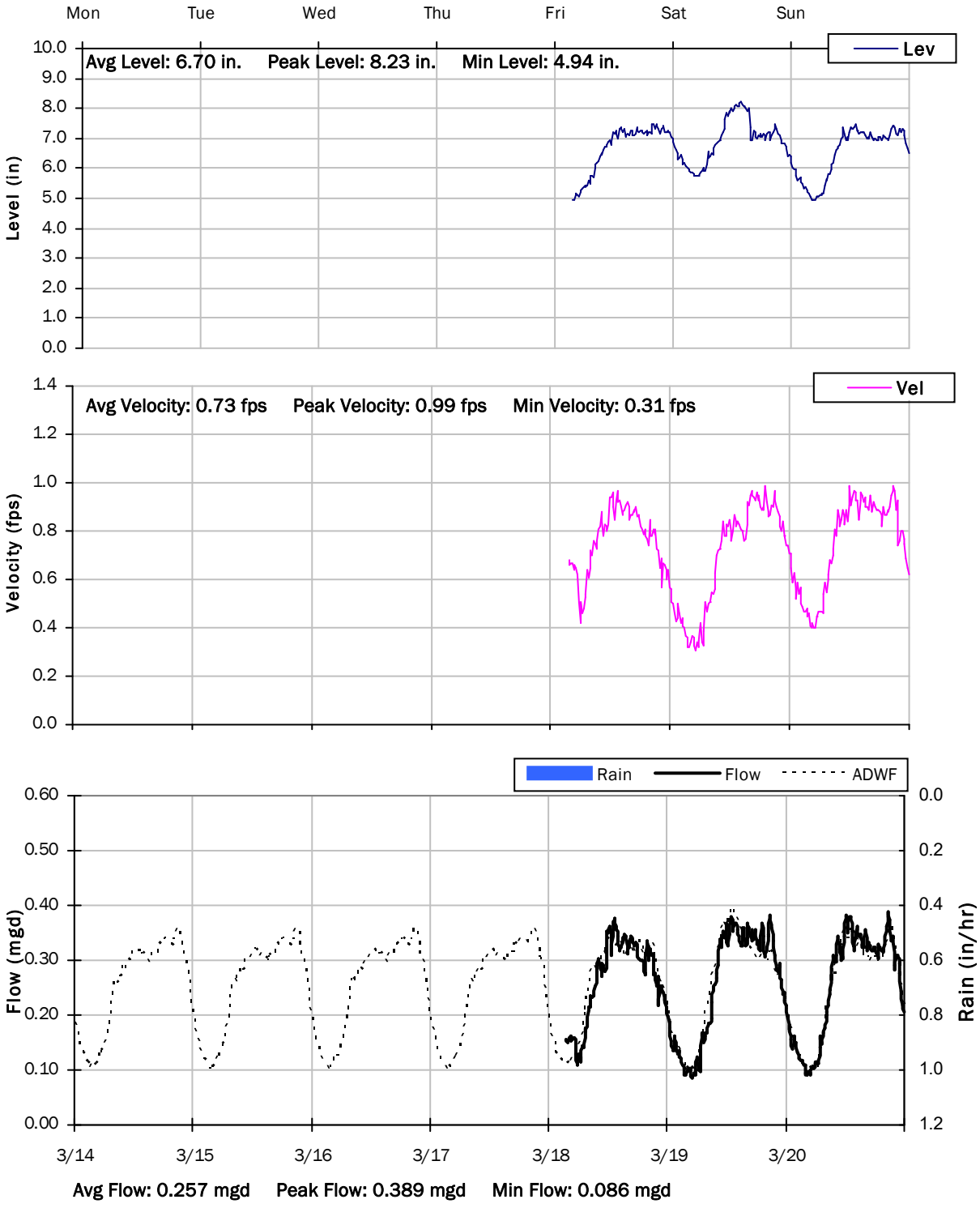
Storm Event I/I Analysis (Rain = 0.67 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.397 *mgd*	**Peak I/I Rate:**	0.262 *mgd*
PF:	1.57	**Total I/I:**	31,000 *gallons*
Peak Level:	7.74 *in*		
d/D Ratio:	0.52		

SITE 3

Weekly Level, Velocity and Flow Hydrographs

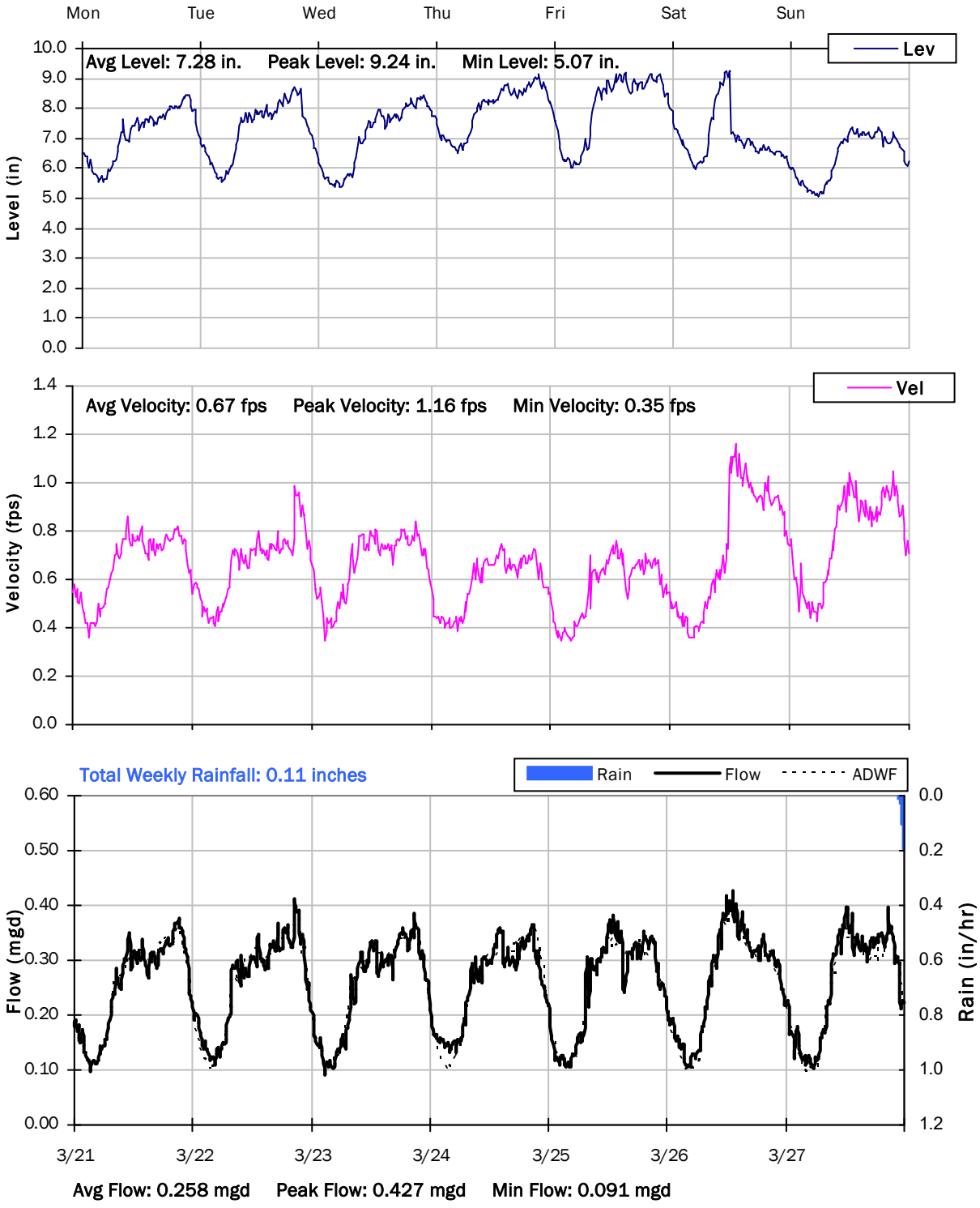
3/14/2022 to 3/21/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

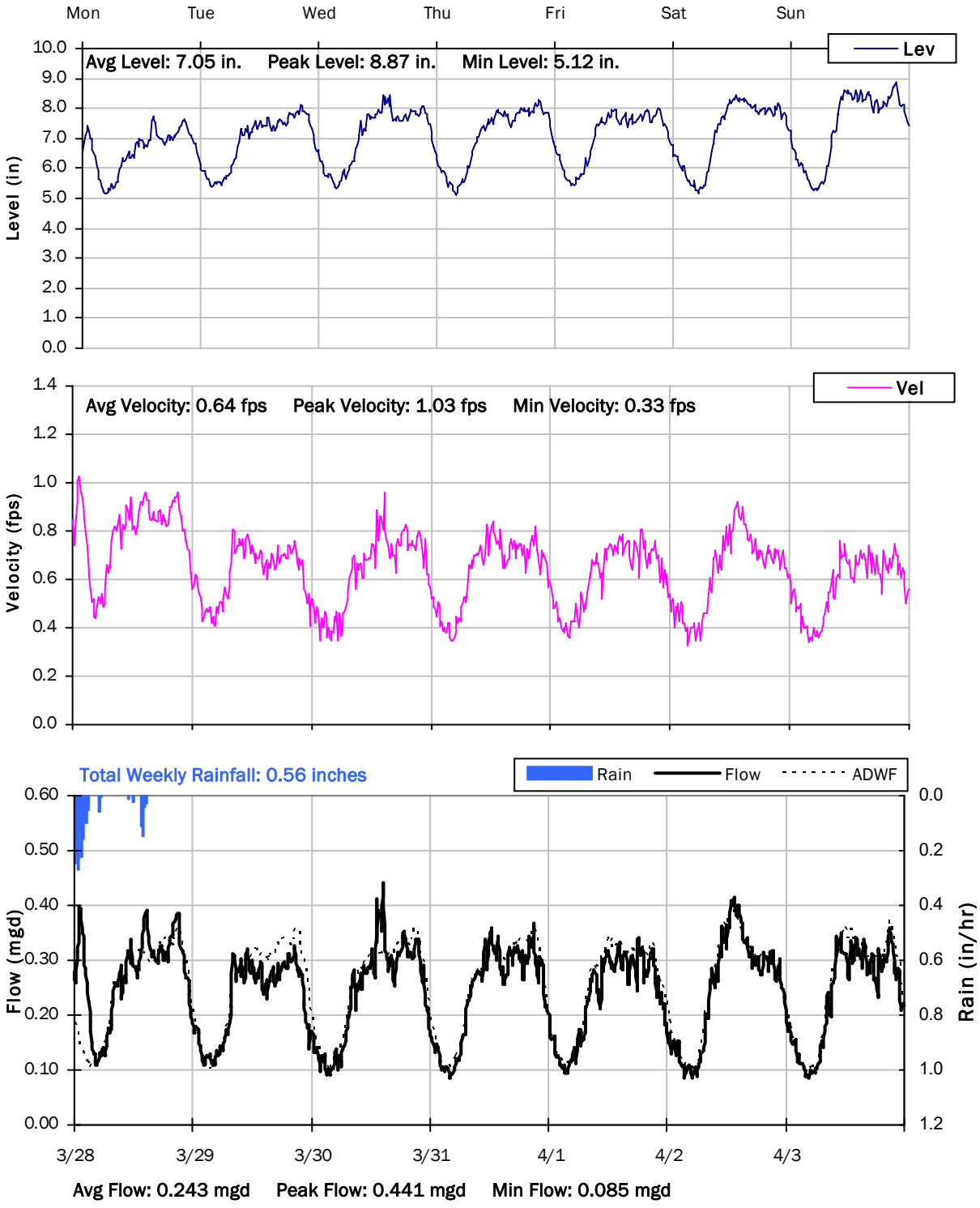
3/21/2022 to 3/28/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

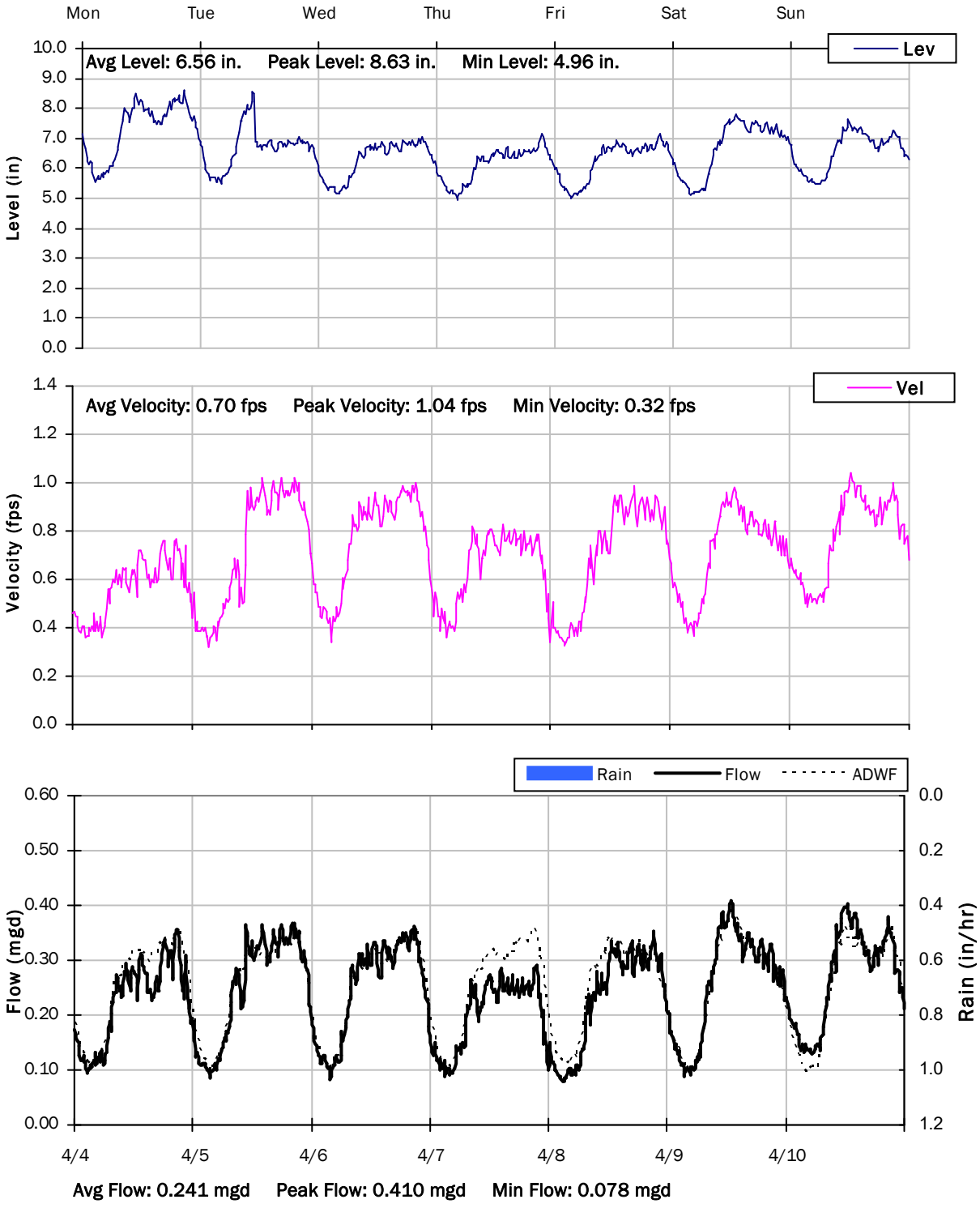
3/28/2022 to 4/4/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

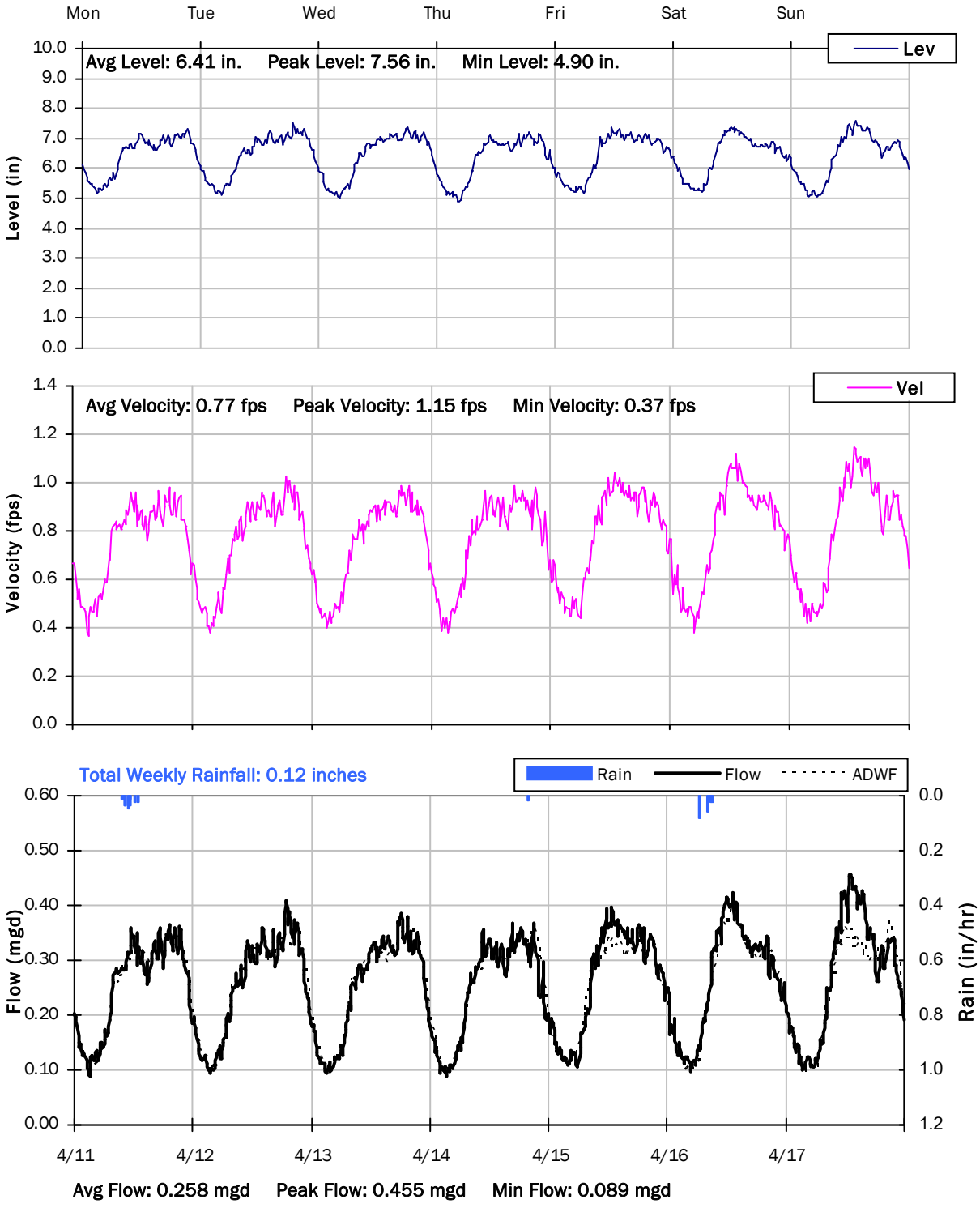
4/4/2022 to 4/11/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

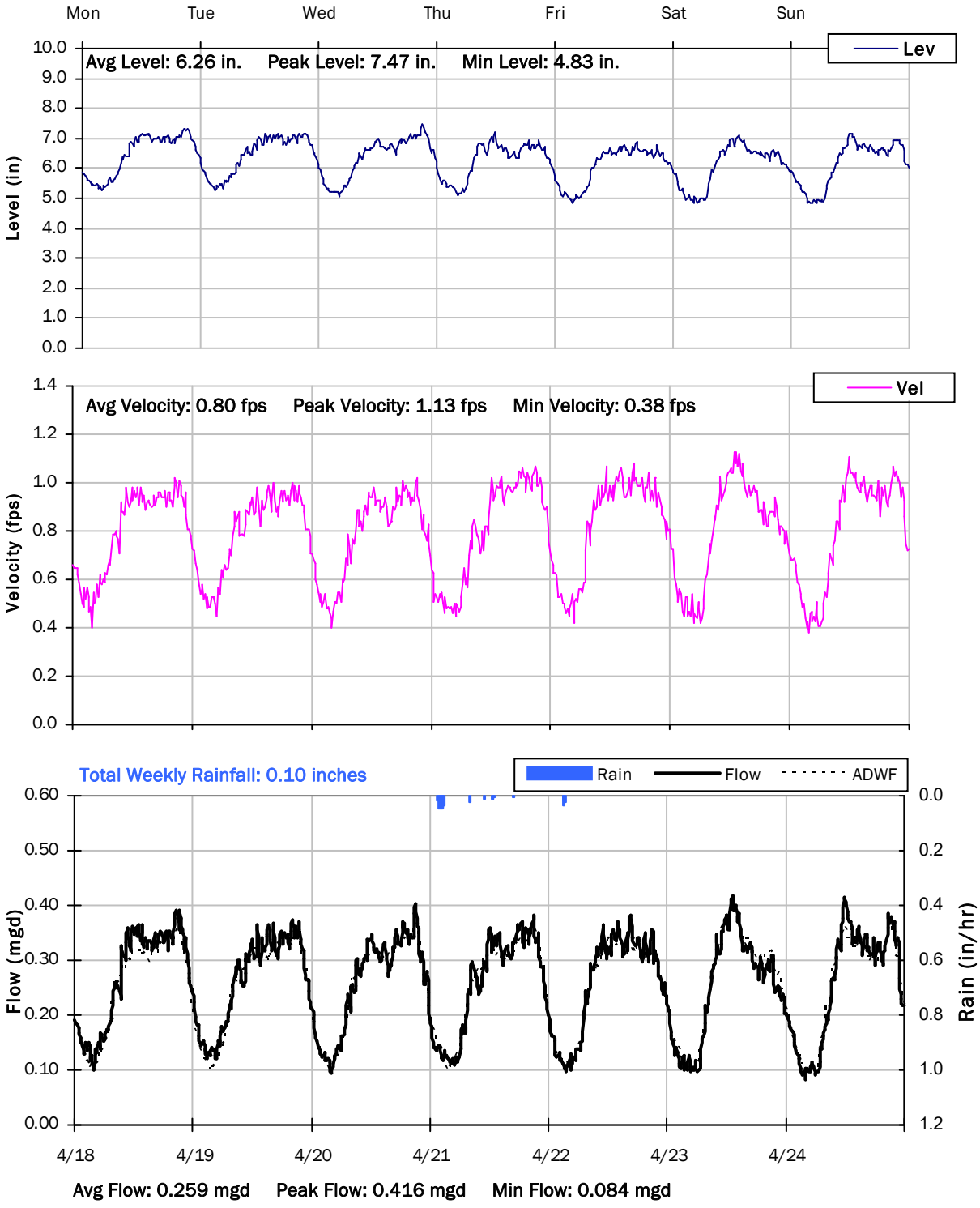
4/11/2022 to 4/18/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

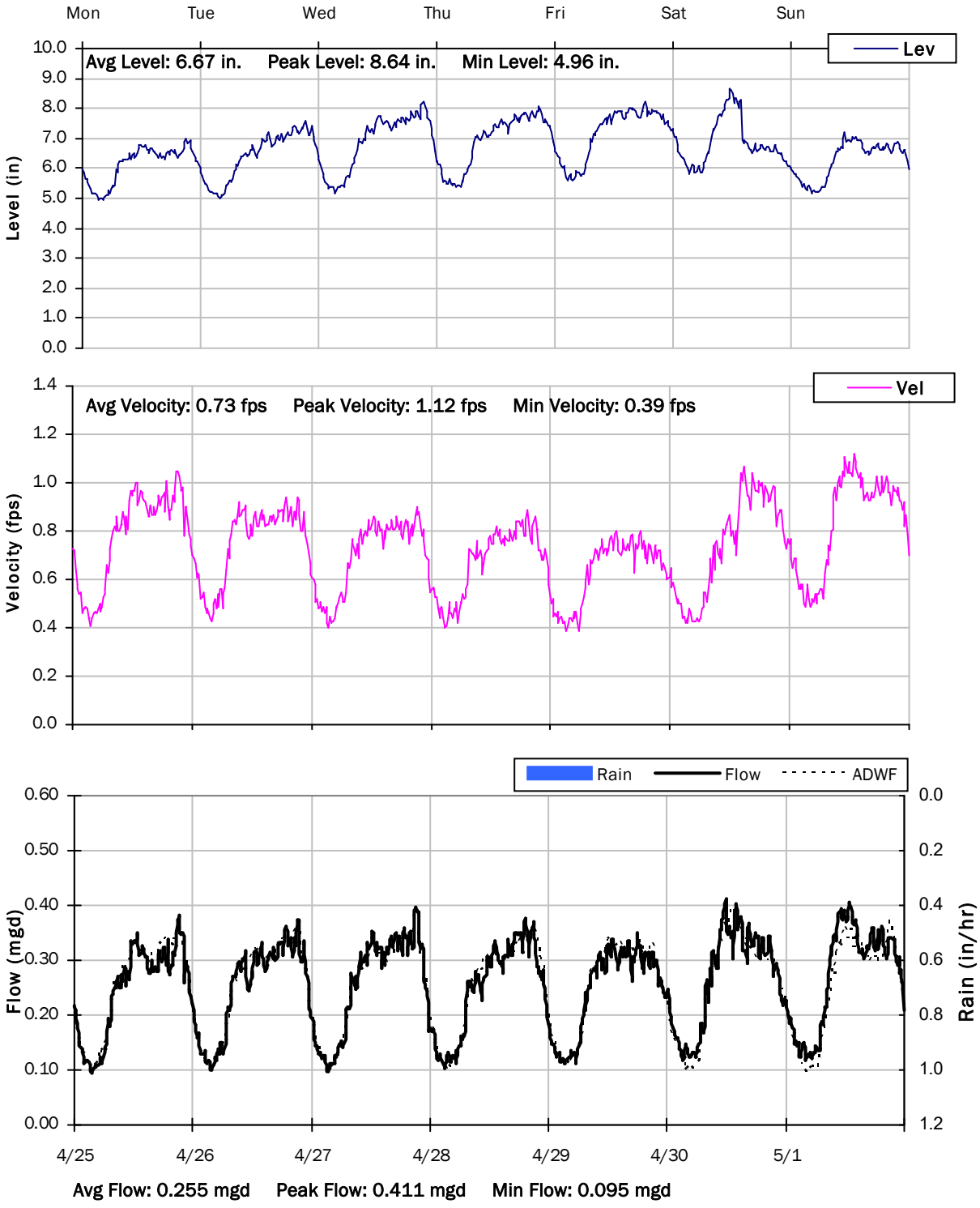
4/18/2022 to 4/25/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

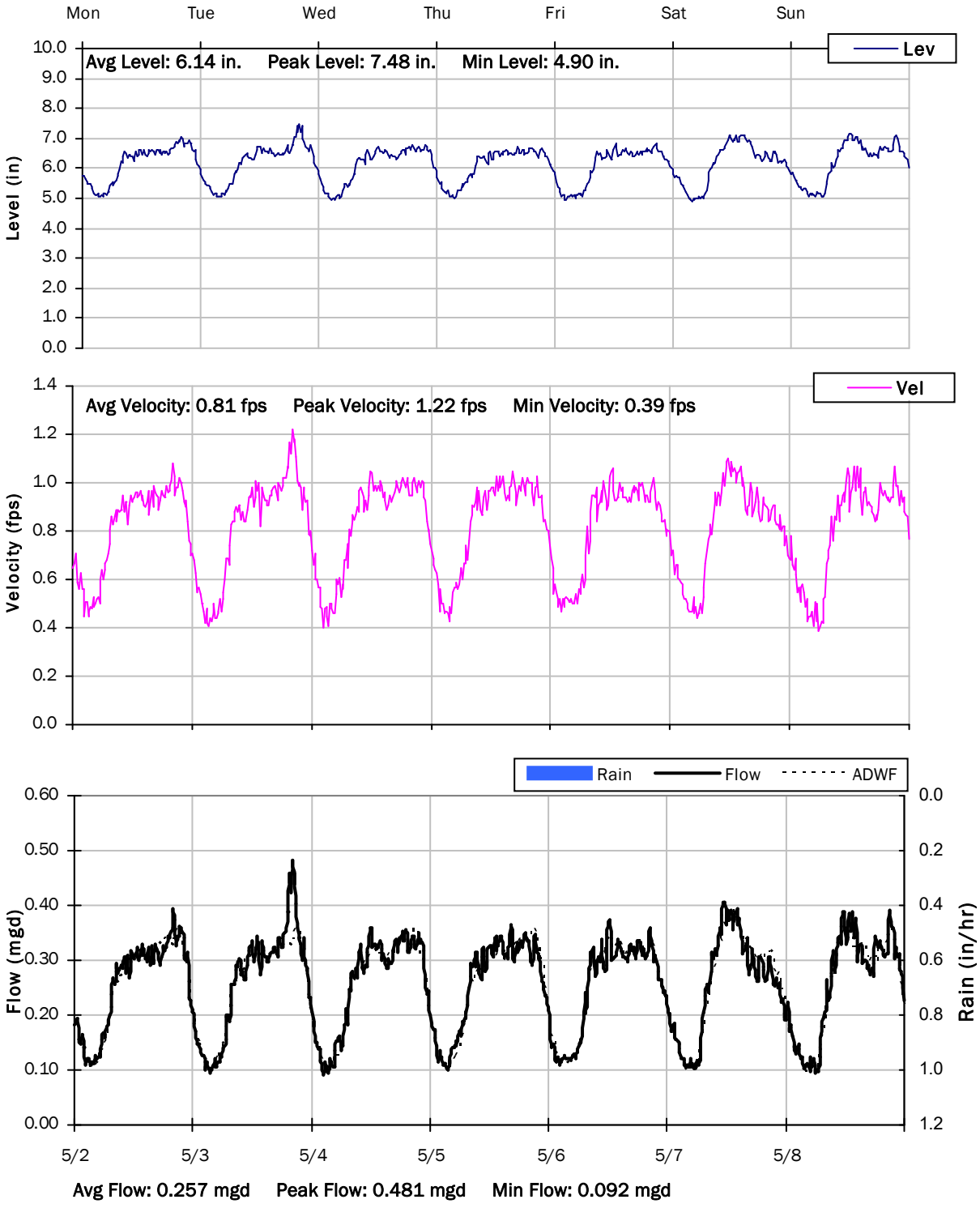
4/25/2022 to 5/2/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

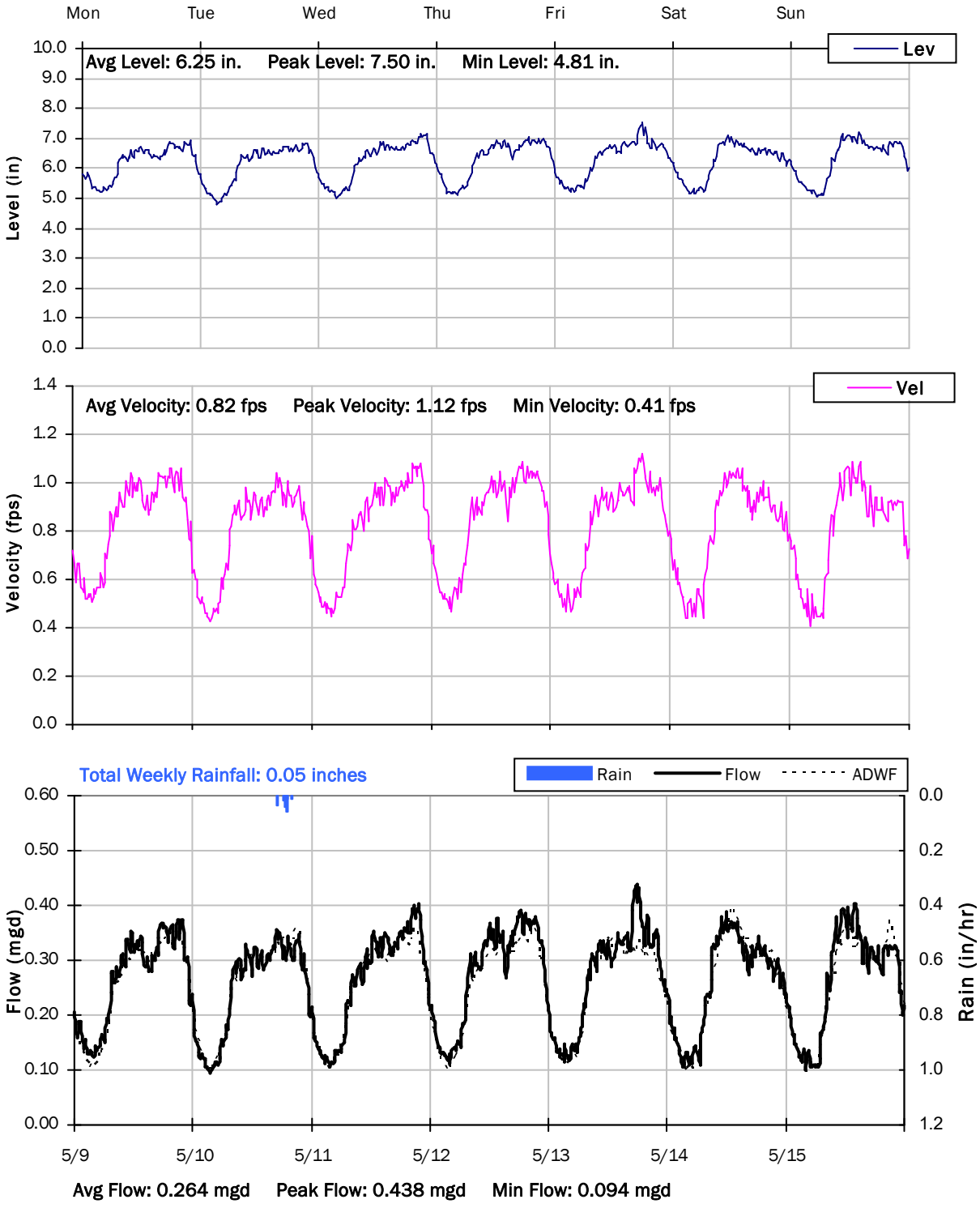
5/2/2022 to 5/9/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

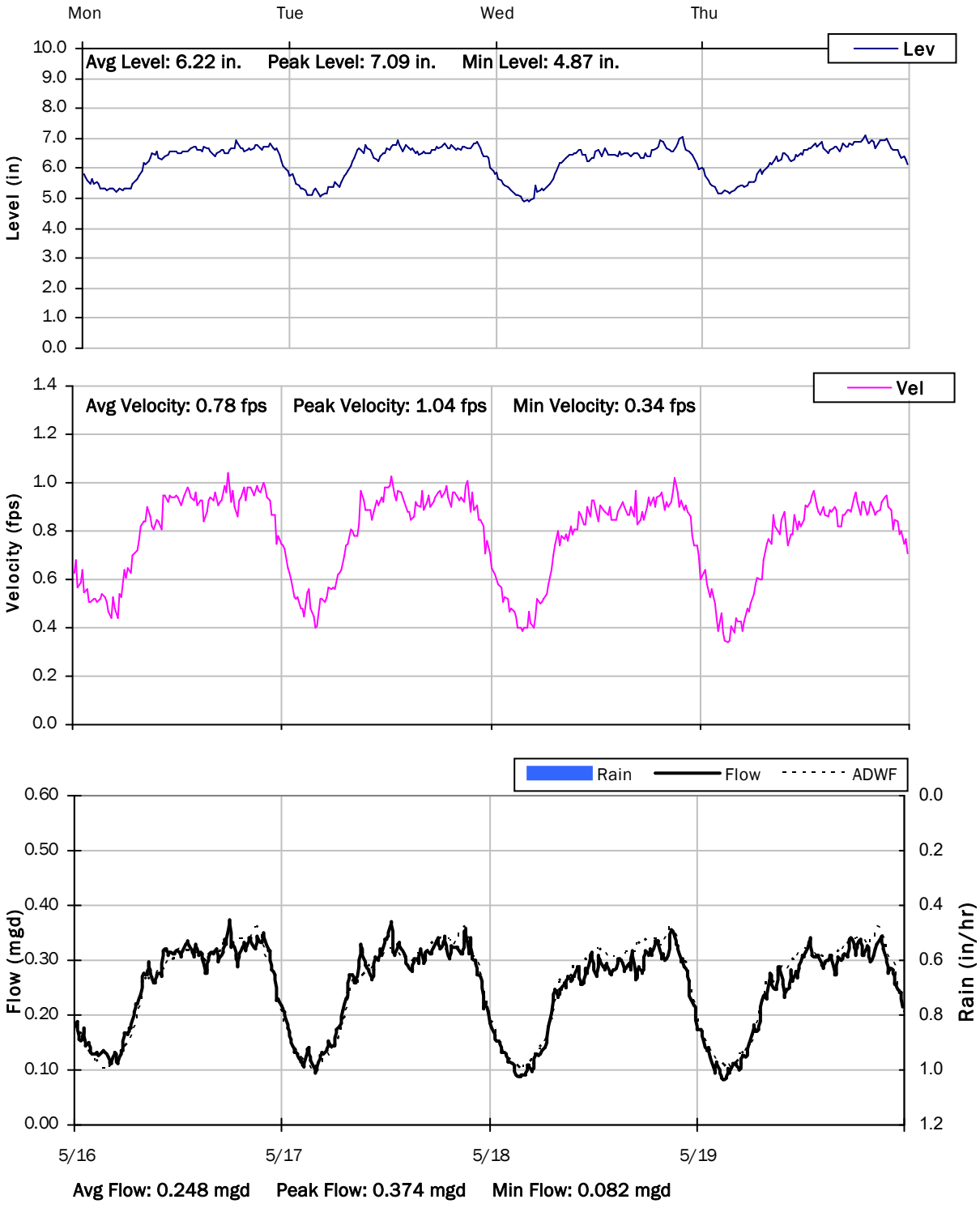
5/9/2022 to 5/16/2022



SITE 3

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 4

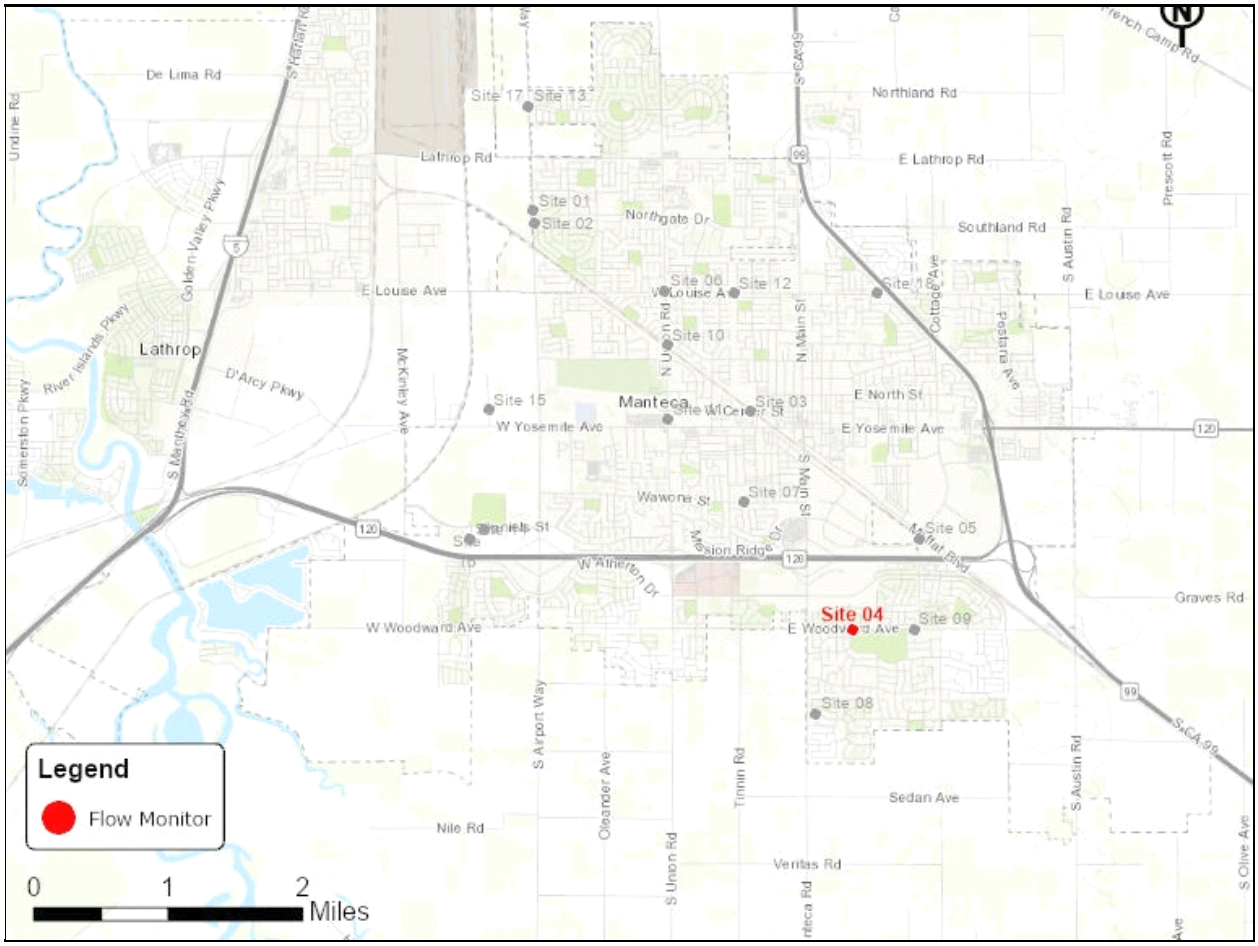
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Woodward Avenue East of Buena Vista Drive

Data Summary Report



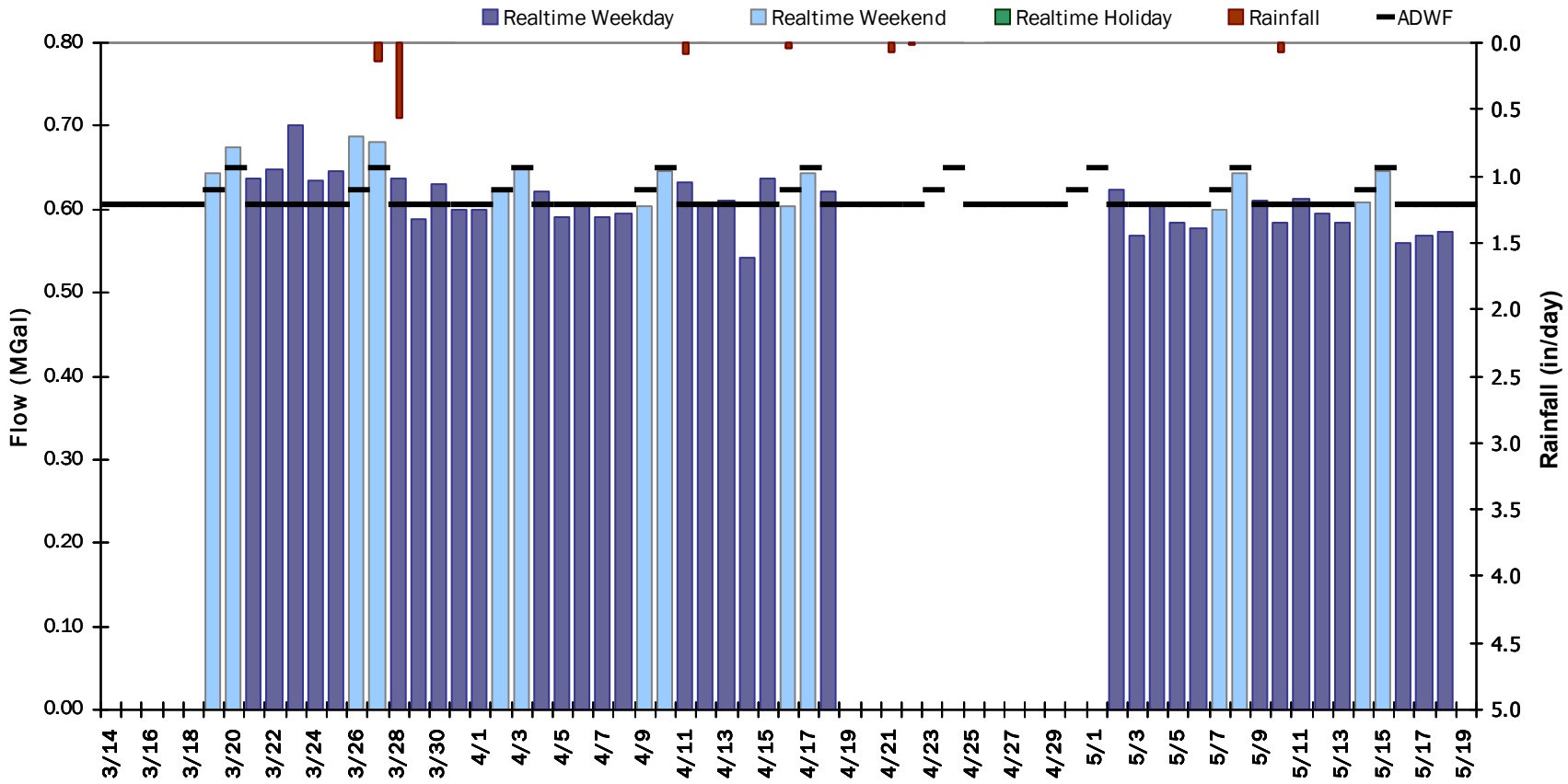
Vicinity Map: Site 4

SITE 4

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.620 MGal Peak Daily Flow: 0.840 MGal Min Daily Flow: 0.542 MGal

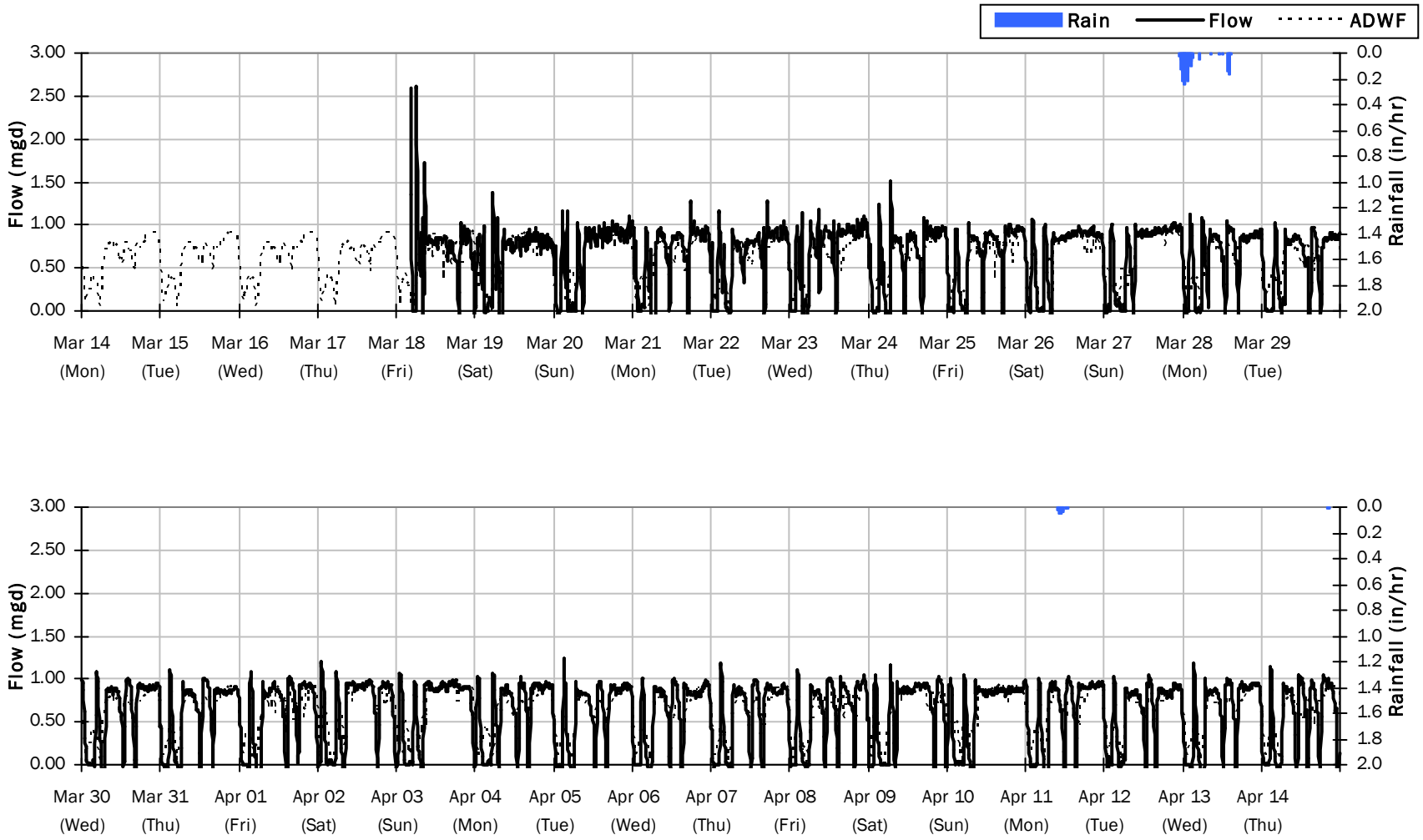
Total Rainfall: 0.90 inches



SITE 4

Flow Summary: 3/14/2022 to 4/14/2022

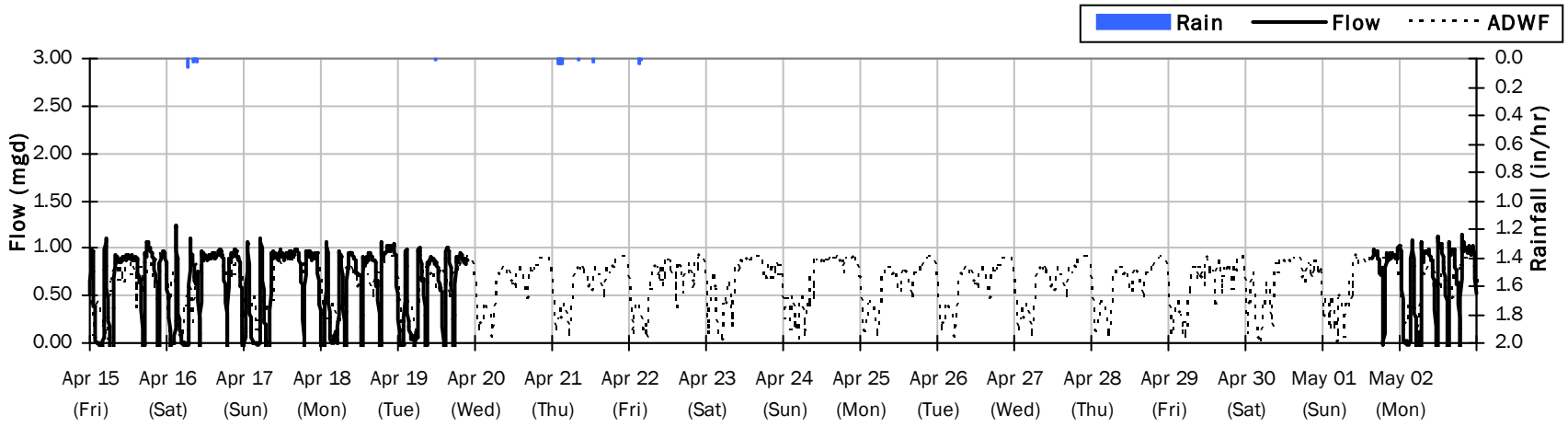
Period Rainfall: 0.79 inches Period Avg Flow: 0.630 mgd Period Peak Flow: 2.598 mgd Period Min Flow: -0.266 mgd

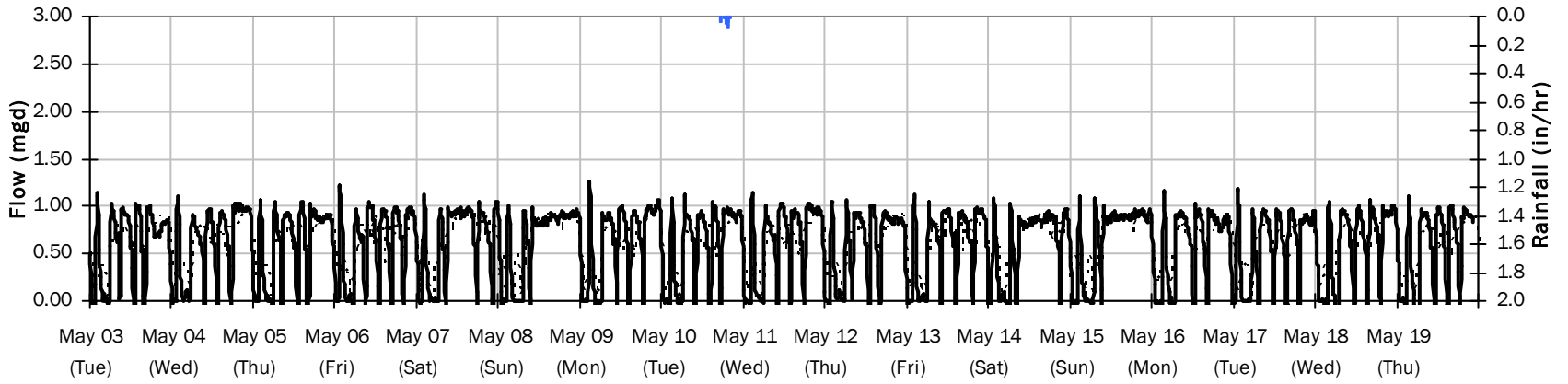


SITE 4

Flow Summary: 4/15/2022 to 5/19/2022

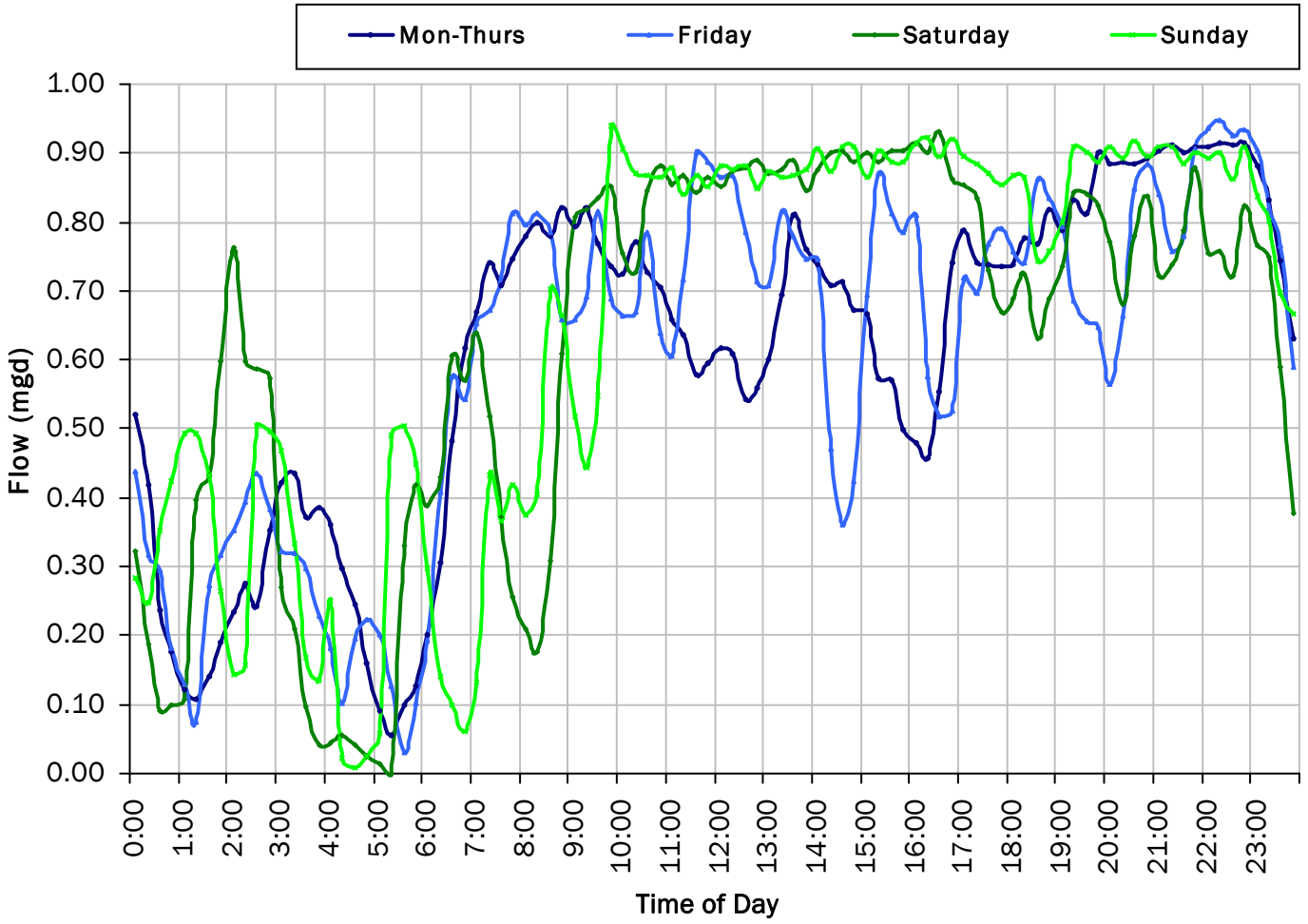
Period Rainfall: 0.19 inches Period Avg Flow: 0.602 mgd Period Peak Flow: 1.237 mgd Period Min Flow: -0.304 mgd





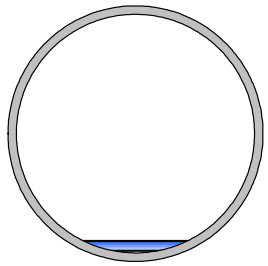
SITE 4

Average Dry Weather Flow Hydrographs



ADWF:

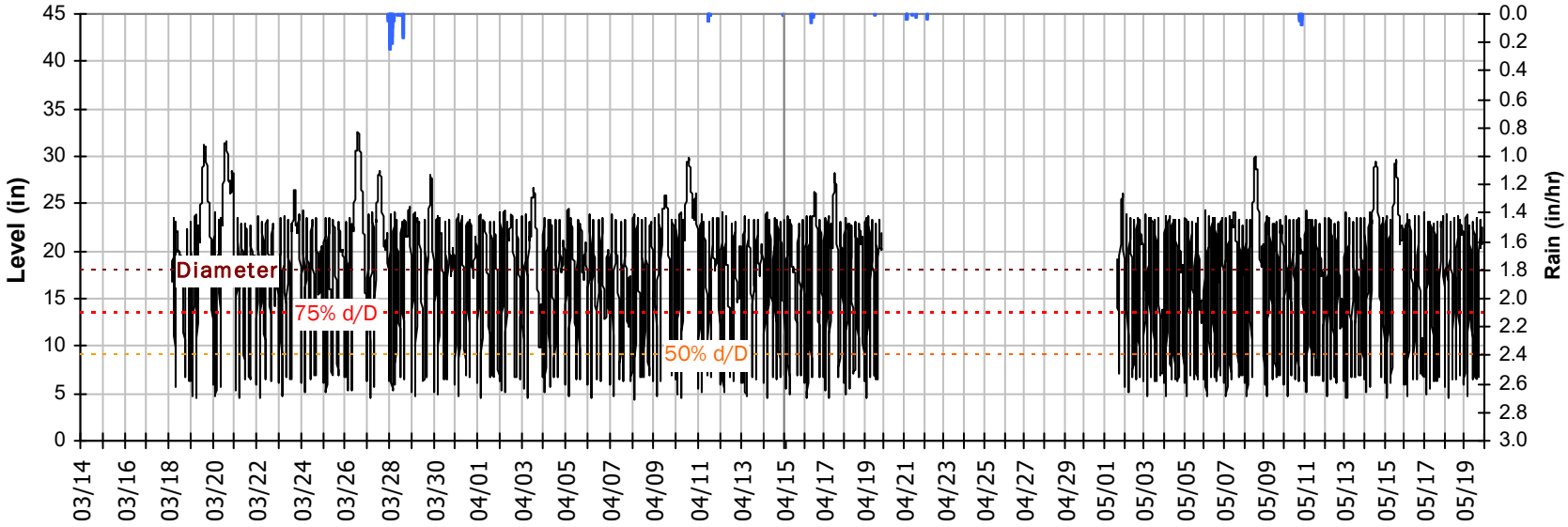
0.614 *mgd*

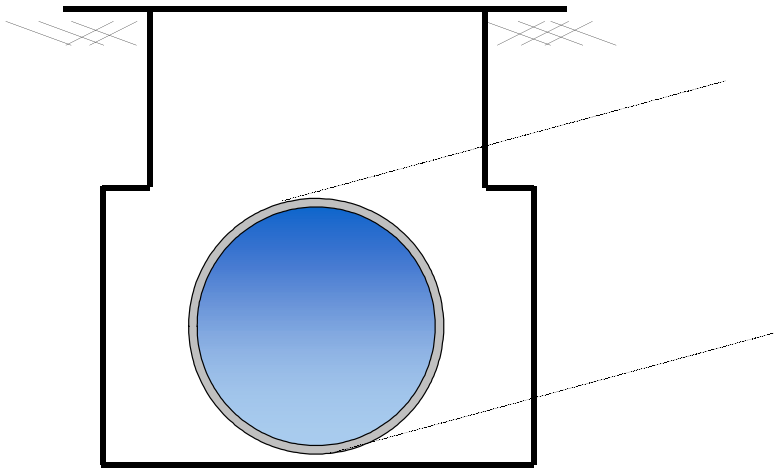


SITE 4

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period





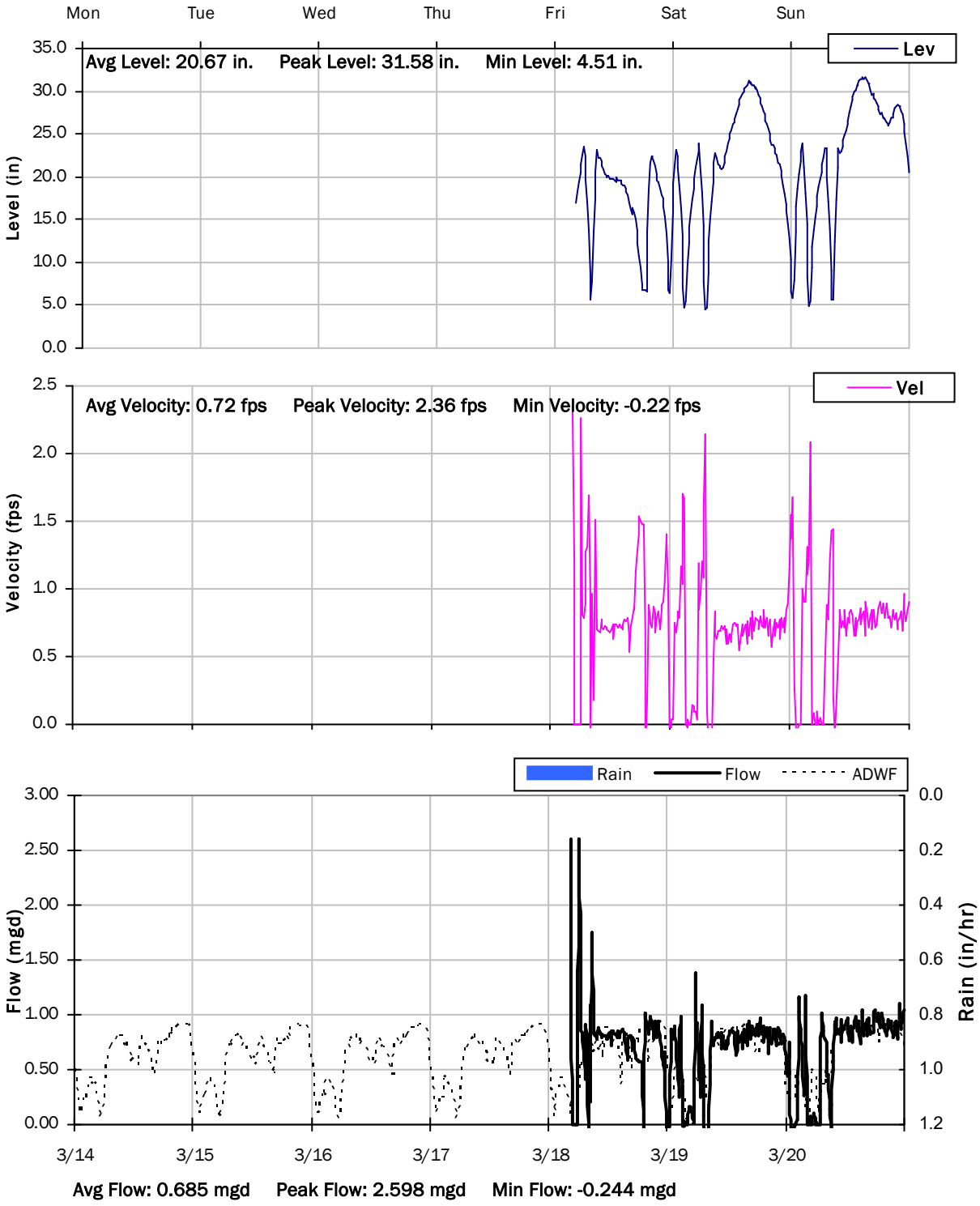
Pipe Diameter:	18	*inches*
Peak Measured Level:	32.6	*inches*
Peak d/D Ratio:	1.81	

Surcharged 14.6 inches over crown

SITE 4

Weekly Level, Velocity and Flow Hydrographs

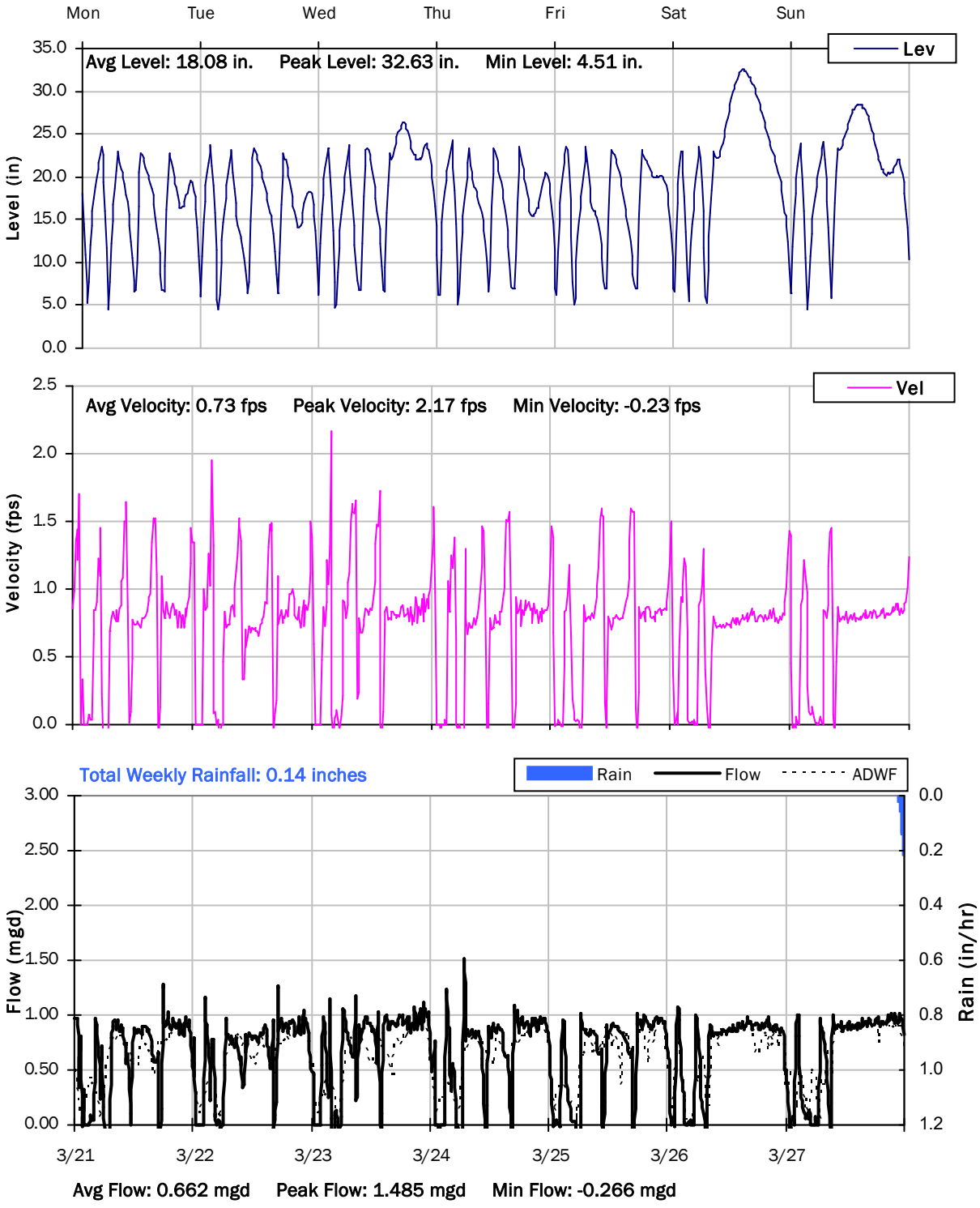
3/14/2022 to 3/21/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

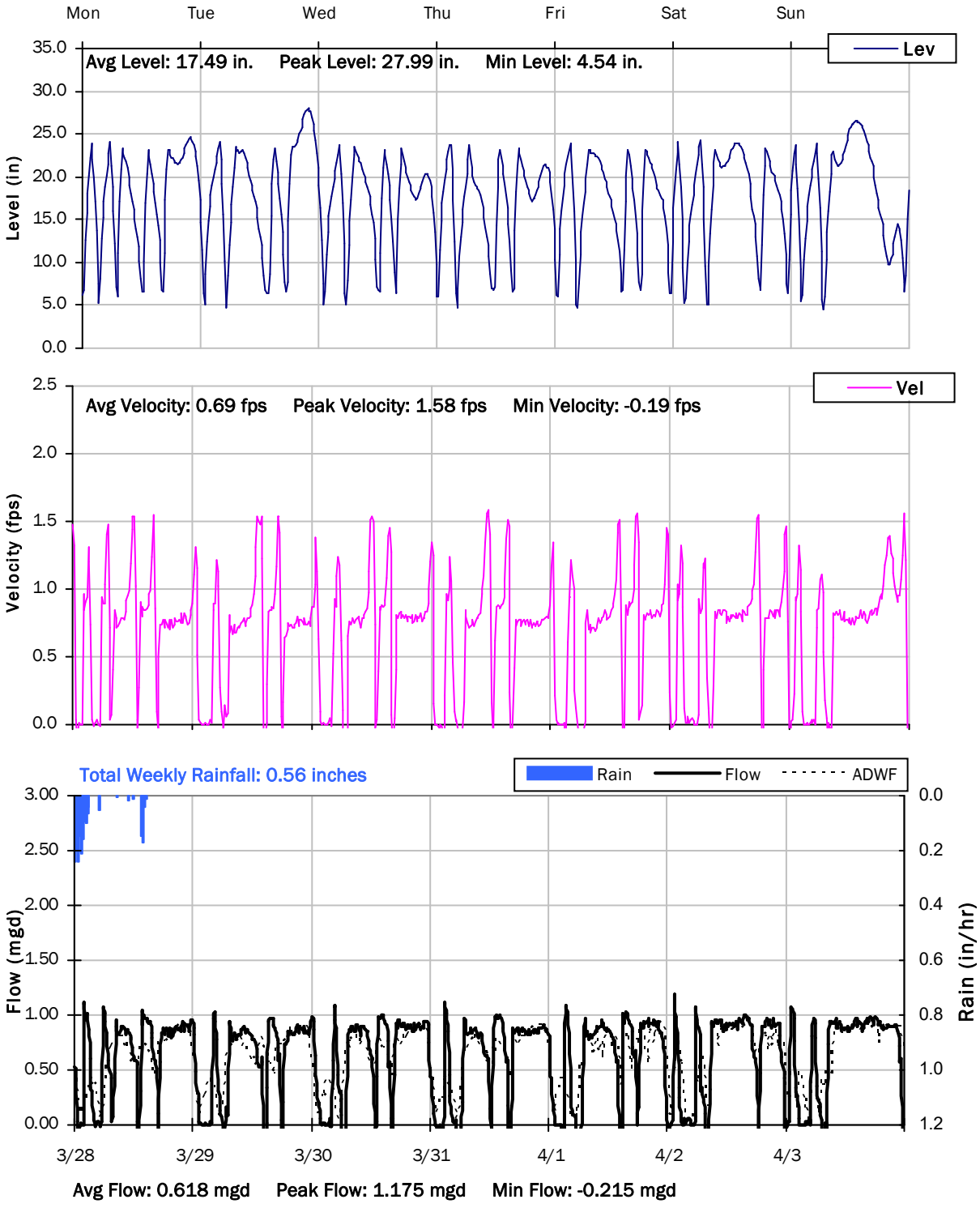
3/21/2022 to 3/28/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

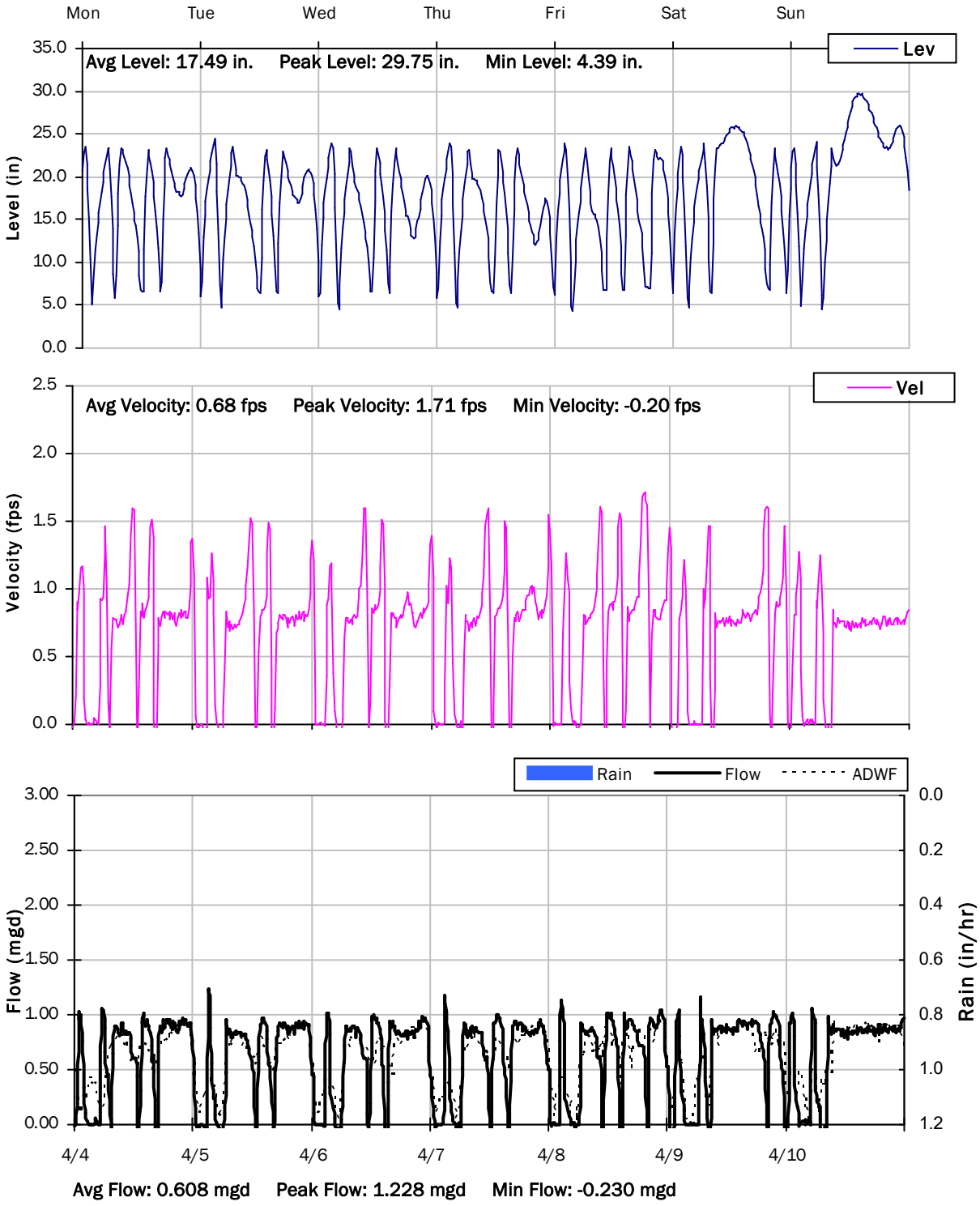
3/28/2022 to 4/4/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

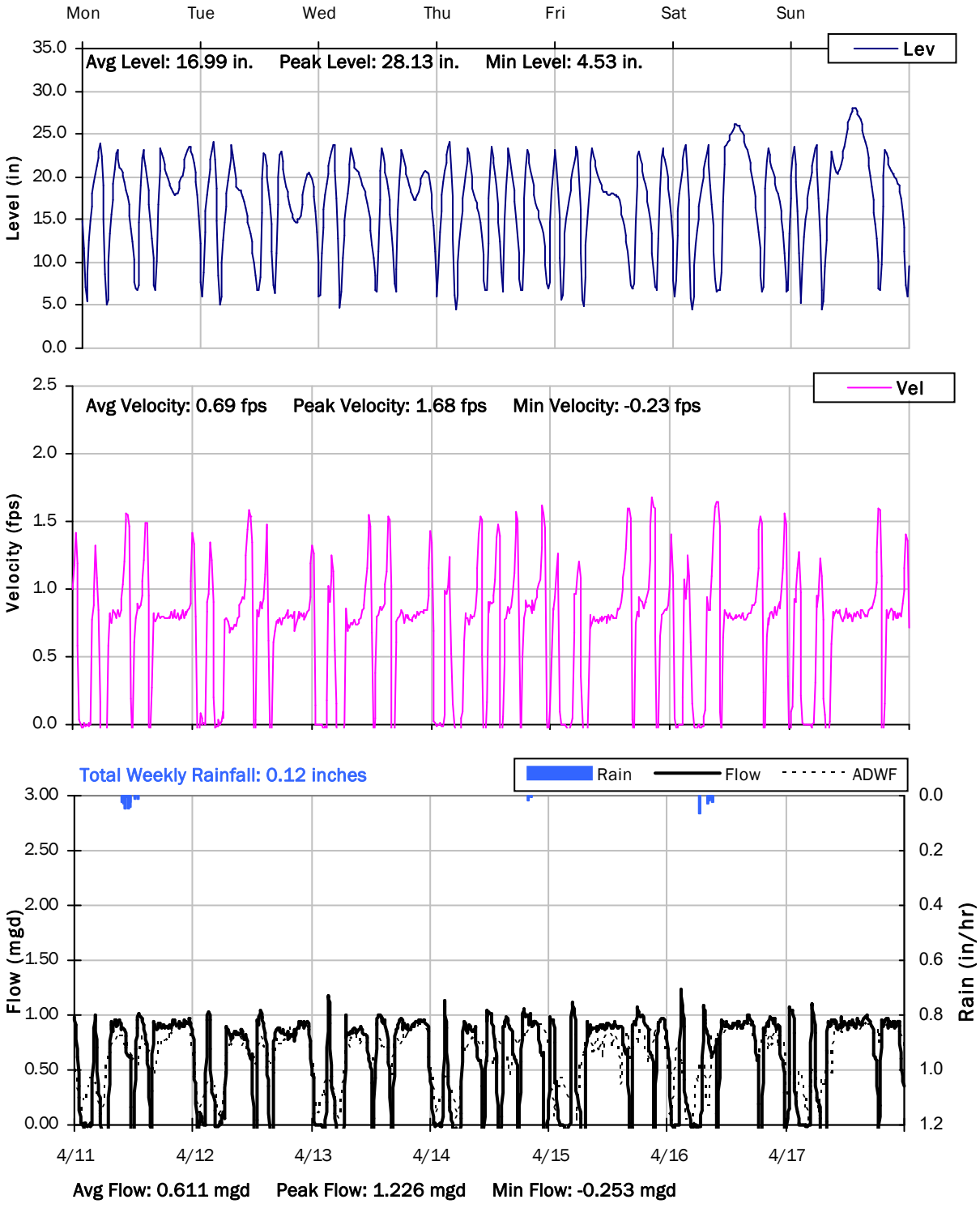
4/4/2022 to 4/11/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

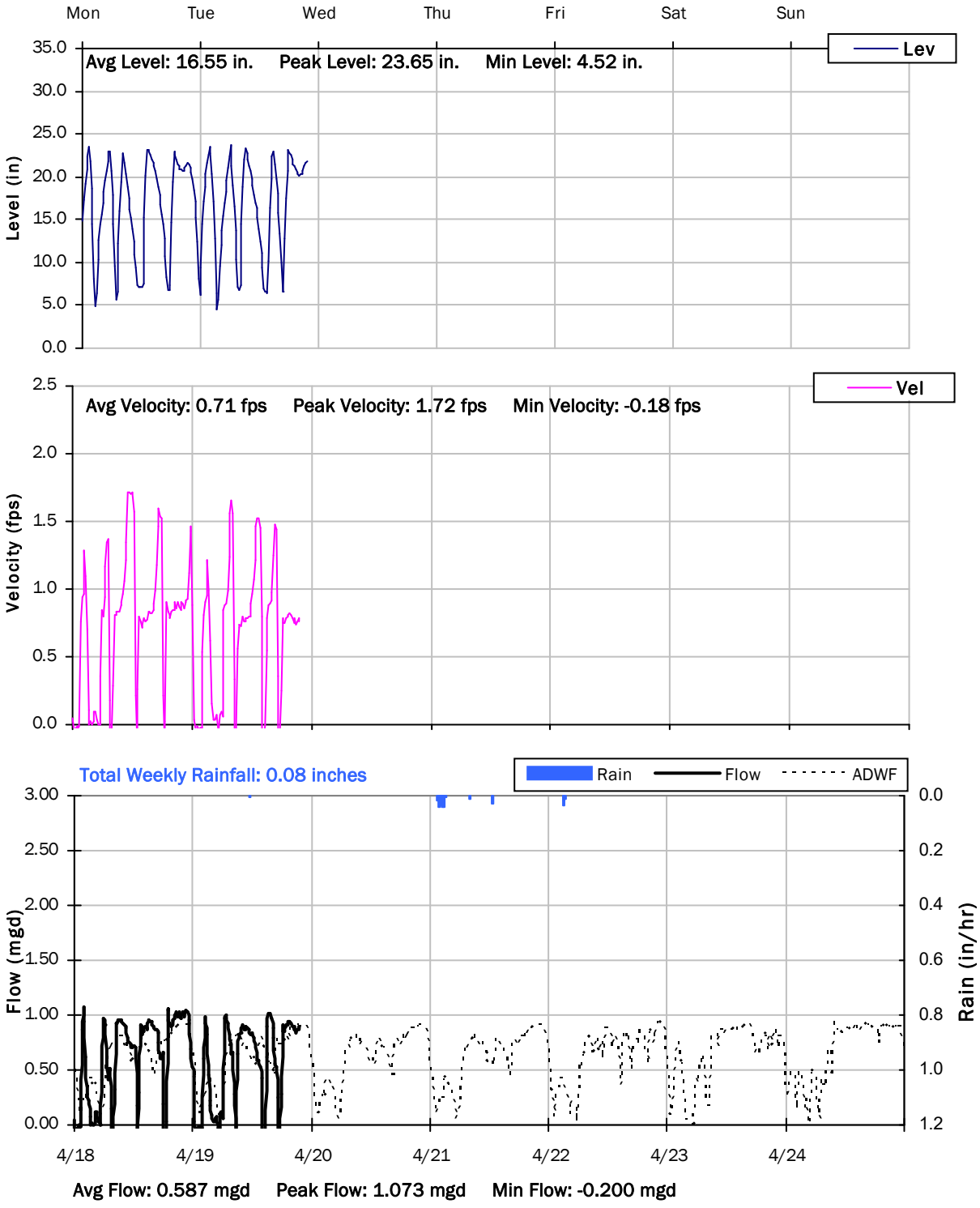
4/11/2022 to 4/18/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

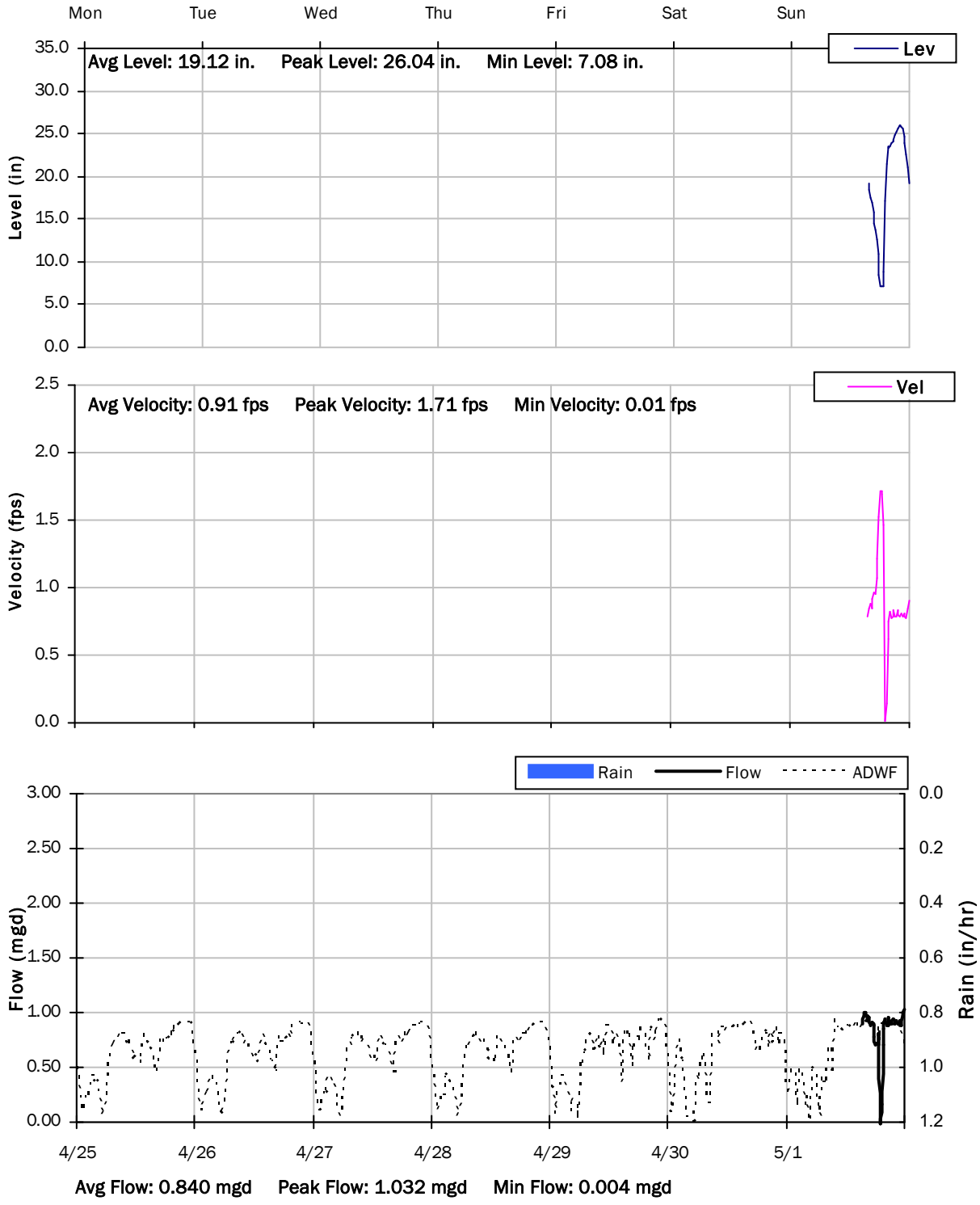
4/18/2022 to 4/25/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

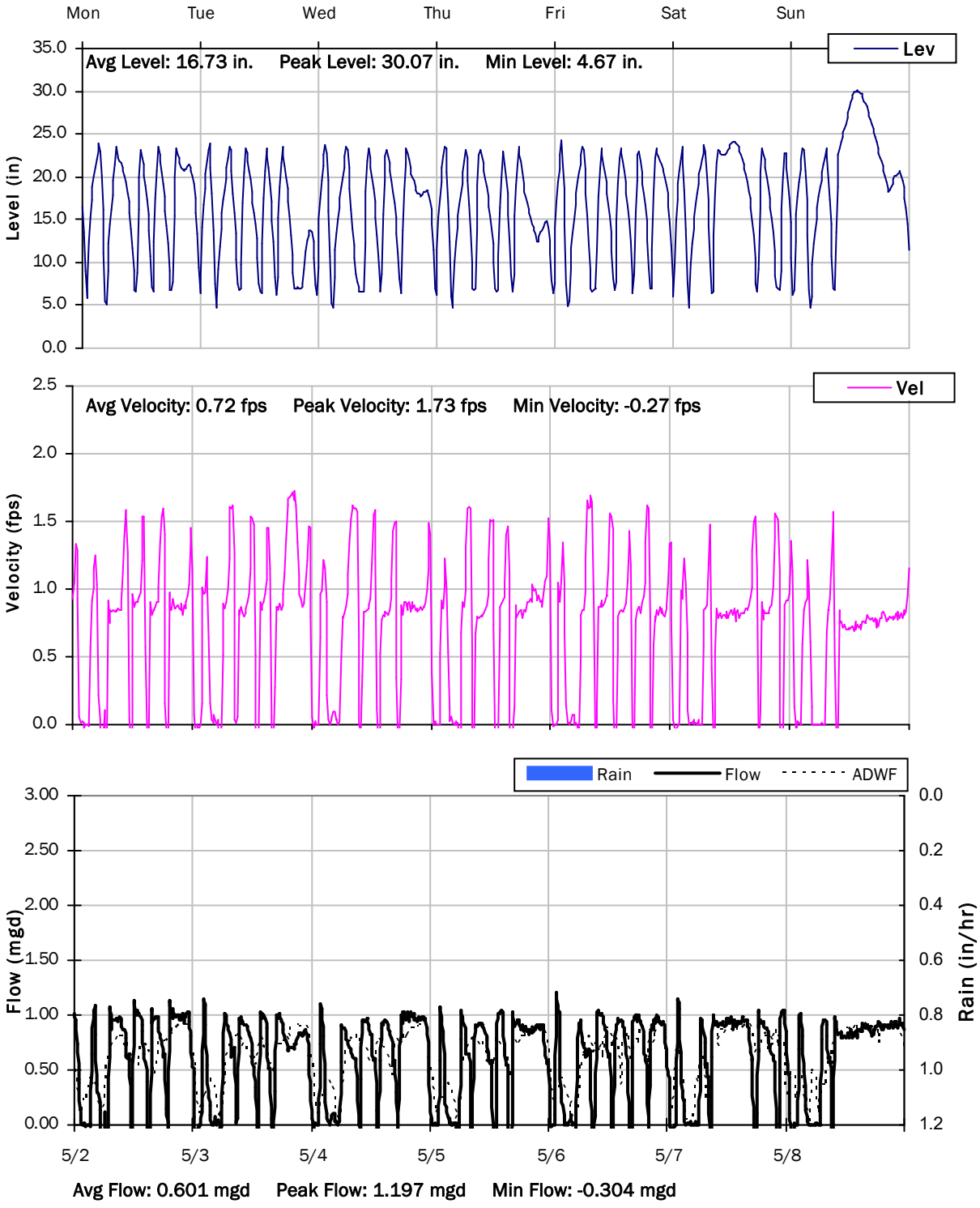
4/25/2022 to 5/2/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

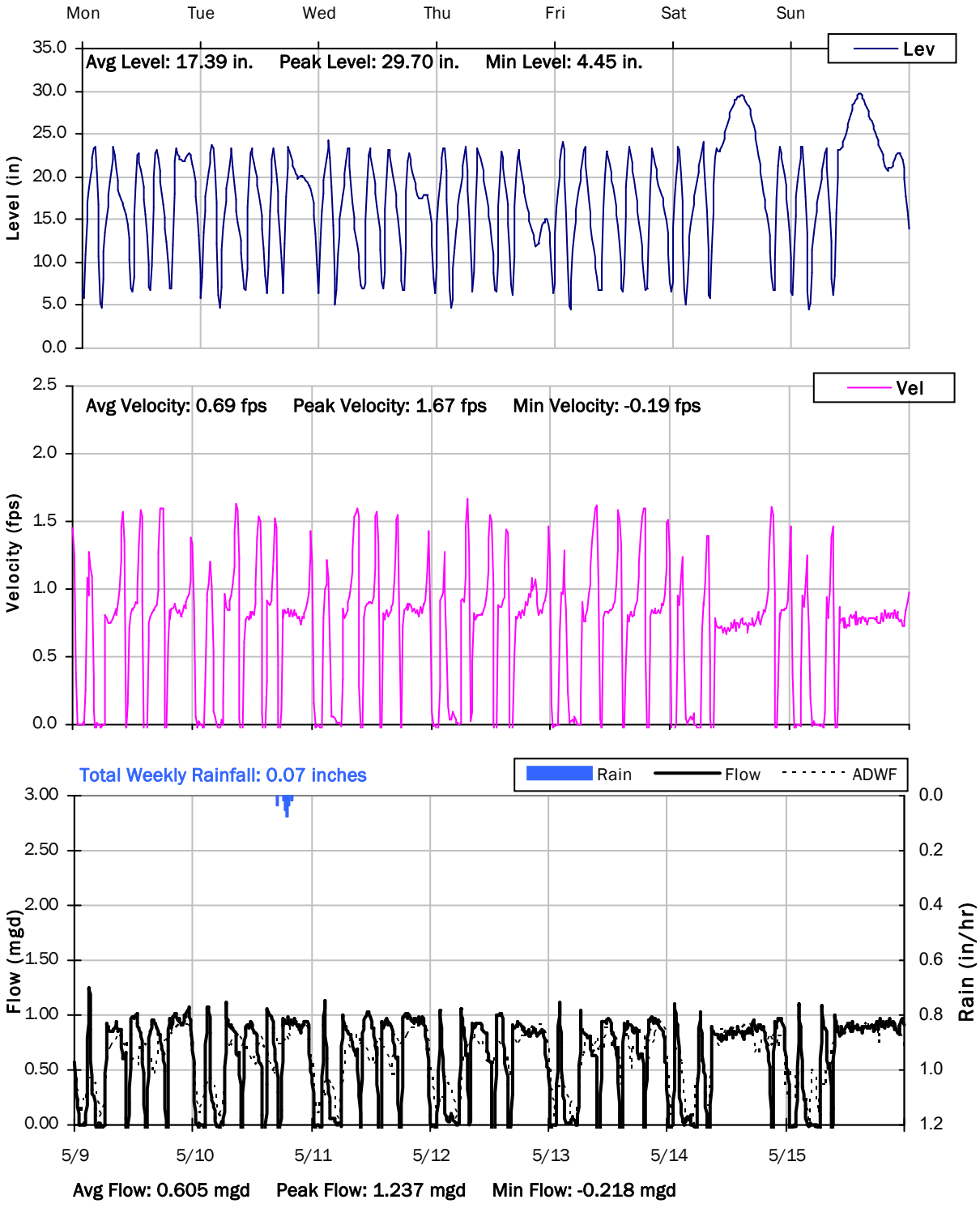
5/2/2022 to 5/9/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

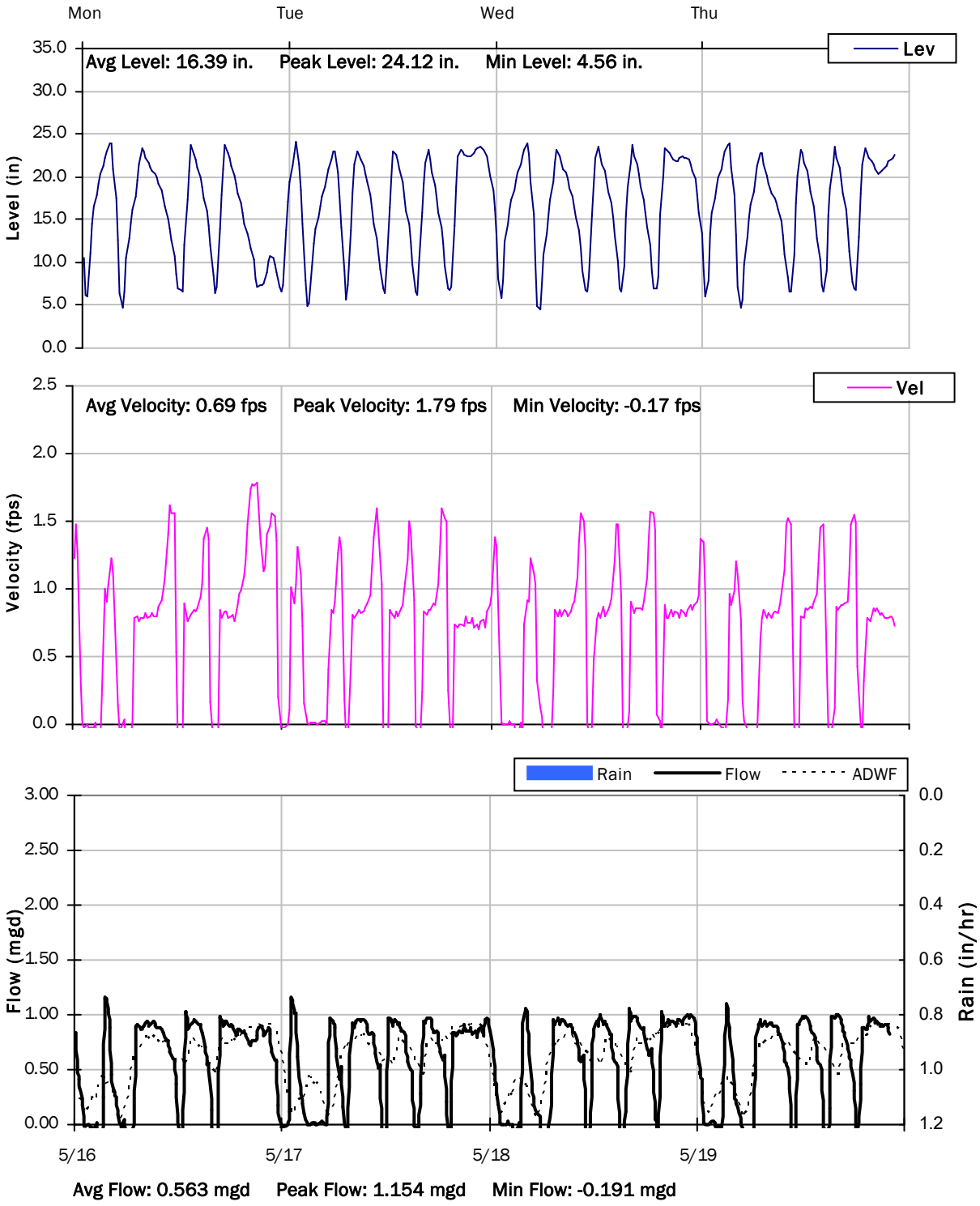
5/9/2022 to 5/16/2022



SITE 4

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 5

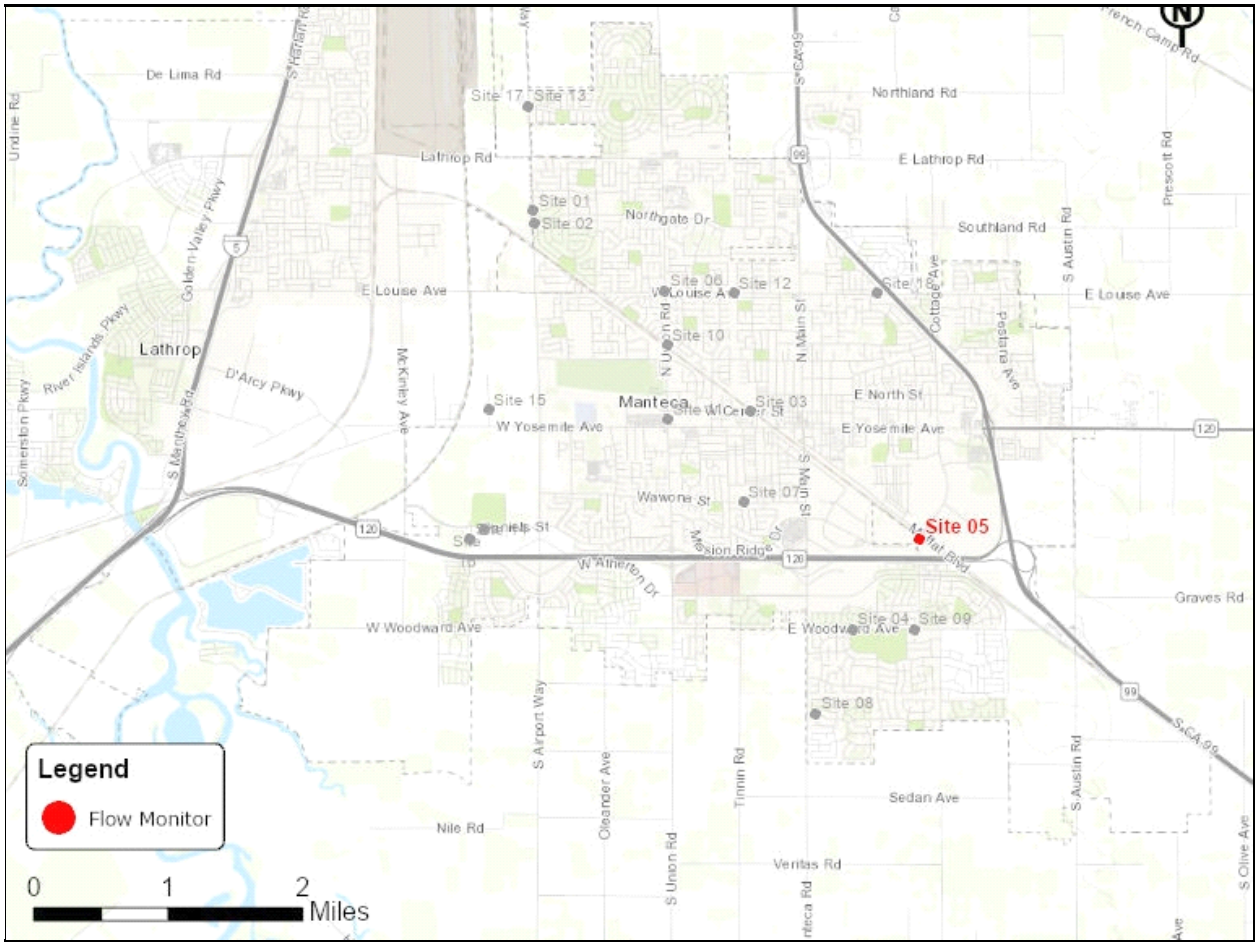
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Industrial Park Drive South of Moffat Boulevard

Data Summary Report



Vicinity Map: Site 5

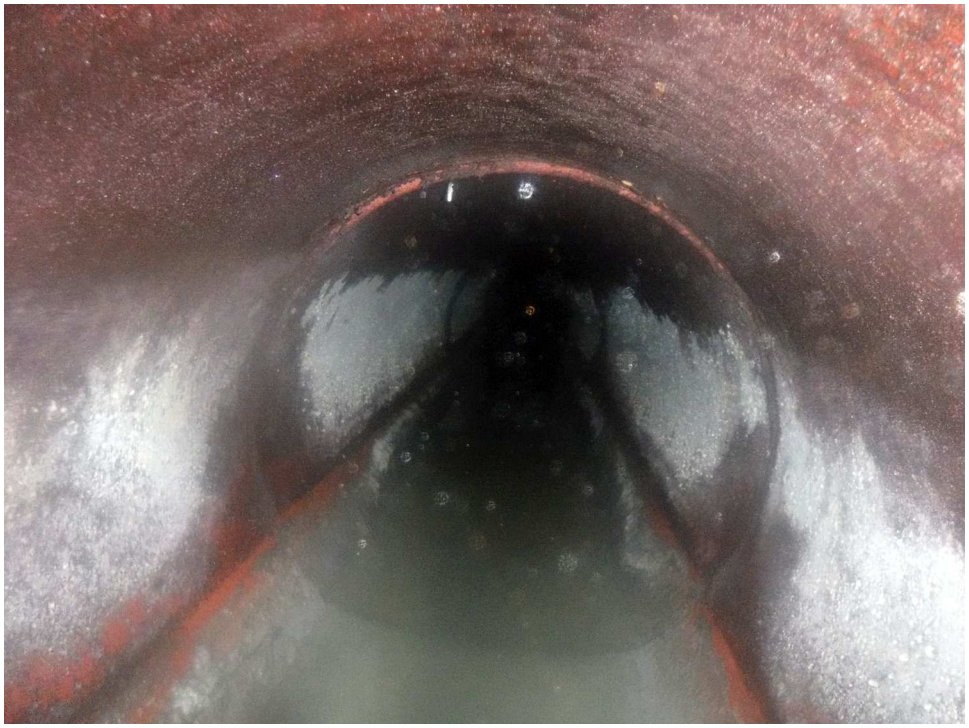
SITE 5

Additional Site Photos

Effluent Pipe



Monitored Northeast Influent Pipe

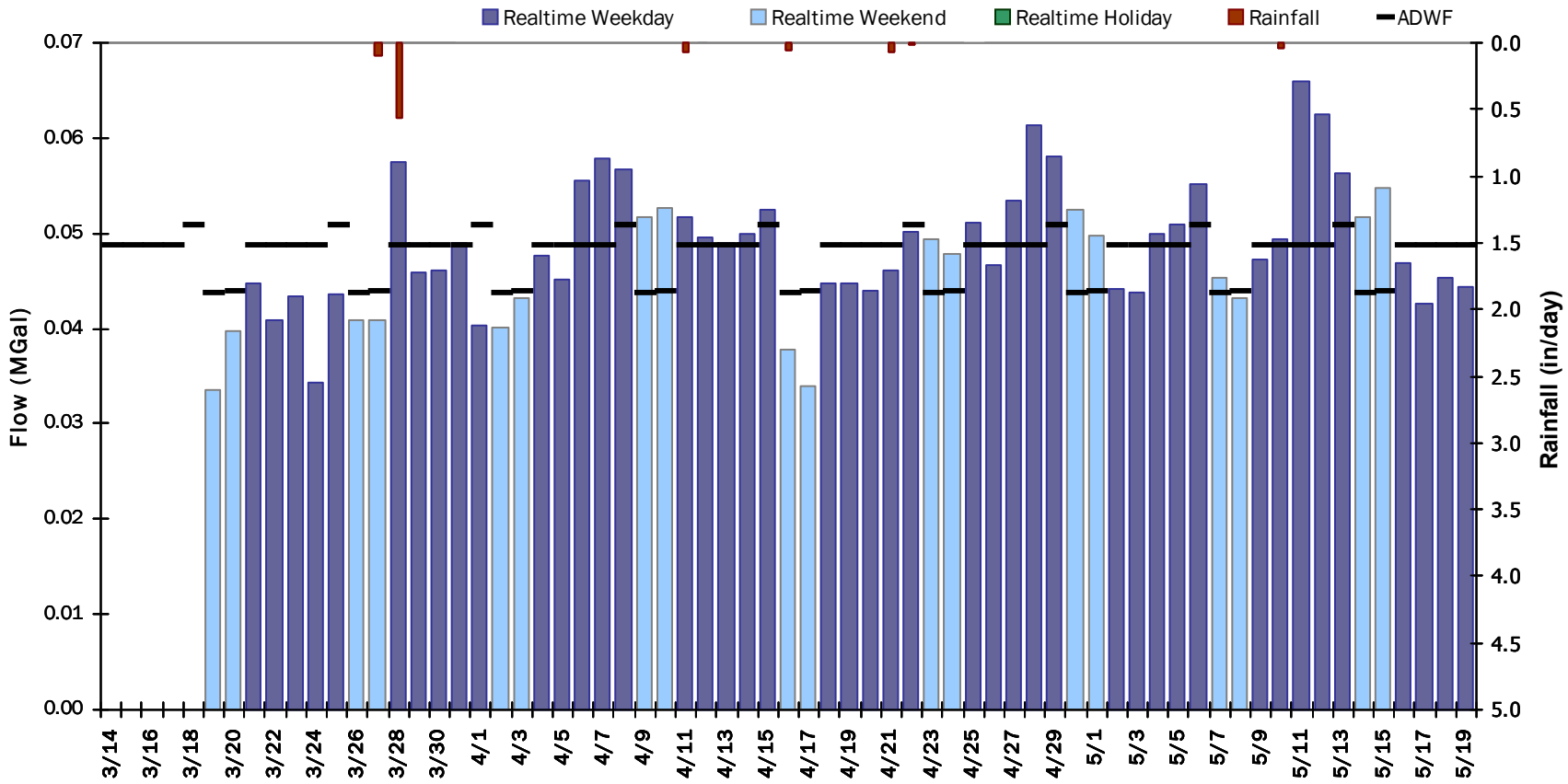


SITE 5

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.048 MGal Peak Daily Flow: 0.066 MGal Min Daily Flow: 0.034 MGal

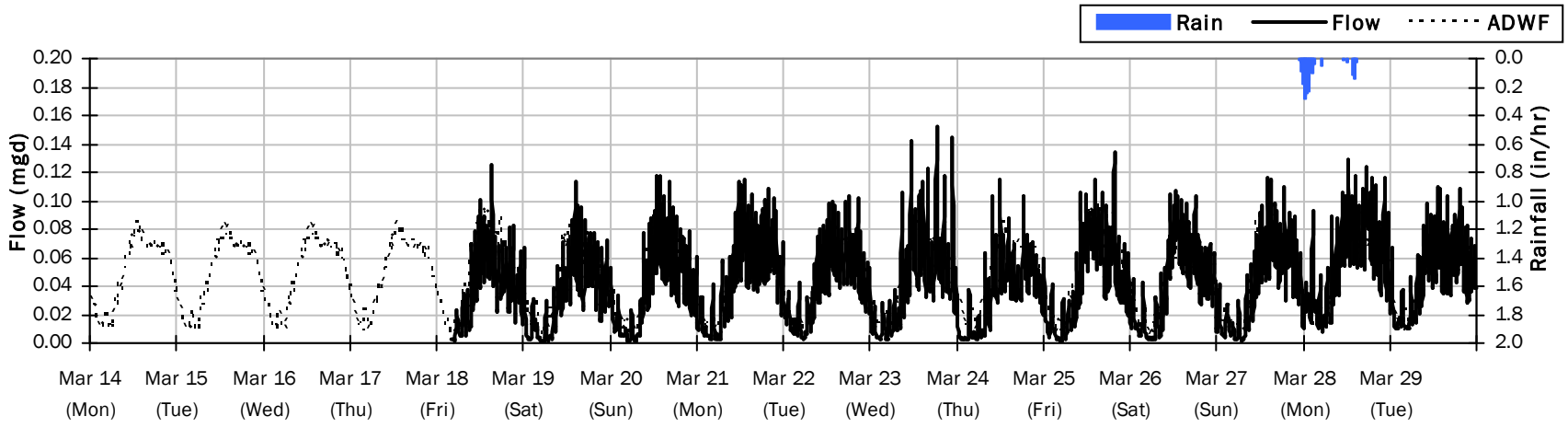
Total Rainfall: 0.91 inches

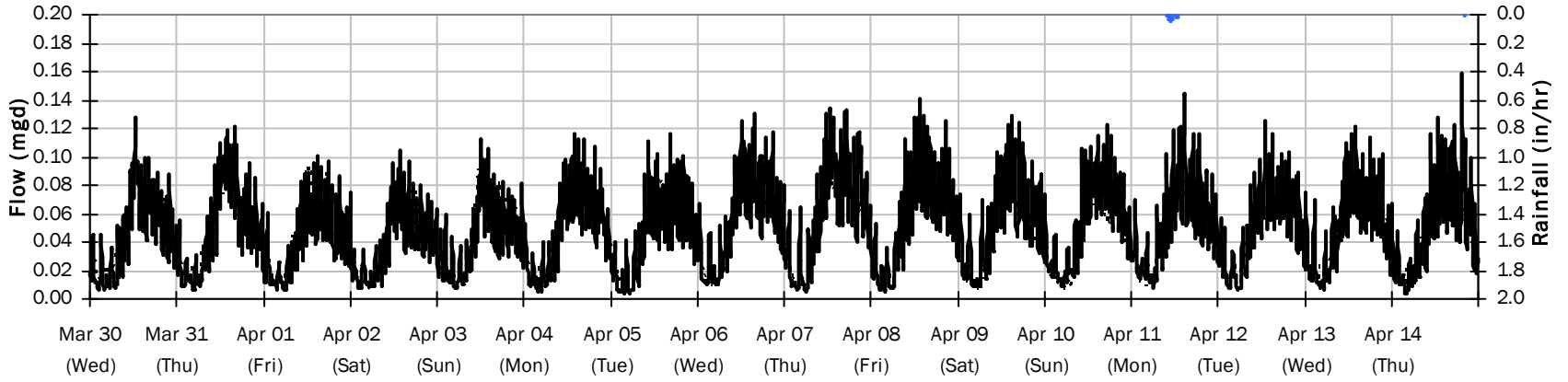


SITE 5

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.73 inches Period Avg Flow: 0.046 mgd Period Peak Flow: 0.159 mgd Period Min Flow: 0.001 mgd

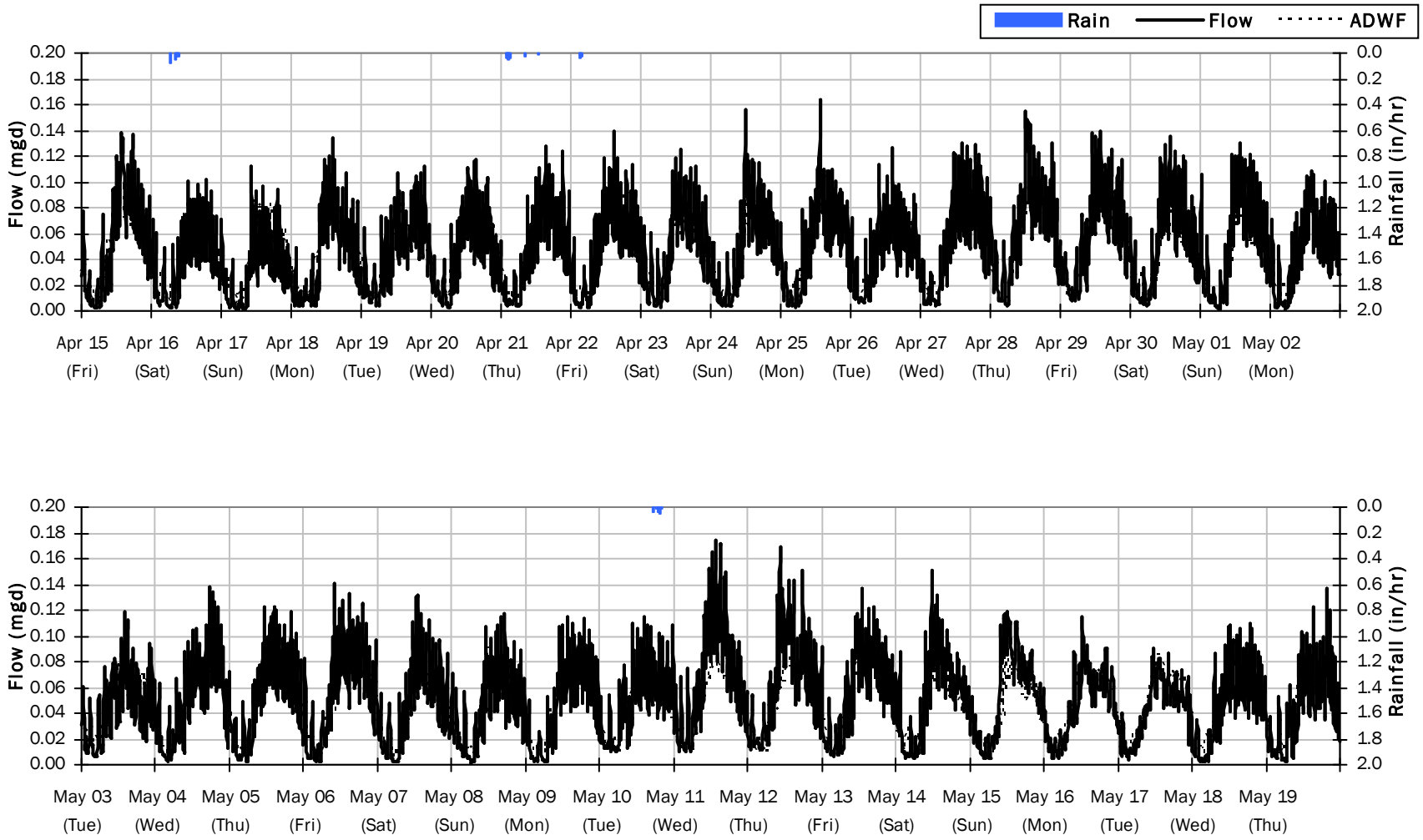




SITE 5

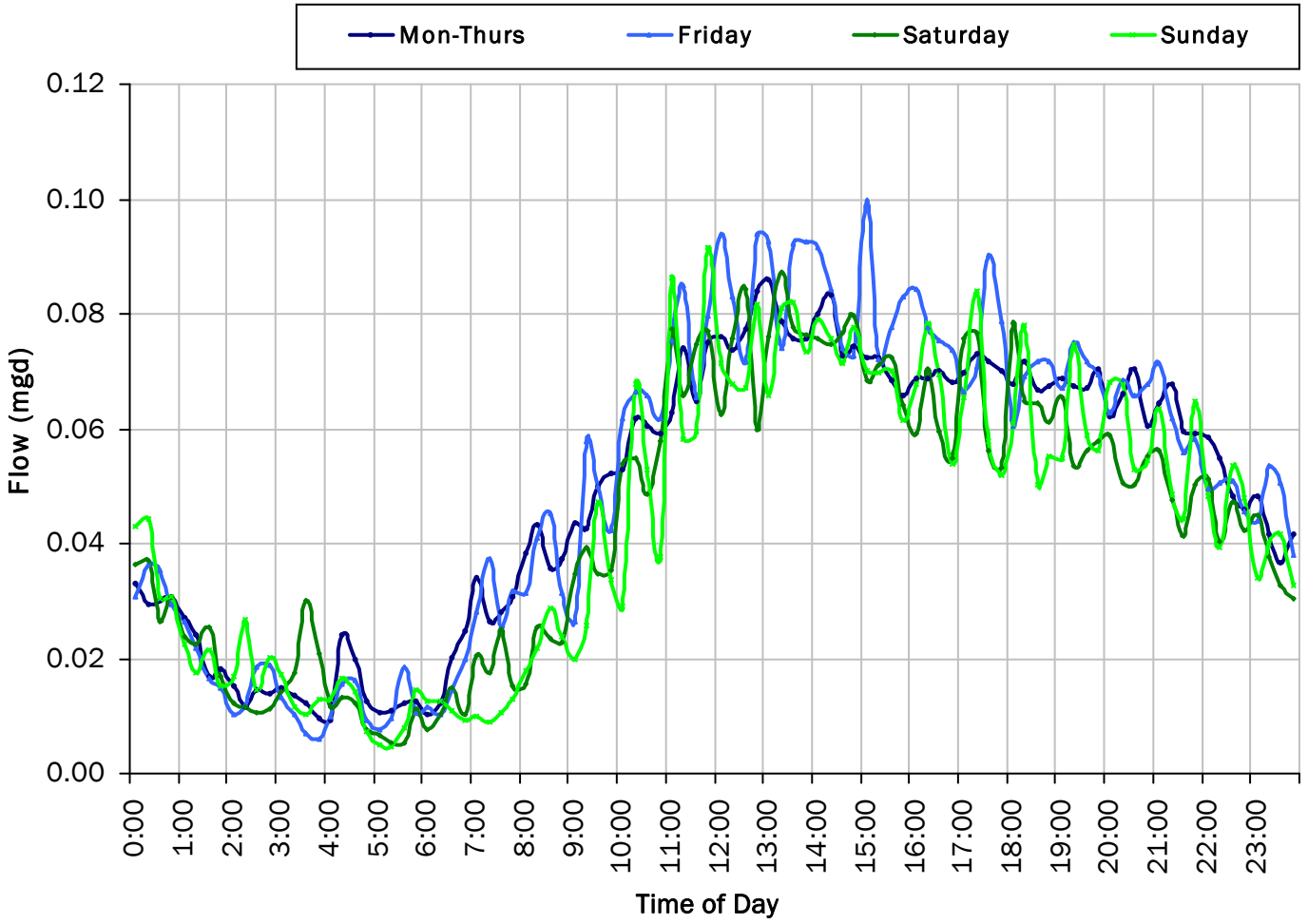
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.18 inches Period Avg Flow: 0.049 mgd Period Peak Flow: 0.174 mgd Period Min Flow: 0.001 mgd



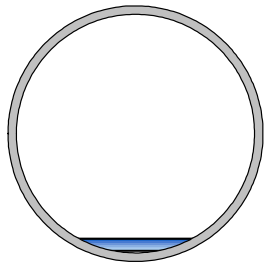
SITE 5

Average Dry Weather Flow Hydrographs



ADWF:

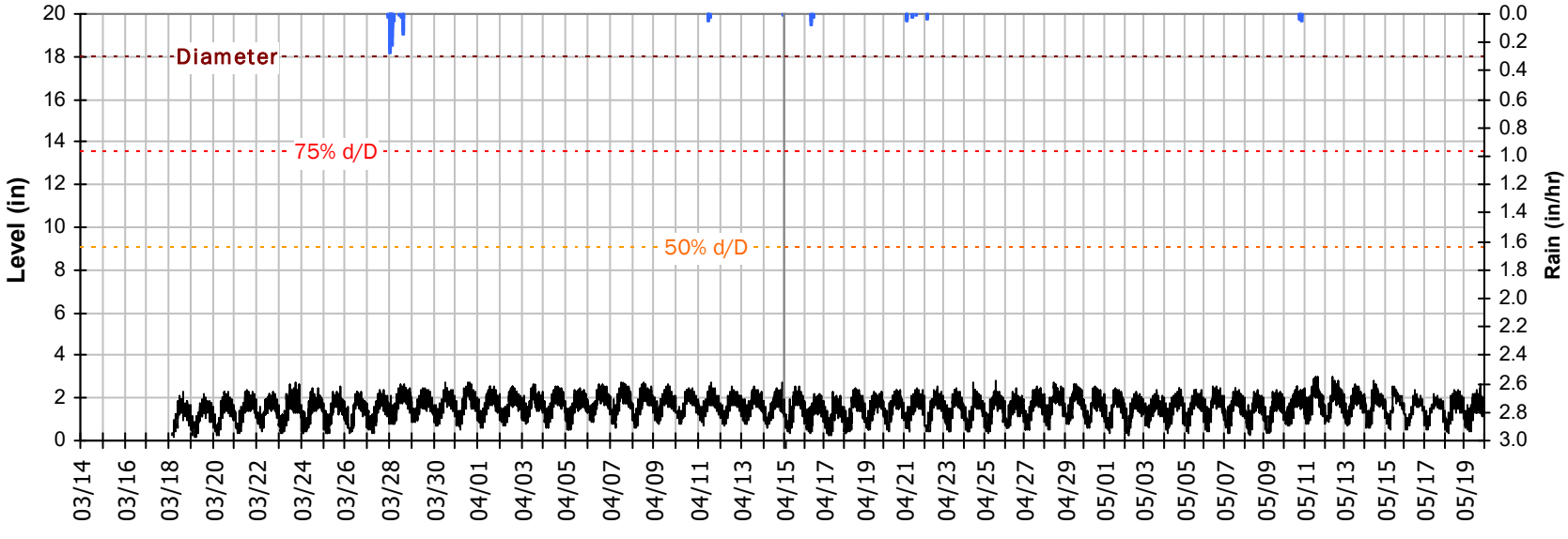
0.048 *mgd*

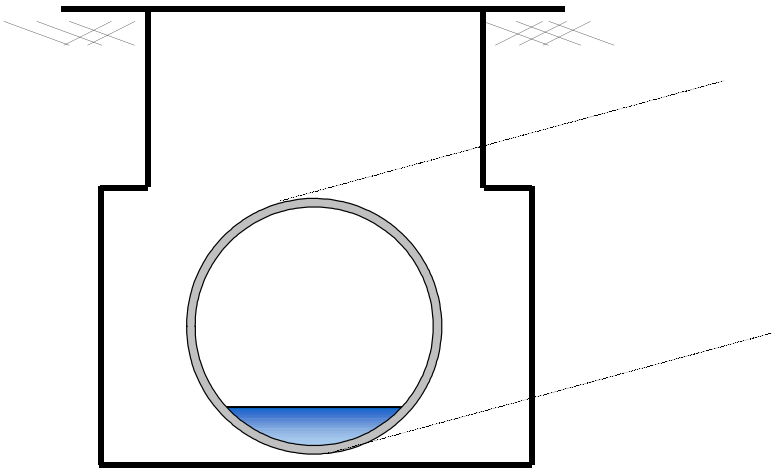


SITE 5

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period



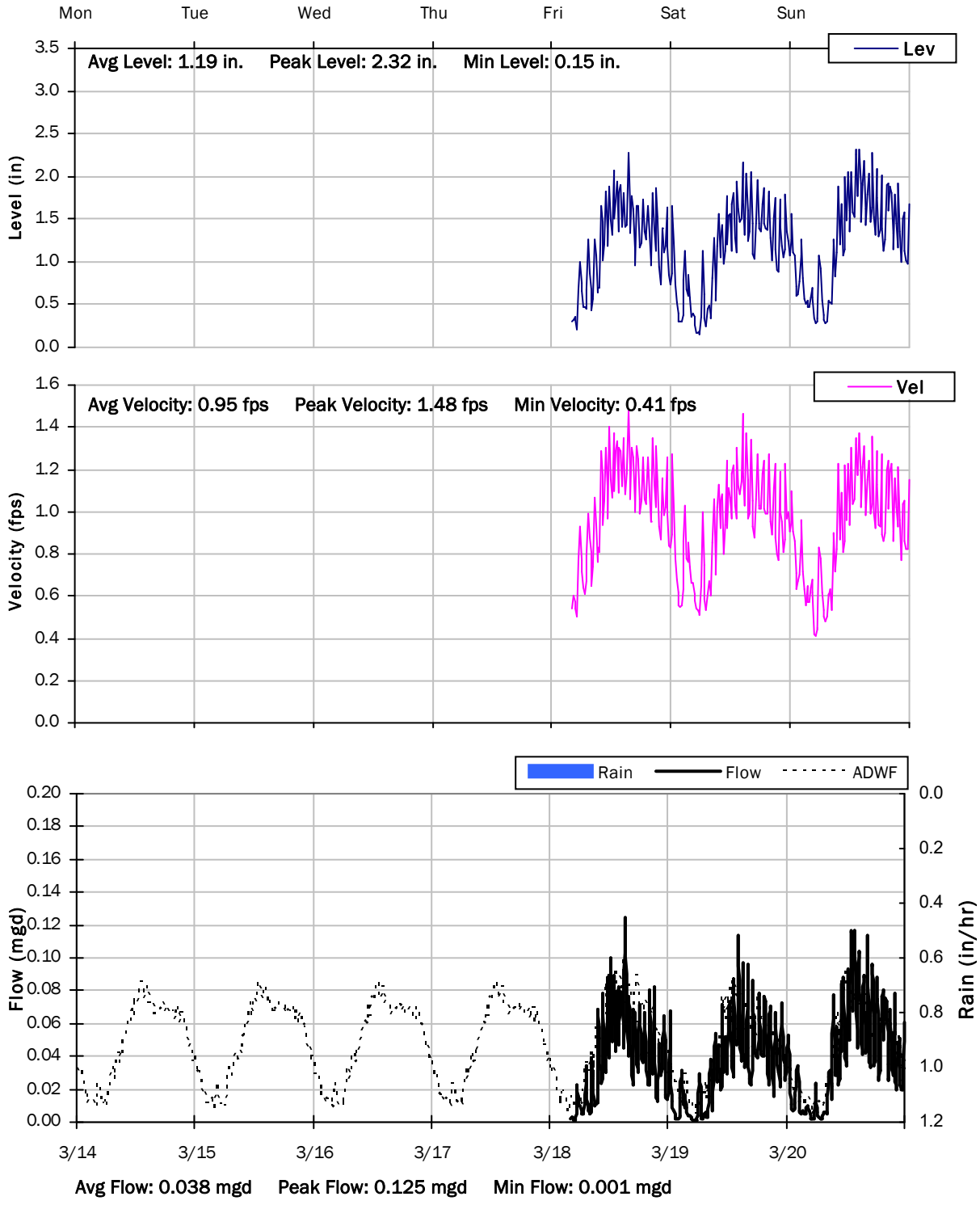


Pipe Diameter:	18	*inches*
Peak Measured Level:	3.01	*inches*
Peak d/D Ratio:	0.17	

SITE 5

Weekly Level, Velocity and Flow Hydrographs

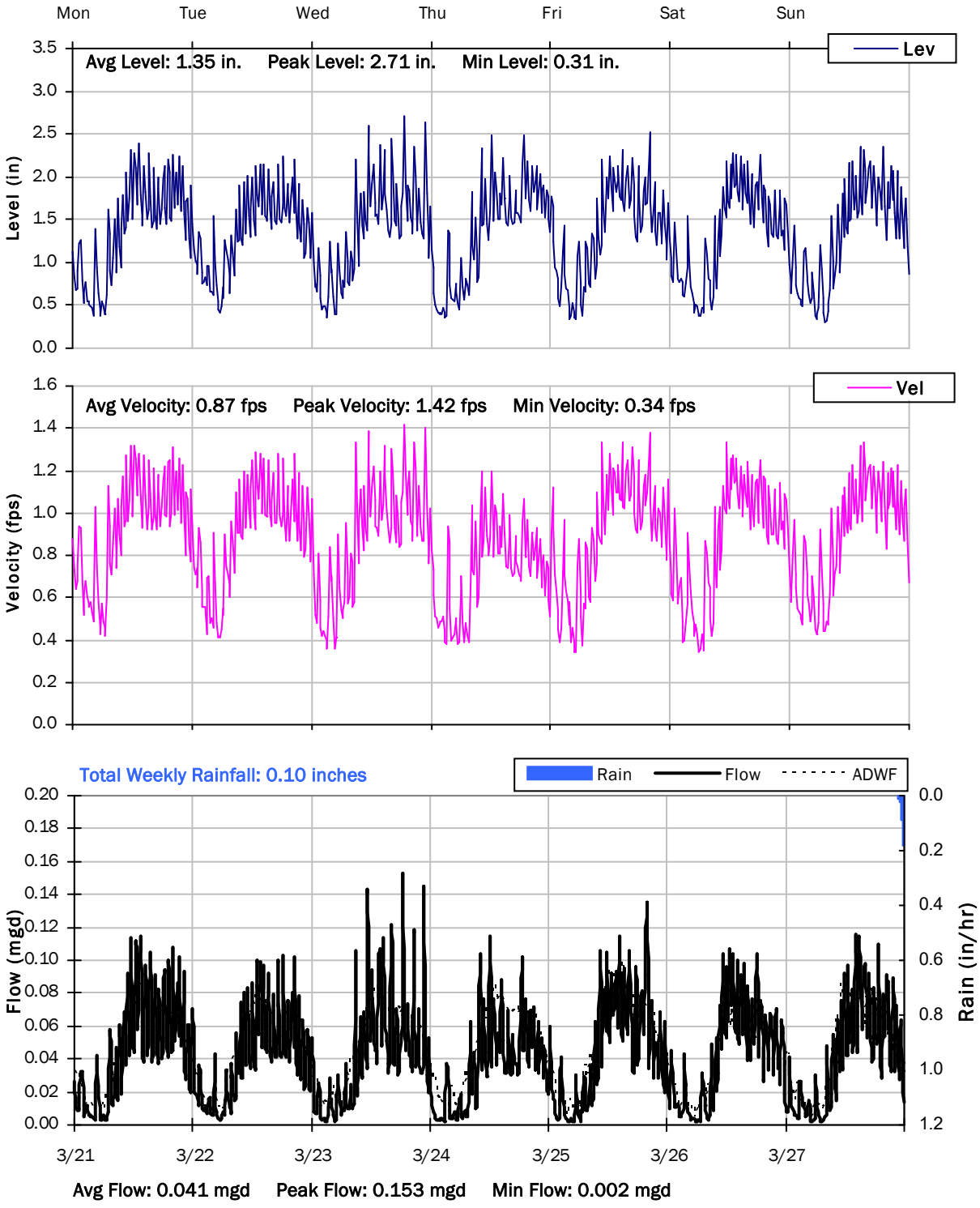
3/14/2022 to 3/21/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

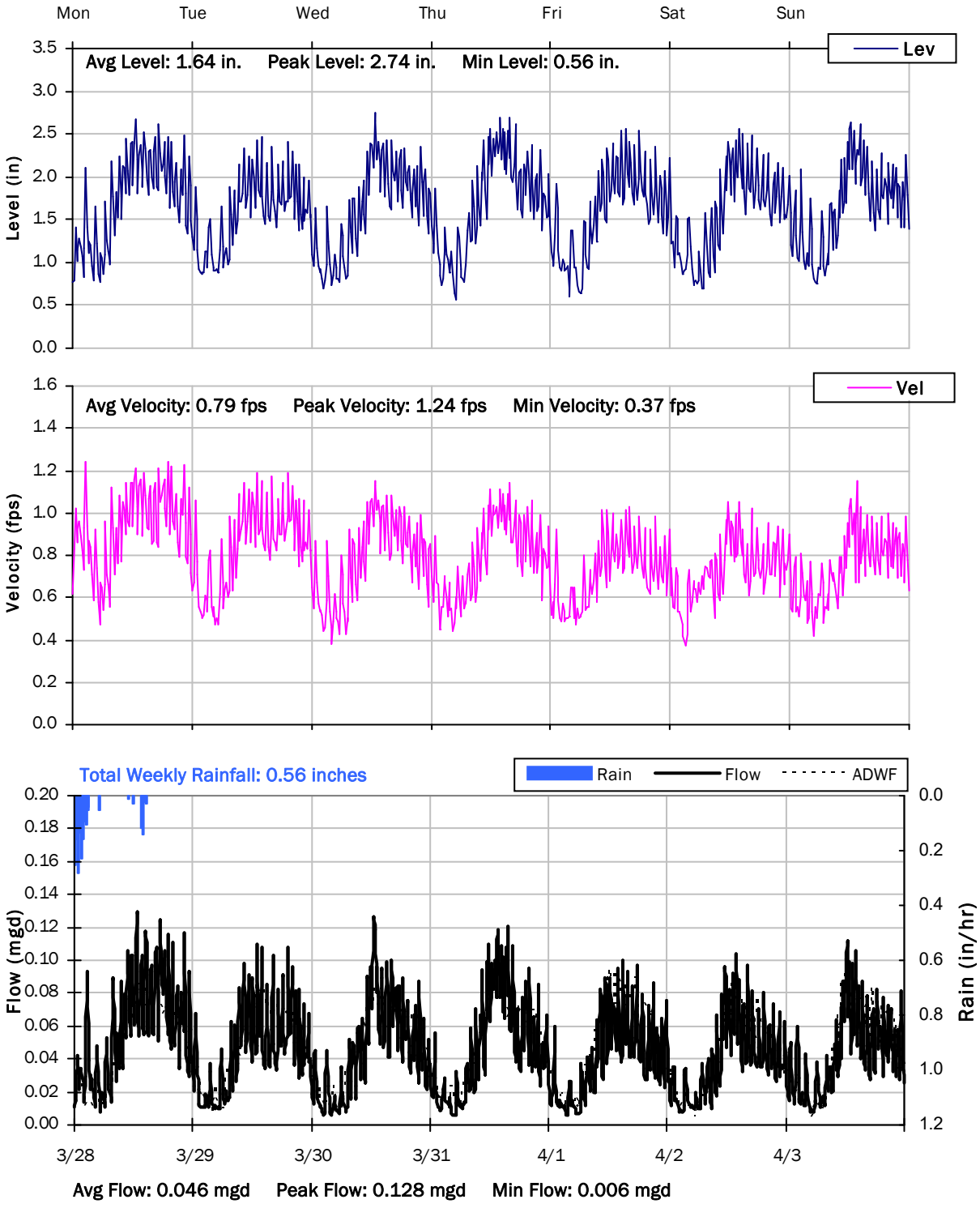
3/21/2022 to 3/28/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

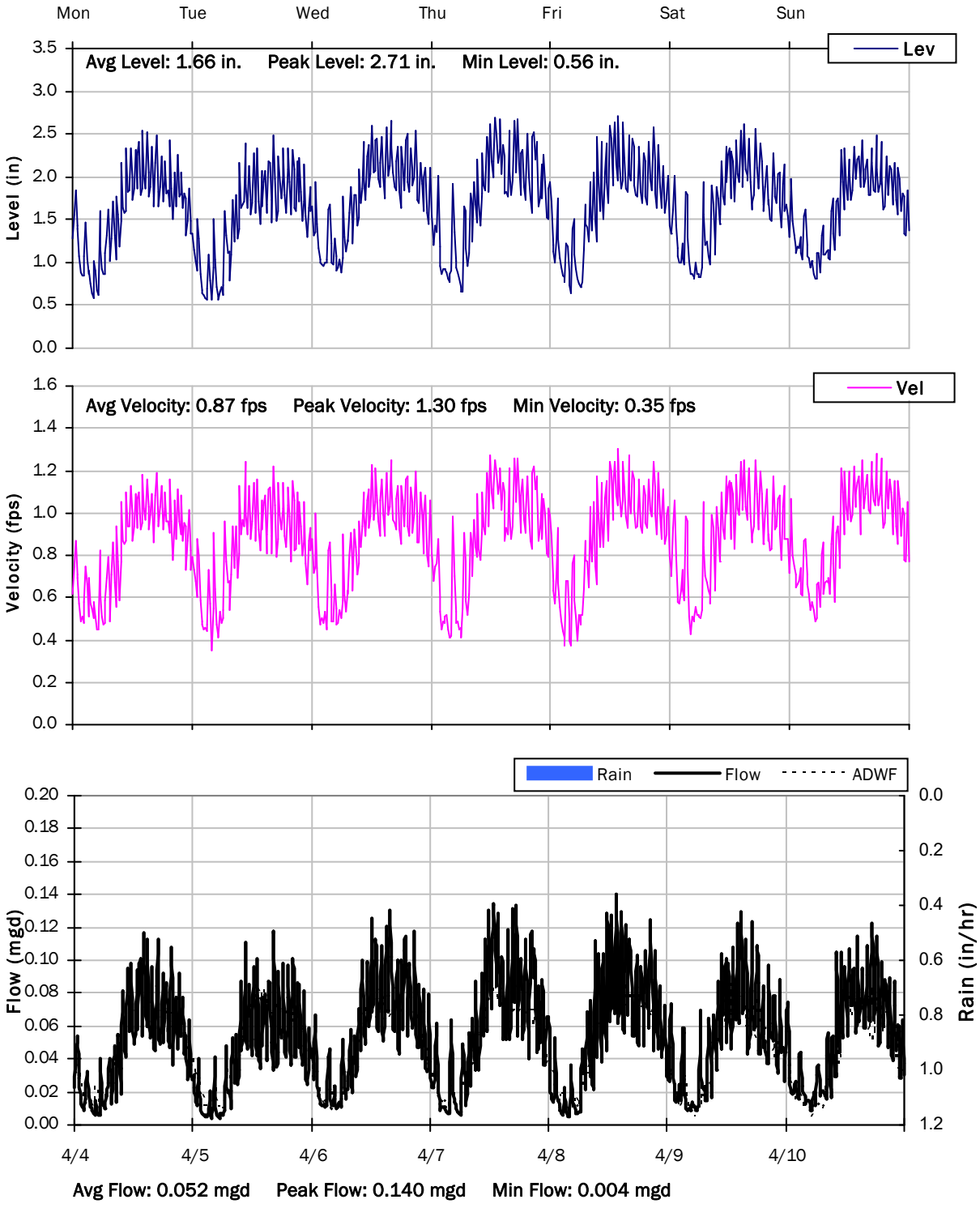
3/28/2022 to 4/4/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

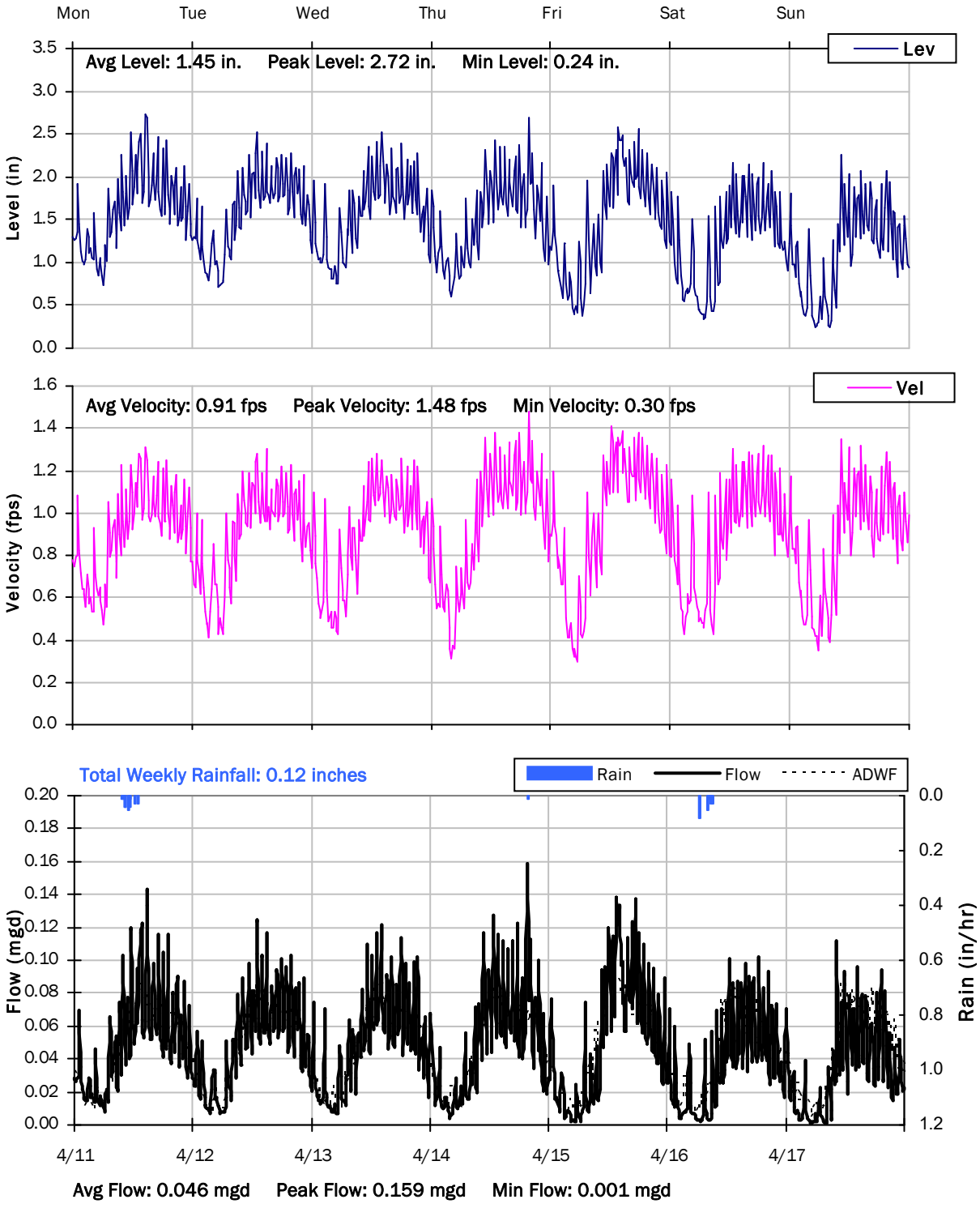
4/4/2022 to 4/11/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

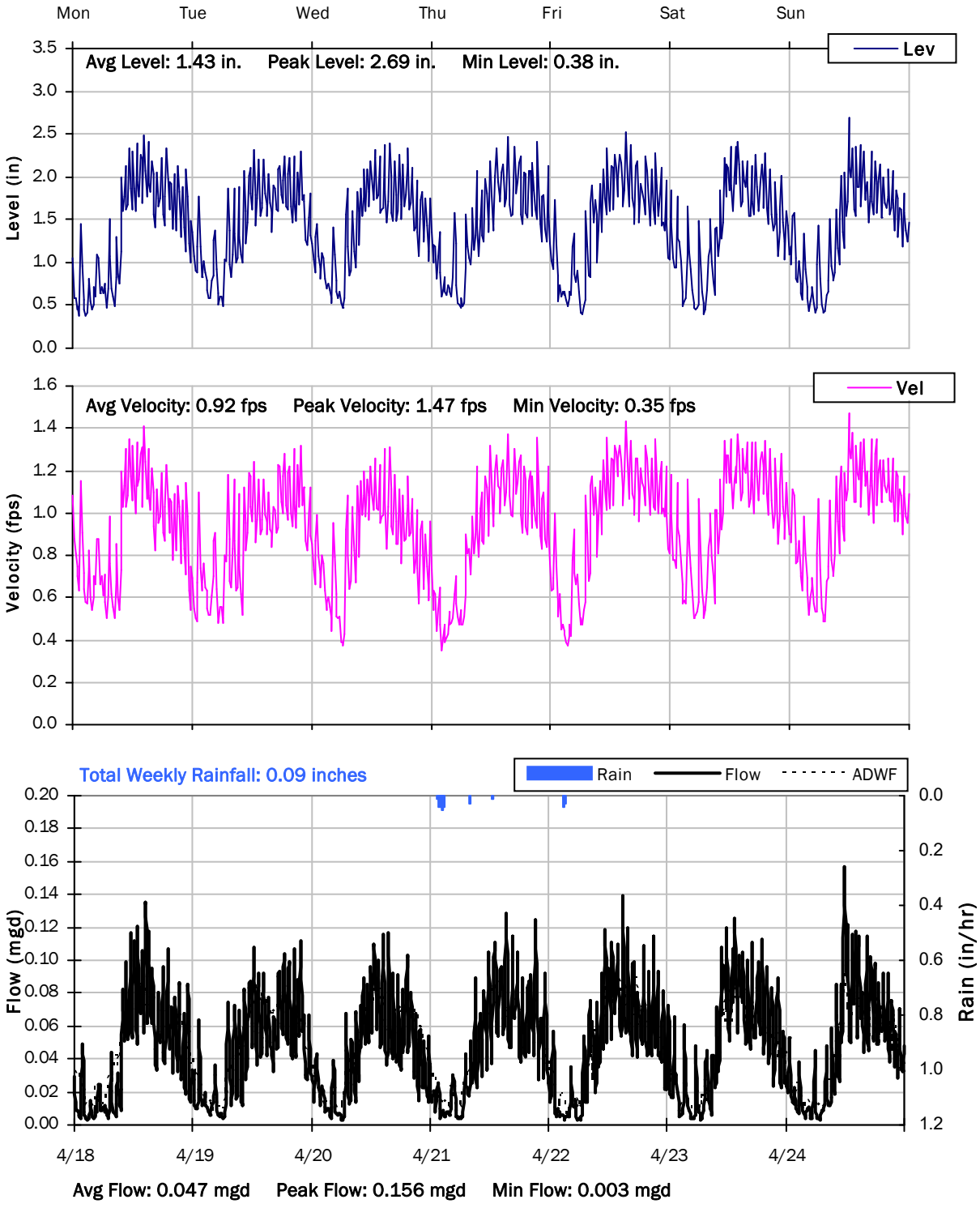
4/11/2022 to 4/18/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

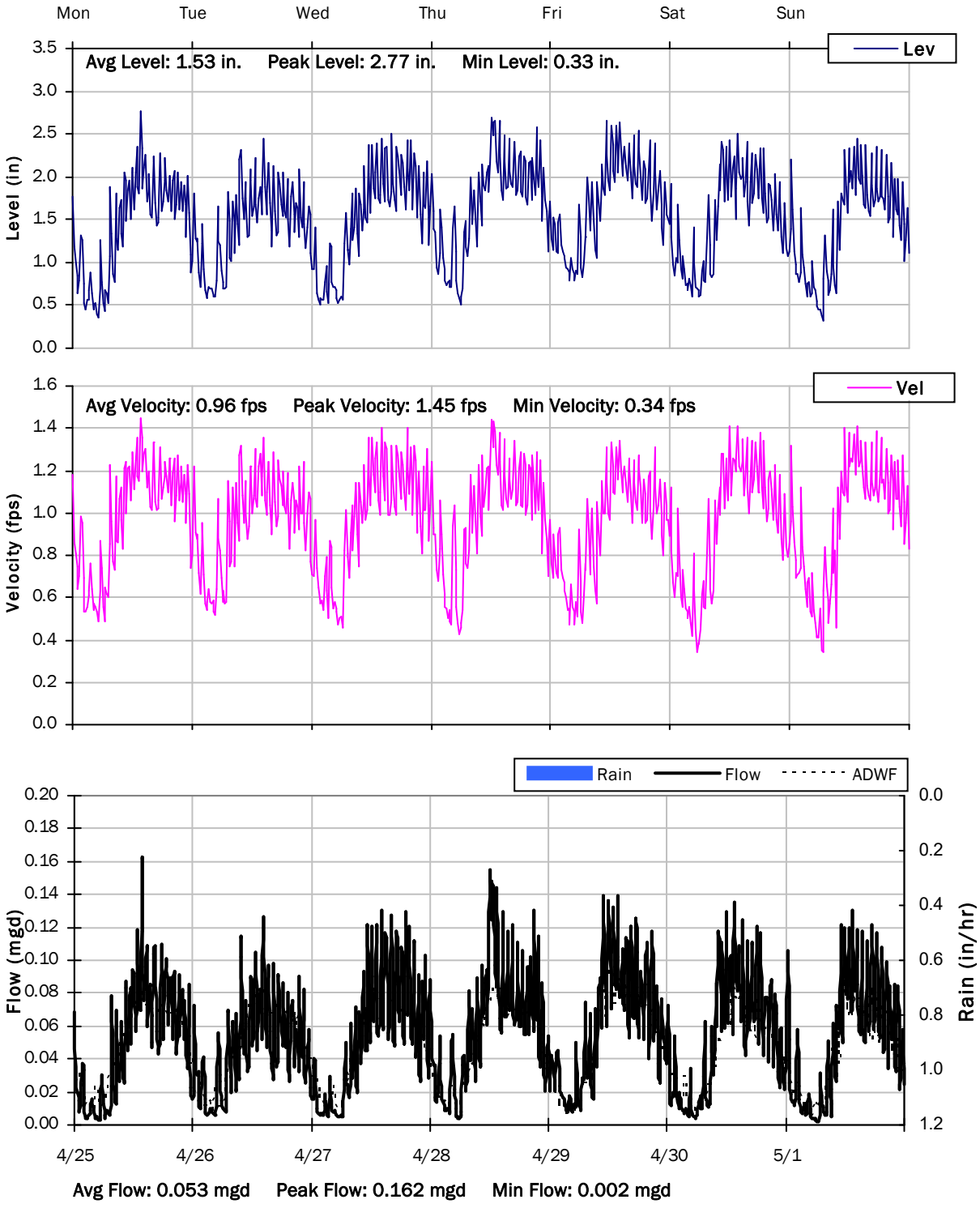
4/18/2022 to 4/25/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

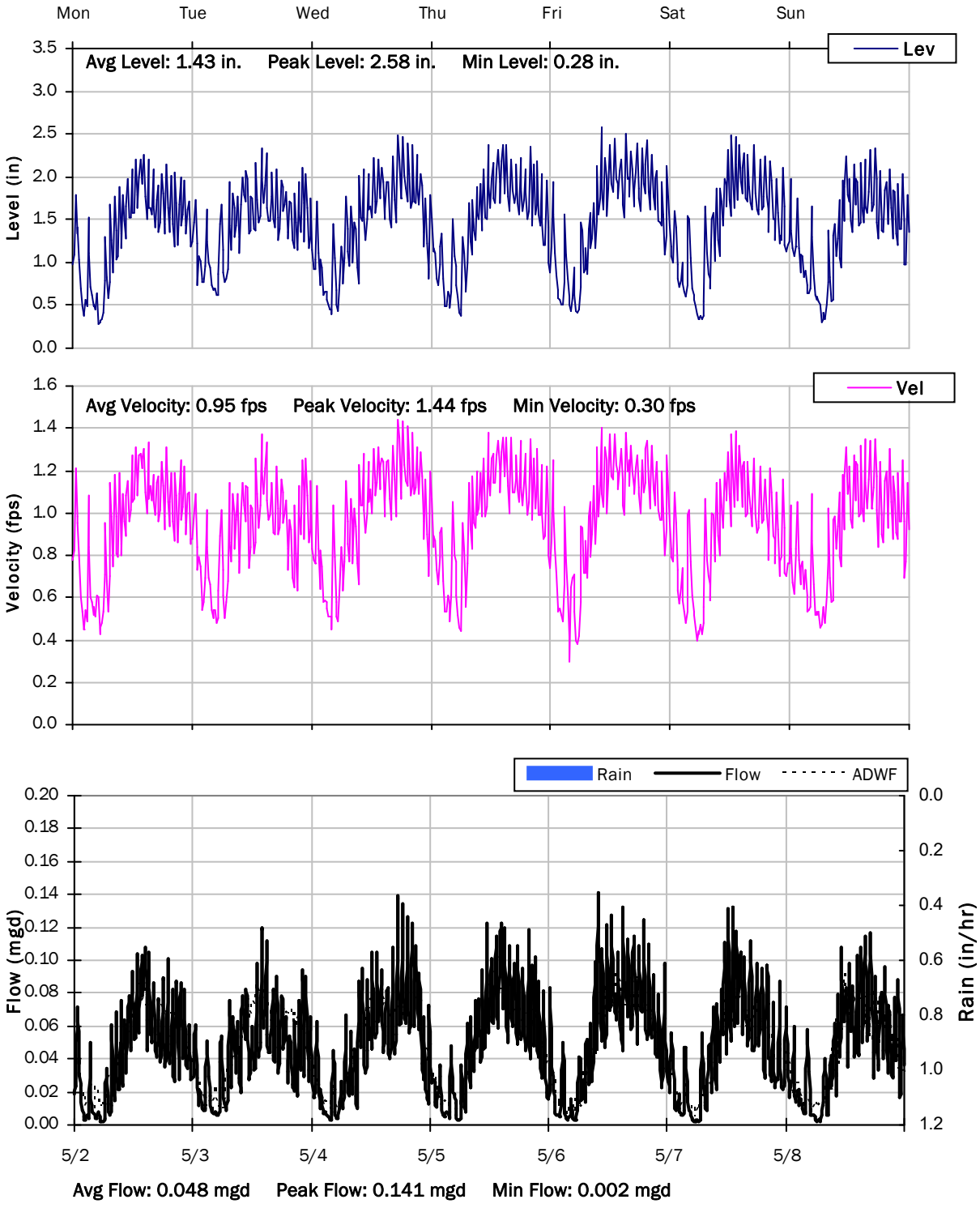
4/25/2022 to 5/2/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

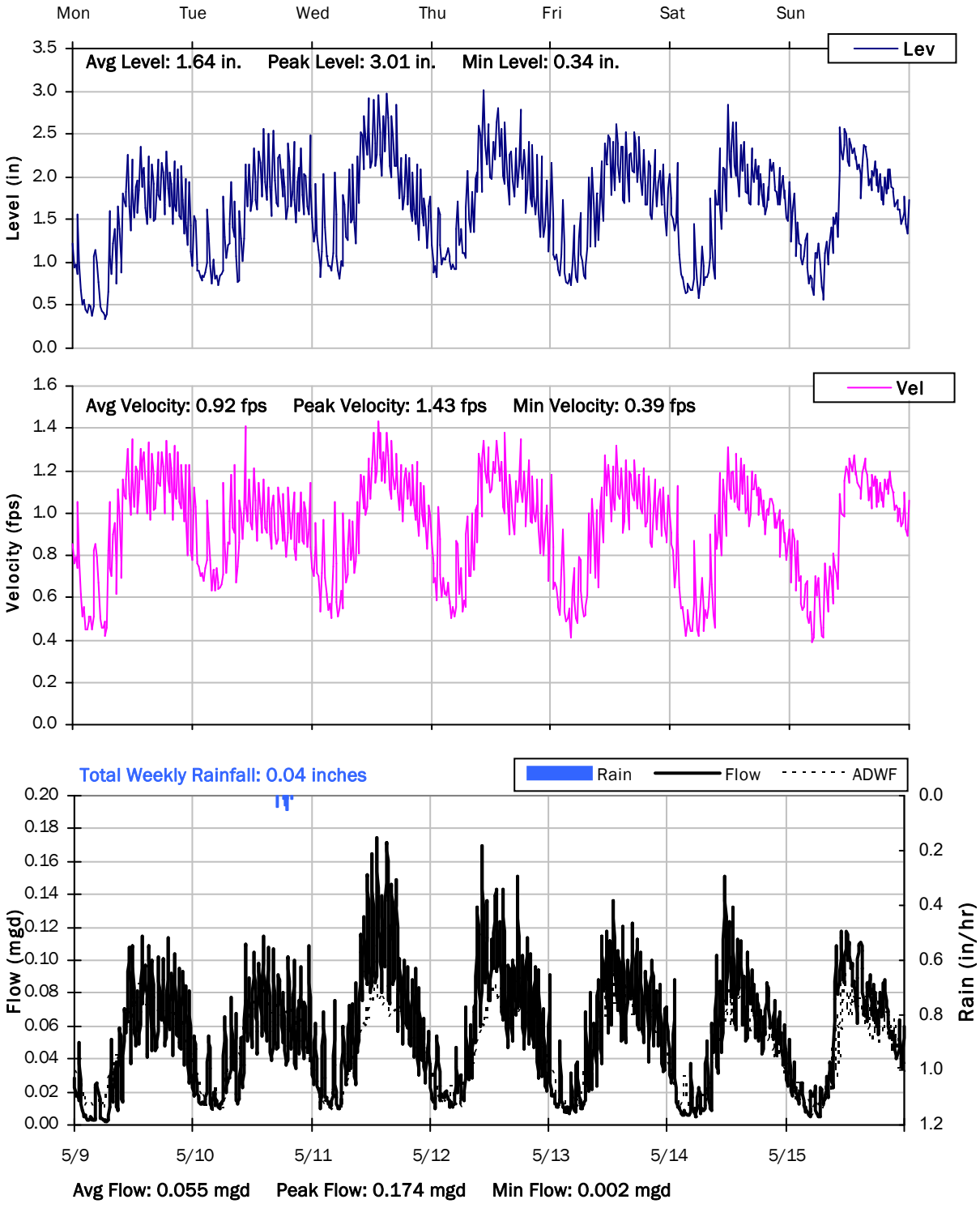
5/2/2022 to 5/9/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

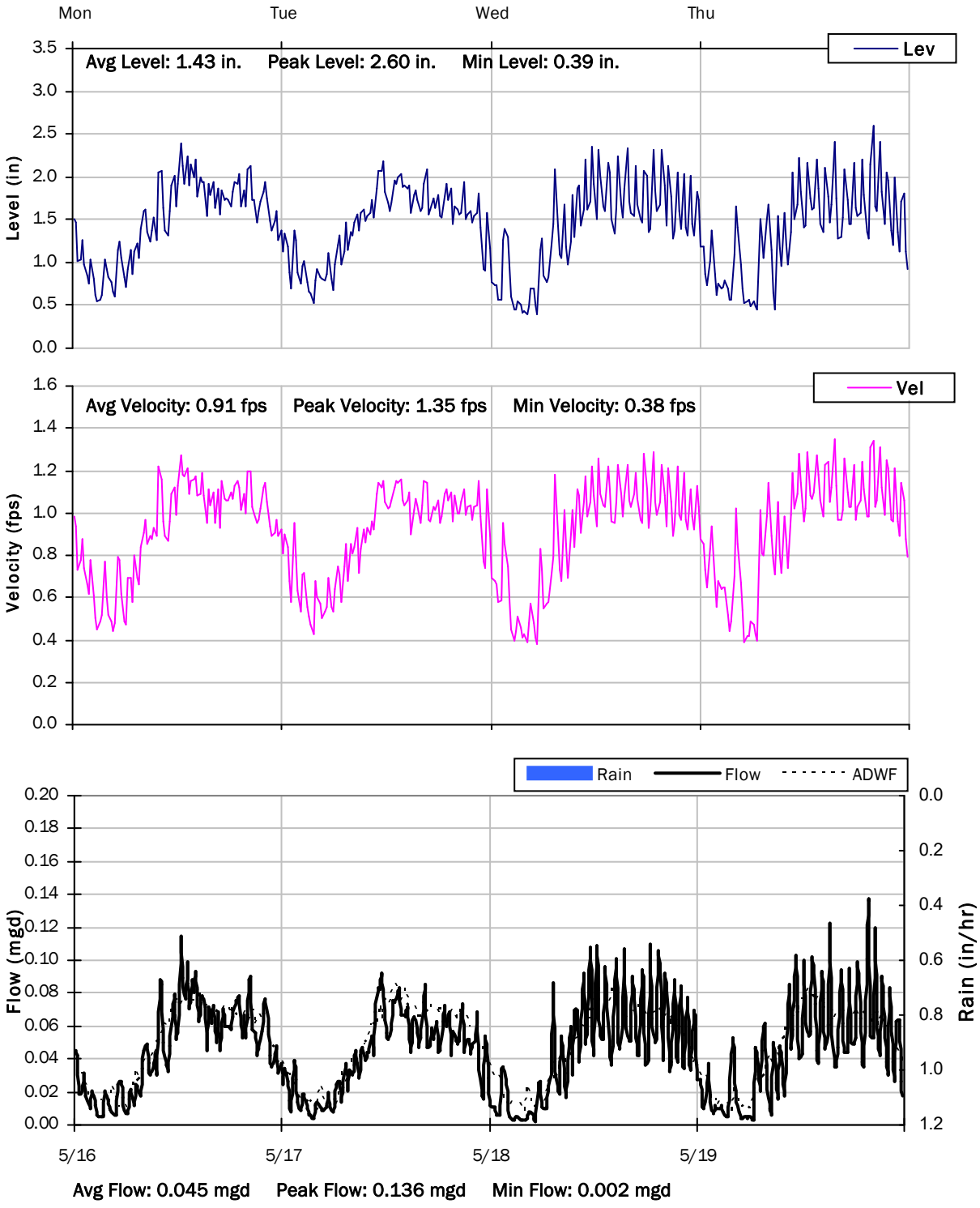
5/9/2022 to 5/16/2022



SITE 5

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 6

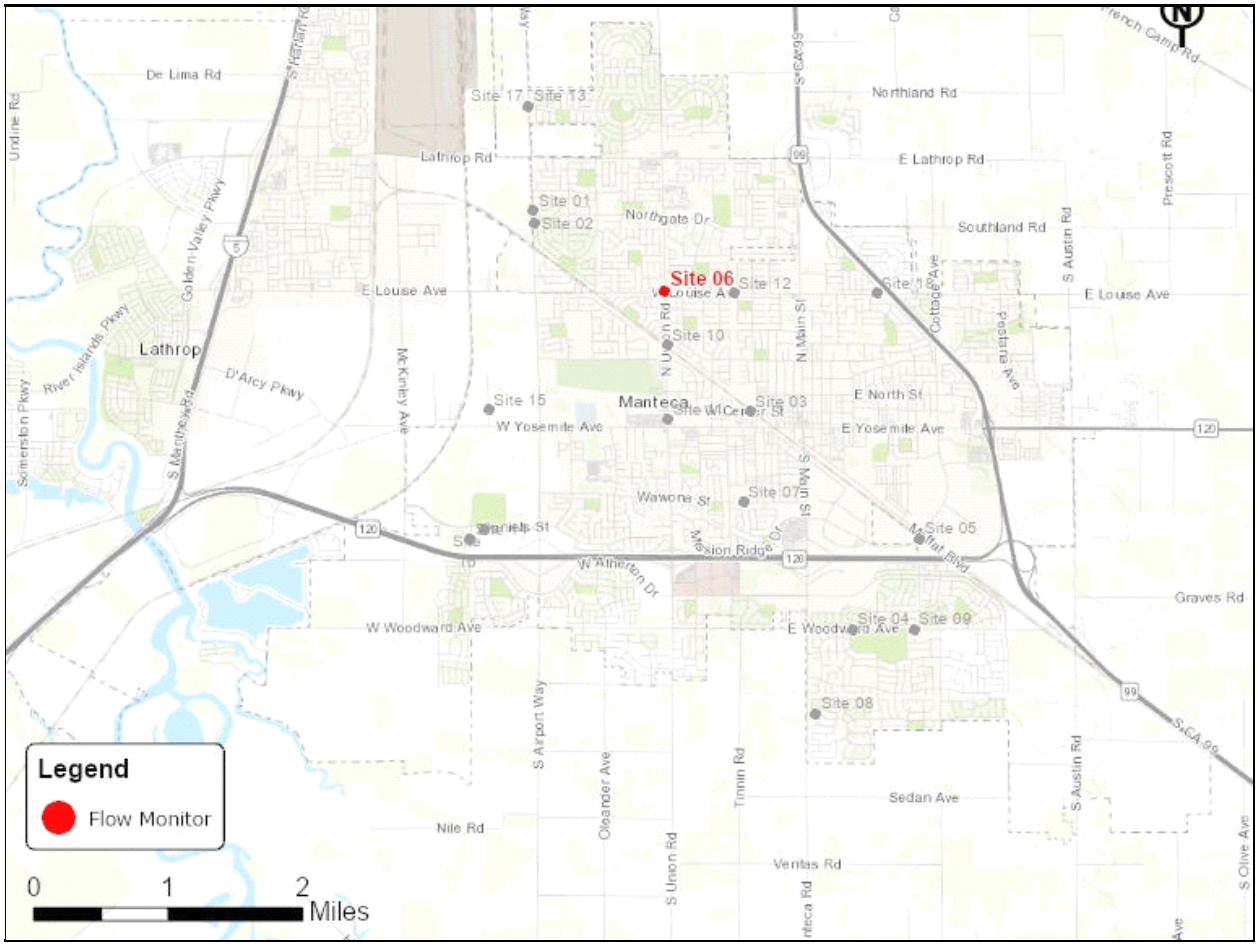
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: W. Louise Avenue at N. Union Road

Data Summary Report



Vicinity Map: Site 6

SITE 6

Additional Site Photos

Effluent Pipe



Monitored Northwest Influent Pipe

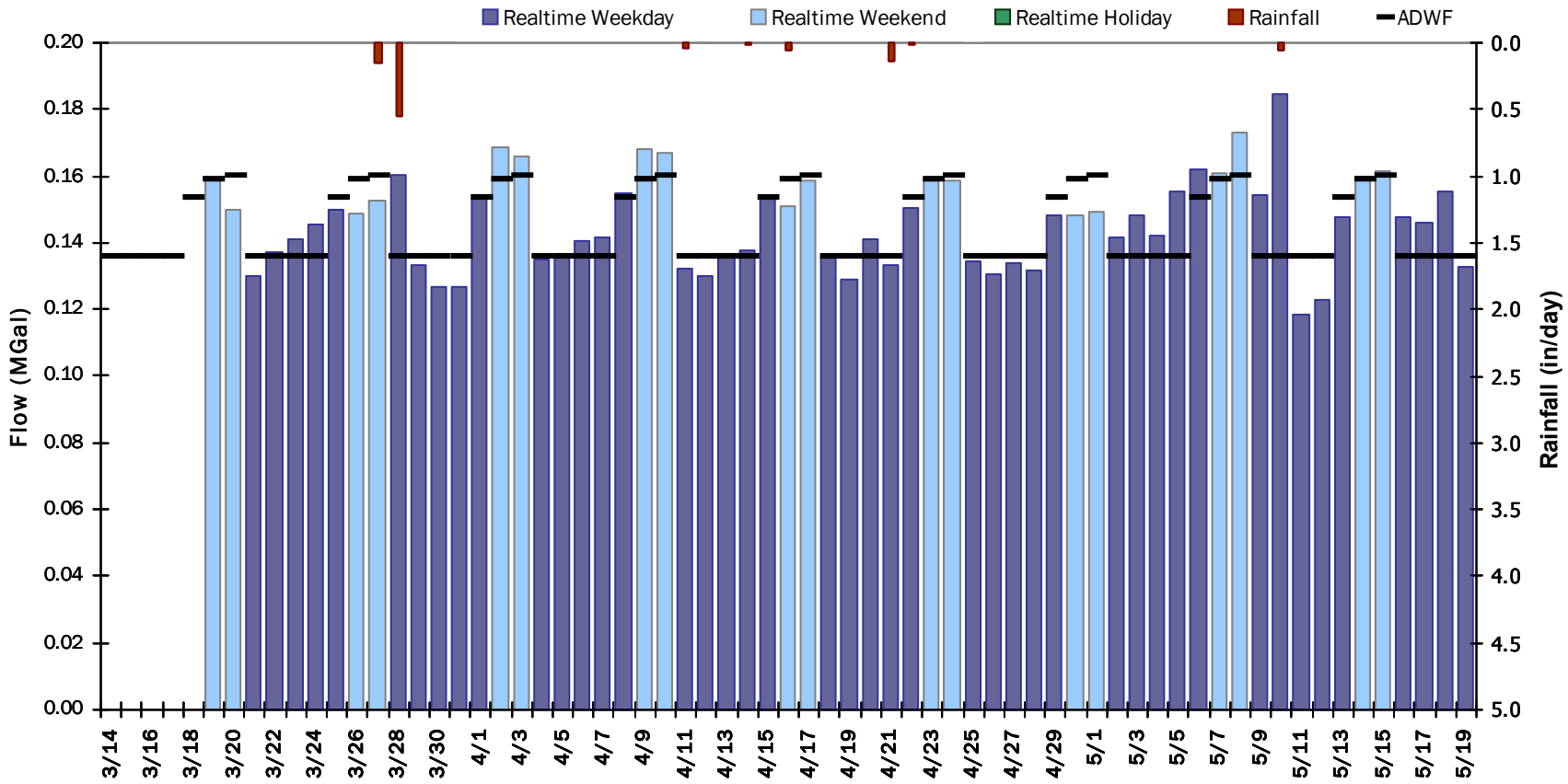


SITE 6

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.147 MGal Peak Daily Flow: 0.185 MGal Min Daily Flow: 0.118 MGal

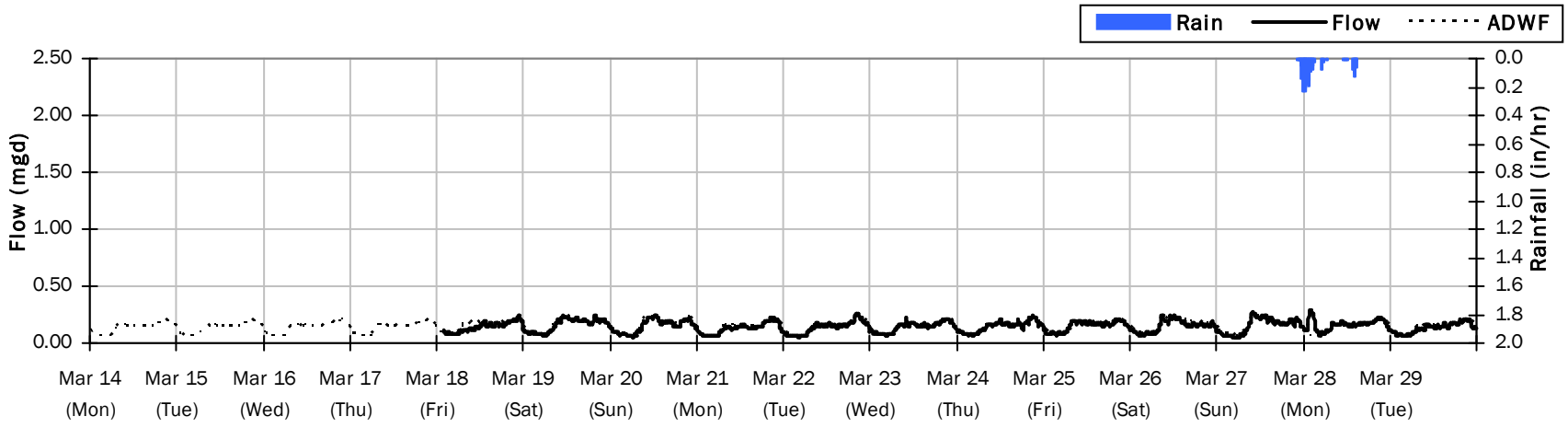
Total Rainfall: 1.02 inches

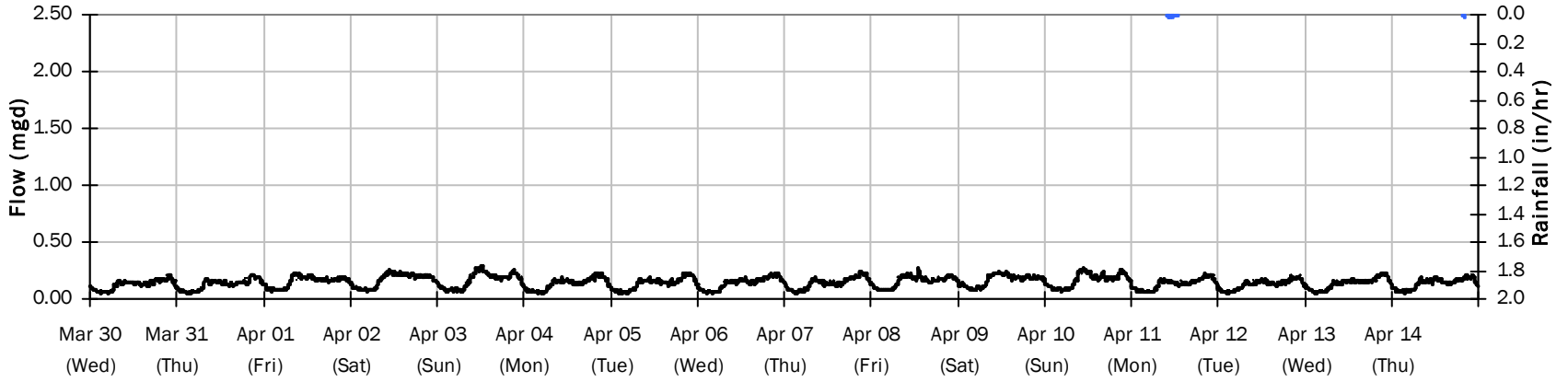


SITE 6

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.76 inches Period Avg Flow: 0.146 mgd Period Peak Flow: 0.296 mgd Period Min Flow: 0.049 mgd

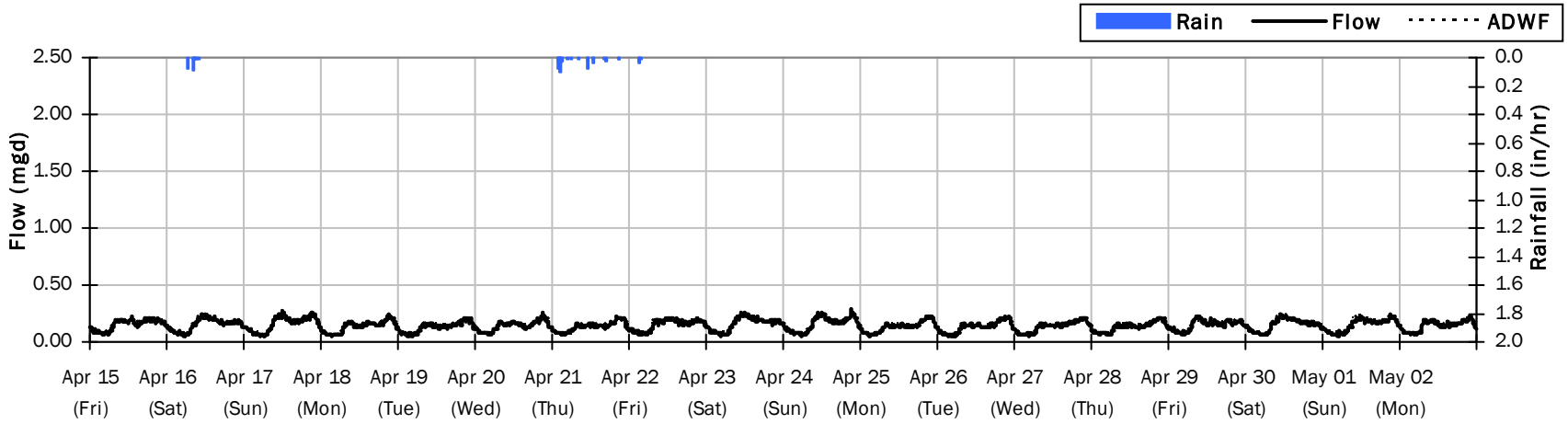


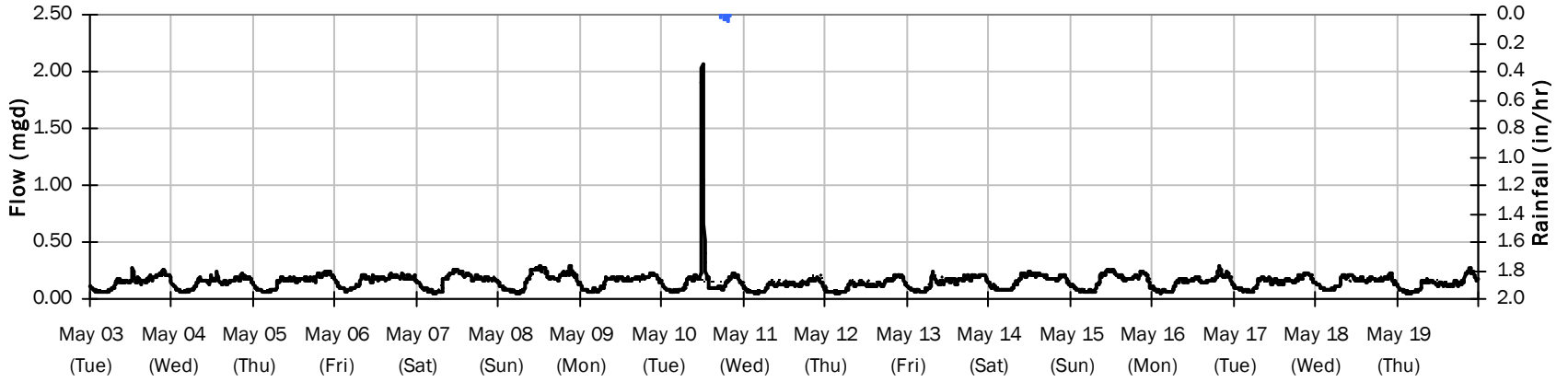


SITE 6

Flow Summary: 4/15/2022 to 5/19/2022

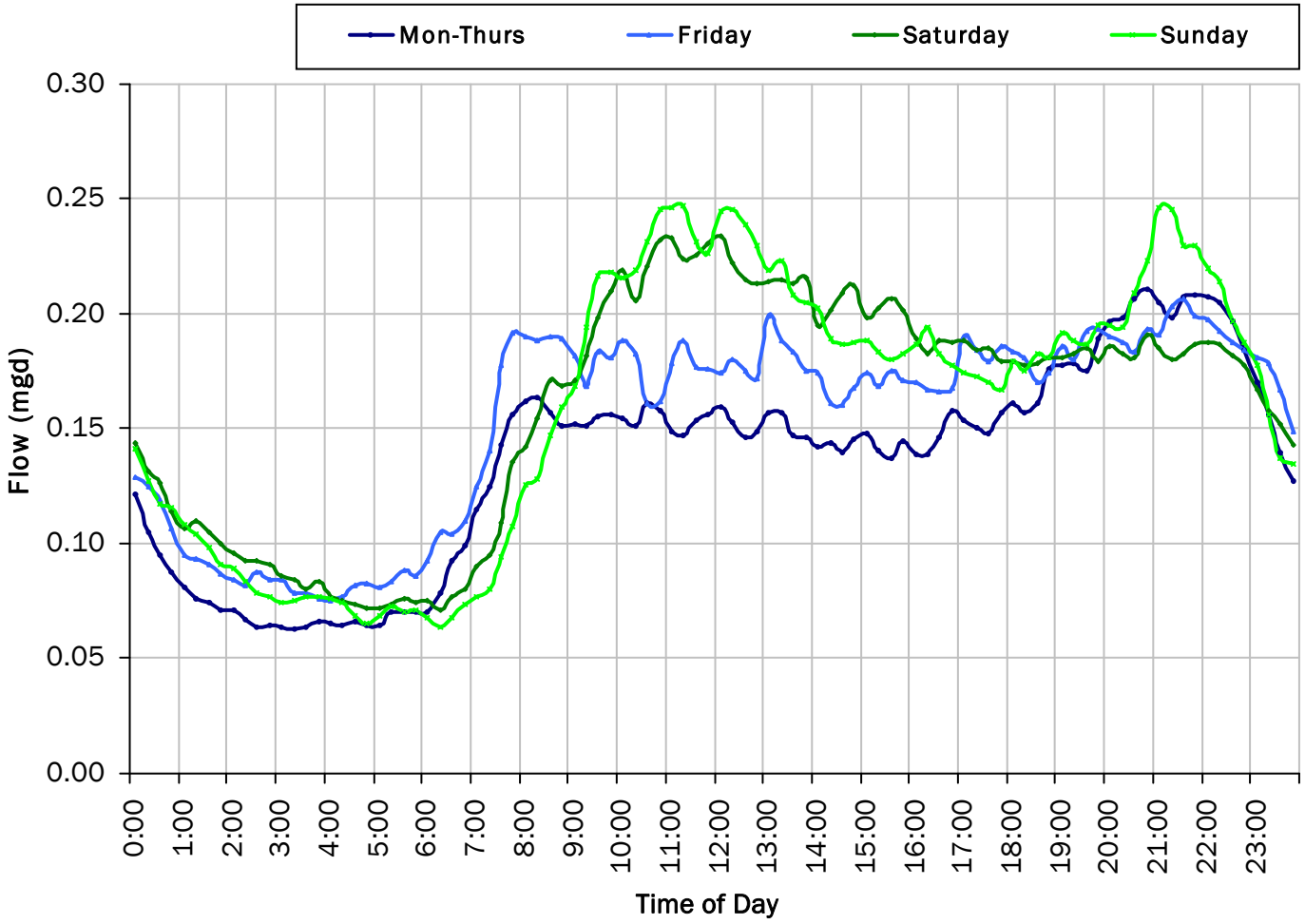
Period Rainfall: 0.27 inches Period Avg Flow: 0.147 mgd Period Peak Flow: 2.060 mgd Period Min Flow: 0.047 mgd





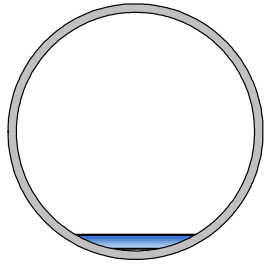
SITE 6

Average Dry Weather Flow Hydrographs



ADWF:

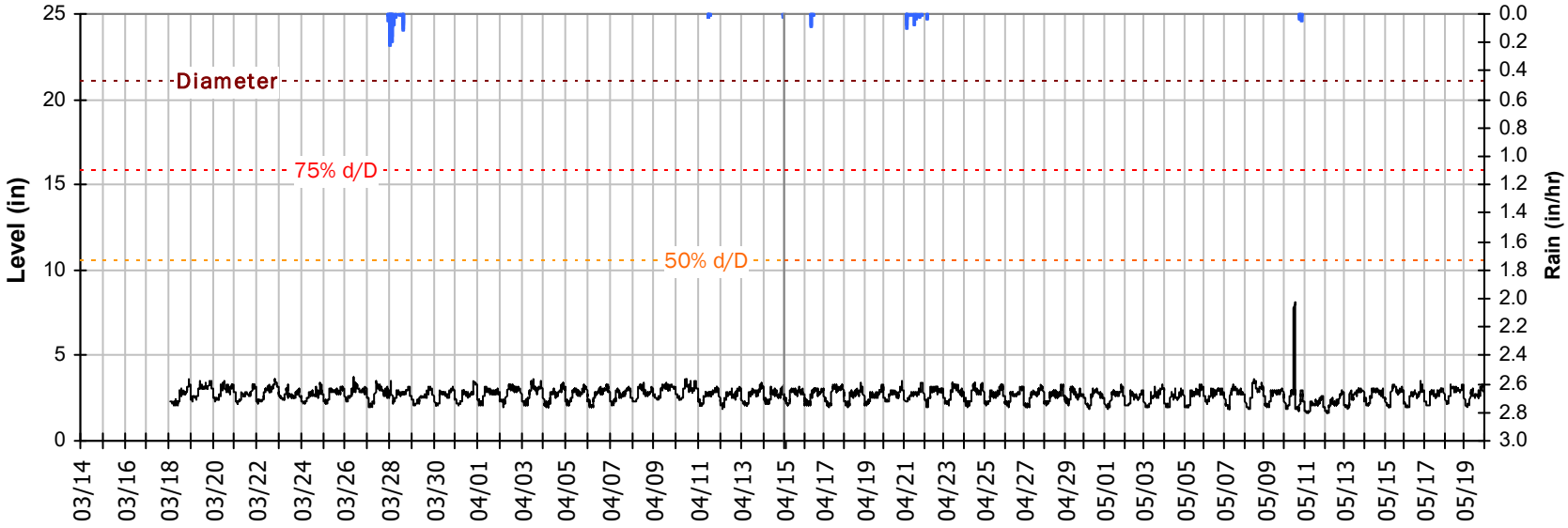
0.145 *mgd*

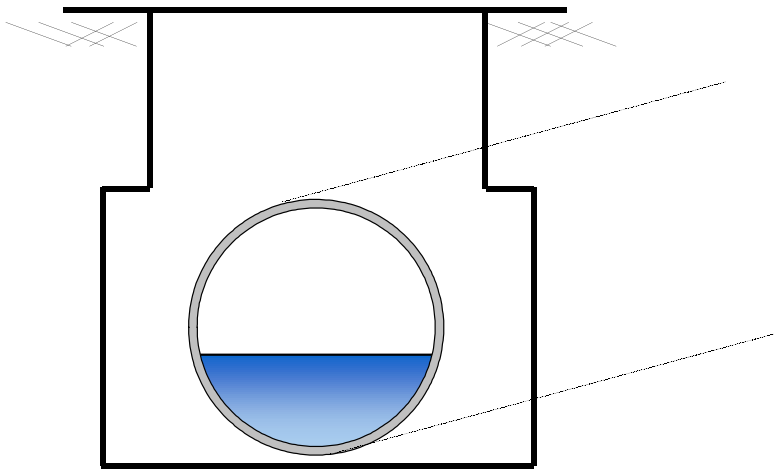


SITE 6

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

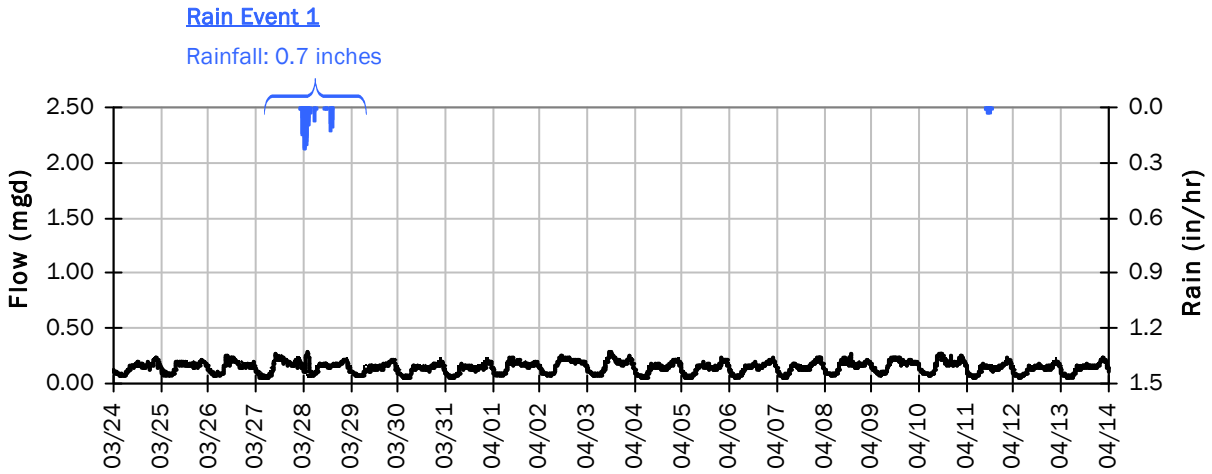




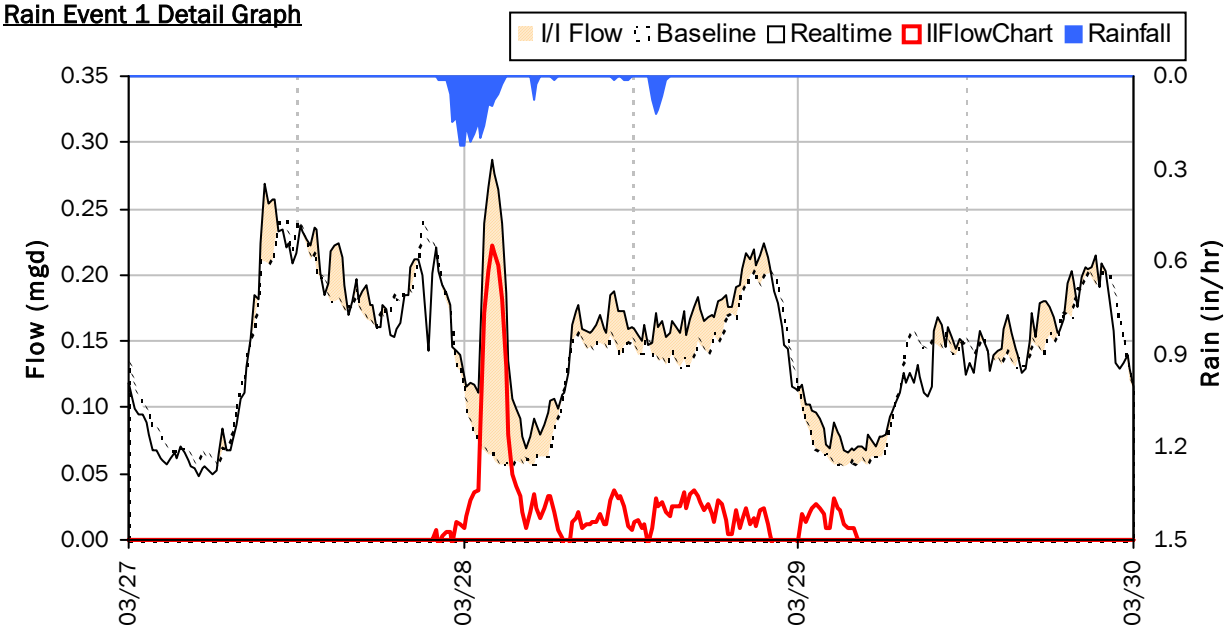
Pipe Diameter:	21	*inches*
Peak Measured Level:	8.11	*inches*
Peak d/D Ratio:	0.39	

SITE 6
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



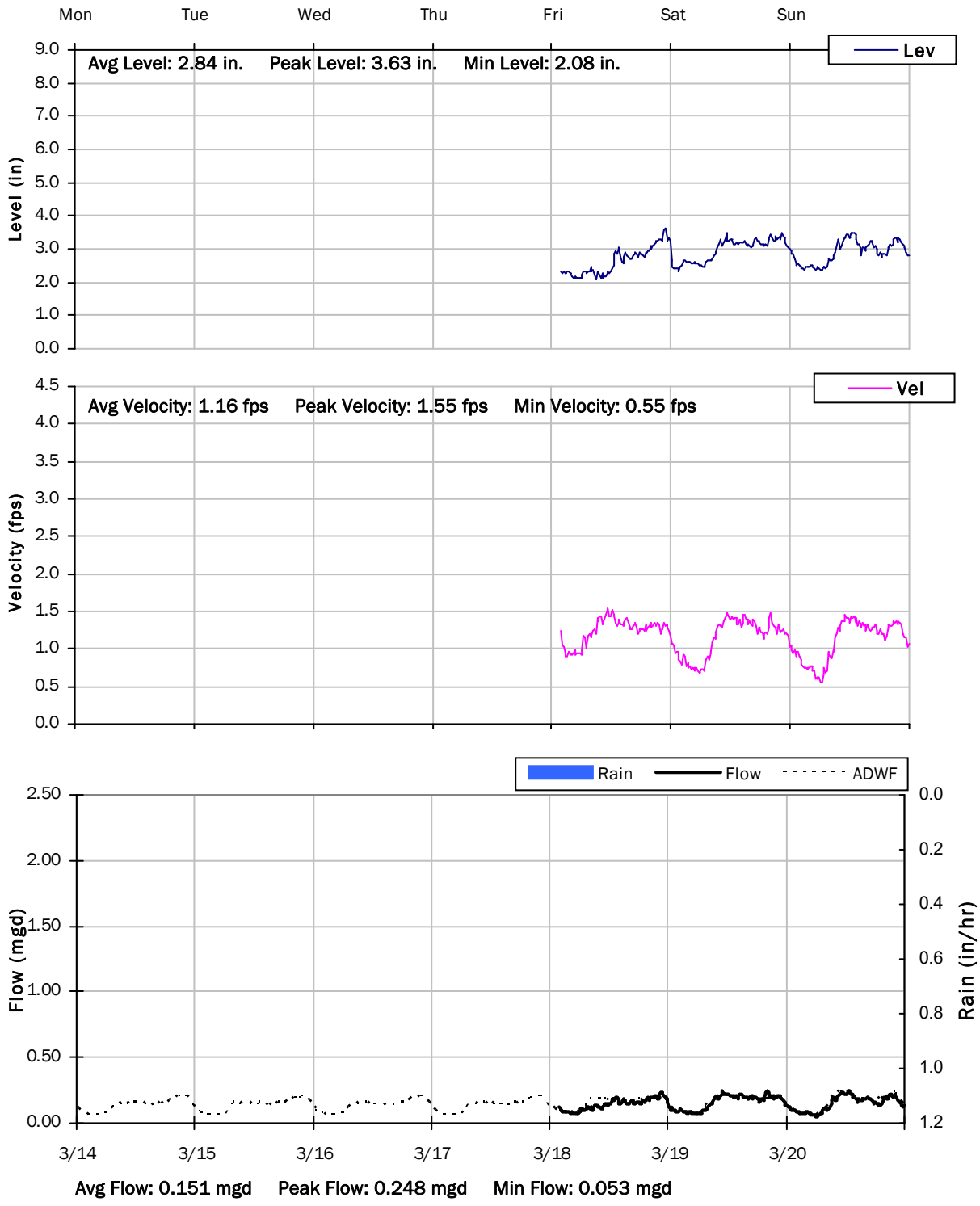
Storm Event I/I Analysis (Rain = 0.70 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.287 *mgd*	**Peak I/I Rate:**	0.223 *mgd*
PF:	1.98	**Total I/I:**	35,000 *gallons*
Peak Level:	3.50 *in*		
d/D Ratio:	0.17		

SITE 6

Weekly Level, Velocity and Flow Hydrographs

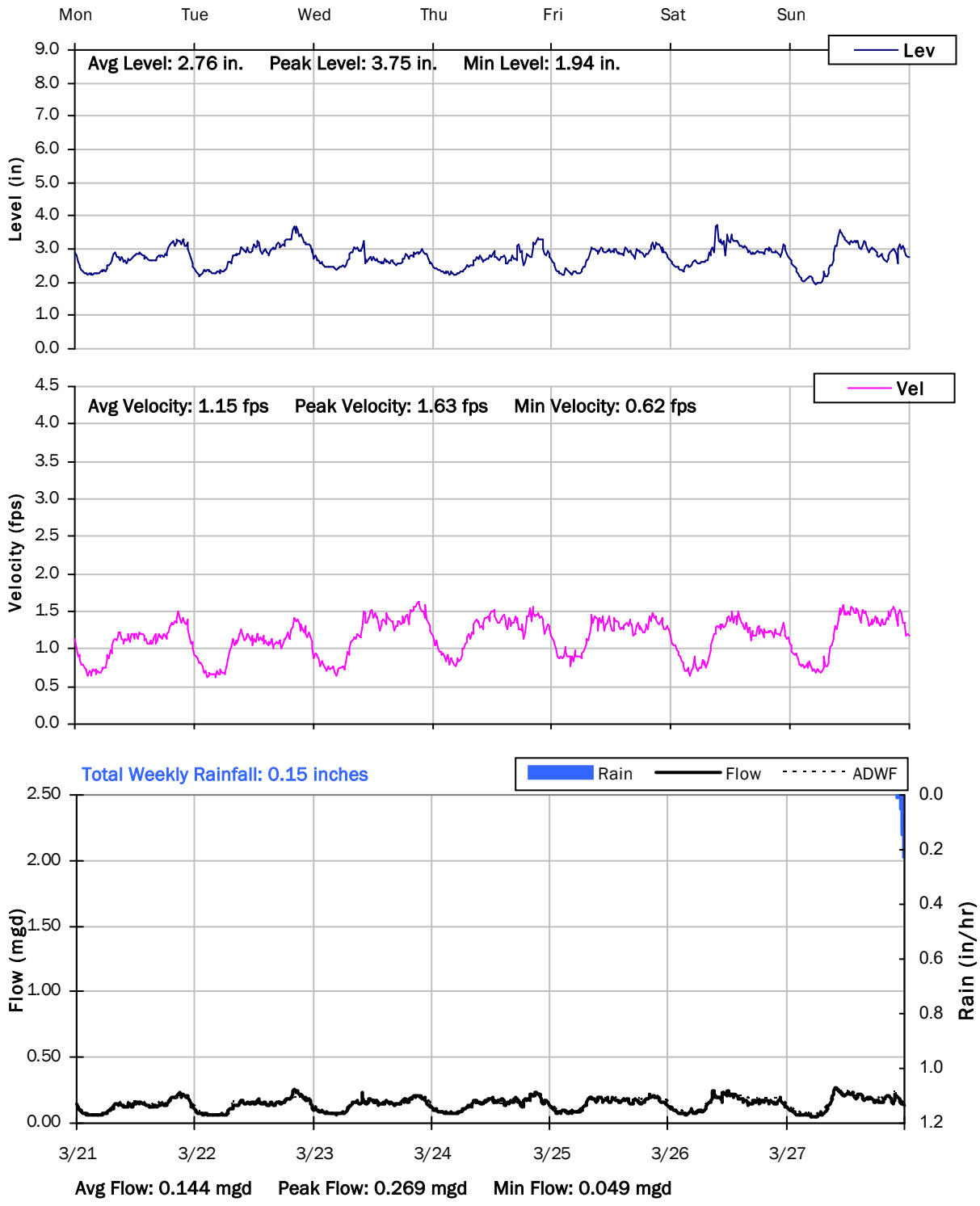
3/14/2022 to 3/21/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

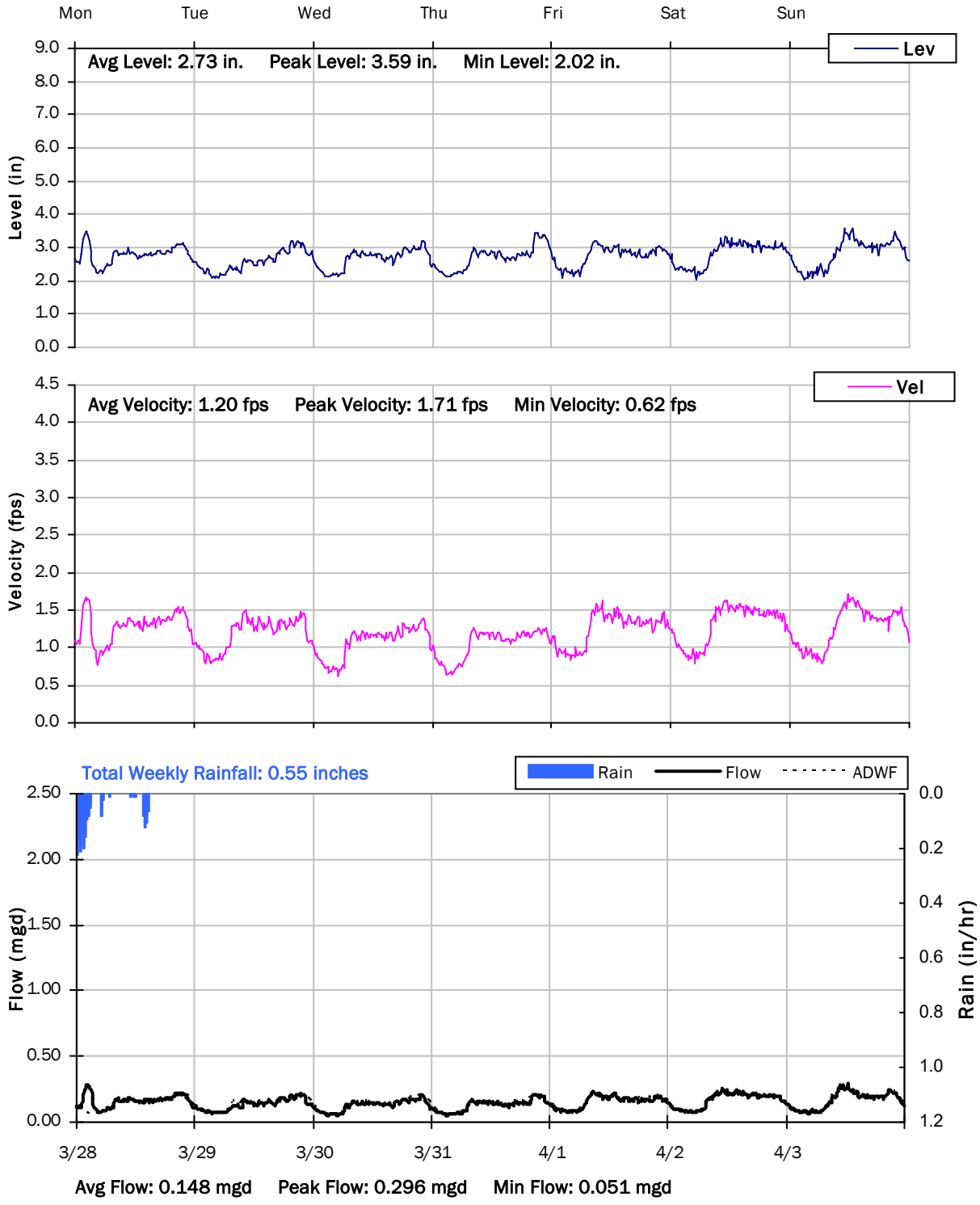
3/21/2022 to 3/28/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

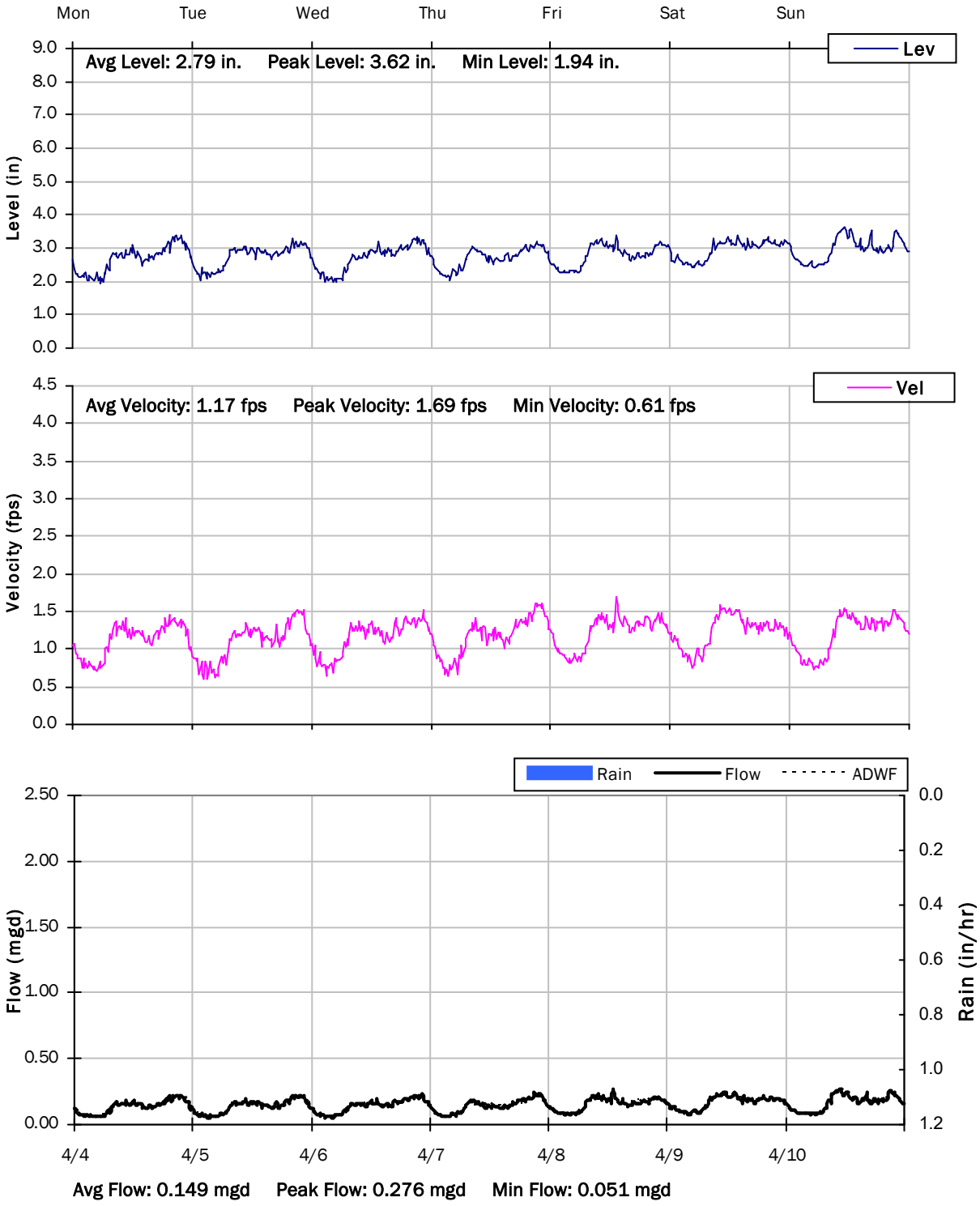
3/28/2022 to 4/4/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

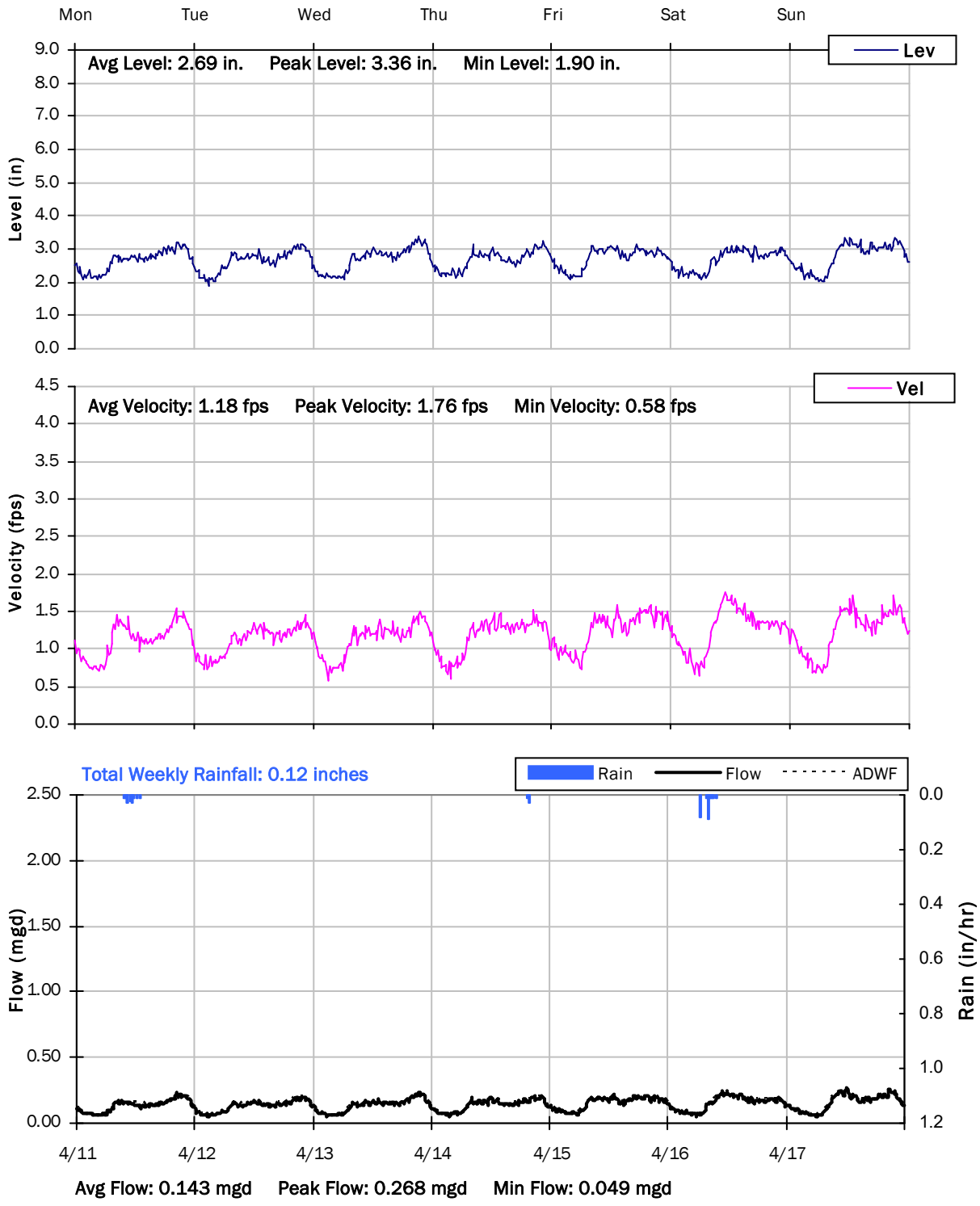
4/4/2022 to 4/11/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

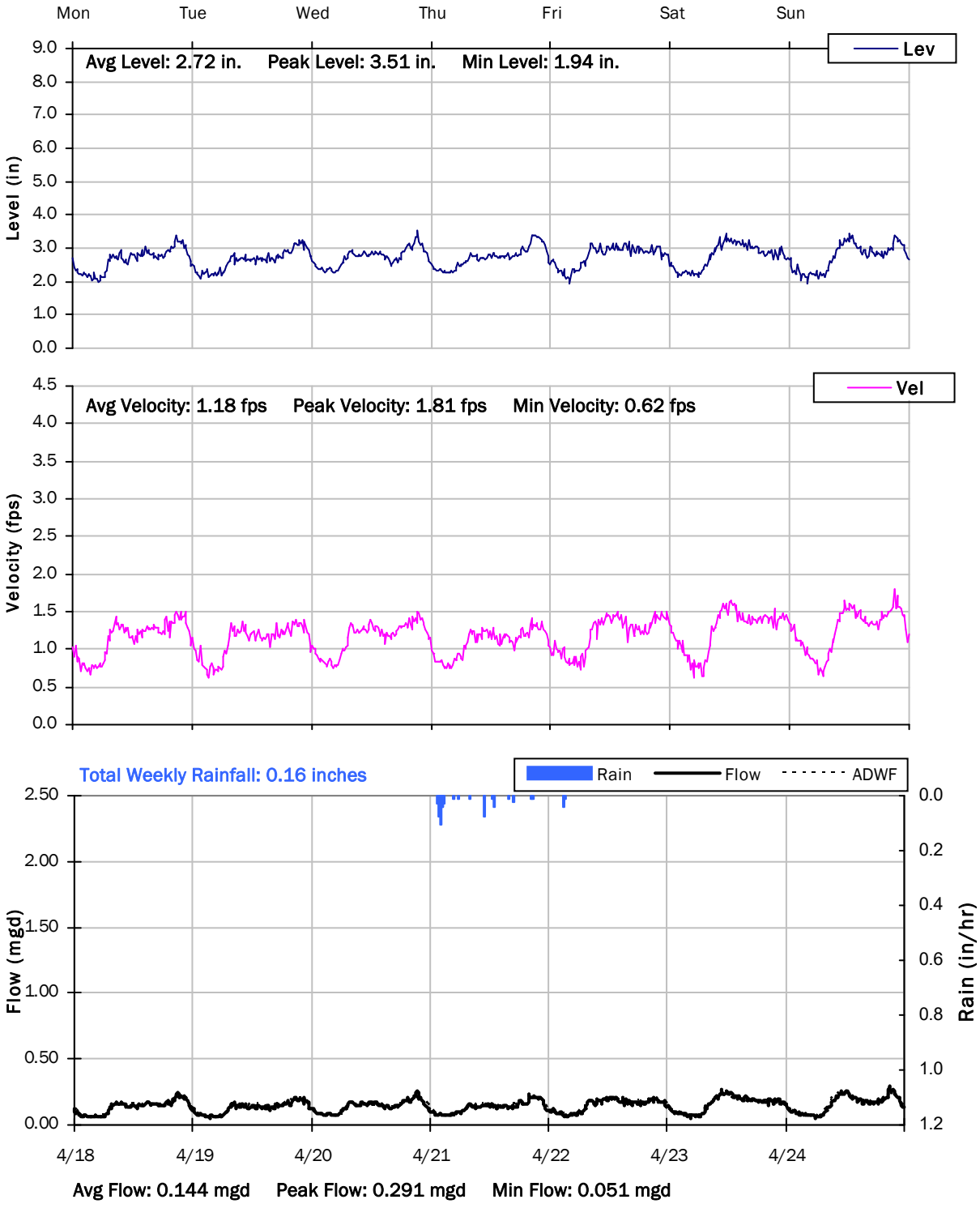
4/11/2022 to 4/18/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

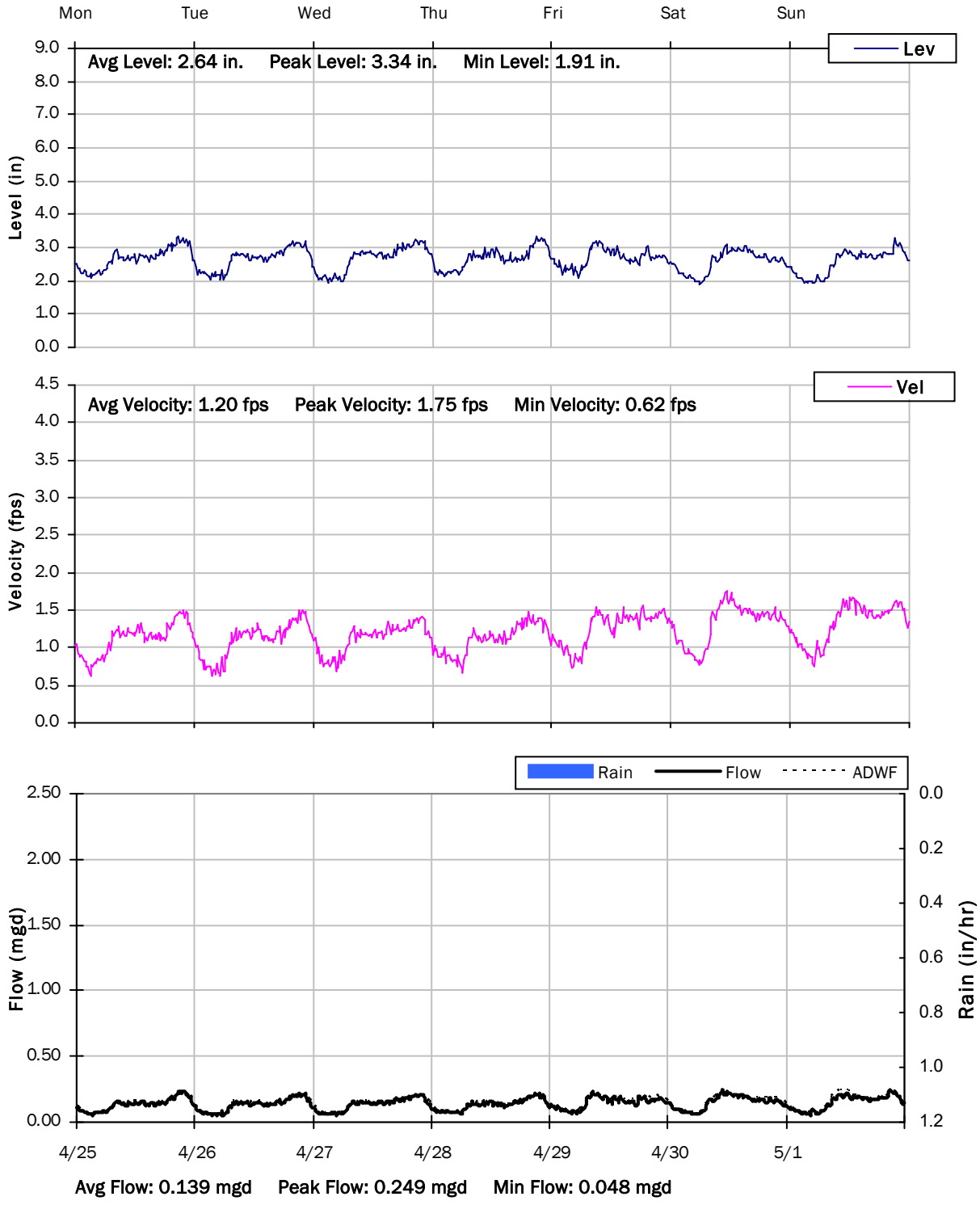
4/18/2022 to 4/25/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

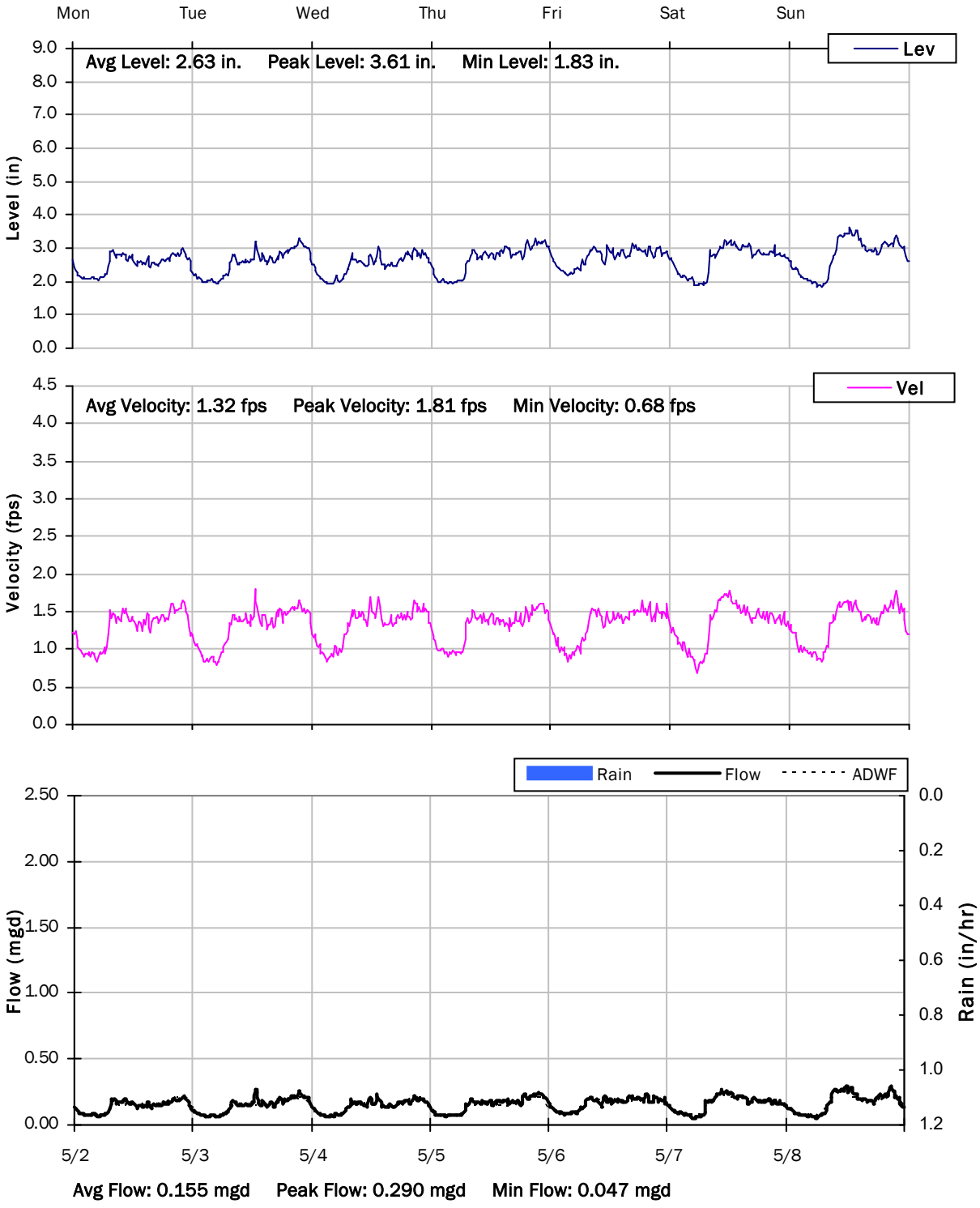
4/25/2022 to 5/2/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

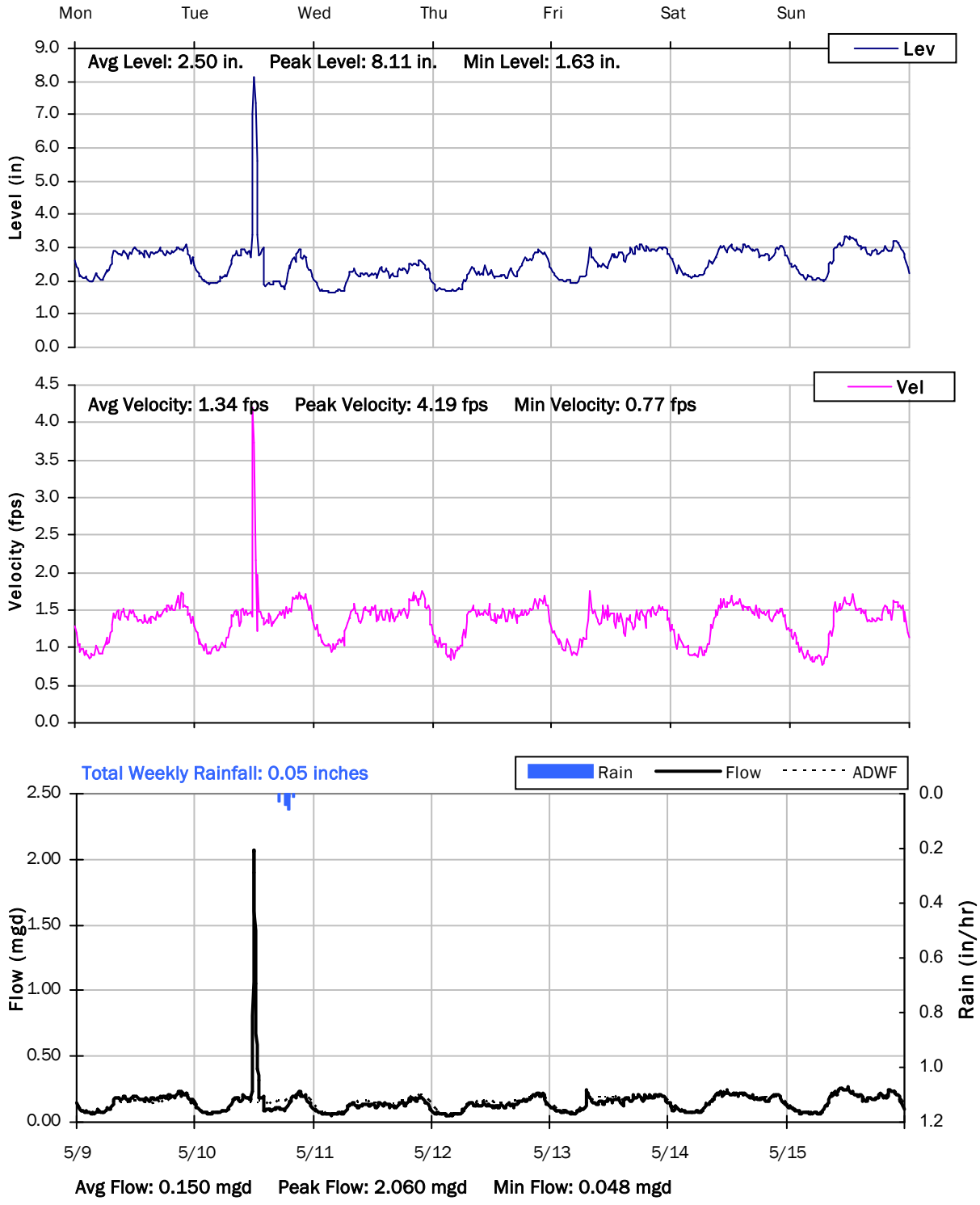
5/2/2022 to 5/9/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

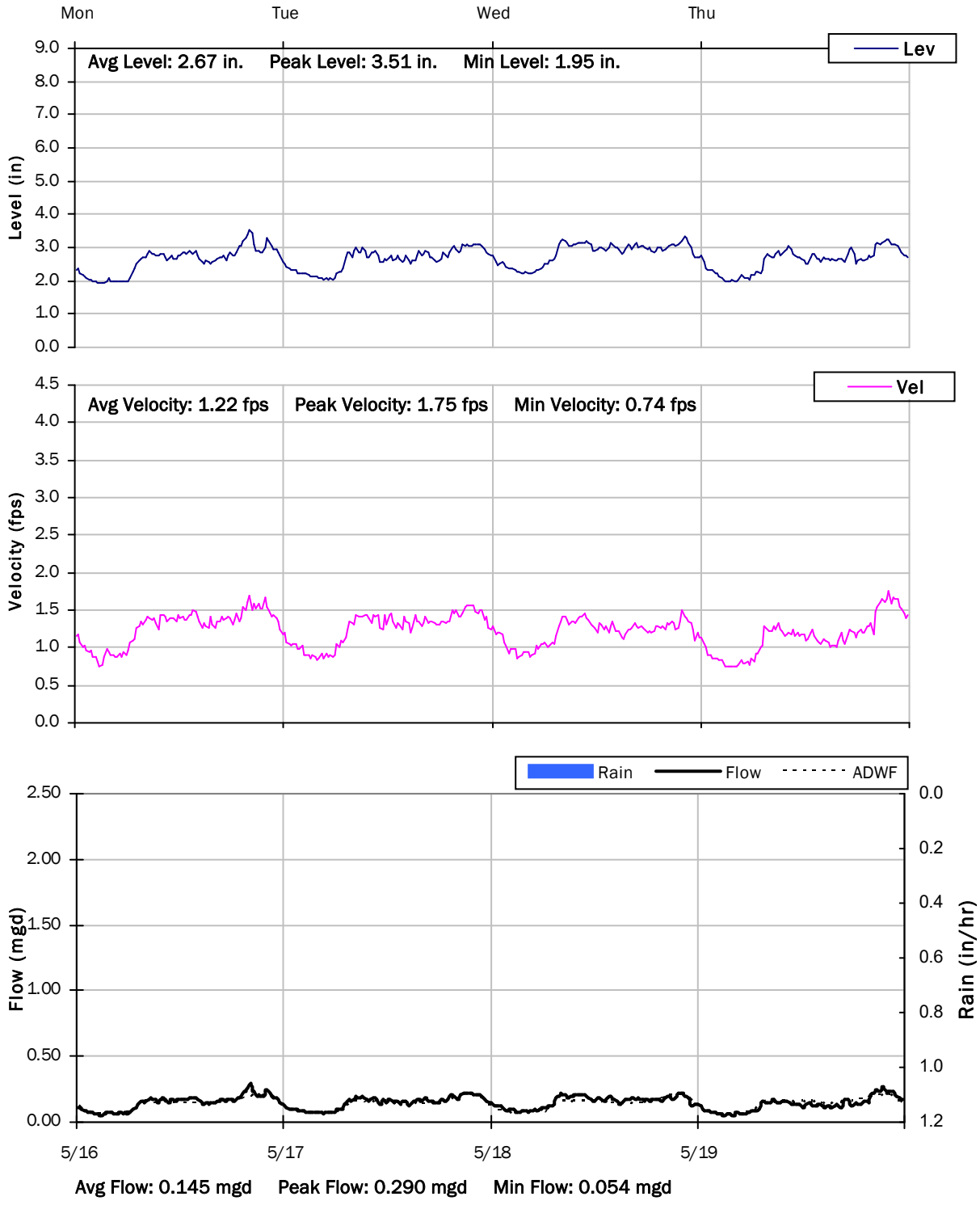
5/9/2022 to 5/16/2022



SITE 6

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 7

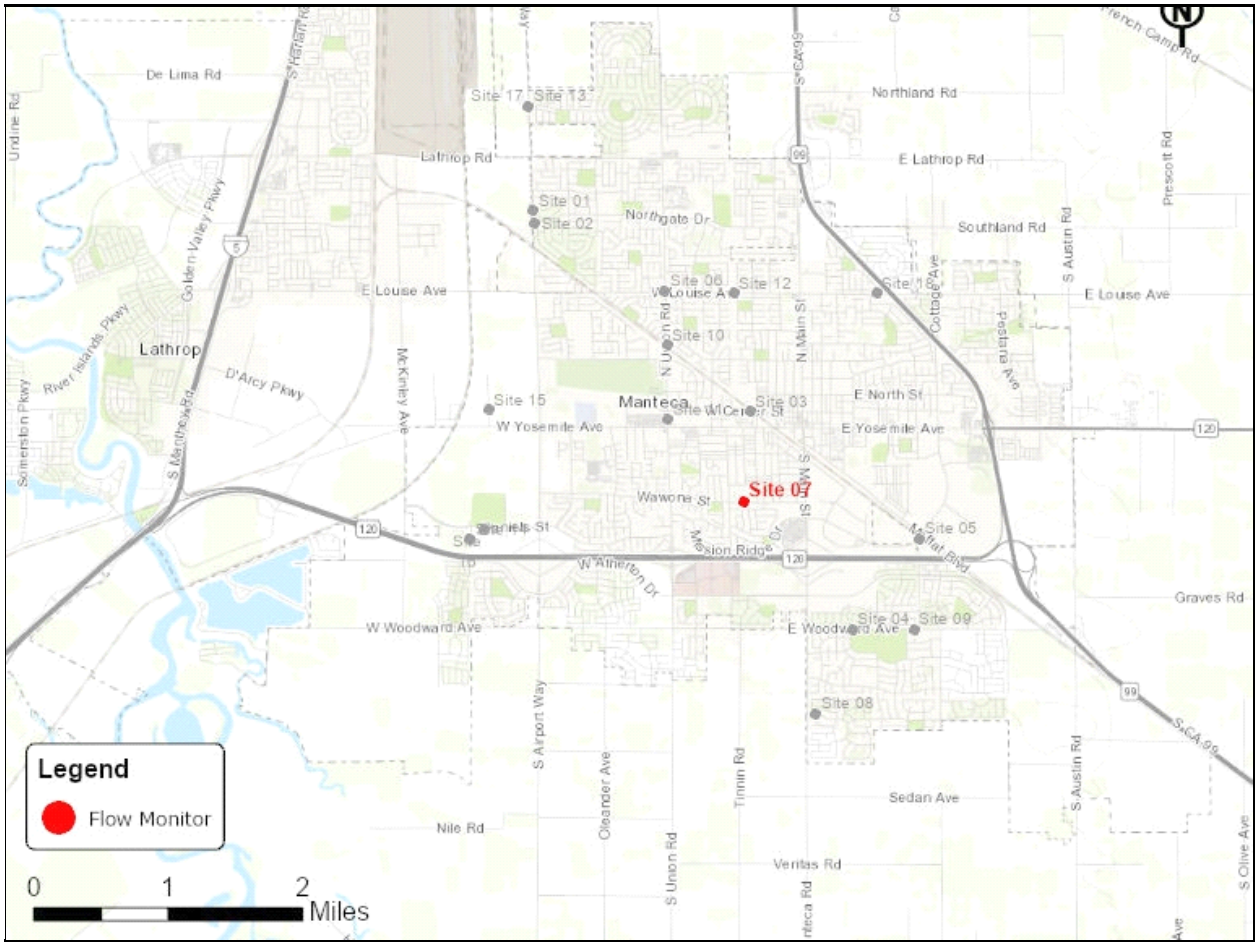
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Wawona Street West of Sequoia Avenue

Data Summary Report

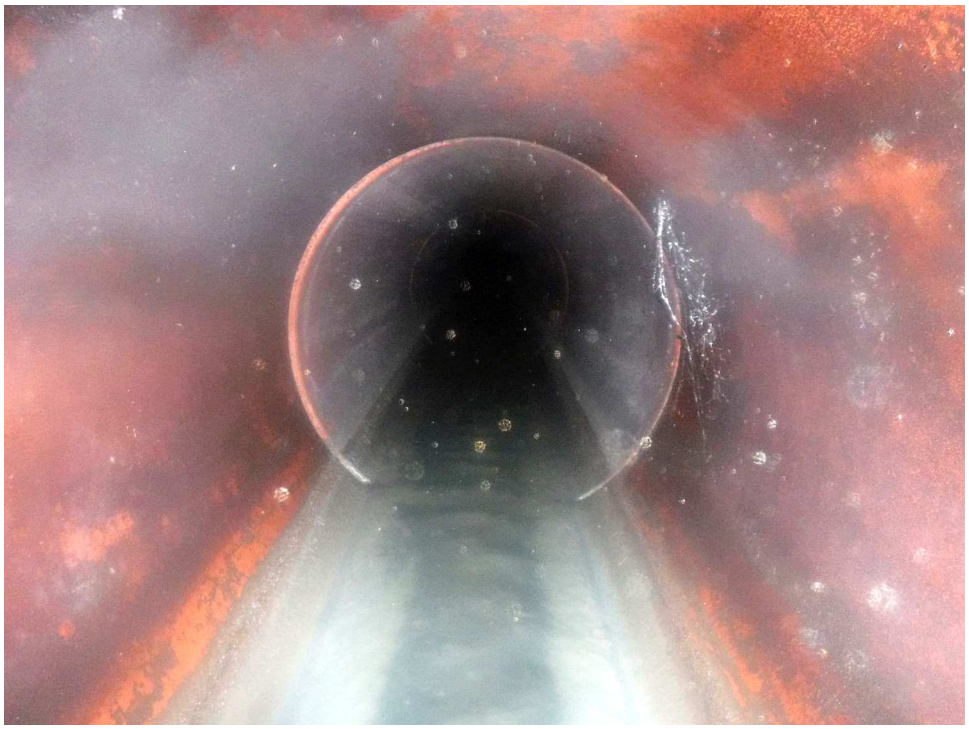


Vicinity Map: Site 7

SITE 7

Additional Site Photos

Effluent Pipe



Monitored East Influent Pipe

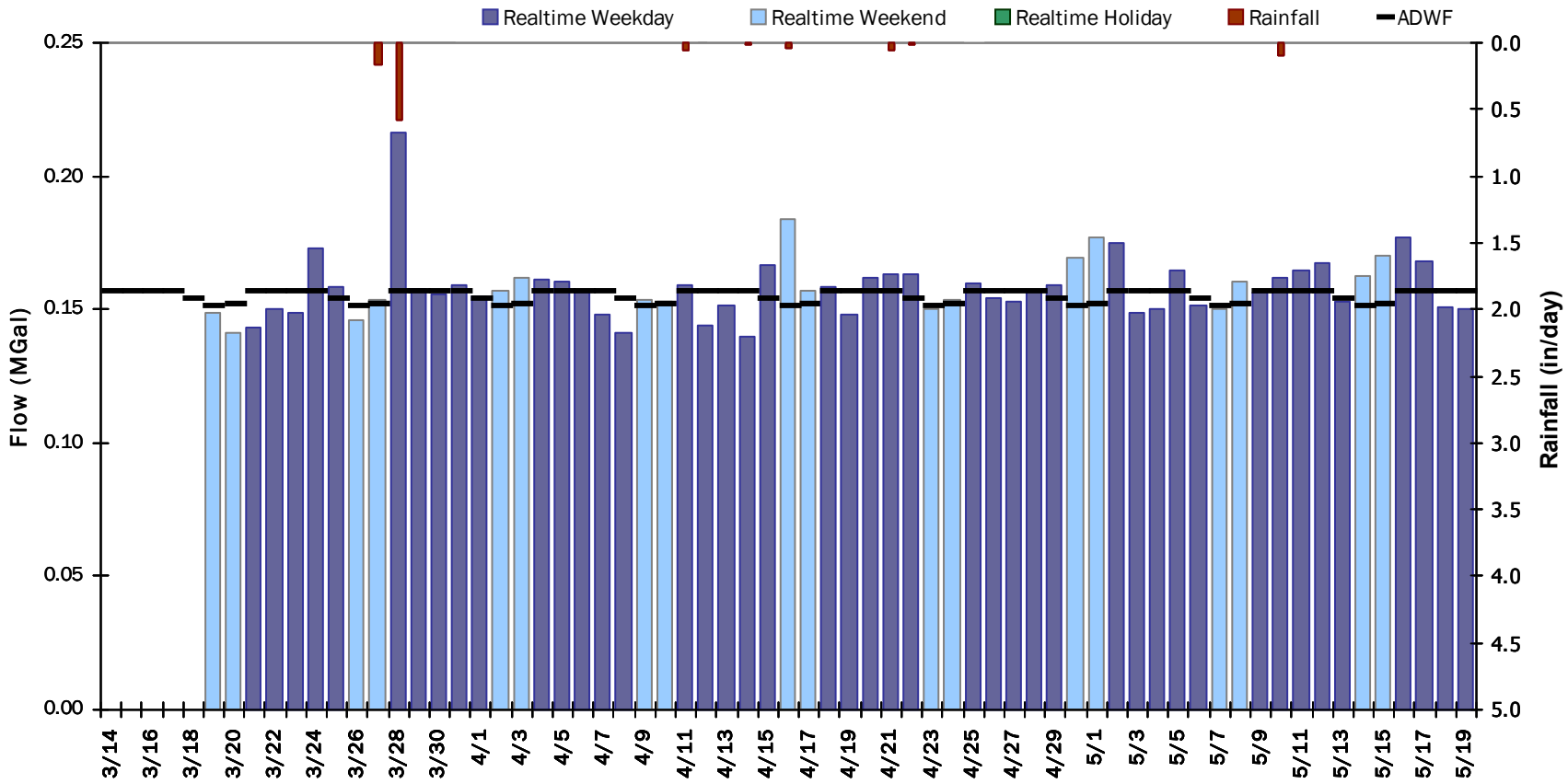


SITE 7

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.159 MGal Peak Daily Flow: 0.216 MGal Min Daily Flow: 0.140 MGal

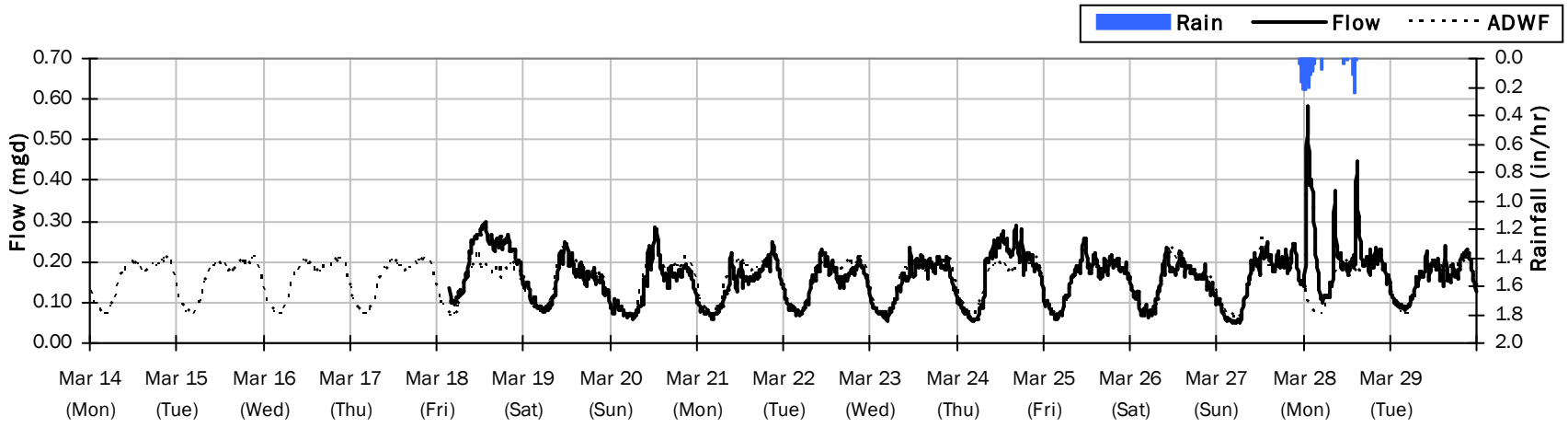
Total Rainfall: 1.02 inches

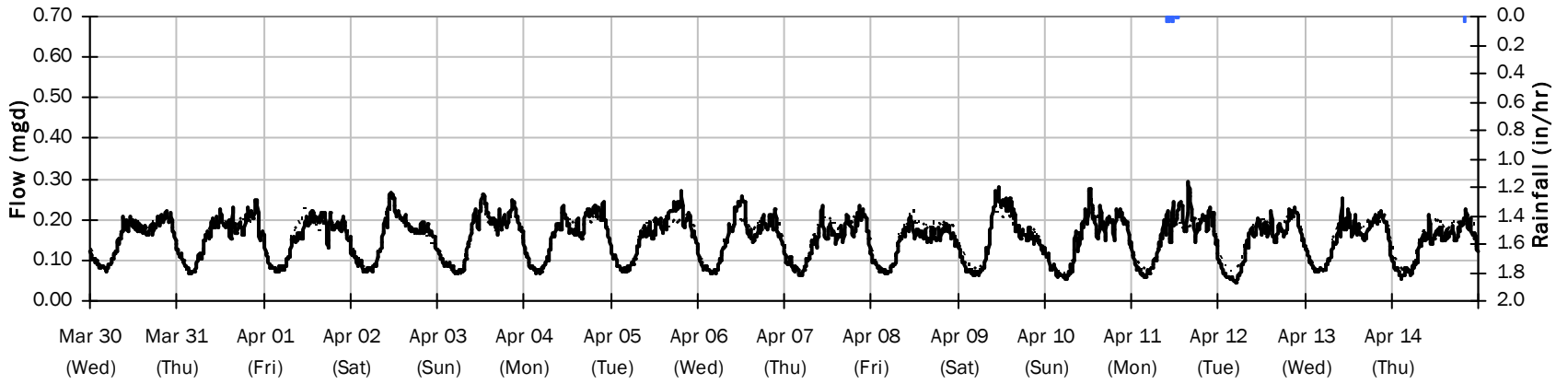


SITE 7

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.81 inches Period Avg Flow: 0.157 mgd Period Peak Flow: 0.576 mgd Period Min Flow: 0.046 mgd

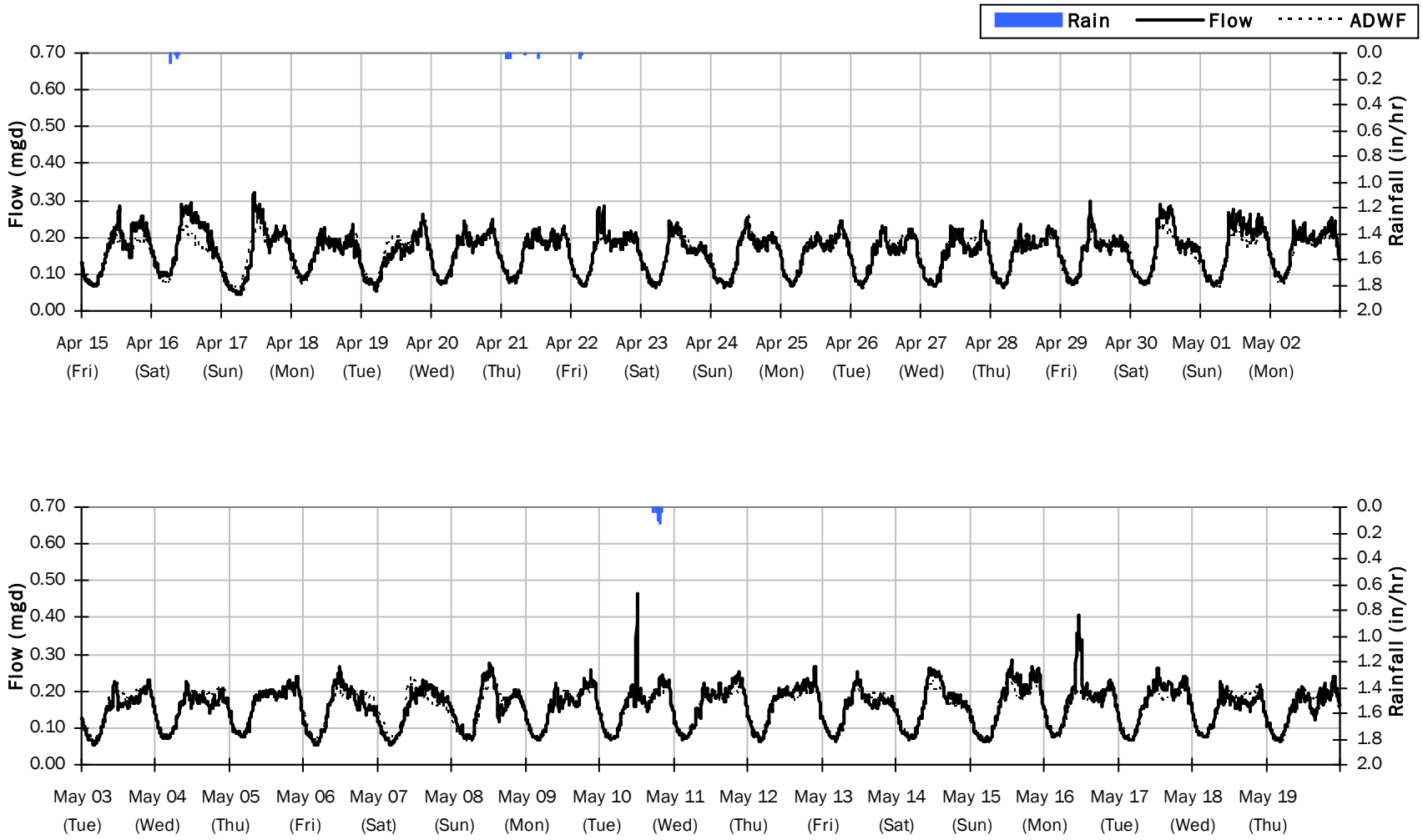




SITE 7

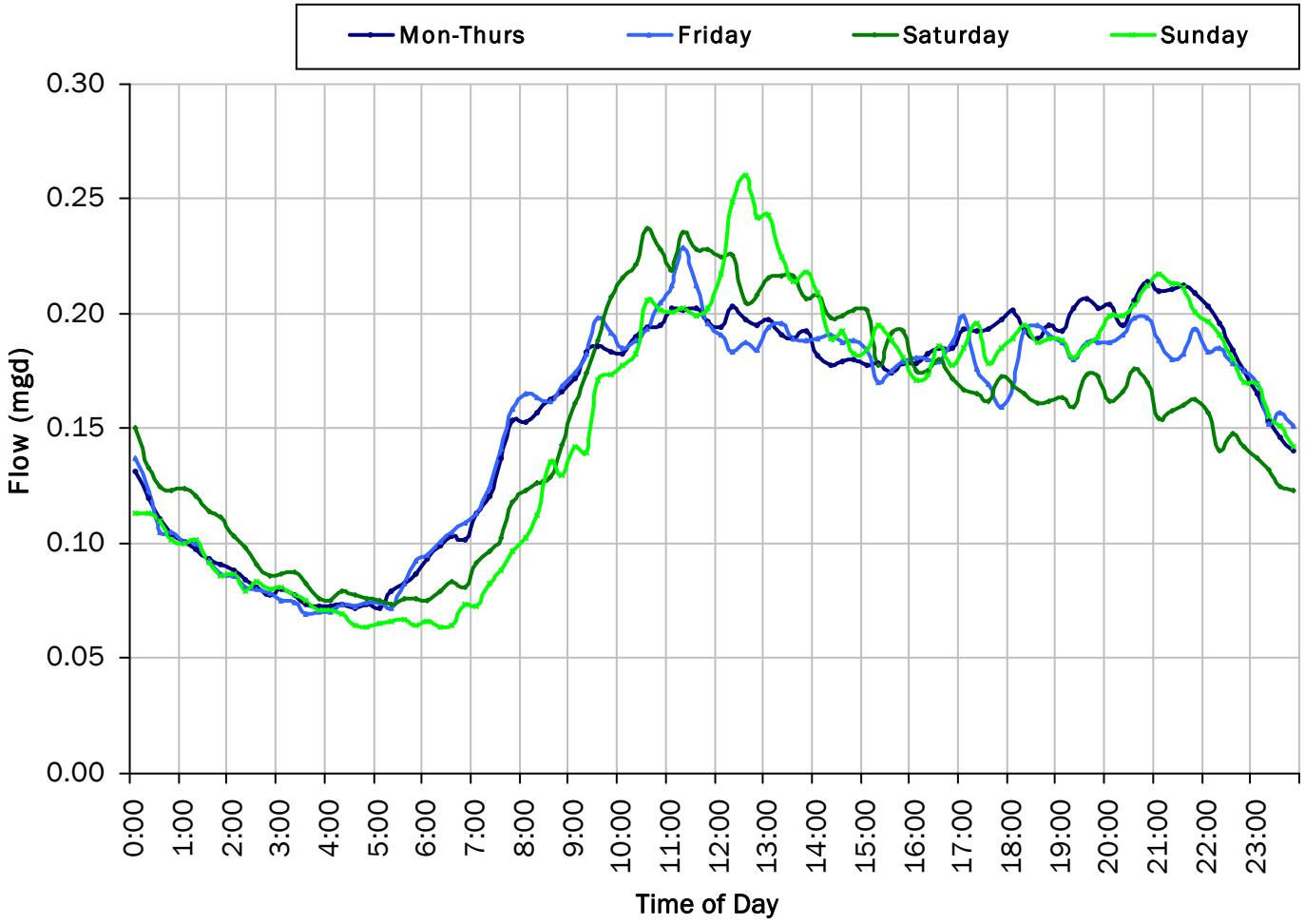
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.21 inches Period Avg Flow: 0.160 mgd Period Peak Flow: 0.467 mgd Period Min Flow: 0.044 mgd



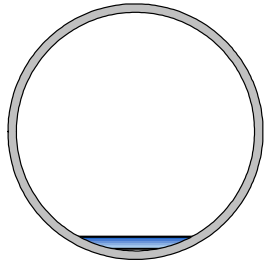
SITE 7

Average Dry Weather Flow Hydrographs



ADWF:

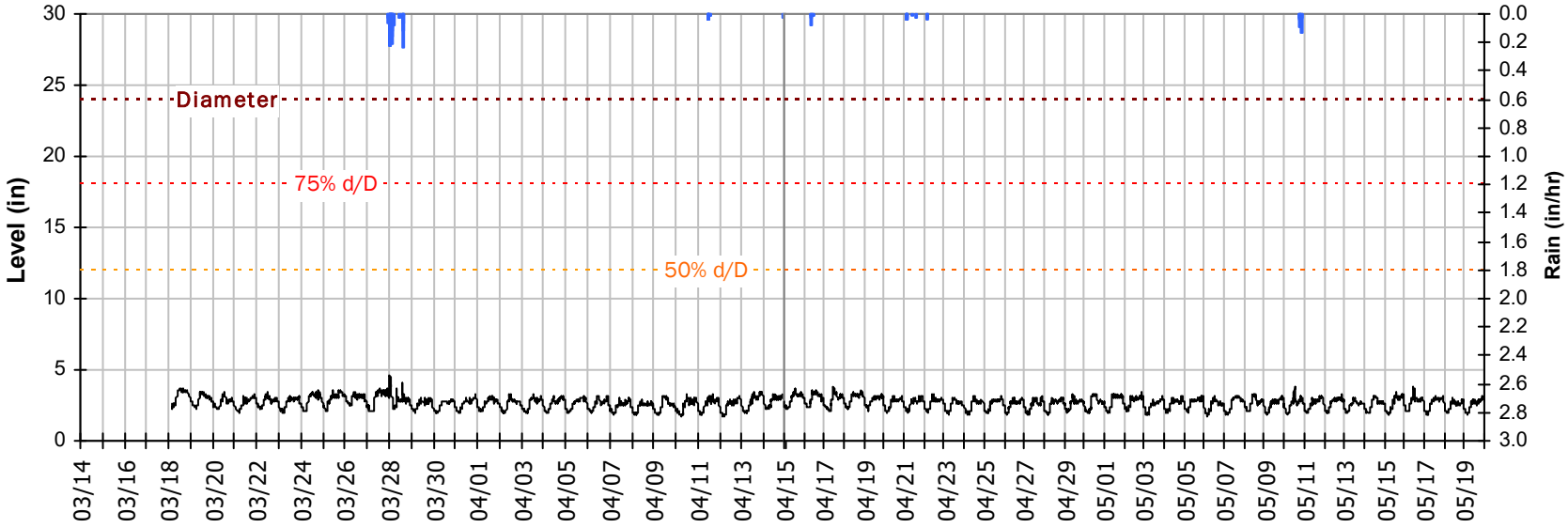
0.155 *mgd*

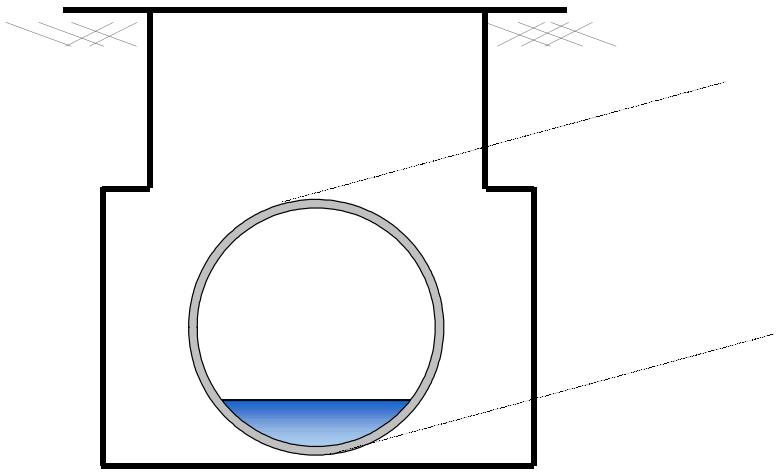


SITE 7

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

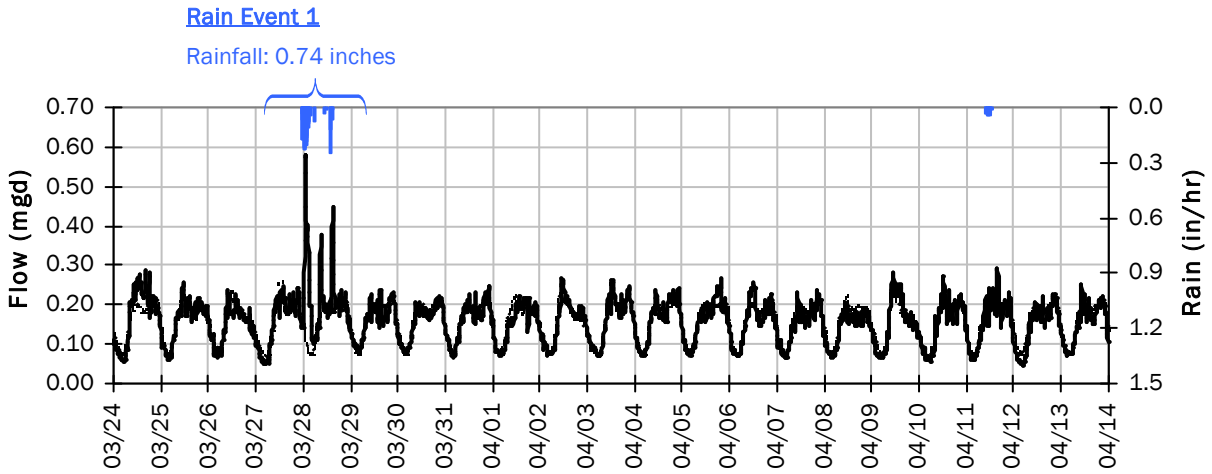




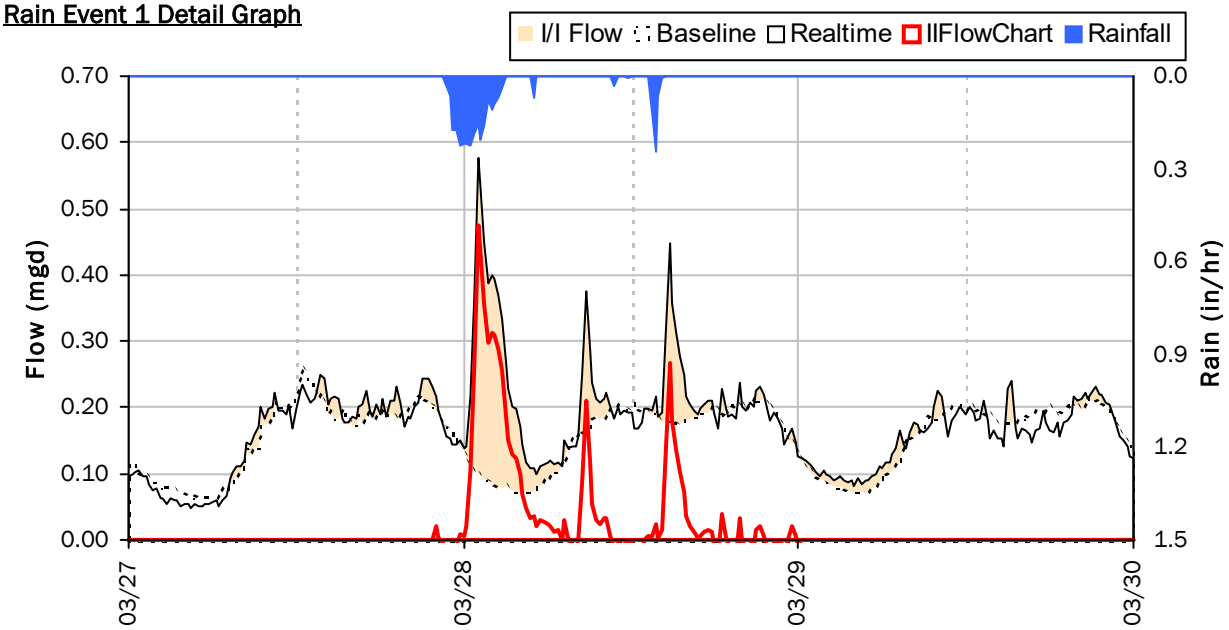
Pipe Diameter:	24	*inches*
Peak Measured Level:	4.64	*inches*
Peak d/D Ratio:	0.19	

SITE 7
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



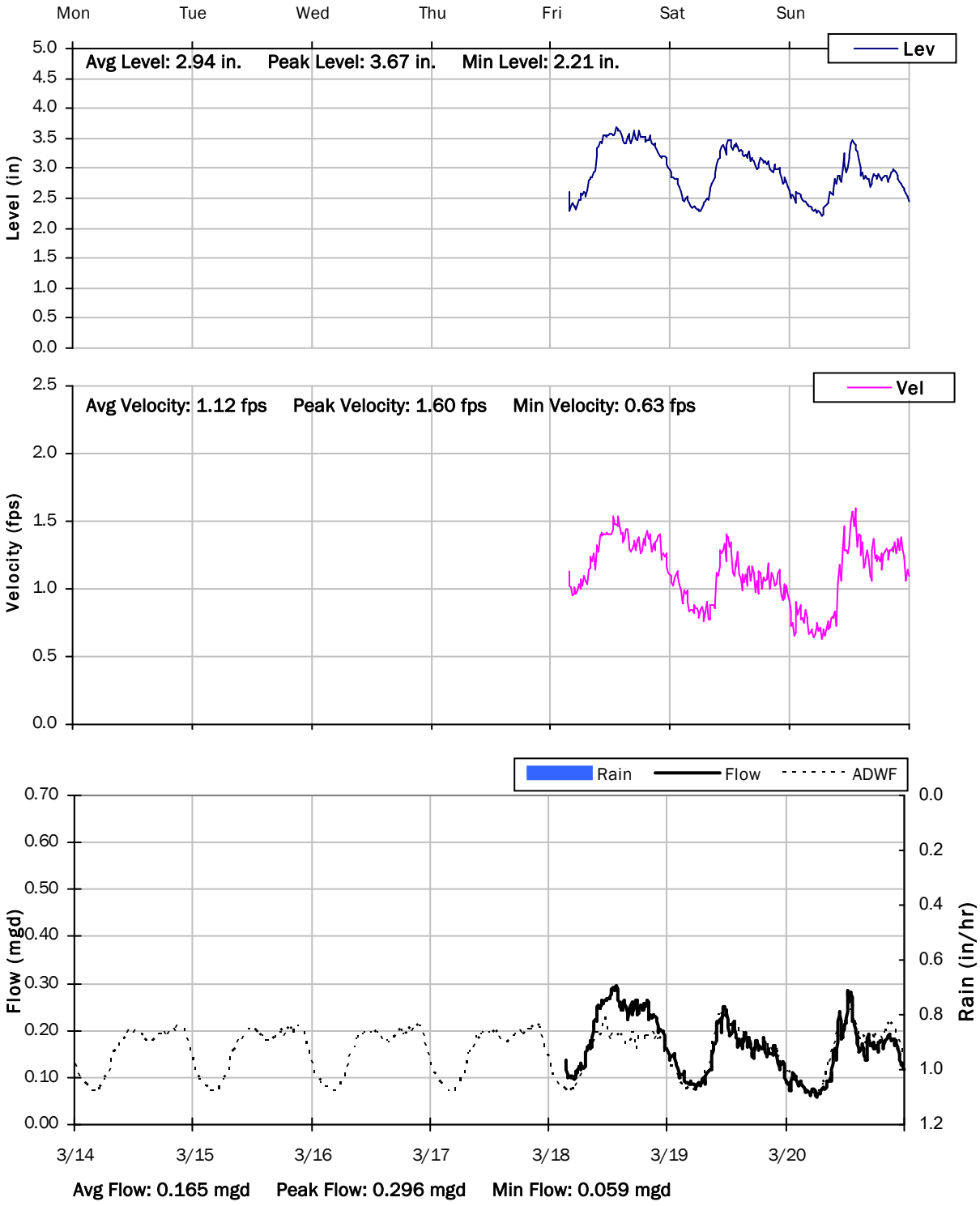
Storm Event I/I Analysis (Rain = 0.74 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.576 *mgd*	**Peak I/I Rate:**	0.476 *mgd*
PF:	3.72	**Total I/I:**	59,000 *gallons*
Peak Level:	4.64 *in*		
d/D Ratio:	0.19		

SITE 7

Weekly Level, Velocity and Flow Hydrographs

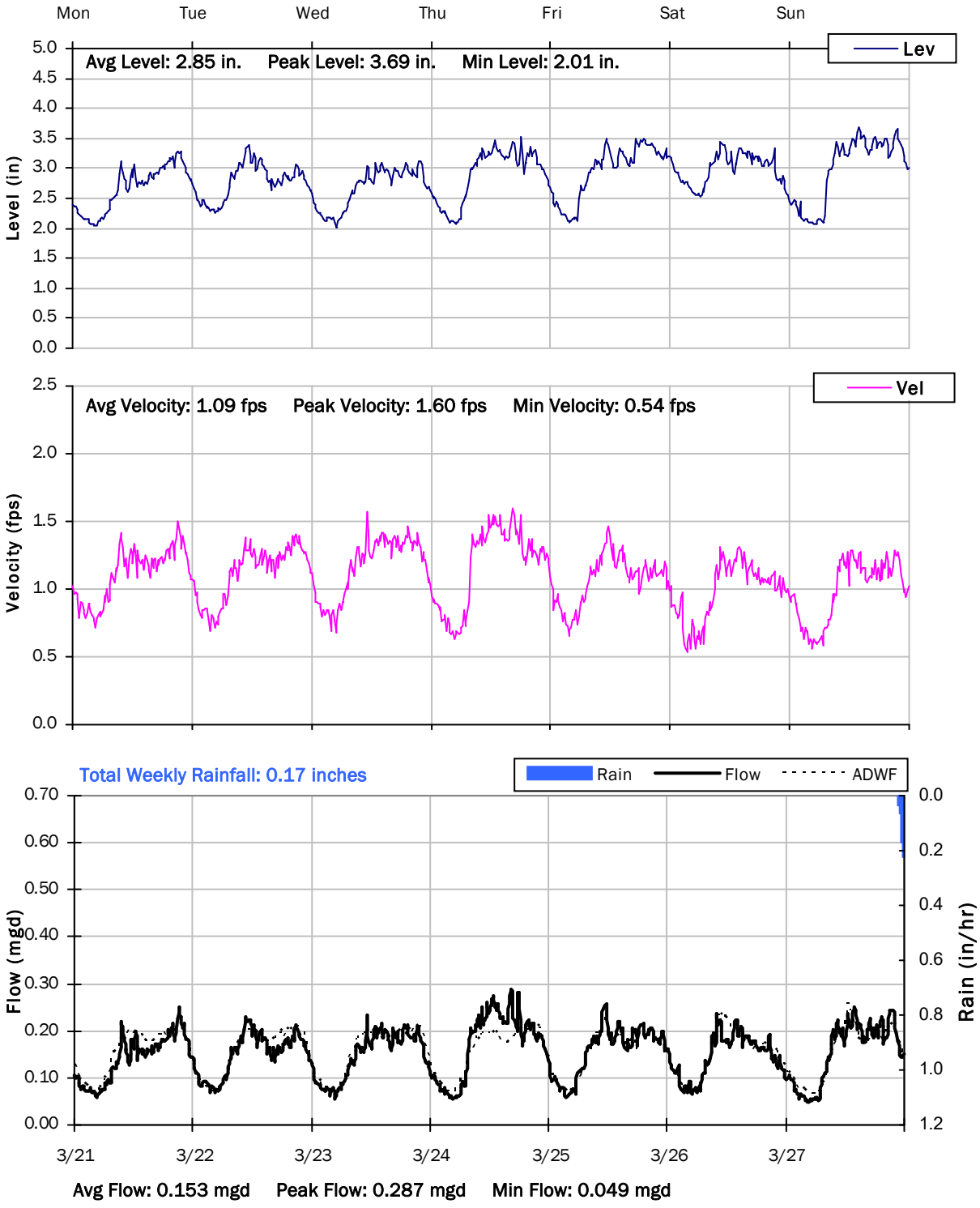
3/14/2022 to 3/21/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

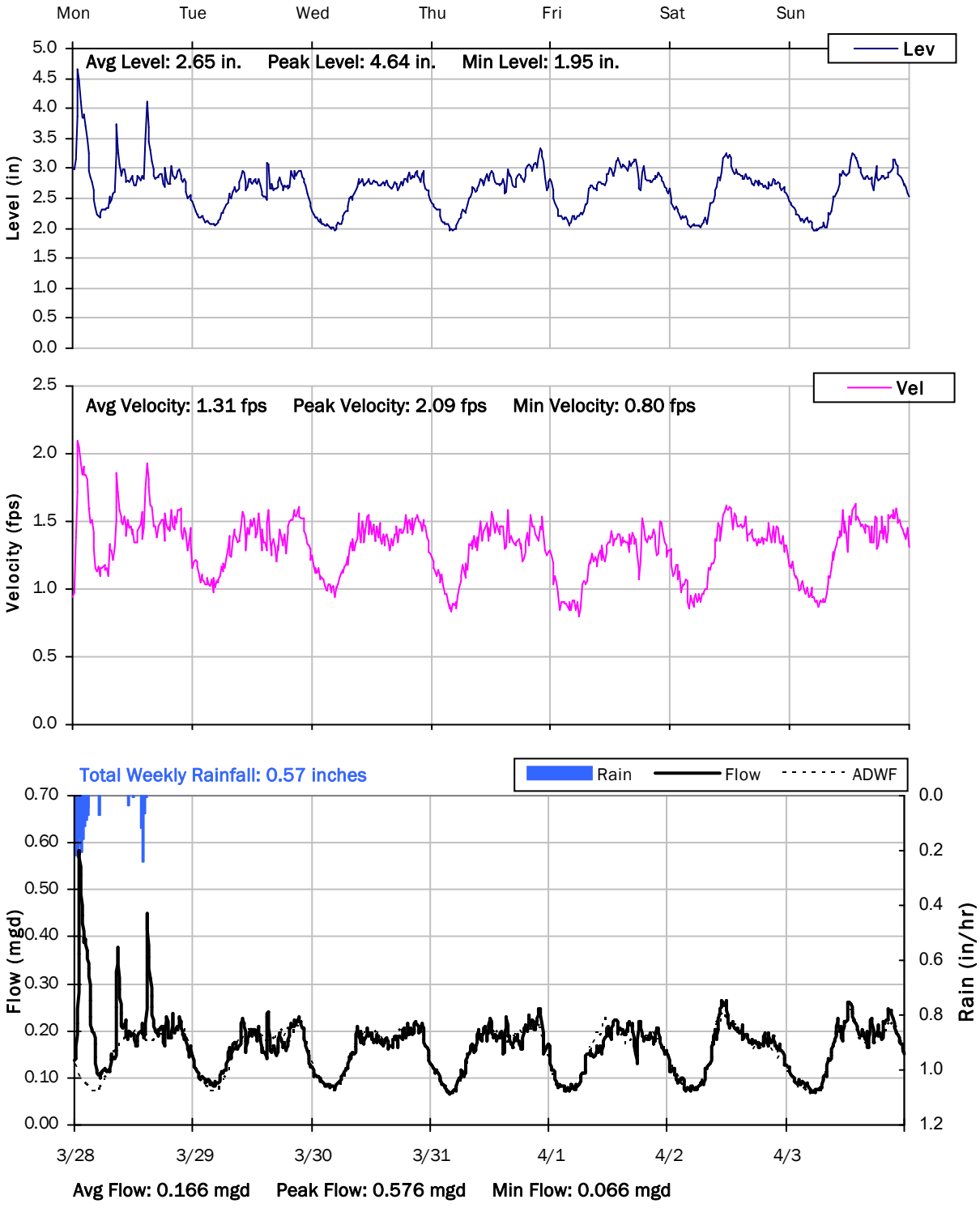
3/21/2022 to 3/28/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

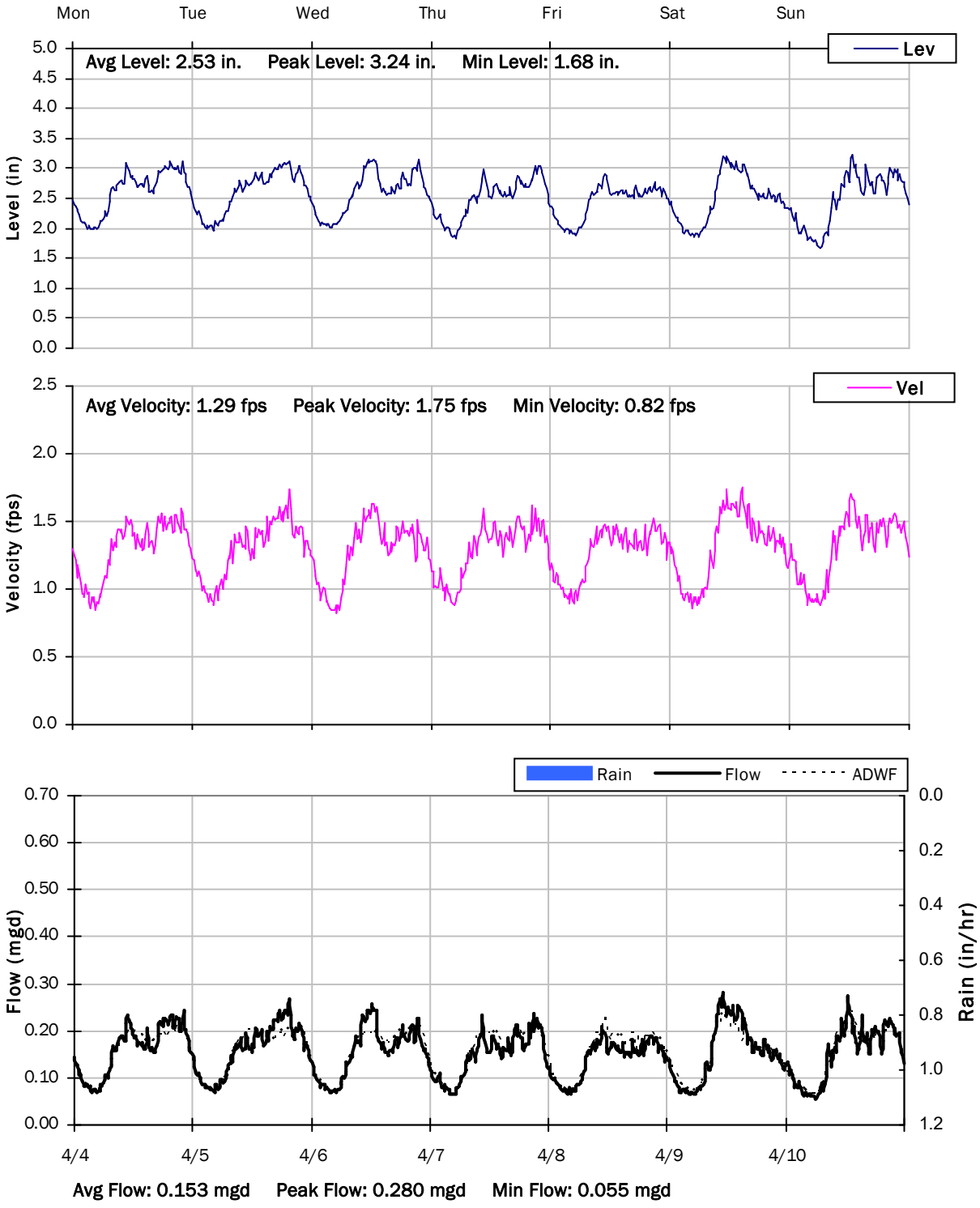
3/28/2022 to 4/4/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

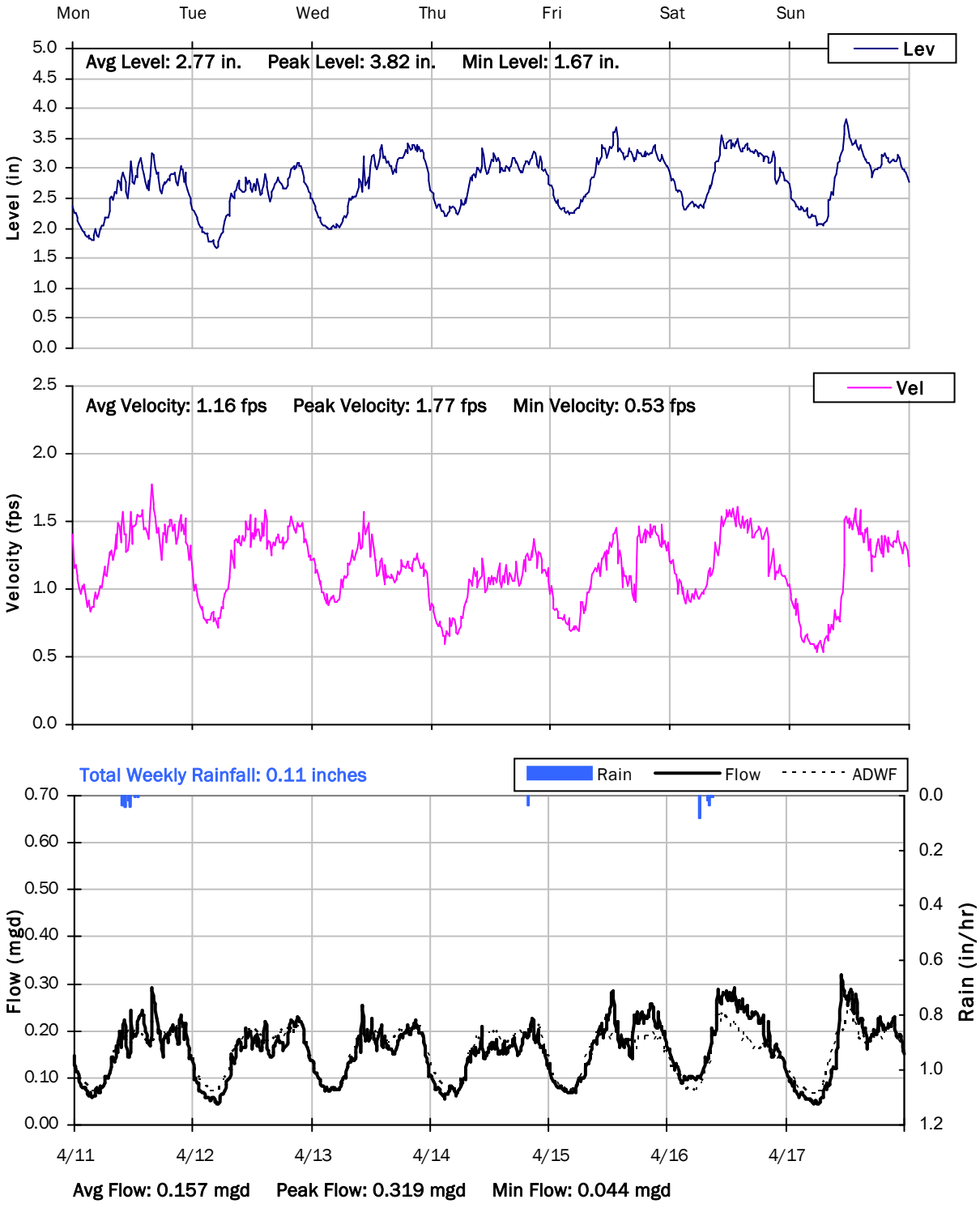
4/4/2022 to 4/11/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

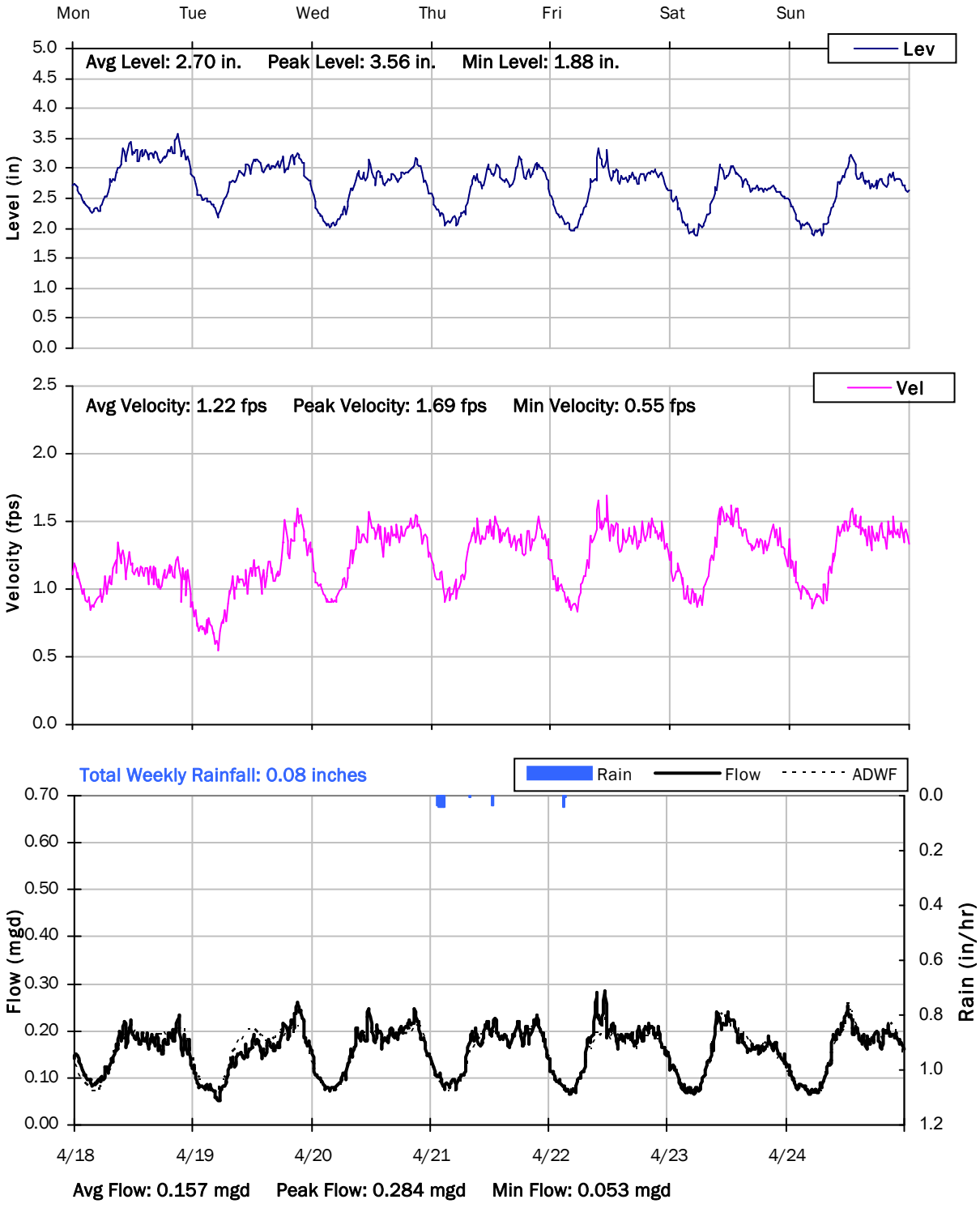
4/11/2022 to 4/18/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

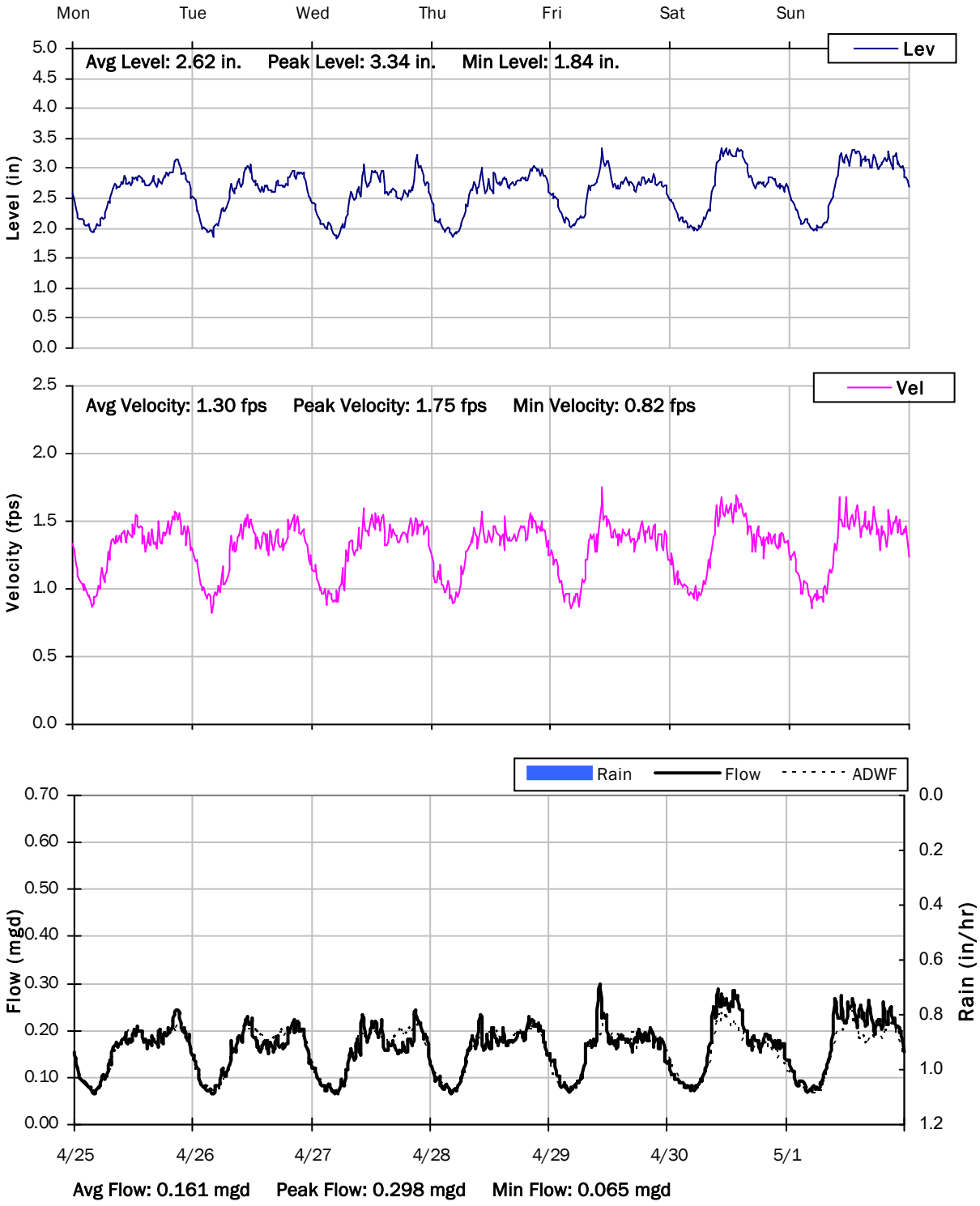
4/18/2022 to 4/25/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

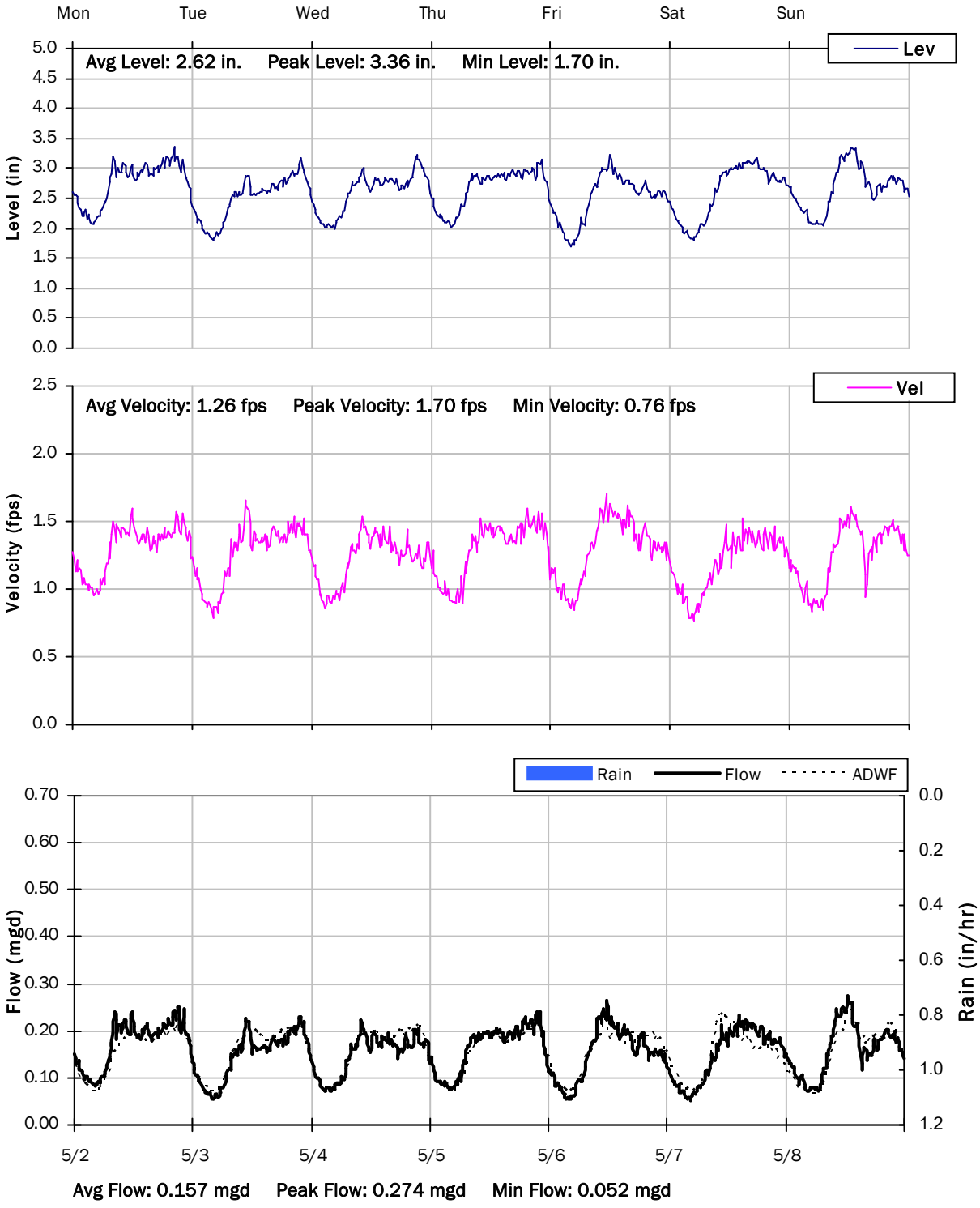
4/25/2022 to 5/2/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

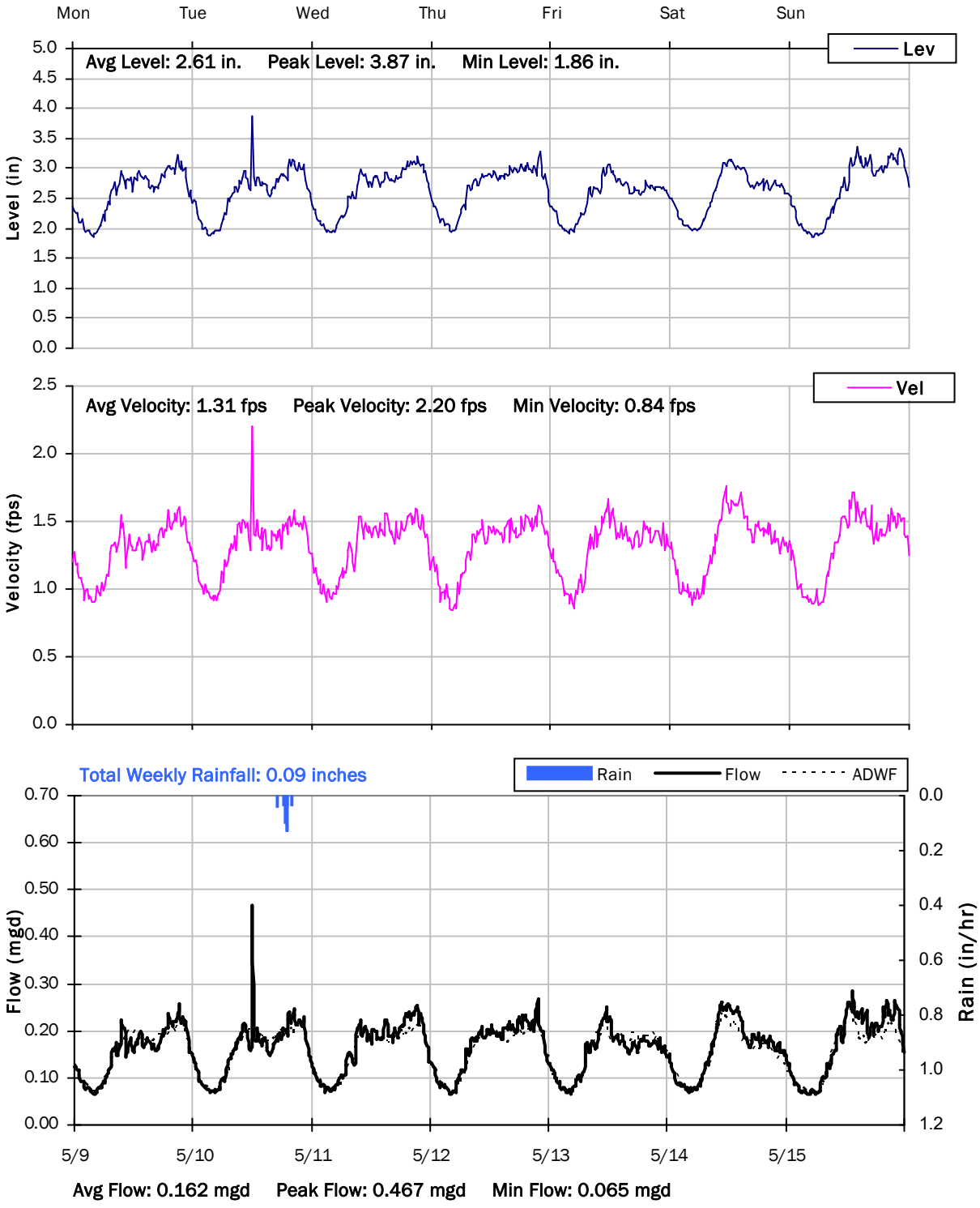
5/2/2022 to 5/9/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

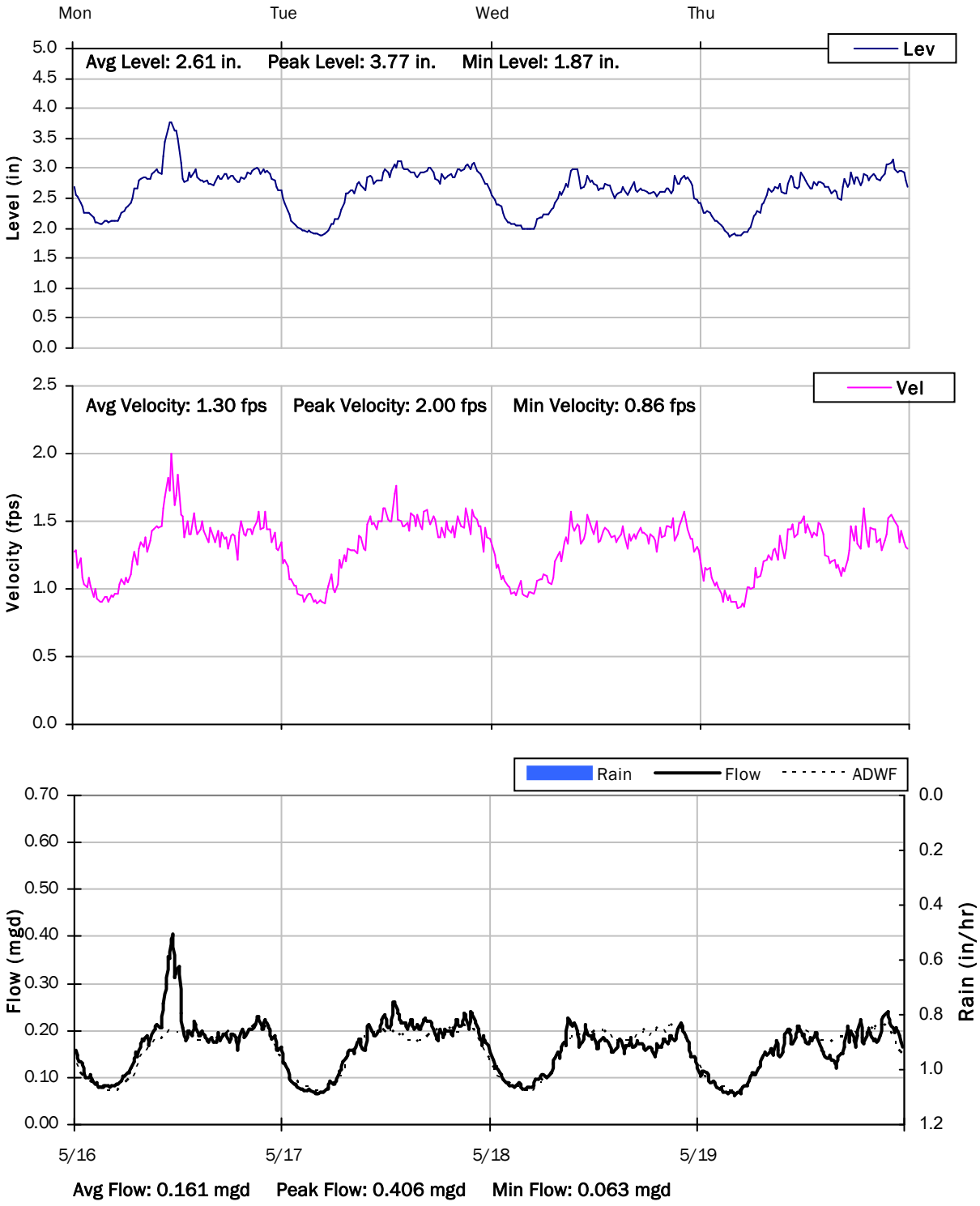
5/9/2022 to 5/16/2022



SITE 7

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 8

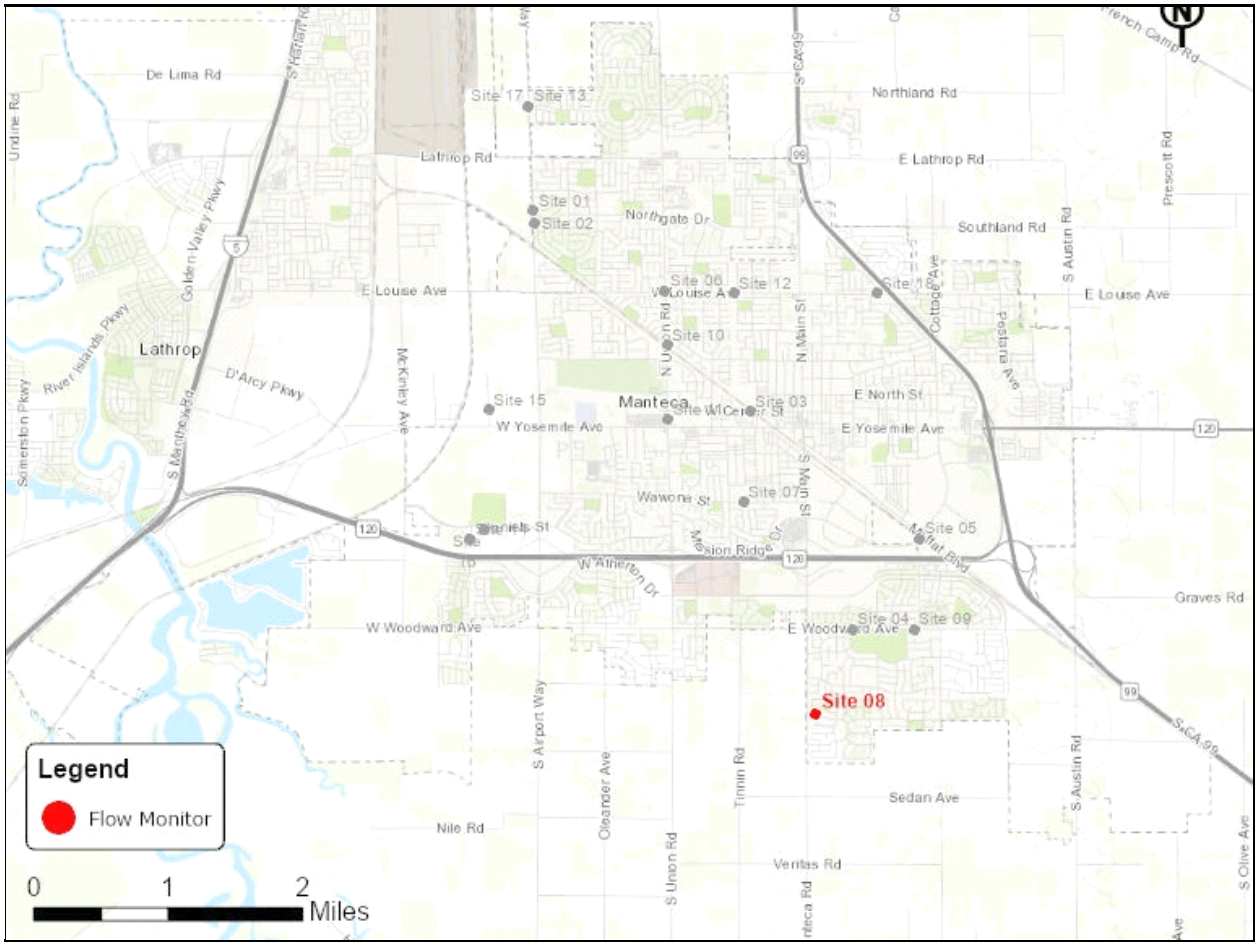
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Lion Drive at Columbus Drive

Data Summary Report



Vicinity Map: Site 8

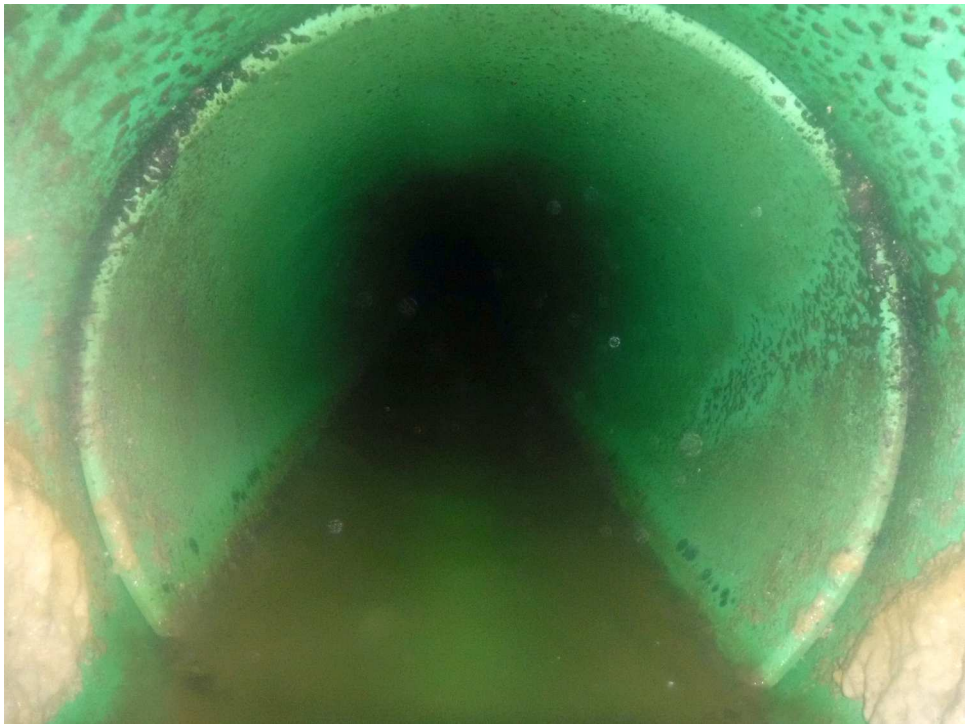
SITE 8

Additional Site Photos

Effluent Pipe



Monitored East Influent Pipe



SITE 8

Additional Site Photos

Infiltration

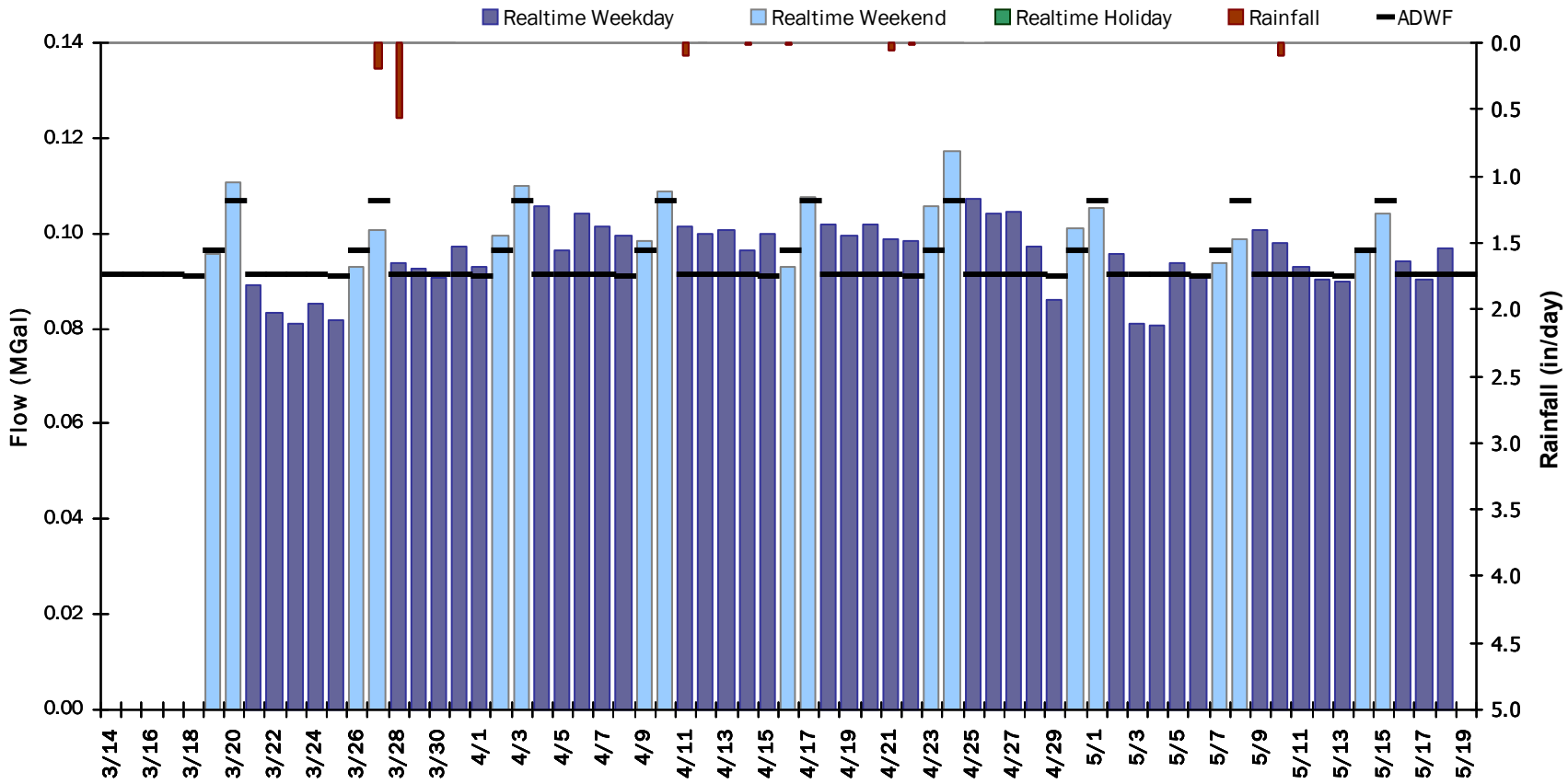


SITE 8

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.097 MGal Peak Daily Flow: 0.117 MGal Min Daily Flow: 0.081 MGal

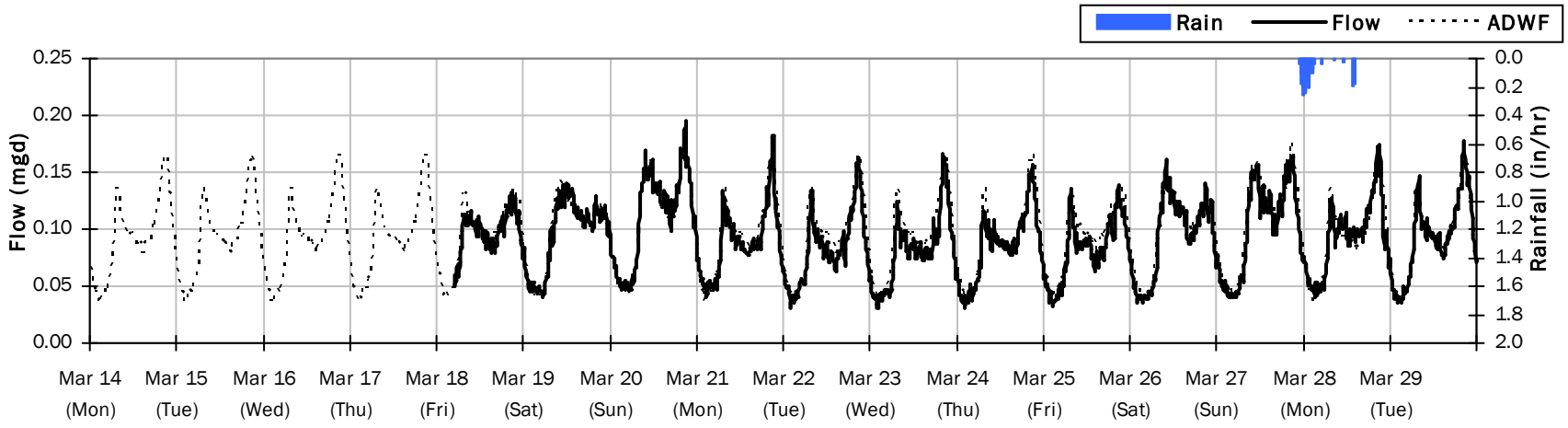
Total Rainfall: 1.06 inches

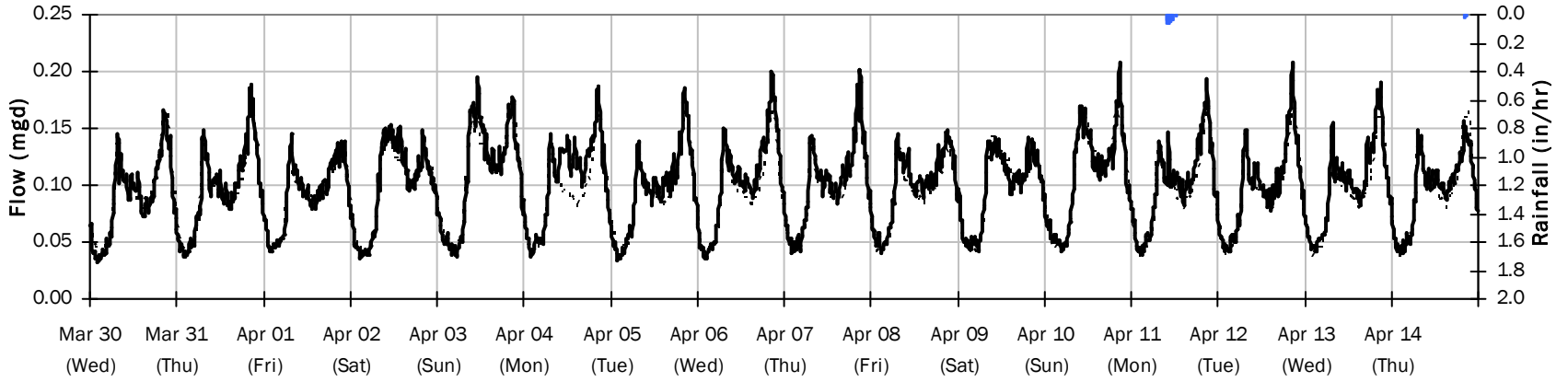


SITE 8

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.87 inches Period Avg Flow: 0.097 mgd Period Peak Flow: 0.209 mgd Period Min Flow: 0.030 mgd

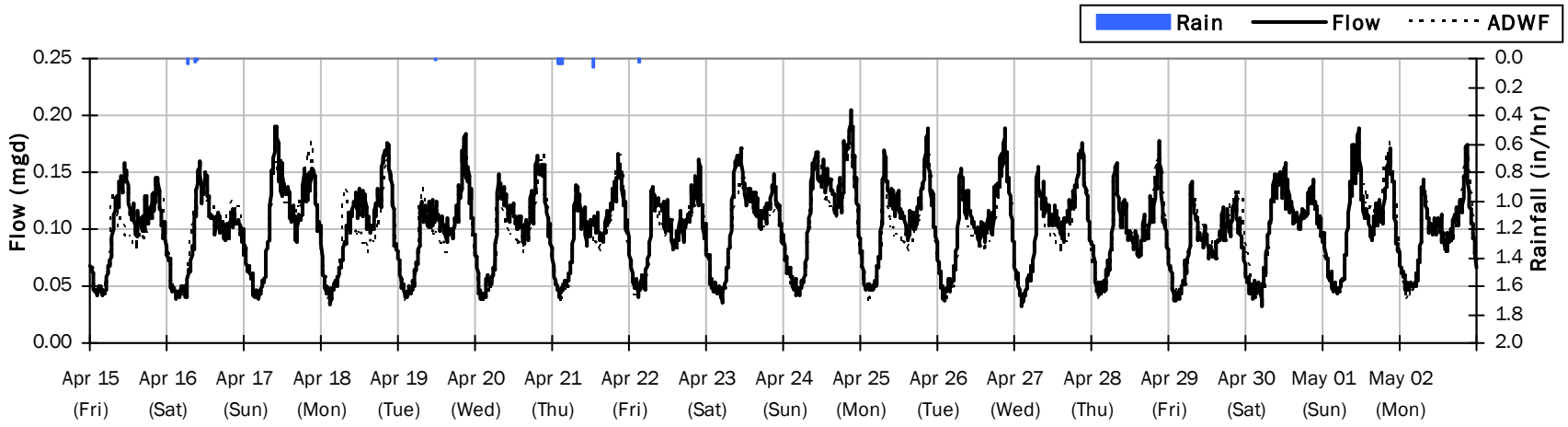


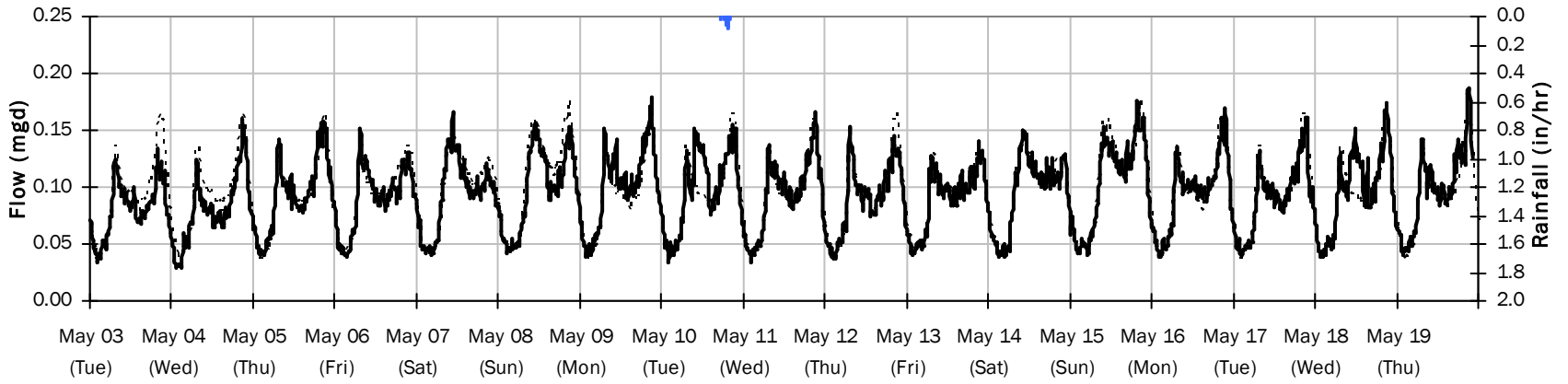


SITE 8

Flow Summary: 4/15/2022 to 5/19/2022

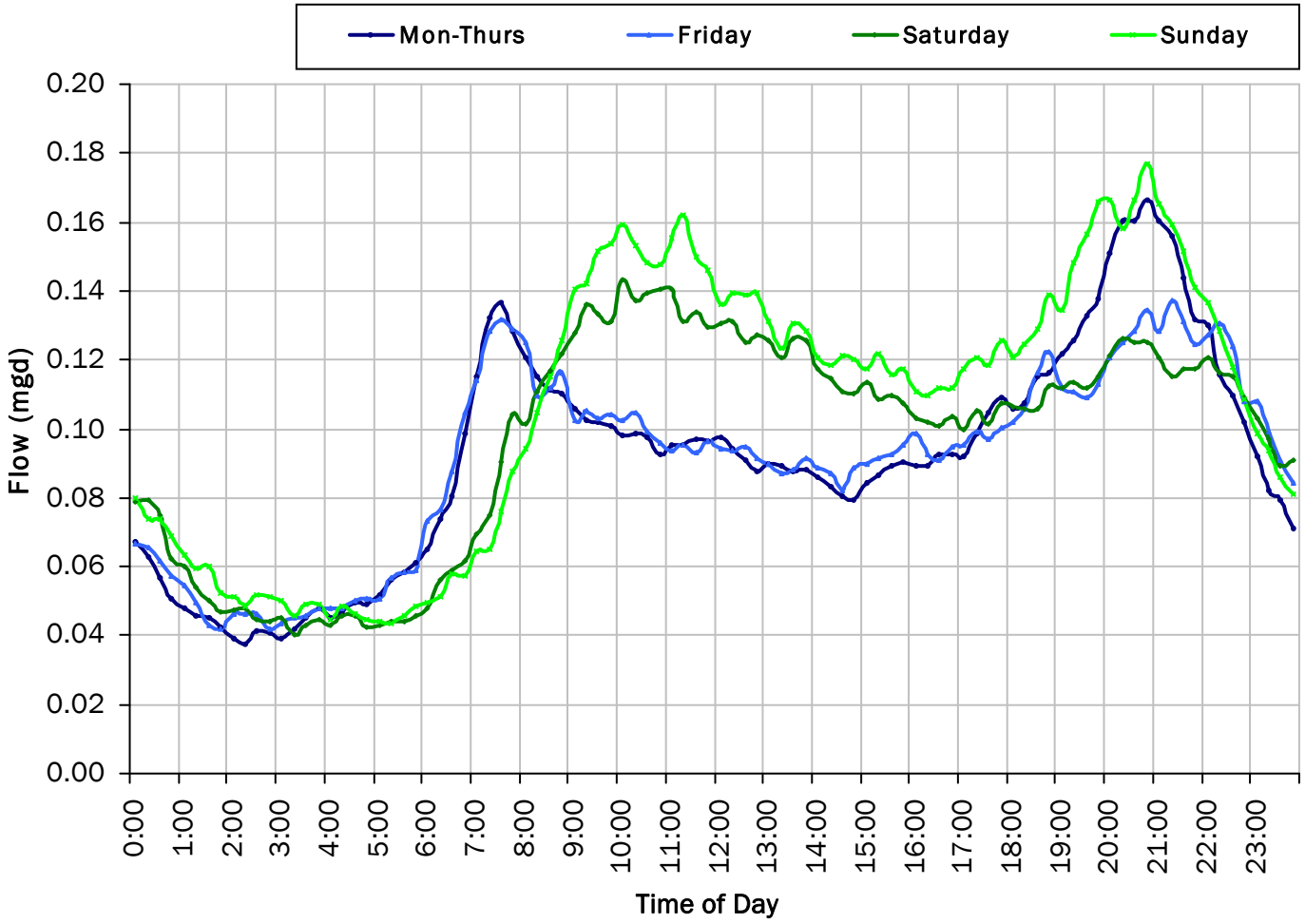
Period Rainfall: 0.19 inches Period Avg Flow: 0.098 mgd Period Peak Flow: 0.204 mgd Period Min Flow: 0.029 mgd





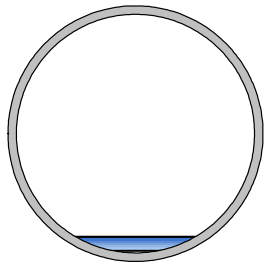
SITE 8

Average Dry Weather Flow Hydrographs



ADWF:

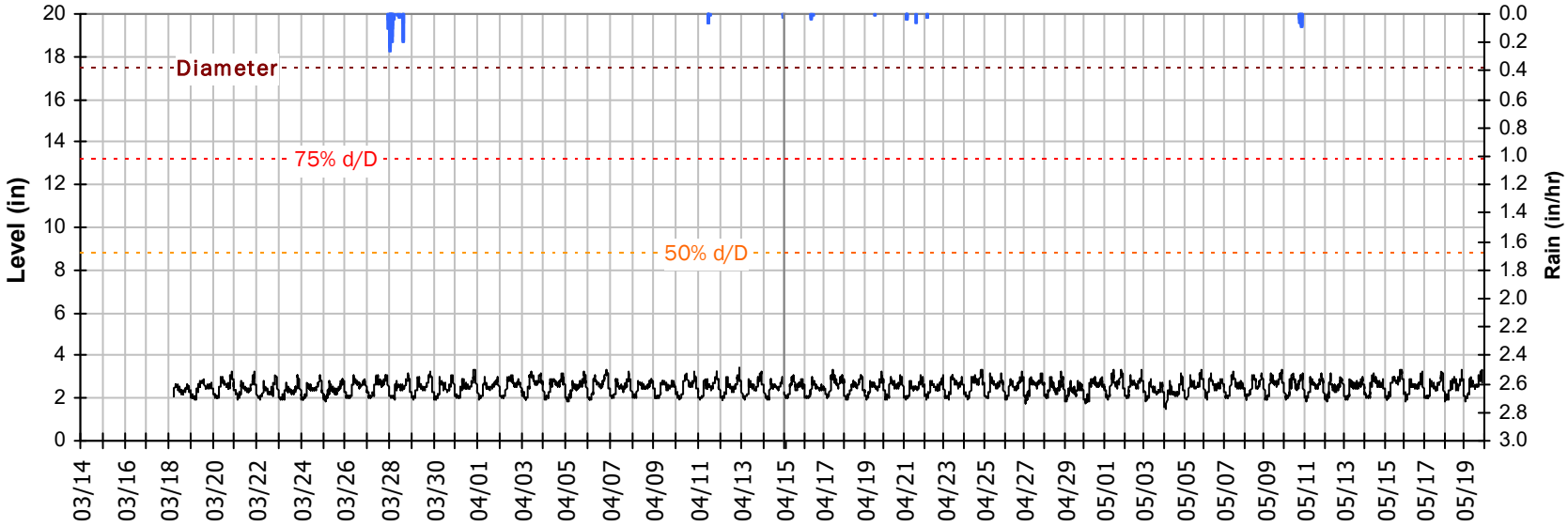
0.094 *mgd*

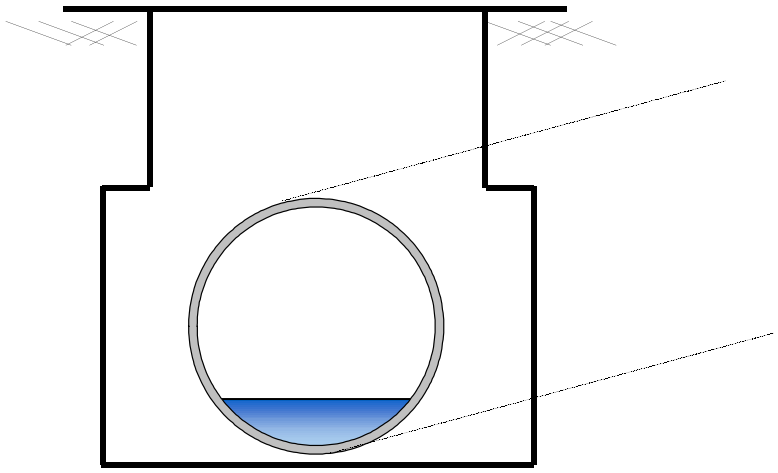


SITE 8

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

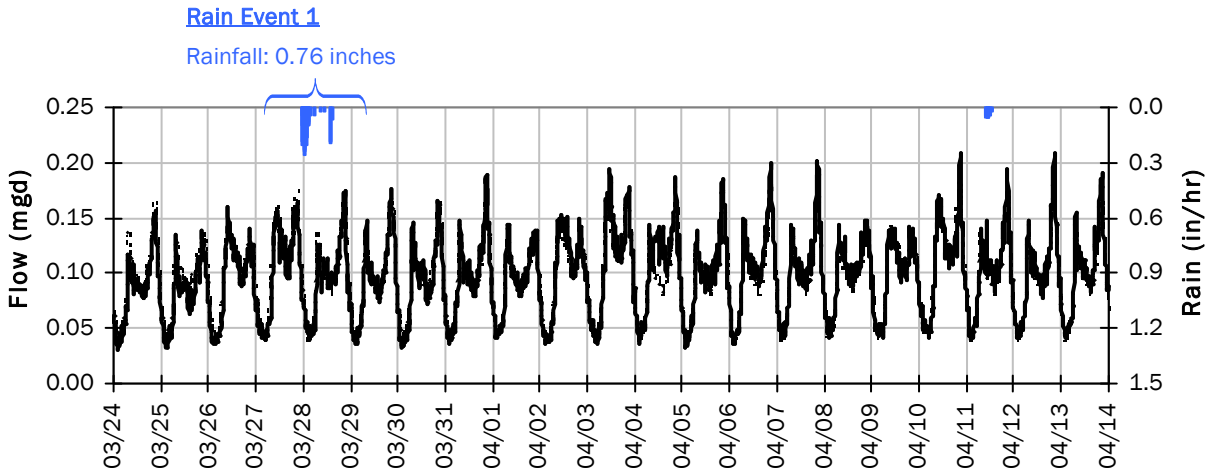




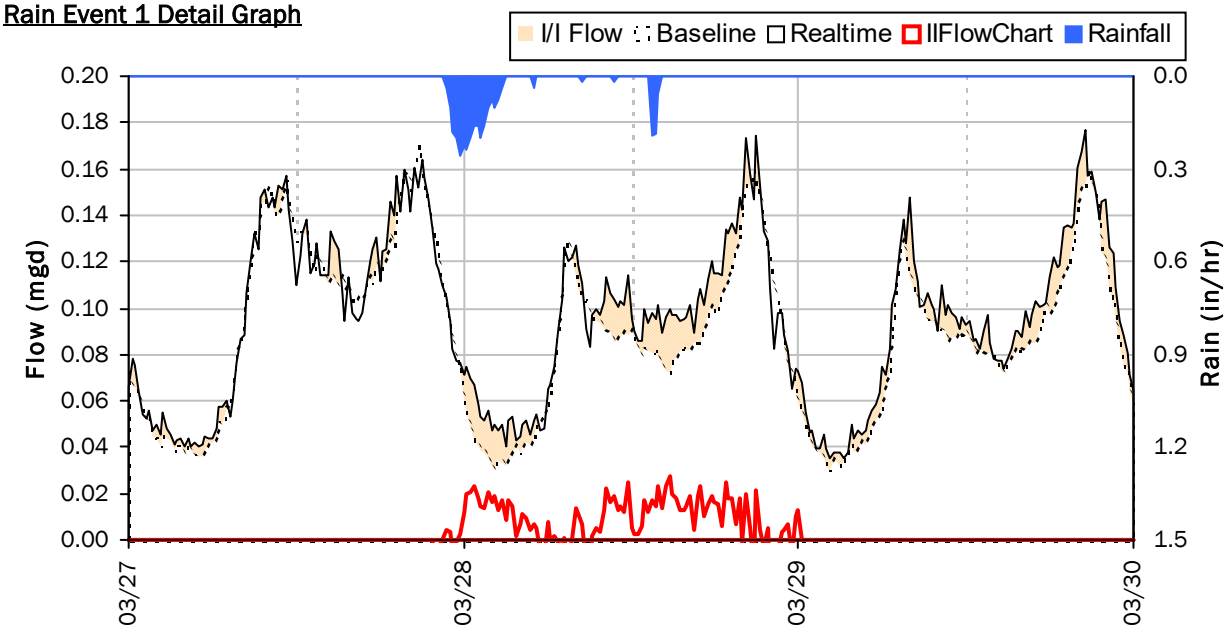
Pipe Diameter:	17.5	*inches*
Peak Measured Level:	3.40	*inches*
Peak d/D Ratio:	0.19	

SITE 8
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



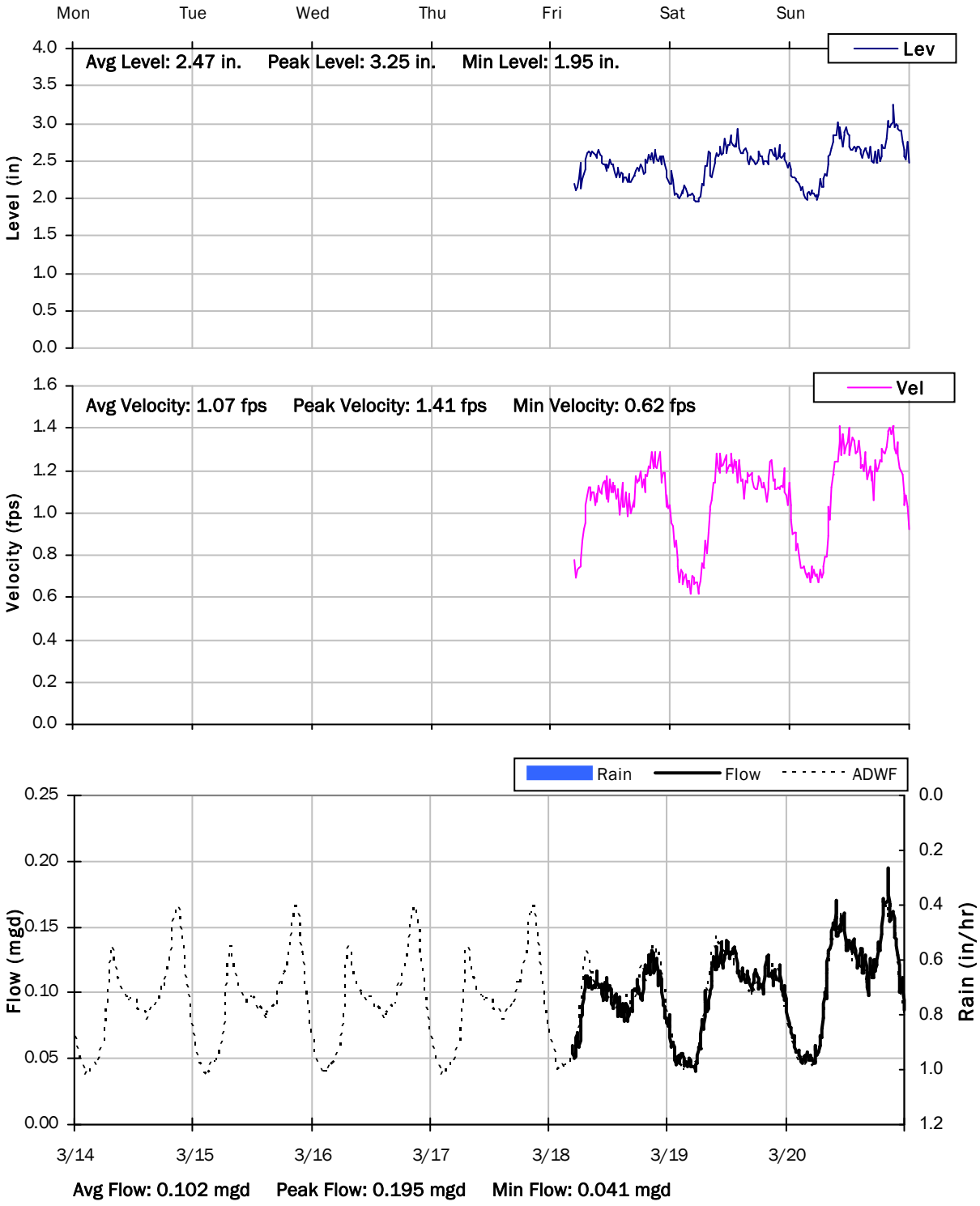
Storm Event I/I Analysis (Rain = 0.76 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.174 *mgd*	**Peak I/I Rate:**	0.028 *mgd*
PF:	1.85	**Total I/I:**	10,000 *gallons*
Peak Level:	3.18 *in*		
d/D Ratio:	0.18		

SITE 8

Weekly Level, Velocity and Flow Hydrographs

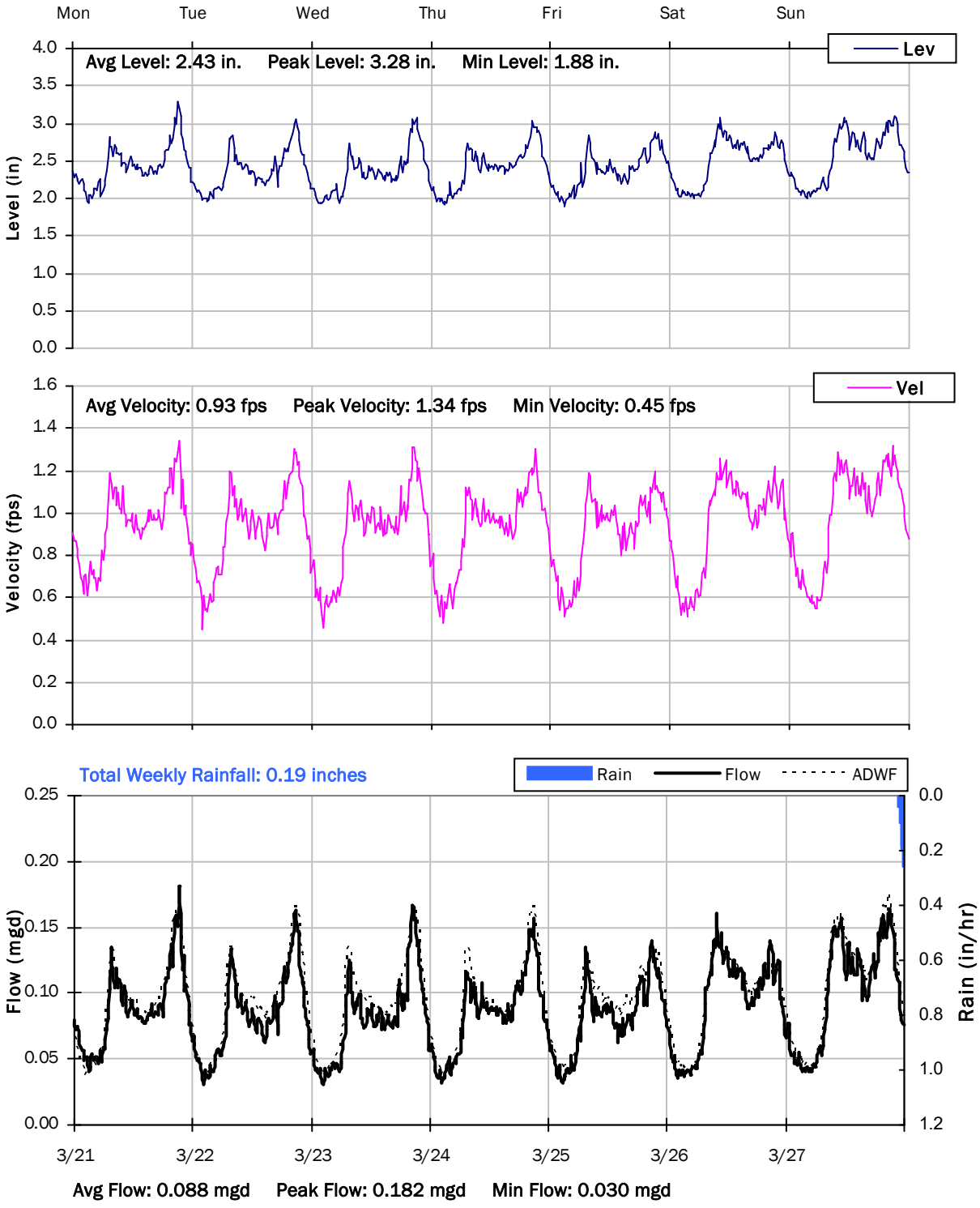
3/14/2022 to 3/21/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

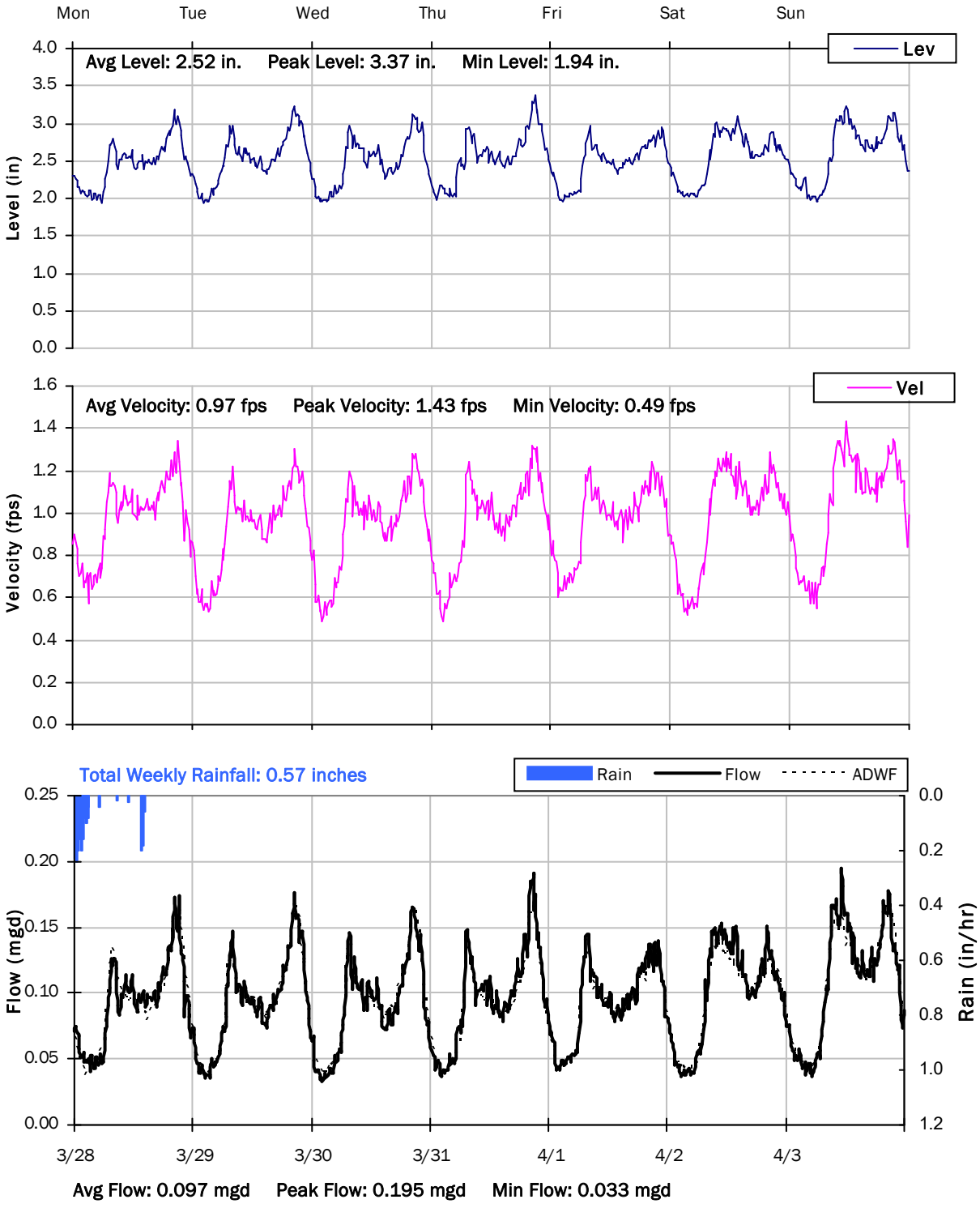
3/21/2022 to 3/28/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

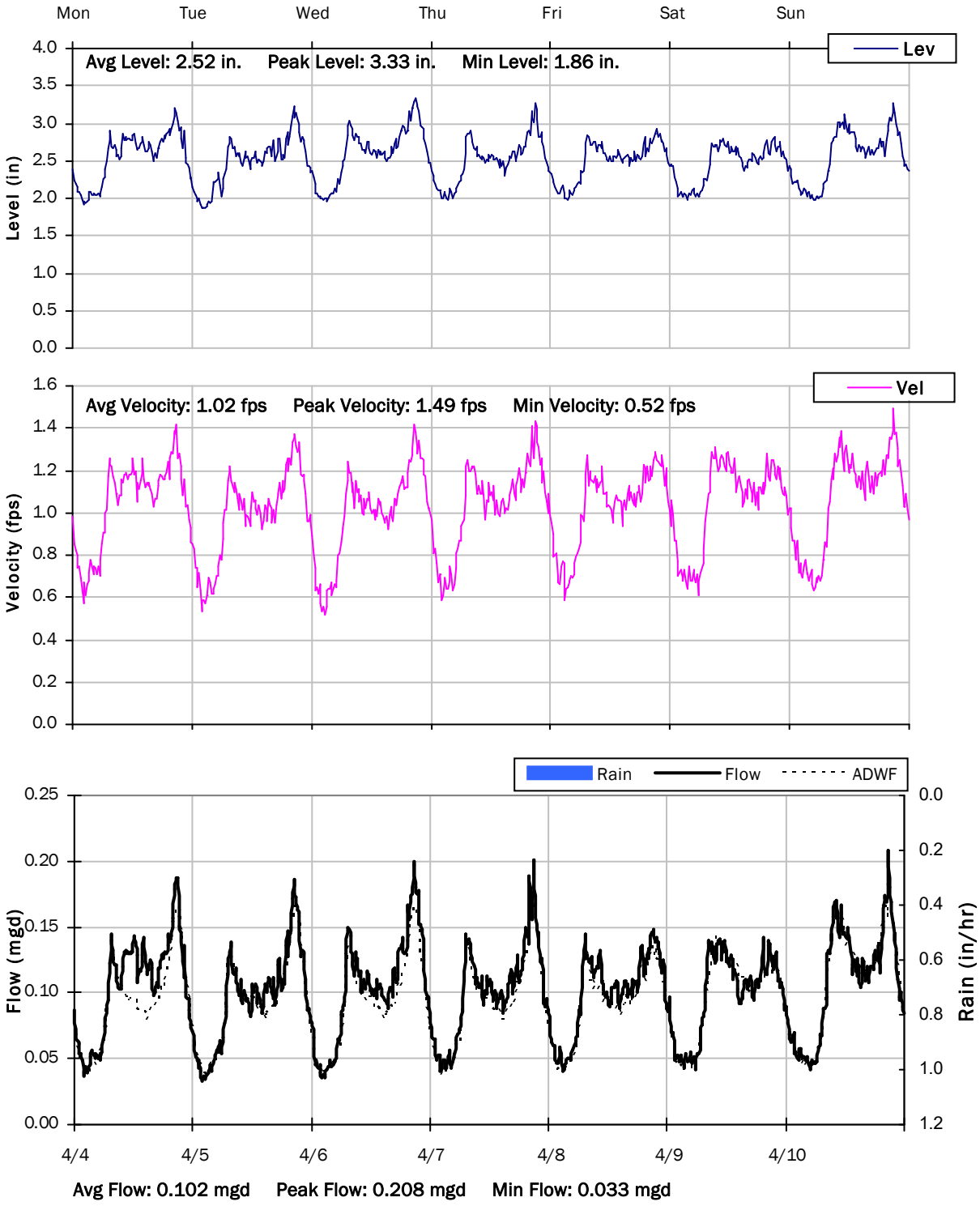
3/28/2022 to 4/4/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

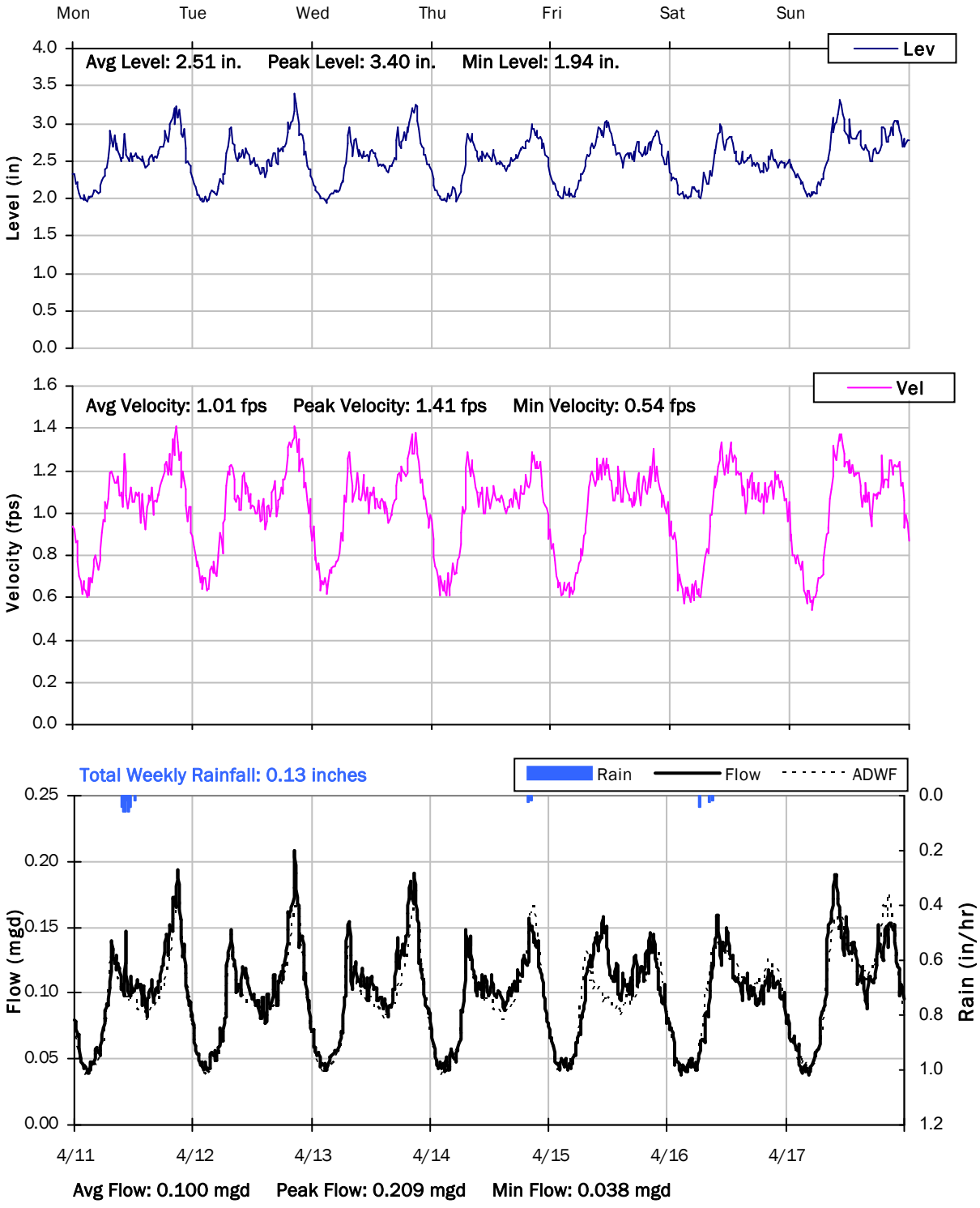
4/4/2022 to 4/11/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

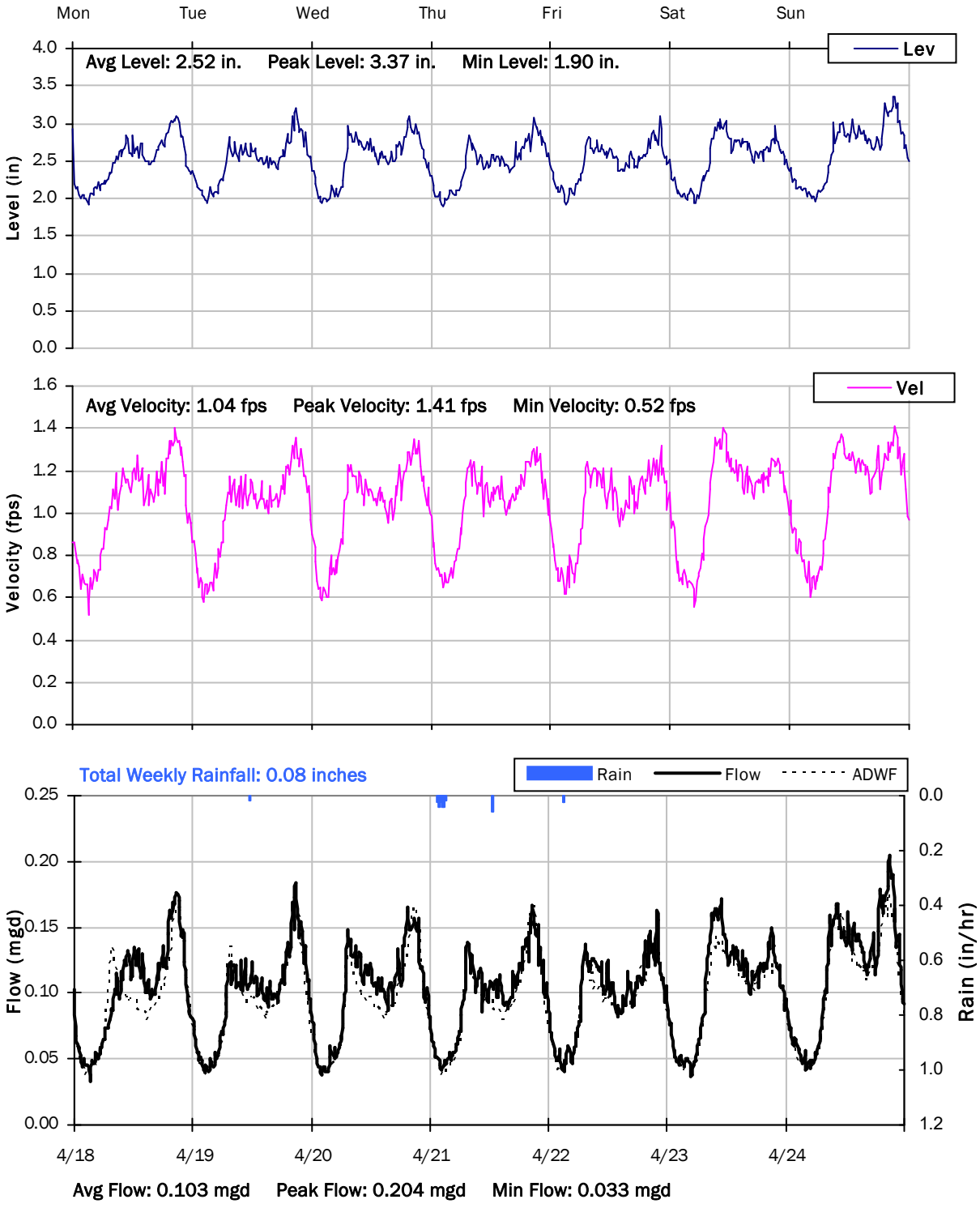
4/11/2022 to 4/18/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

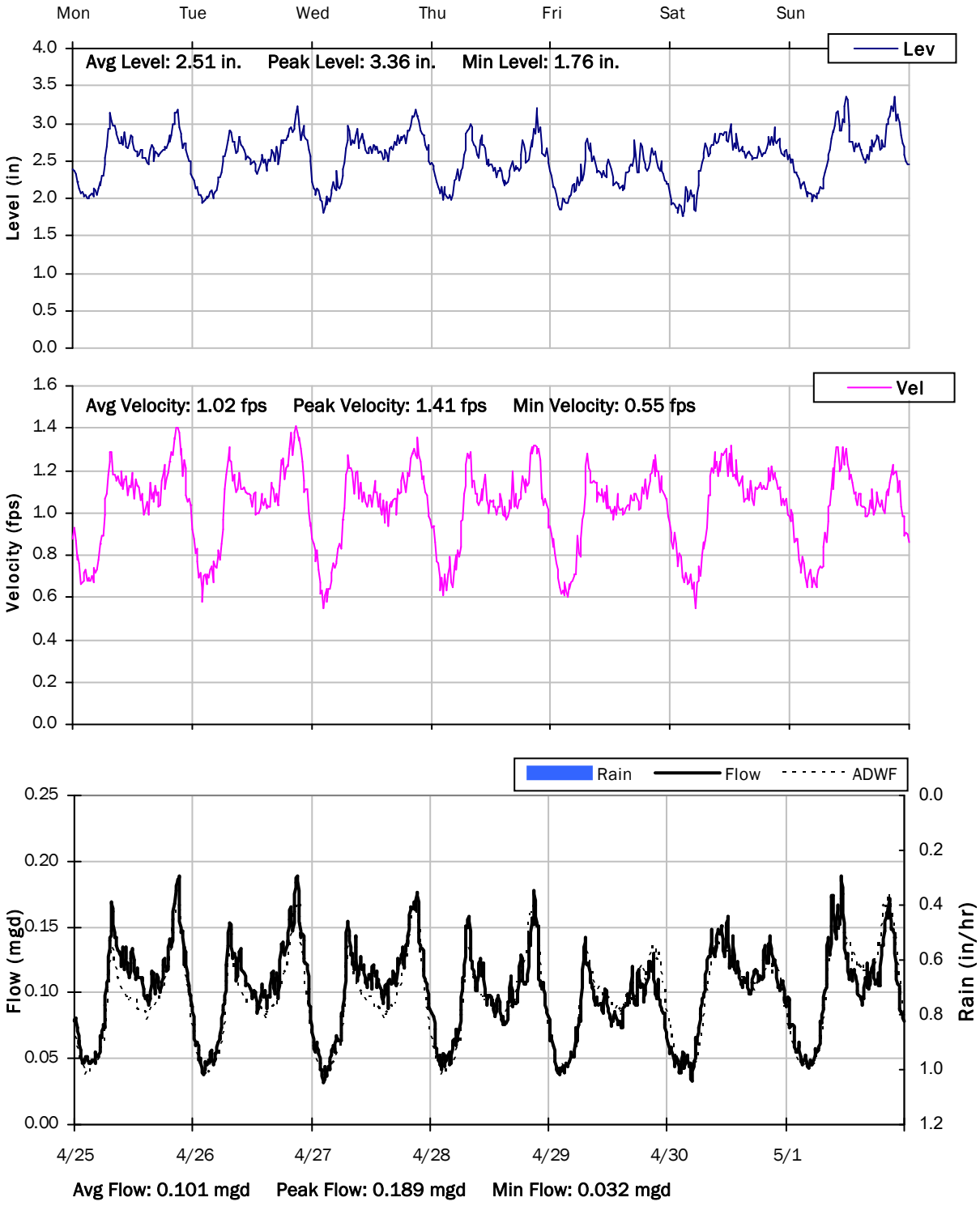
4/18/2022 to 4/25/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

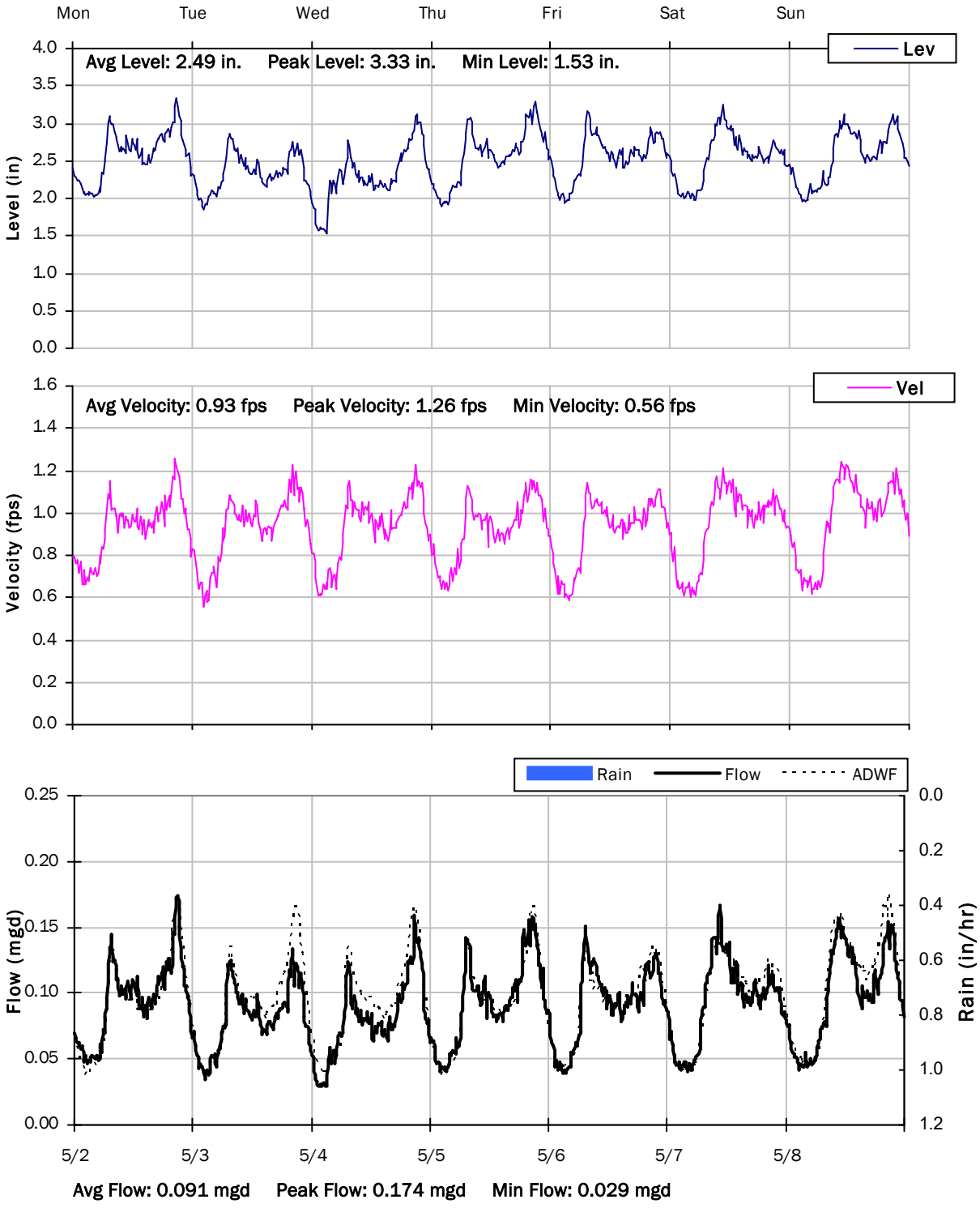
4/25/2022 to 5/2/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

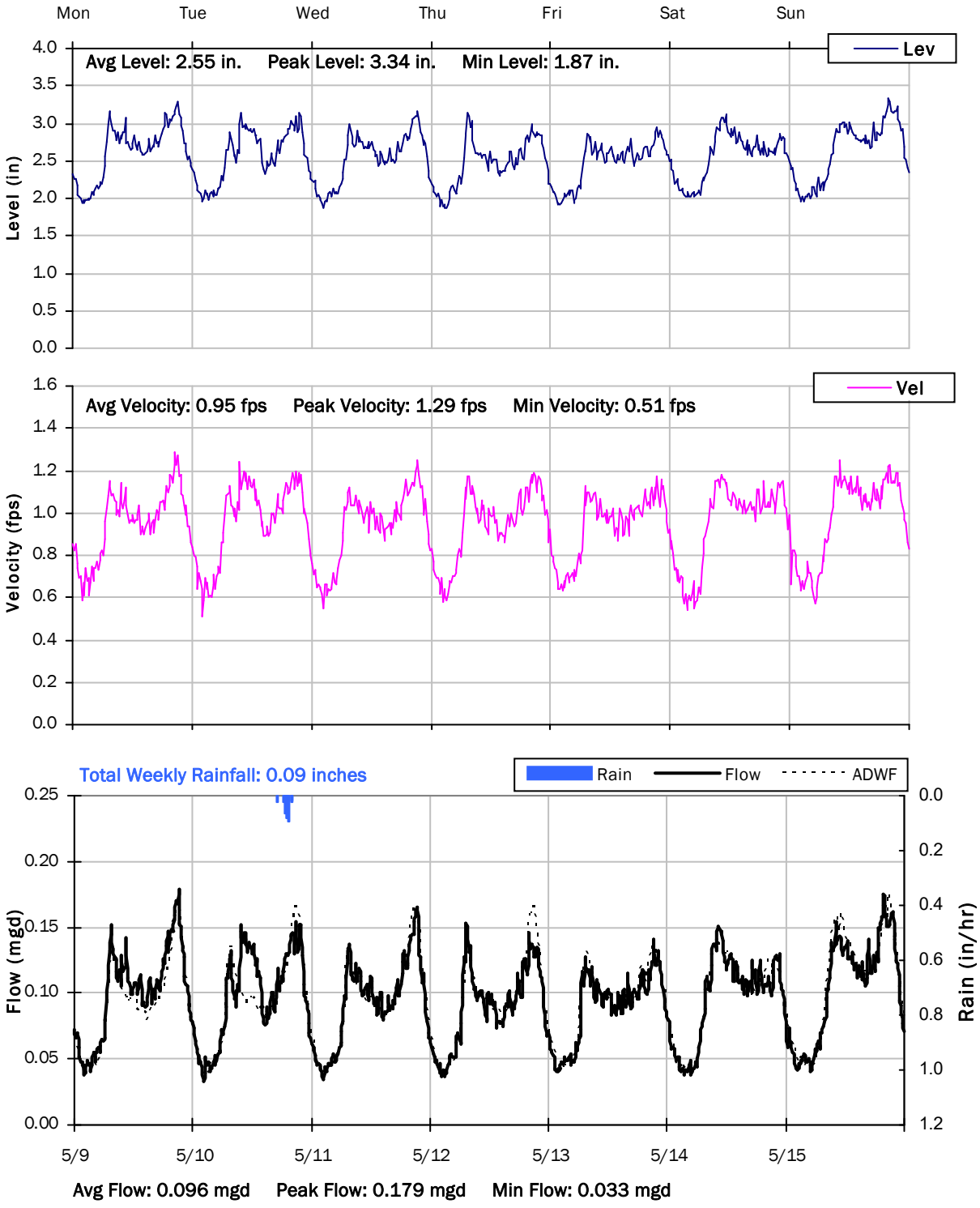
5/2/2022 to 5/9/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

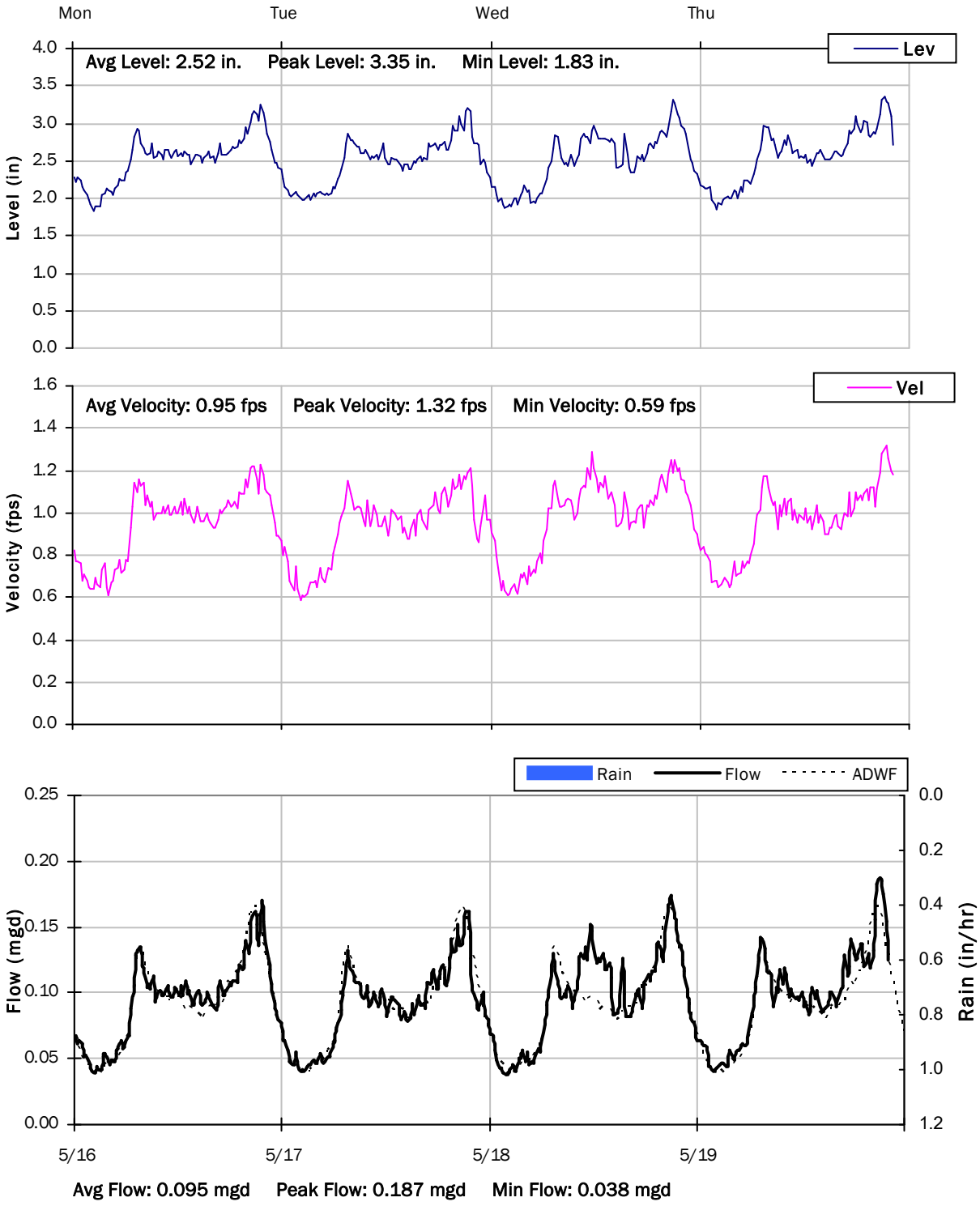
5/9/2022 to 5/16/2022



SITE 8

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 9

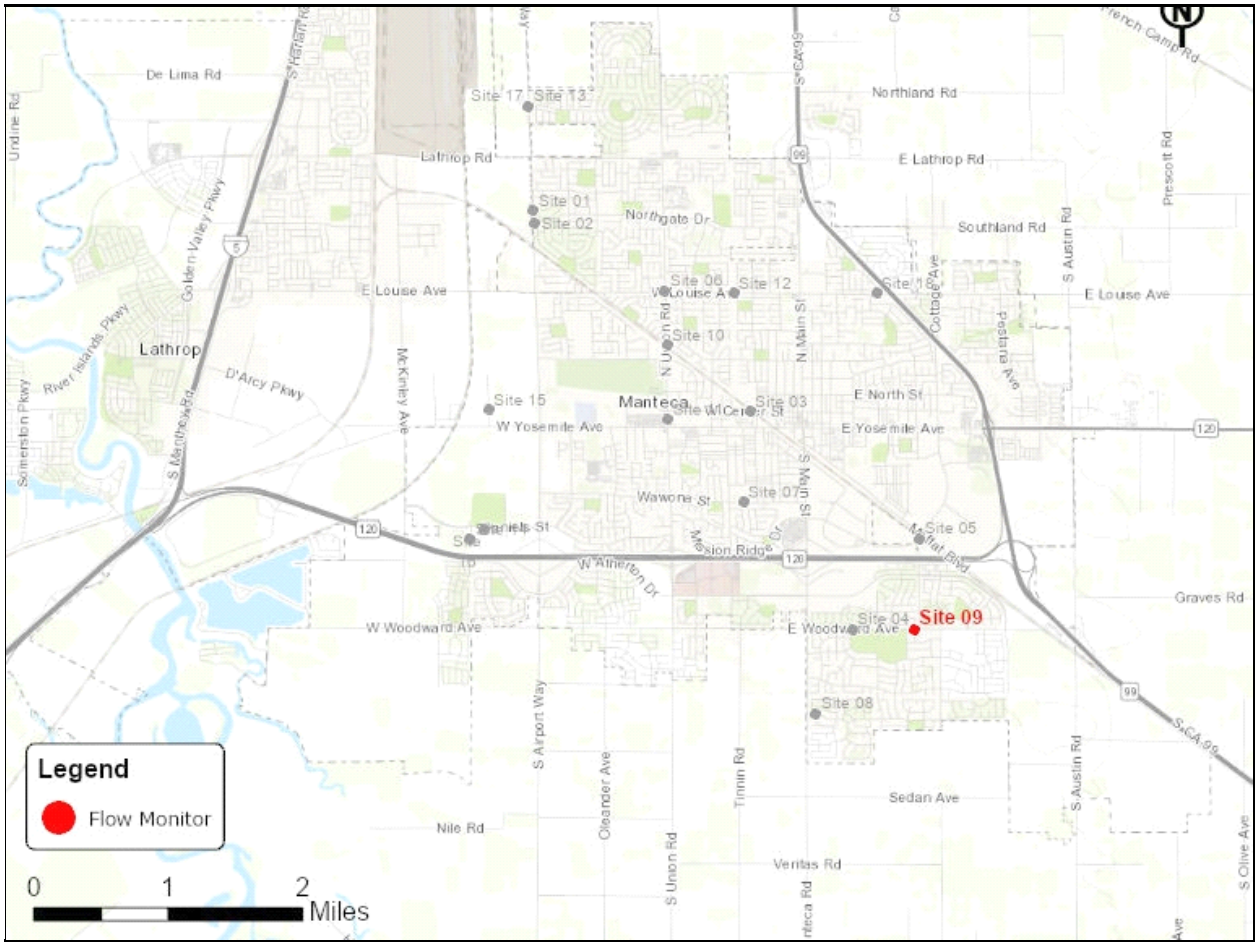
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Woodward Avenue East of Bridewell Avenue

Data Summary Report



Vicinity Map: Site 9

SITE 9

Additional Site Photos

Effluent Pipe



Monitored East Influent Pipe

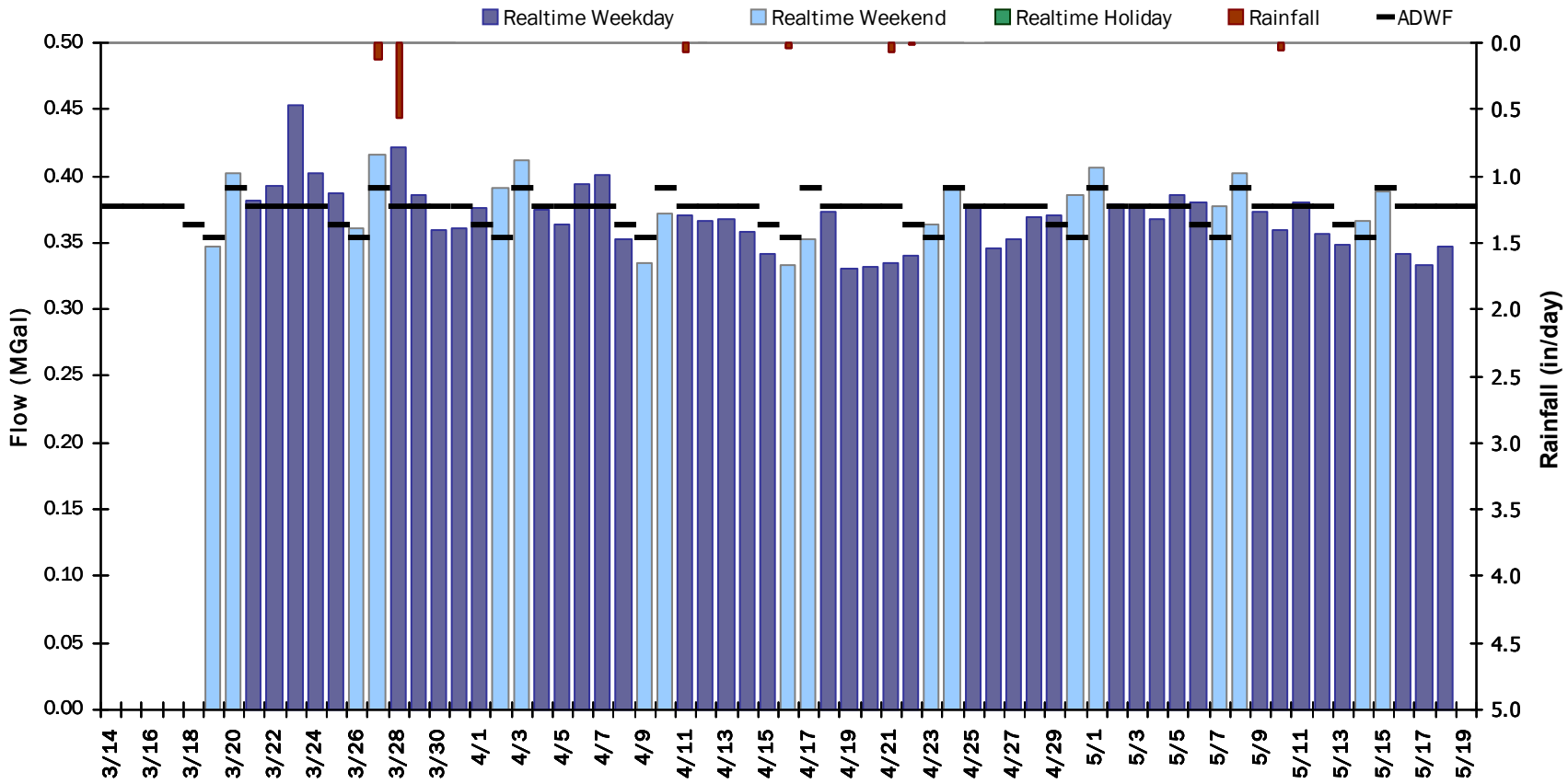


SITE 9

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.371 MGal Peak Daily Flow: 0.453 MGal Min Daily Flow: 0.330 MGal

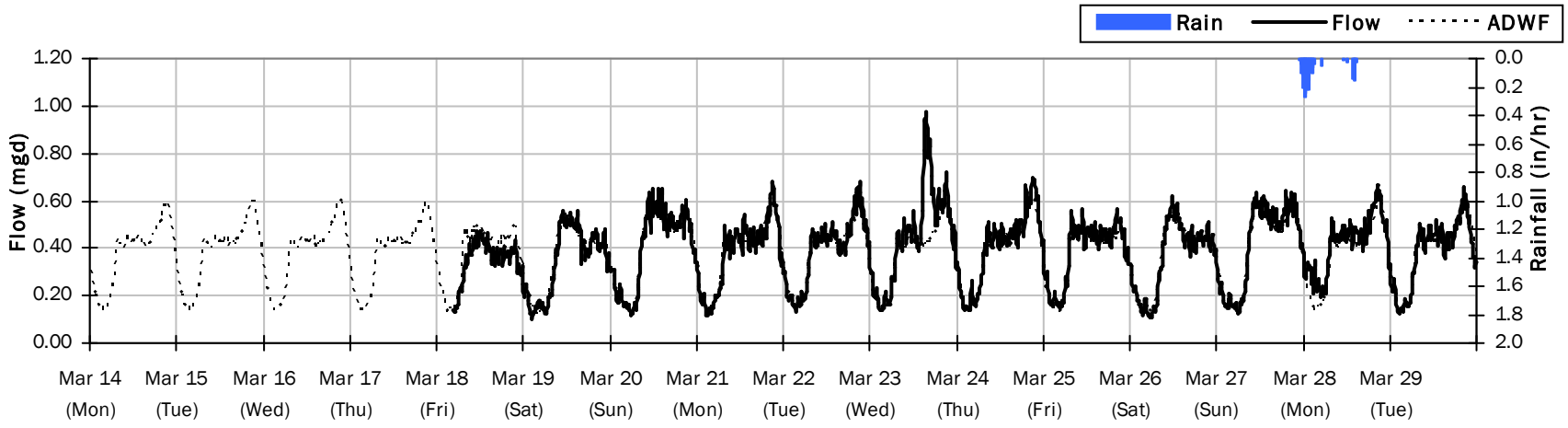
Total Rainfall: 0.94 inches

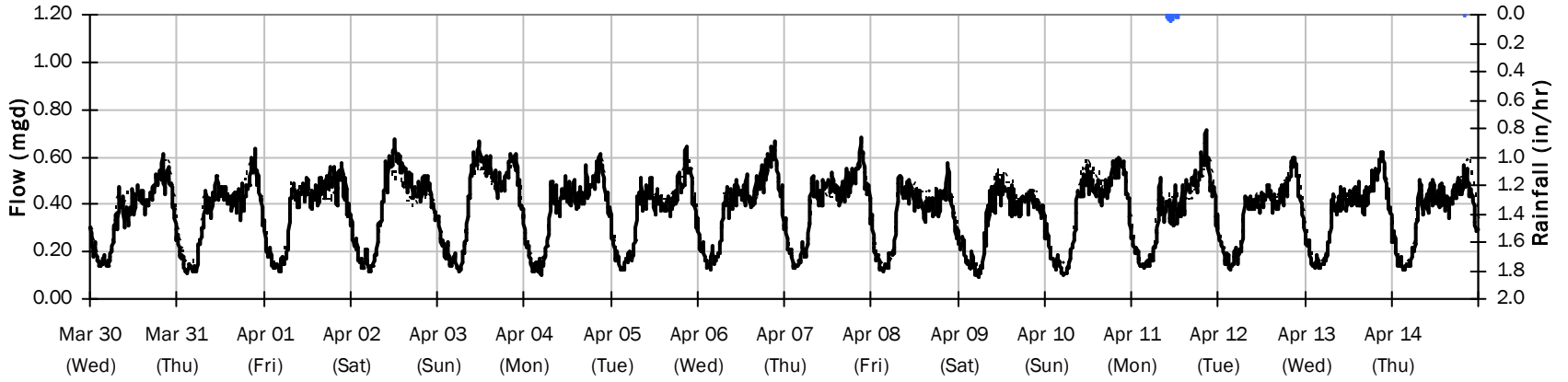


SITE 9

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.76 inches Period Avg Flow: 0.381 mgd Period Peak Flow: 0.974 mgd Period Min Flow: 0.089 mgd

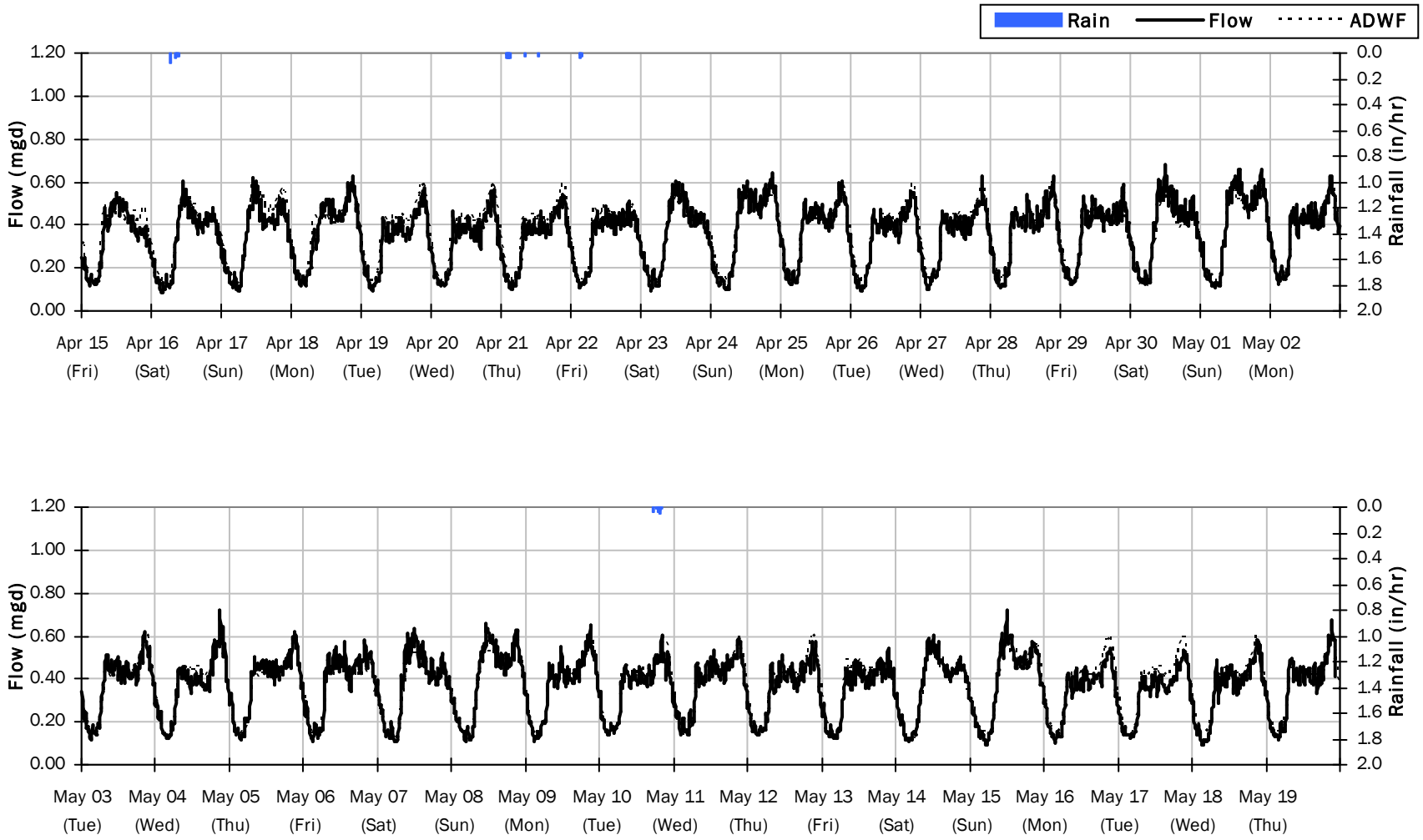




SITE 9

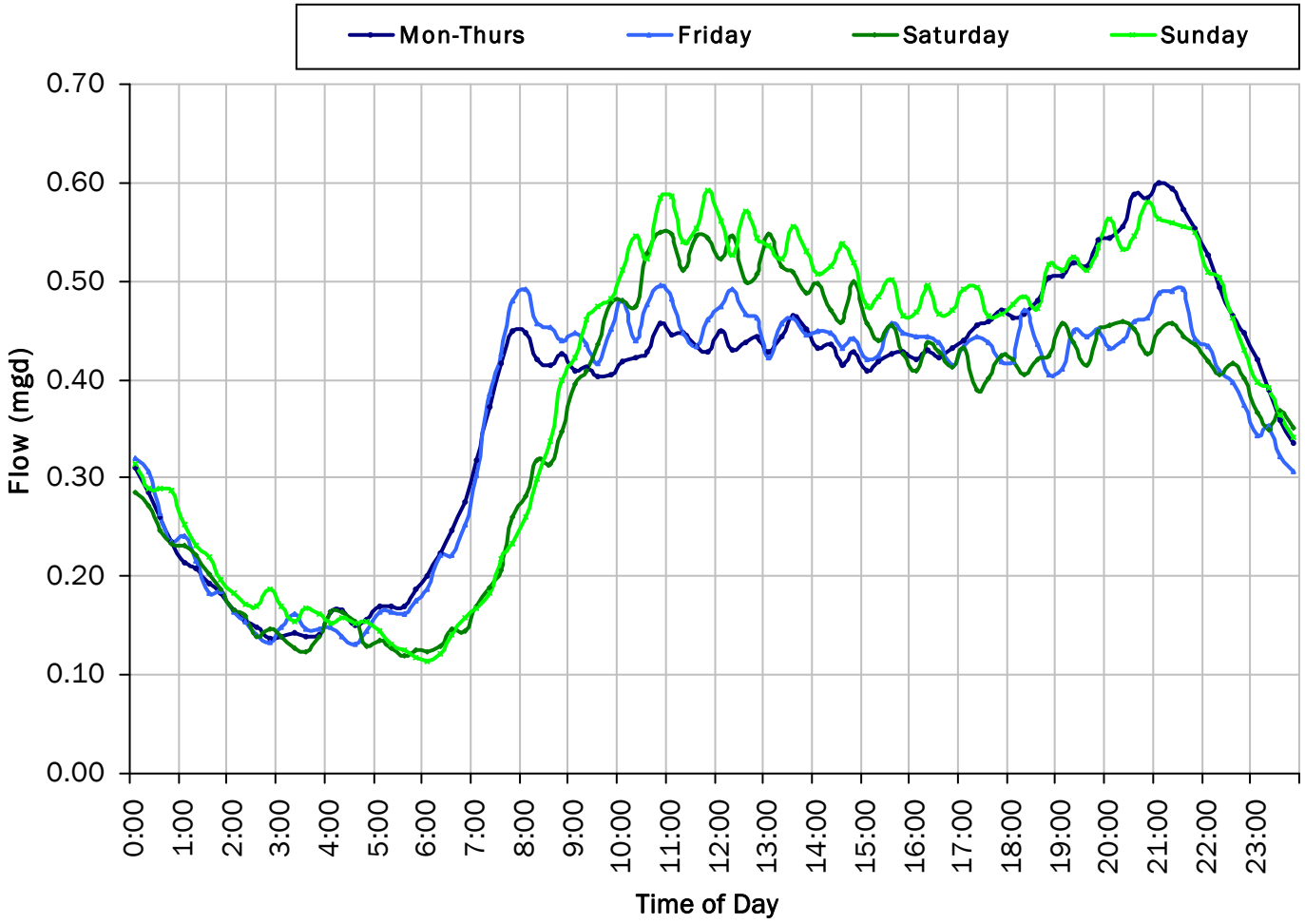
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.18 inches Period Avg Flow: 0.364 mgd Period Peak Flow: 0.717 mgd Period Min Flow: 0.083 mgd



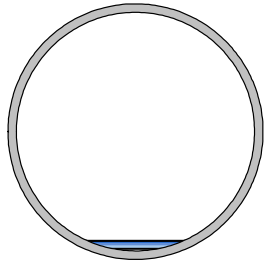
SITE 9

Average Dry Weather Flow Hydrographs



ADWF:

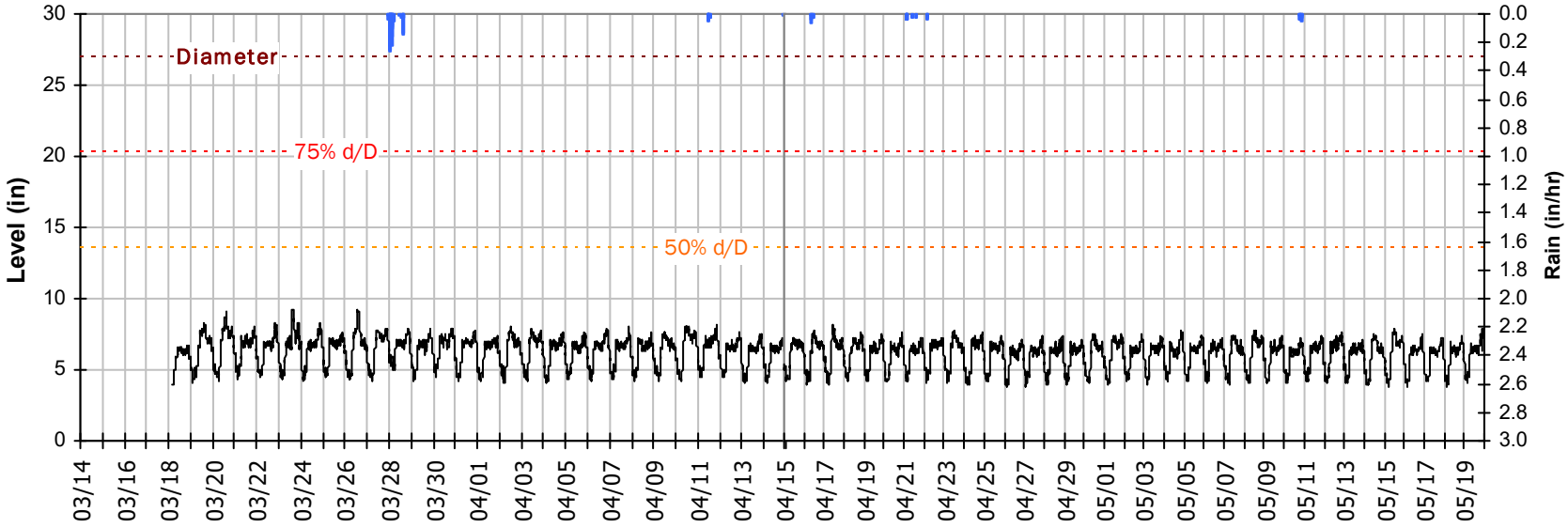
0.374 *mgd*

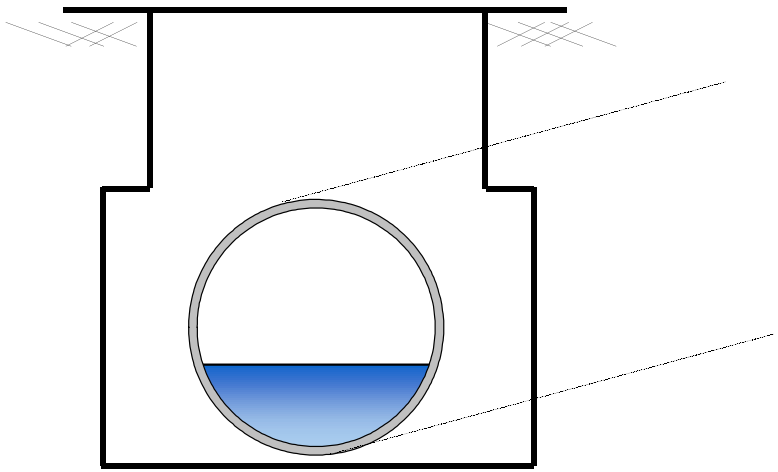


SITE 9

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period



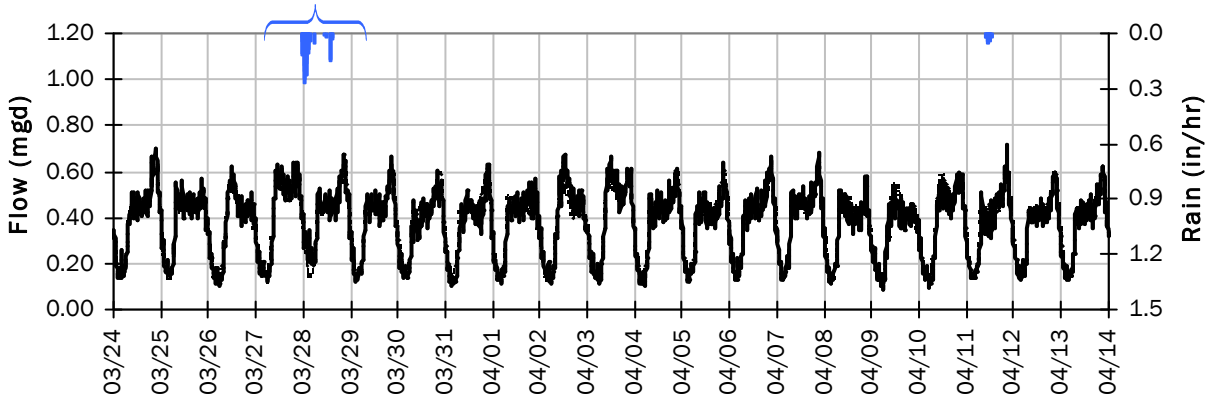


Pipe Diameter:	27	*inches*
Peak Measured Level:	9.26	*inches*
Peak d/D Ratio:	0.34	

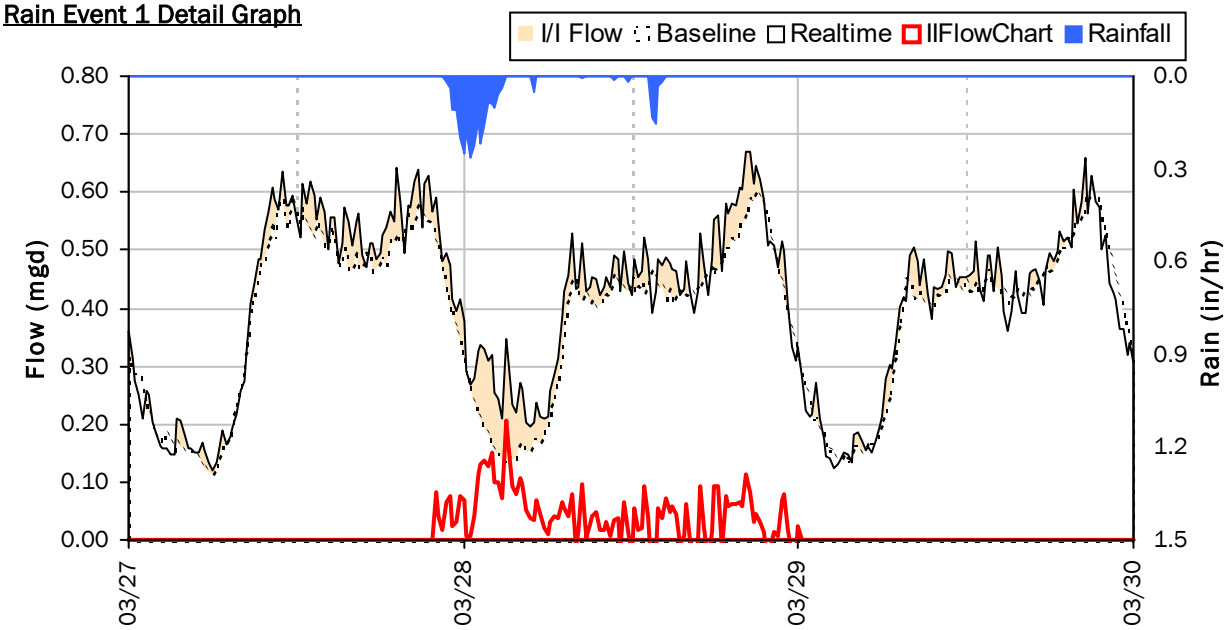
SITE 9
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period

Rain Event 1
Rainfall: 0.68 inches



Rain Event 1 Detail Graph



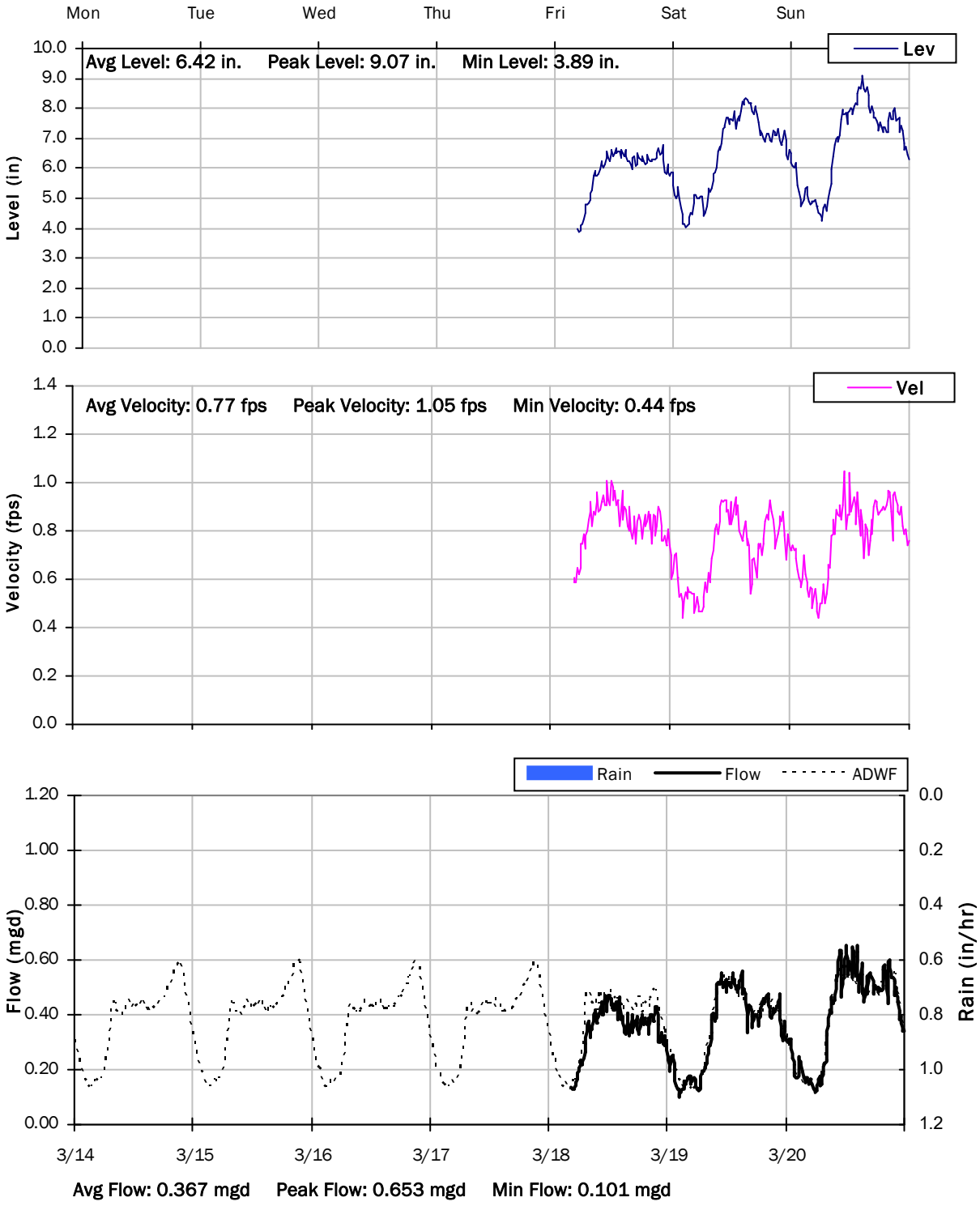
Storm Event I/I Analysis (Rain = 0.68 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.670 *mgd*	**Peak I/I Rate:**	0.207 *mgd*
PF:	1.79	**Total I/I:**	49,000 *gallons*
Peak Level:	7.93 *in*		
d/D Ratio:	0.29		

SITE 9

Weekly Level, Velocity and Flow Hydrographs

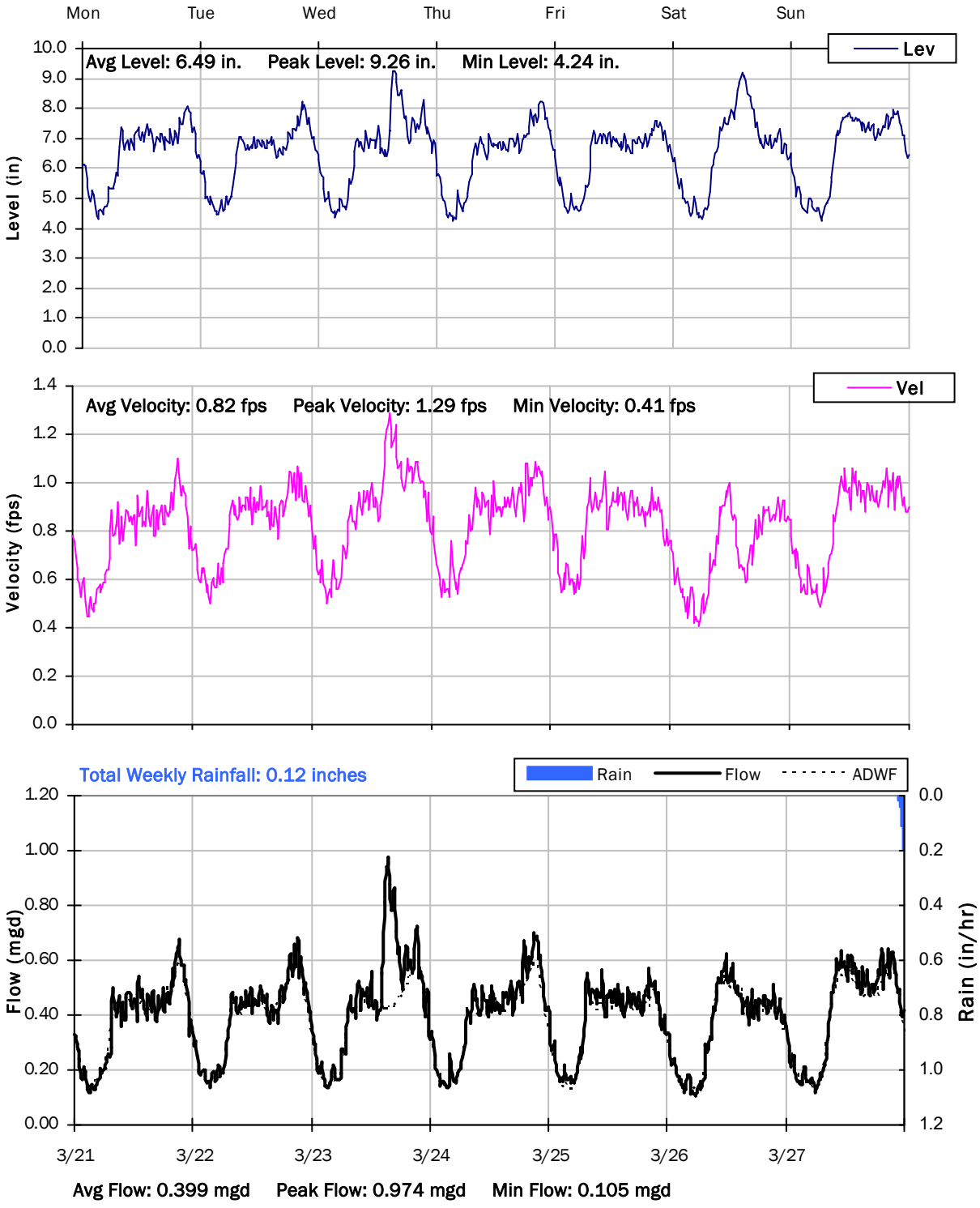
3/14/2022 to 3/21/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

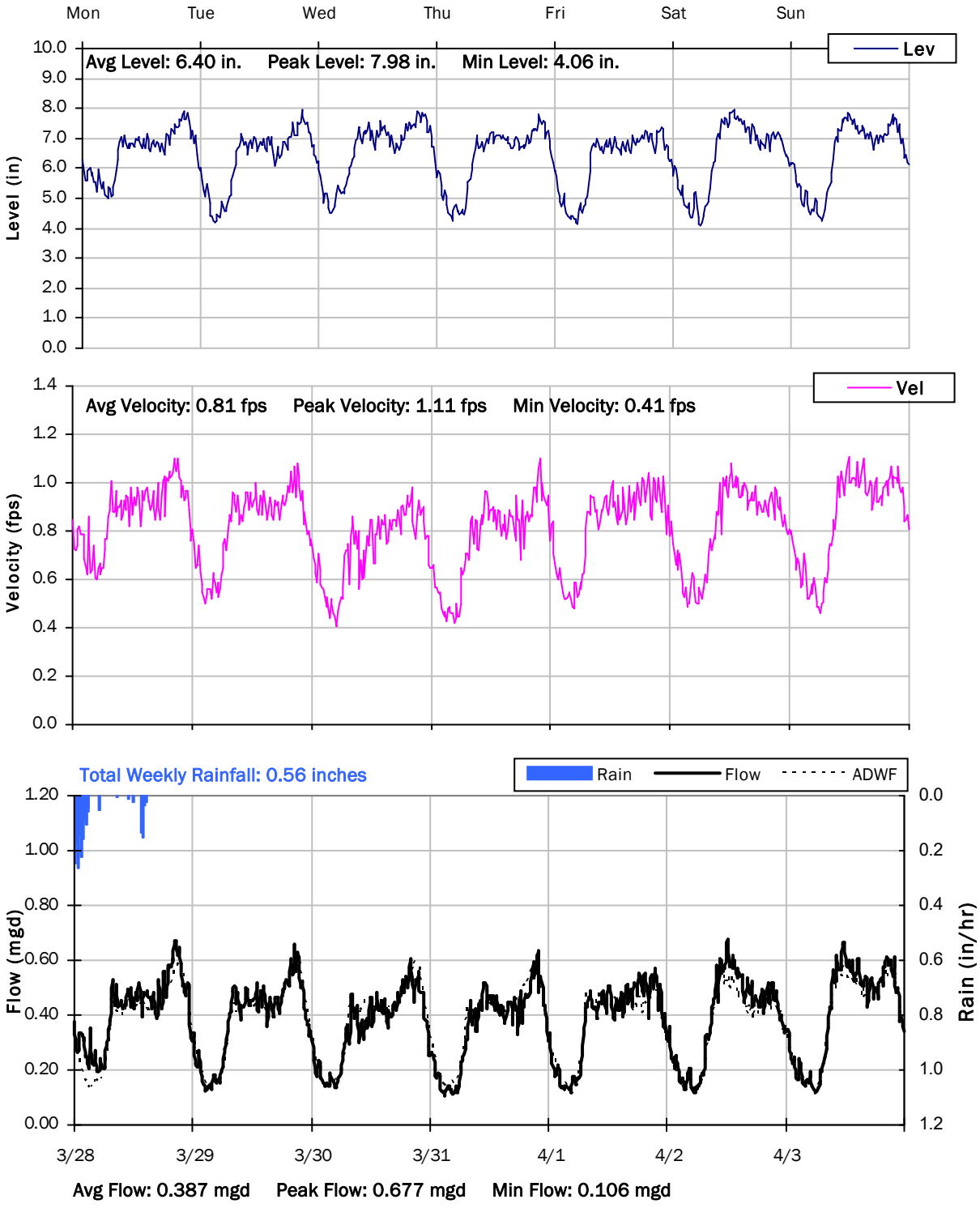
3/21/2022 to 3/28/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

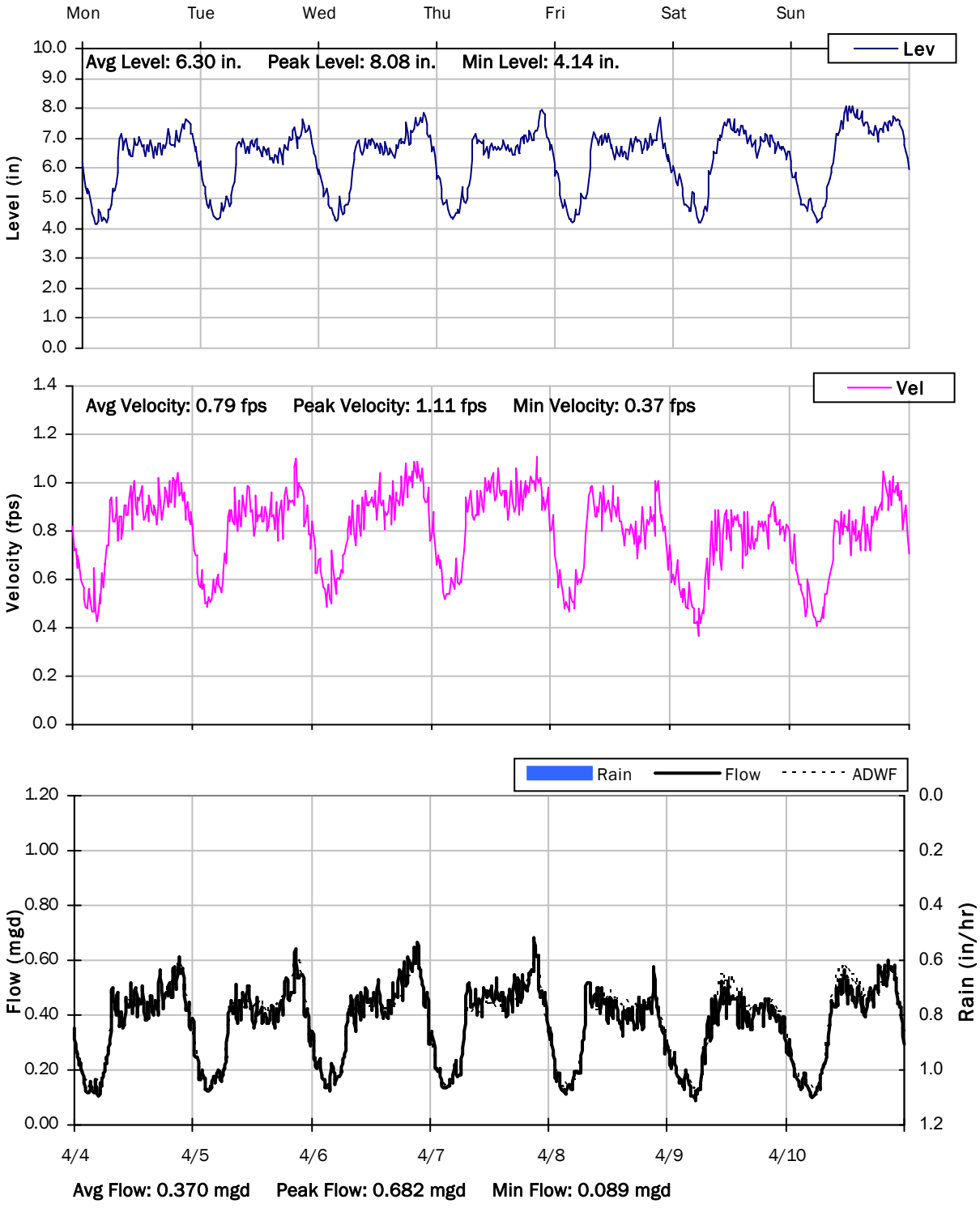
3/28/2022 to 4/4/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

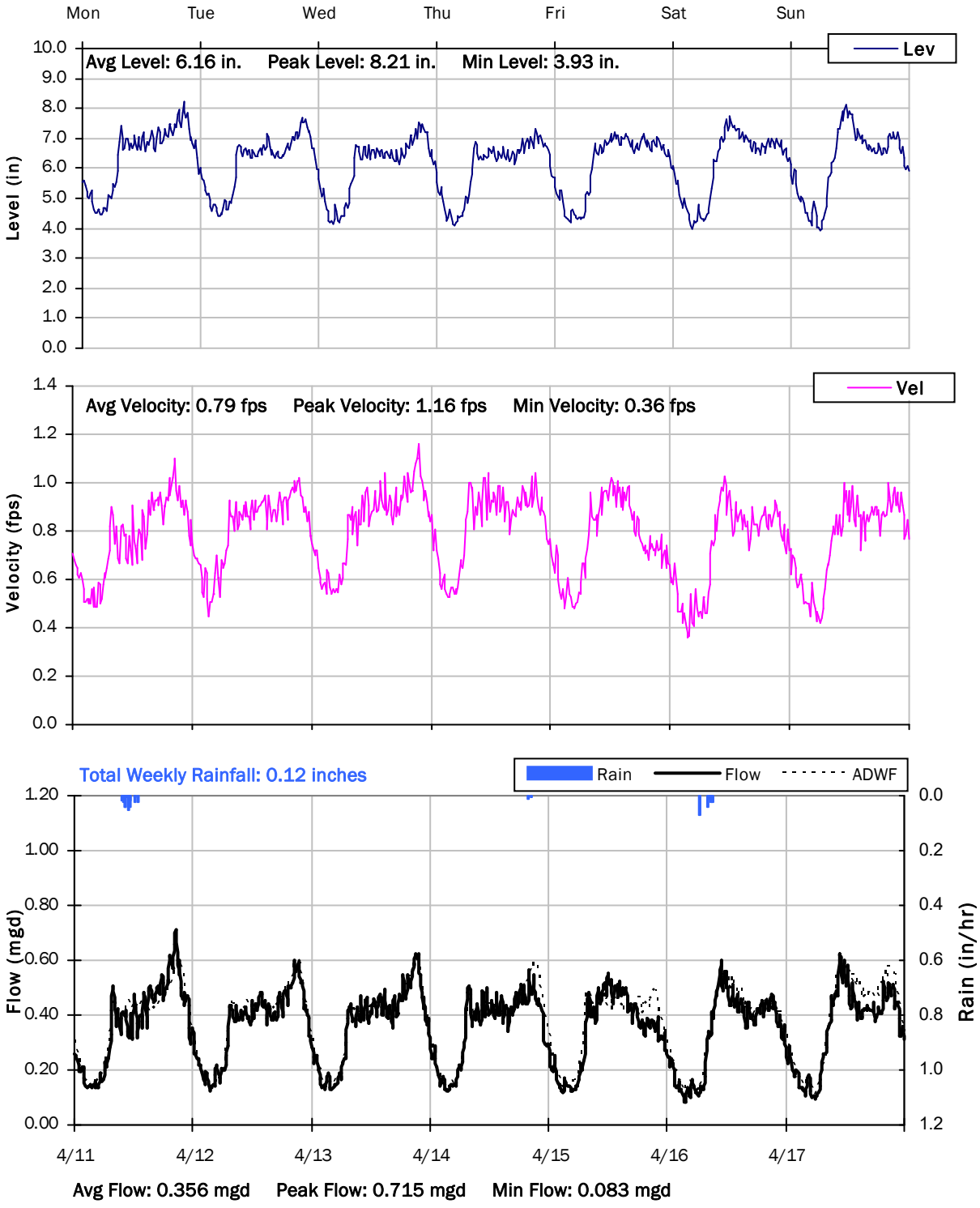
4/4/2022 to 4/11/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

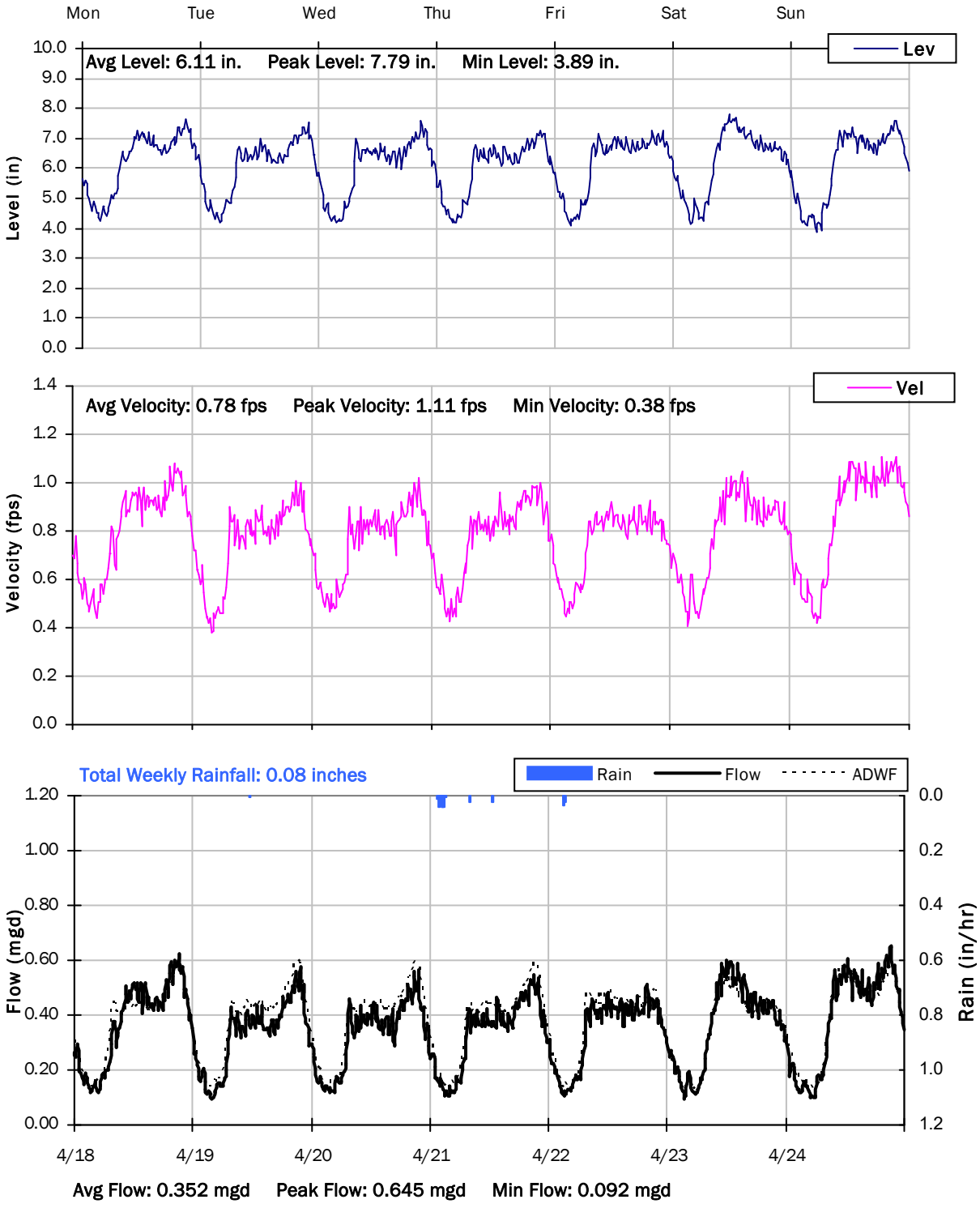
4/11/2022 to 4/18/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

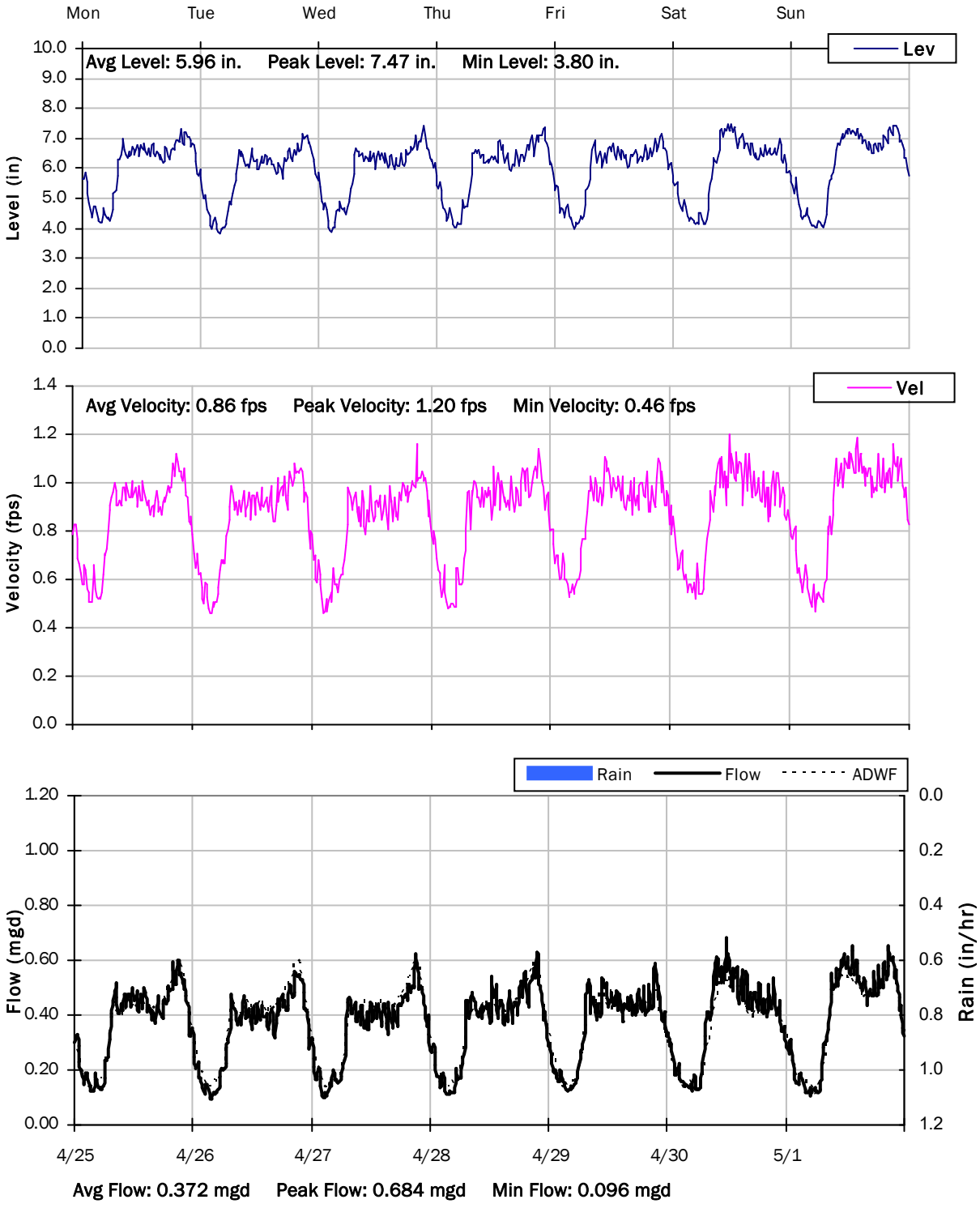
4/18/2022 to 4/25/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

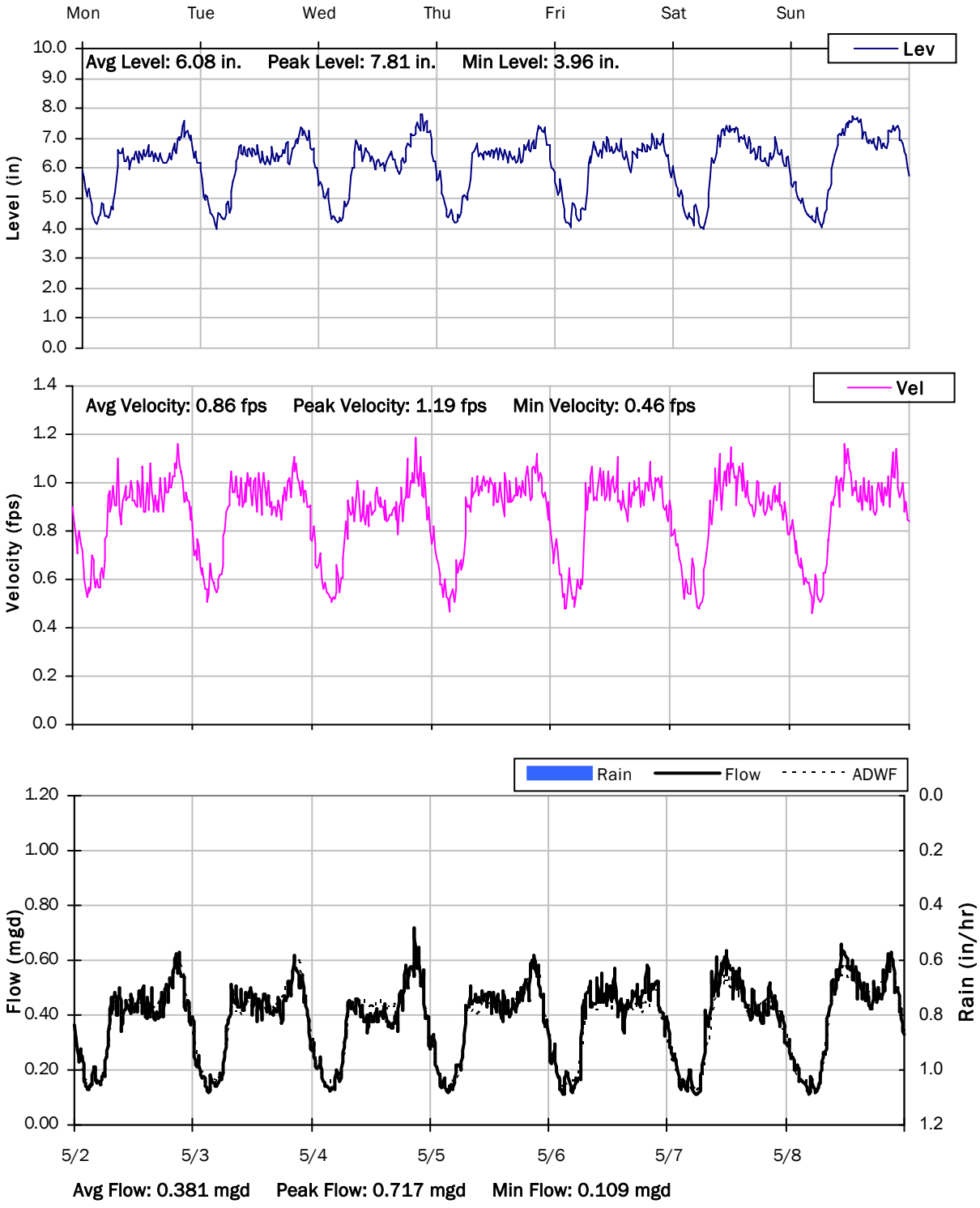
4/25/2022 to 5/2/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

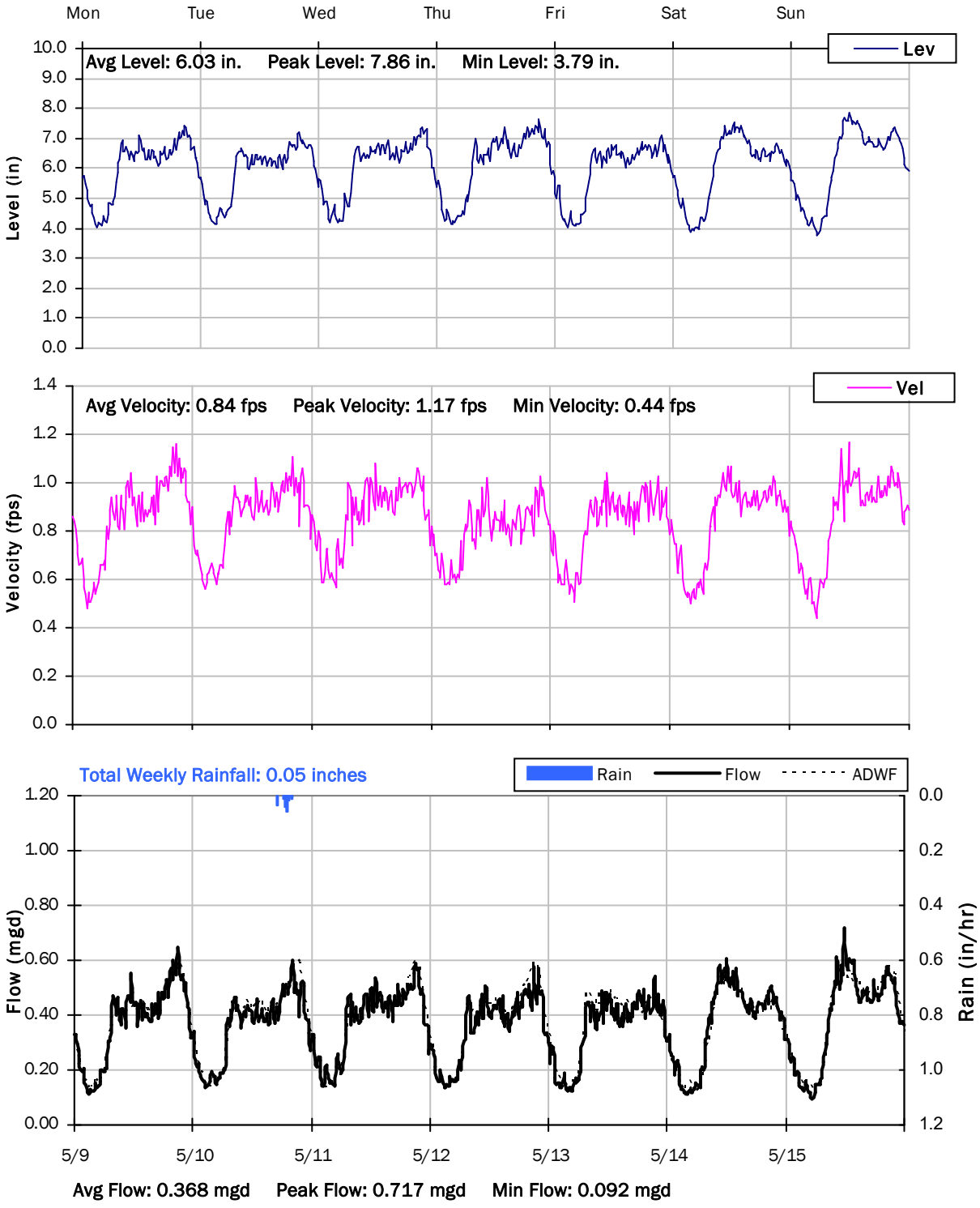
5/2/2022 to 5/9/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

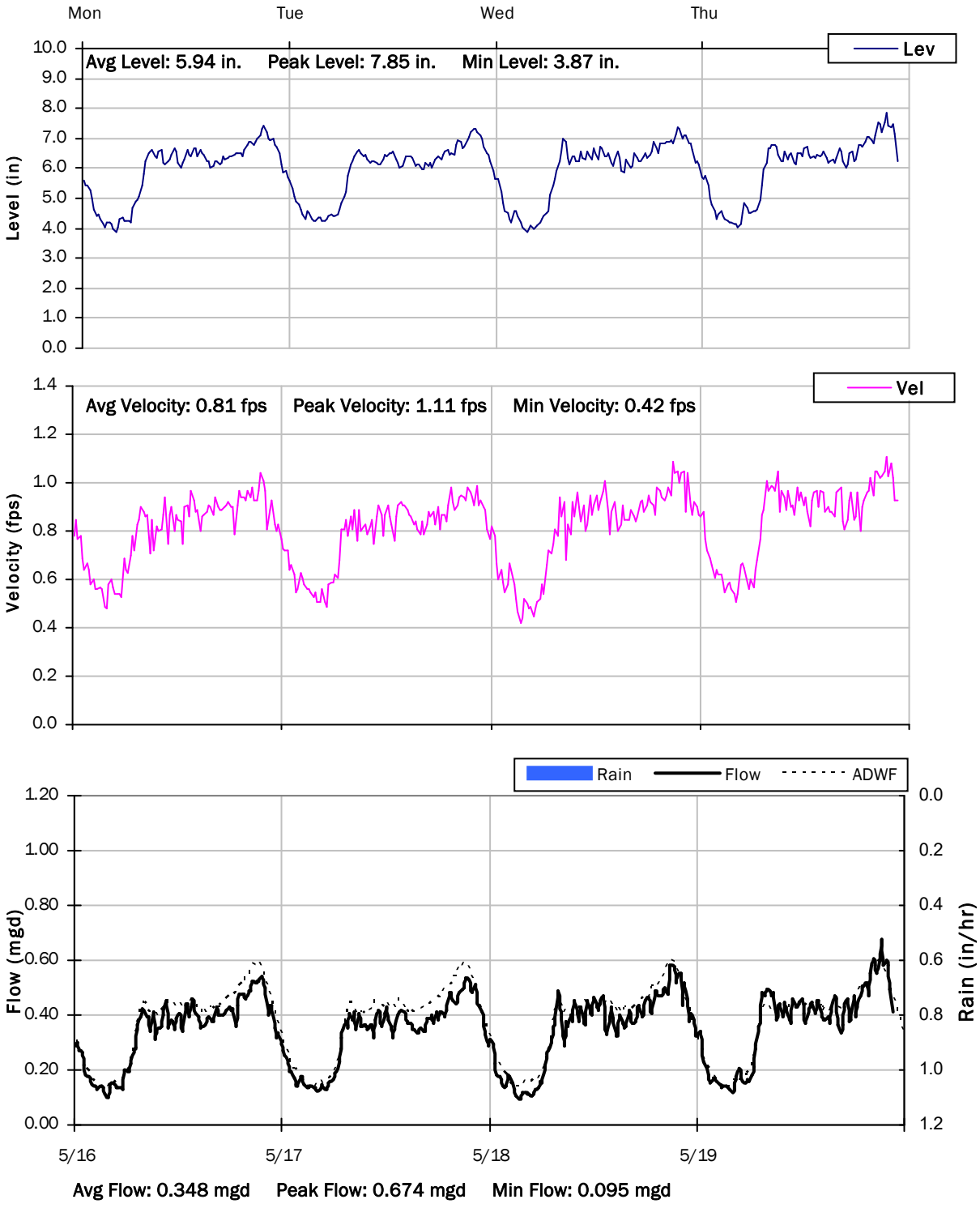
5/9/2022 to 5/16/2022



SITE 9

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 10

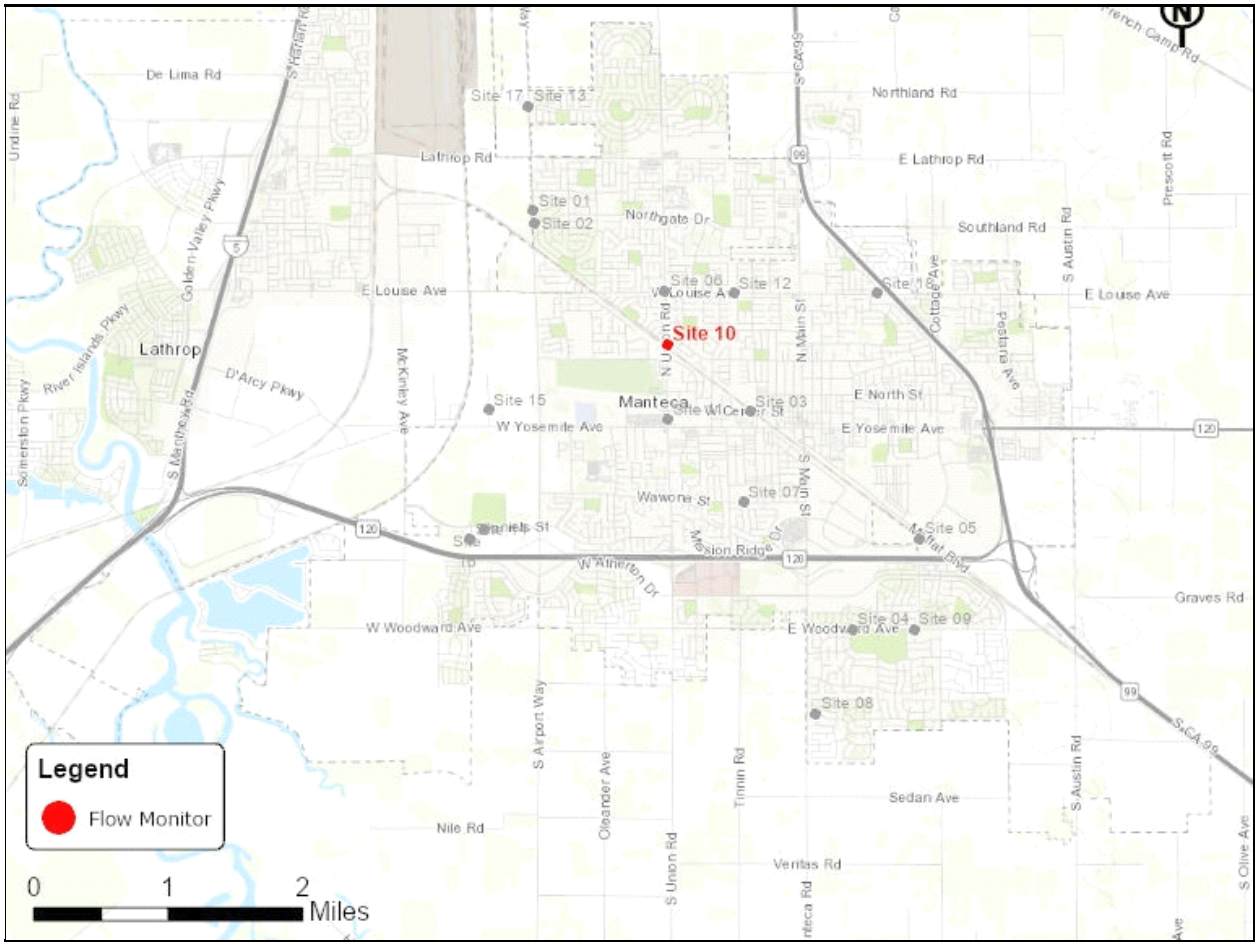
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: N. Union Road South of W. Alameda Street

Data Summary Report

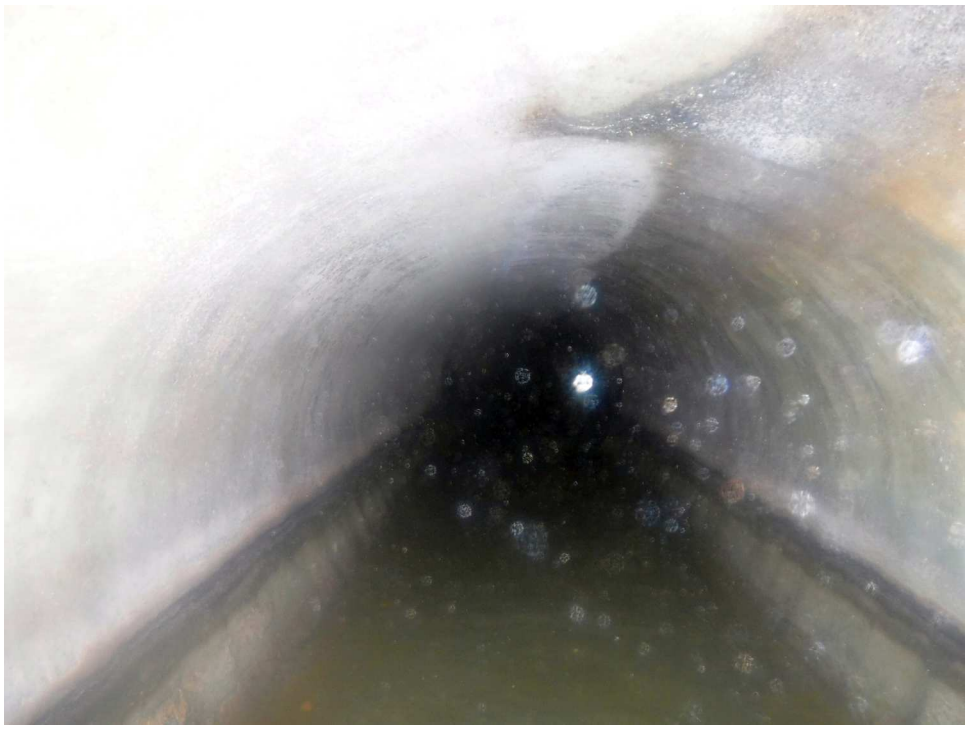


Vicinity Map: Site 10

SITE 10

Additional Site Photos

Effluent Pipe



Monitored North Influent Pipe

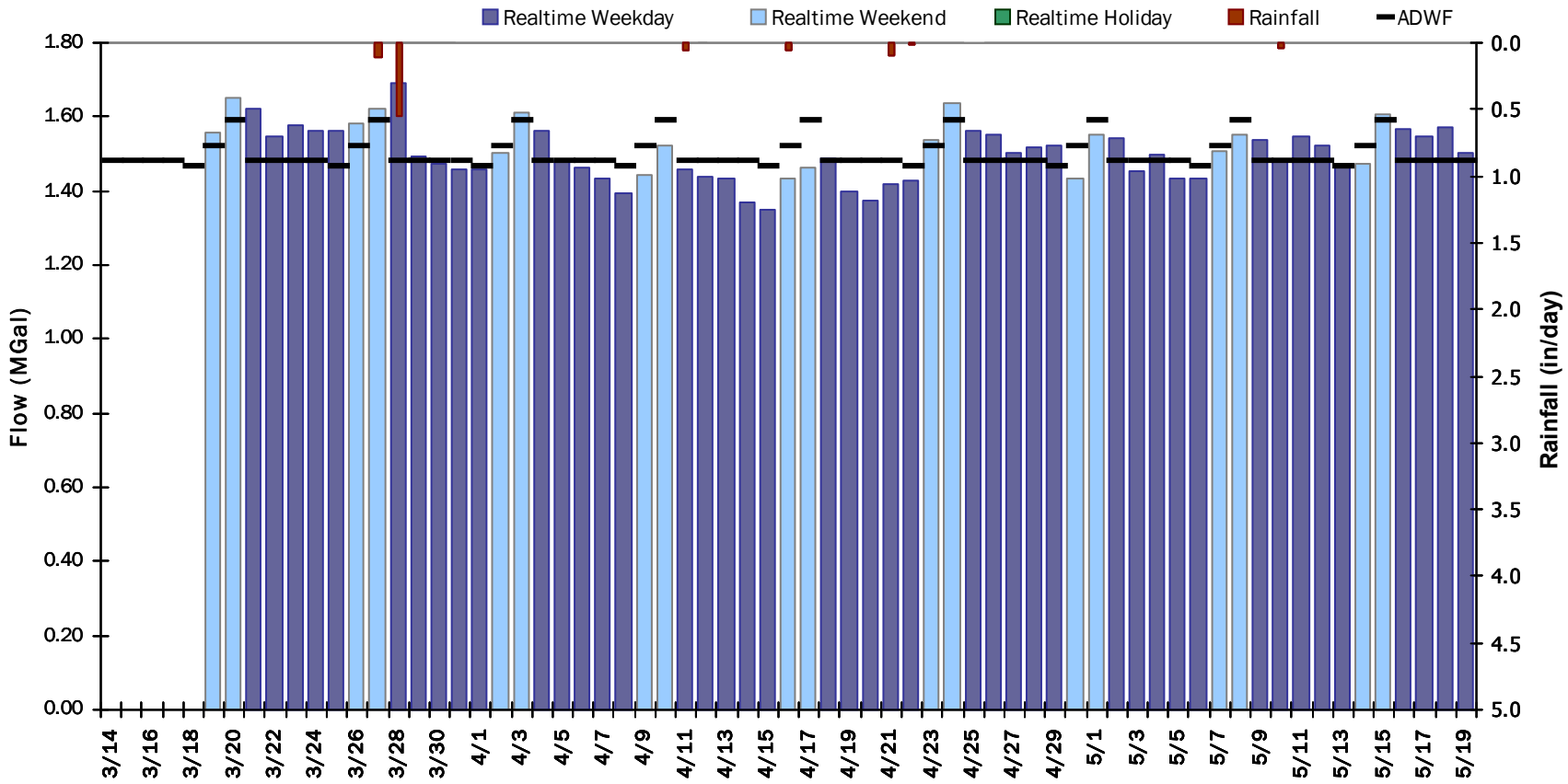


SITE 10

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 1.506 MGal Peak Daily Flow: 1.690 MGal Min Daily Flow: 1.348 MGal

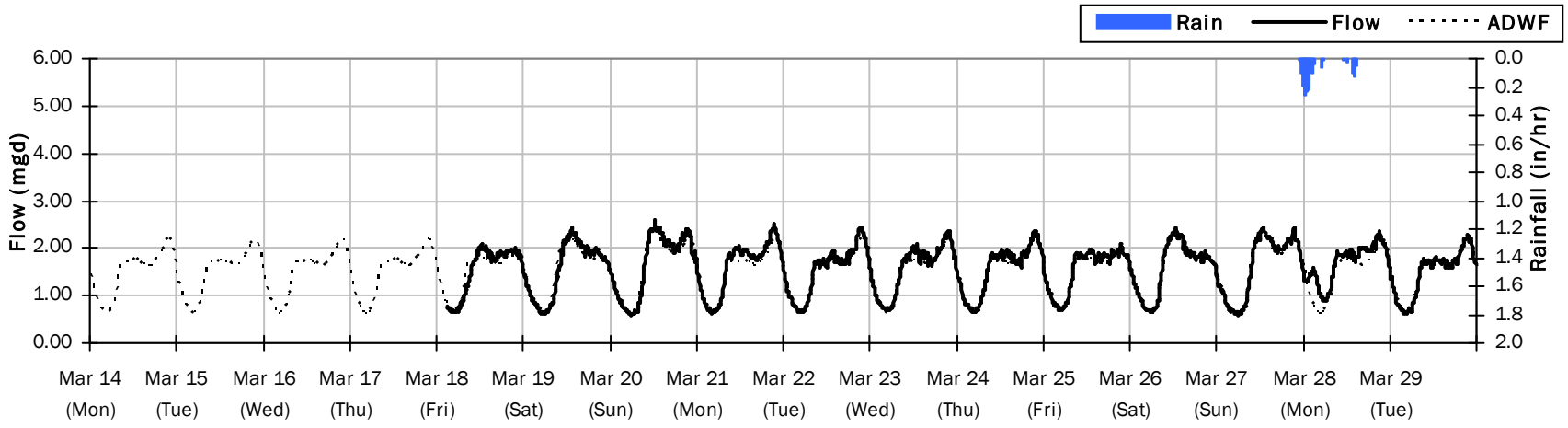
Total Rainfall: 0.94 inches

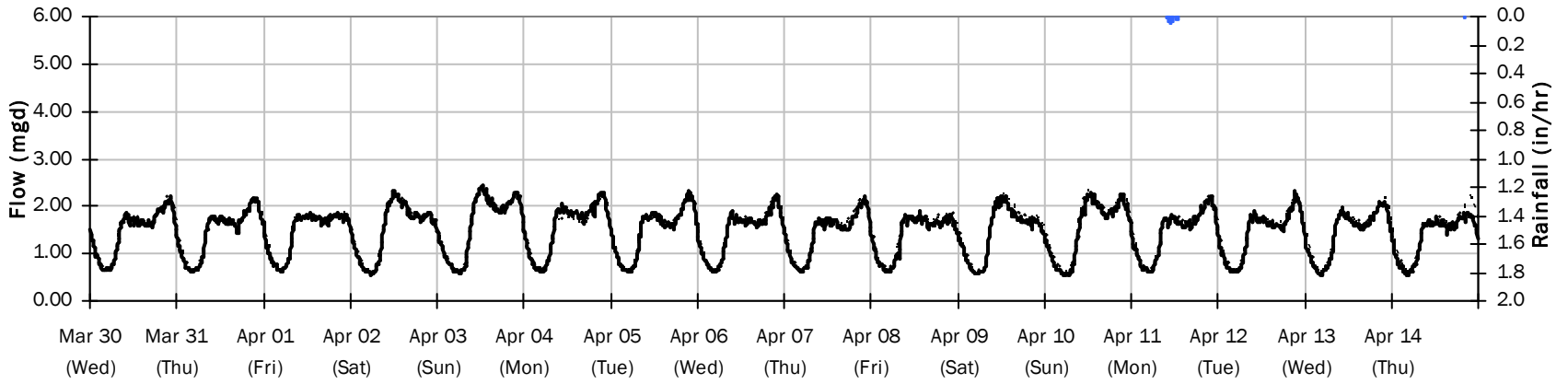


SITE 10

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.73 inches Period Avg Flow: 1.518 mgd Period Peak Flow: 2.597 mgd Period Min Flow: 0.535 mgd

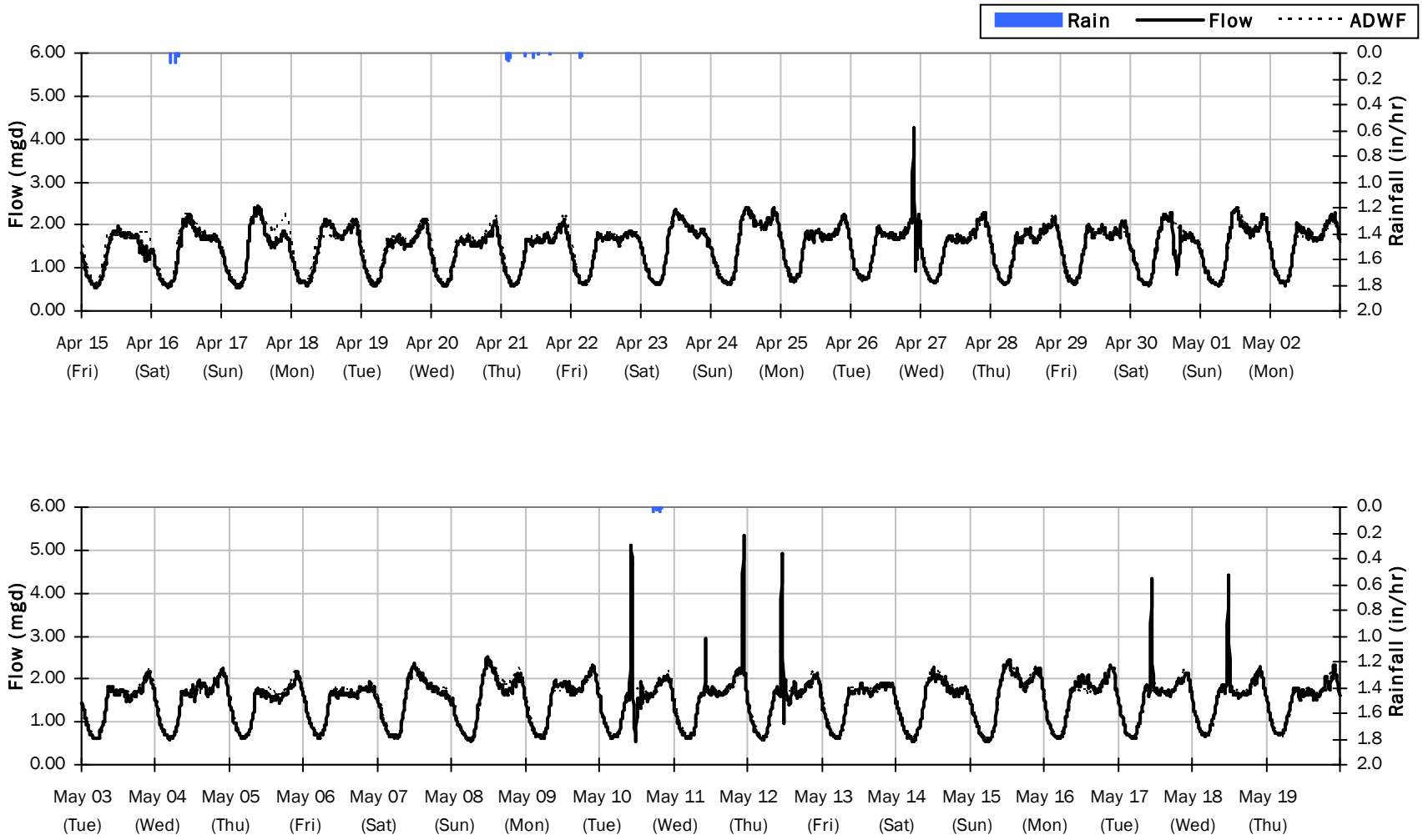




SITE 10

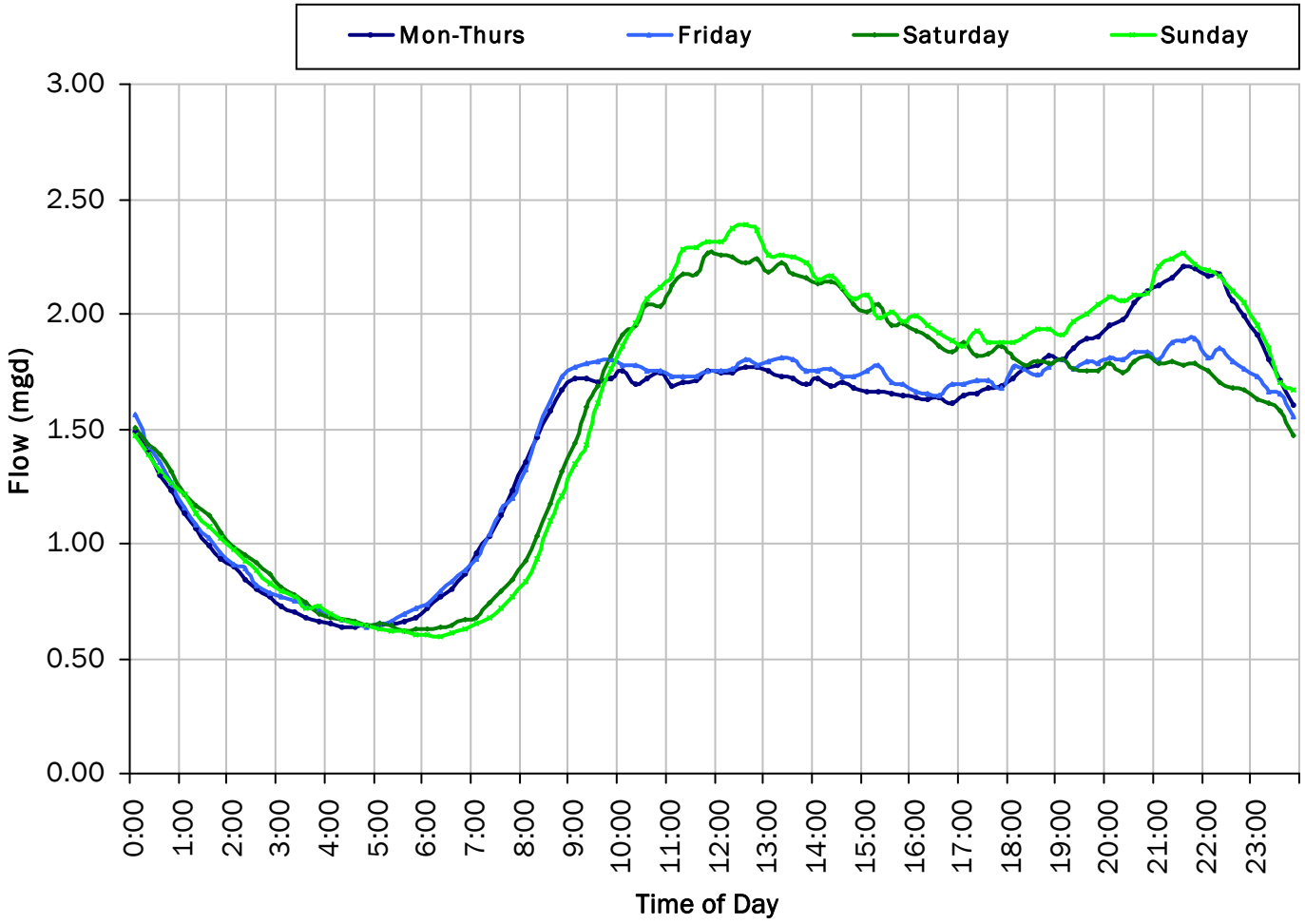
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.21 inches Period Avg Flow: 1.497 mgd Period Peak Flow: 5.332 mgd Period Min Flow: 0.532 mgd



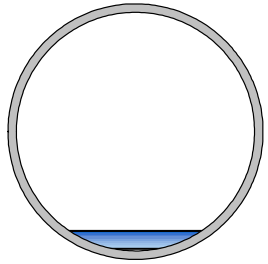
SITE 10

Average Dry Weather Flow Hydrographs



ADWF:

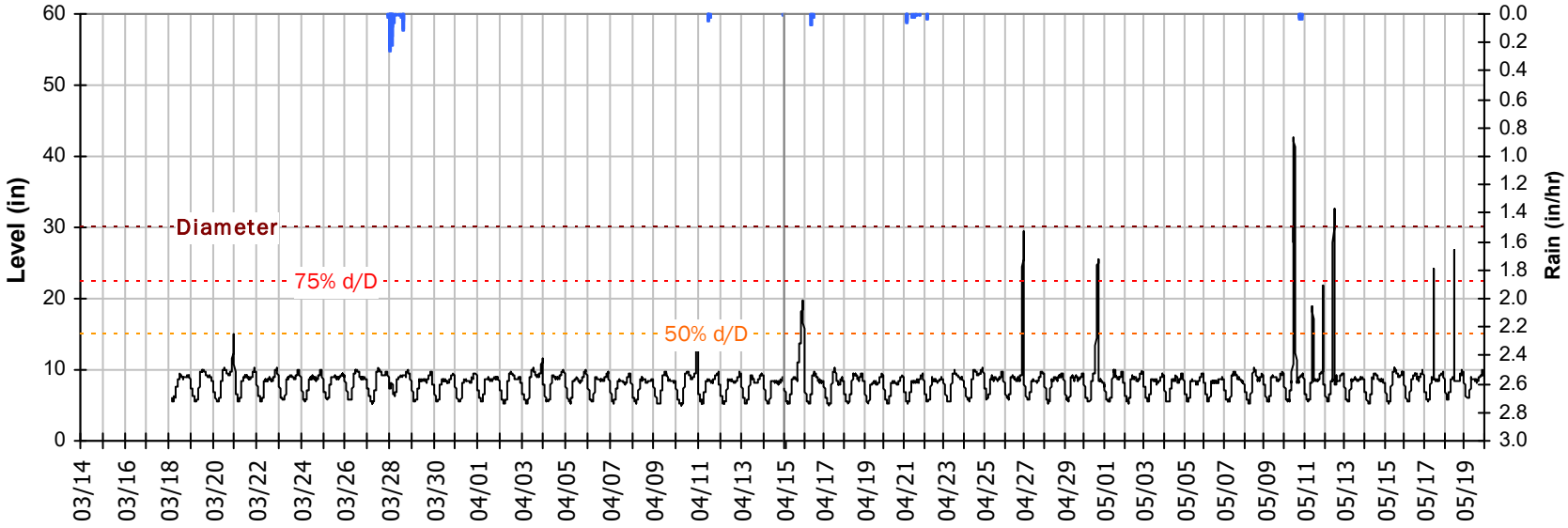
1.499 *mgd*

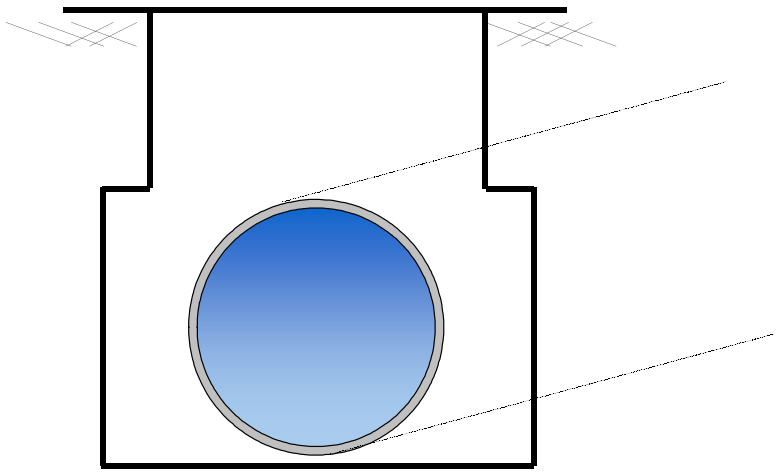


SITE 10

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period



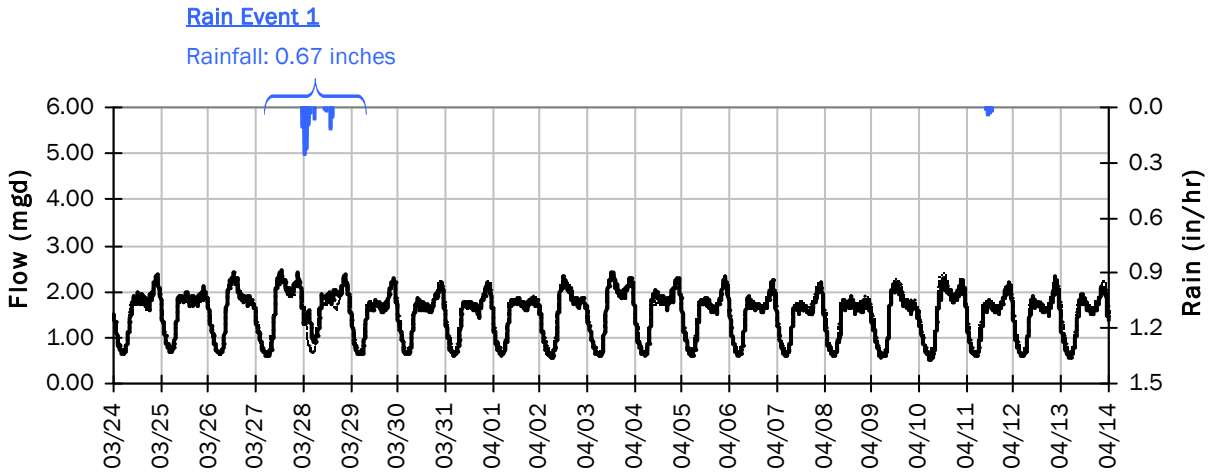


Pipe Diameter:	30	*inches*
Peak Measured Level:	42.7	*inches*
Peak d/D Ratio:	1.42	

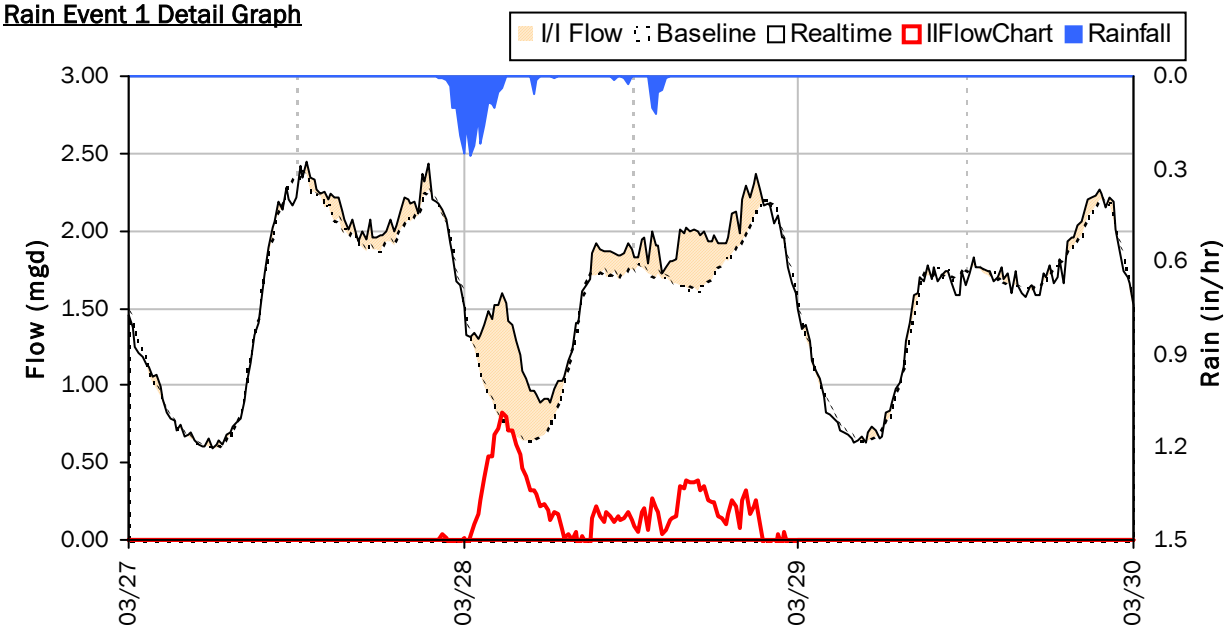
Surcharged 12.7 inches over crown

SITE 10
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



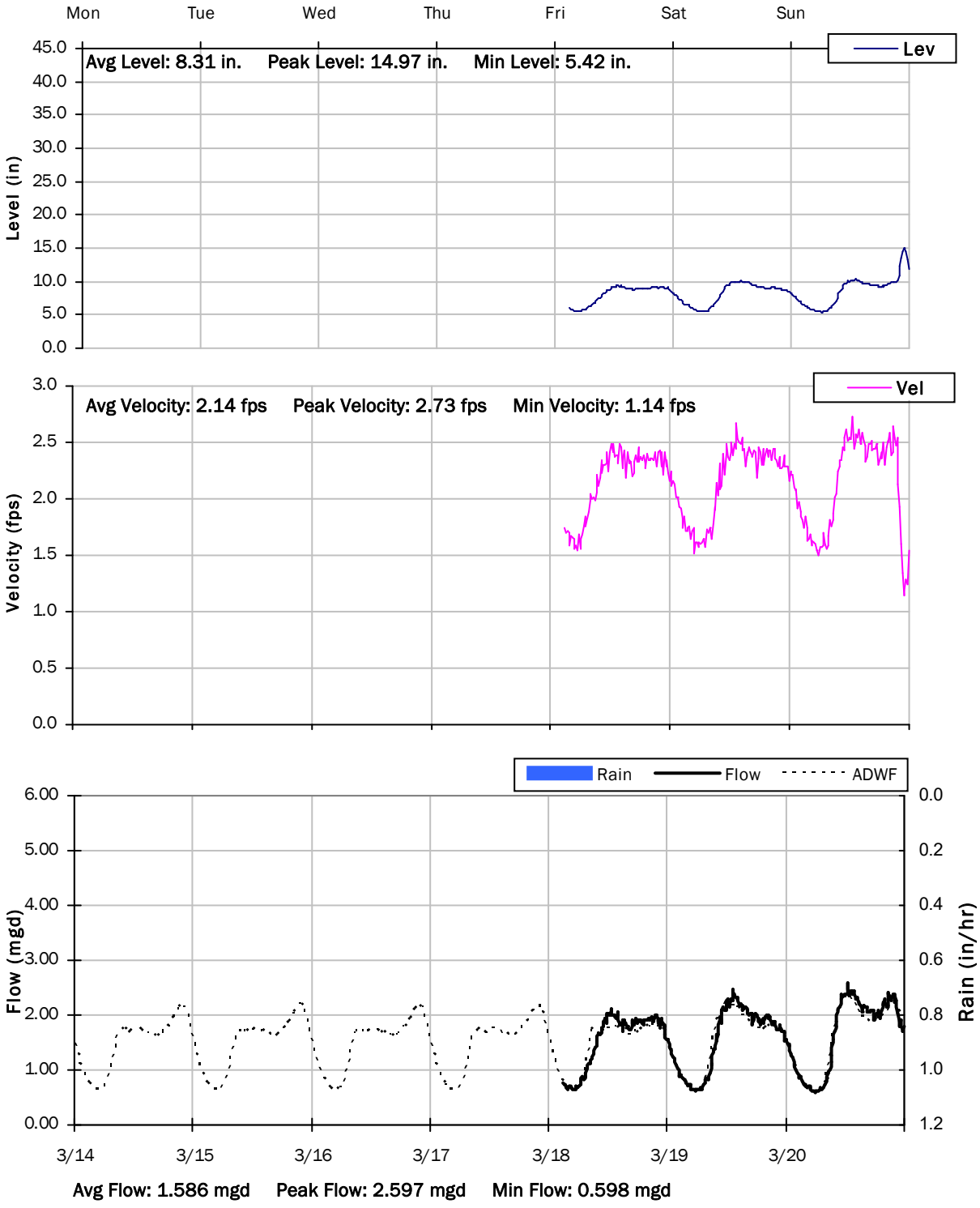
Storm Event I/I Analysis (Rain = 0.67 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	2.375 *mgd*	**Peak I/I Rate:**	0.829 *mgd*
PF:	1.58	**Total I/I:**	208,000 *gallons*
Peak Level:	9.97 *in*		
d/D Ratio:	0.33		

SITE 10

Weekly Level, Velocity and Flow Hydrographs

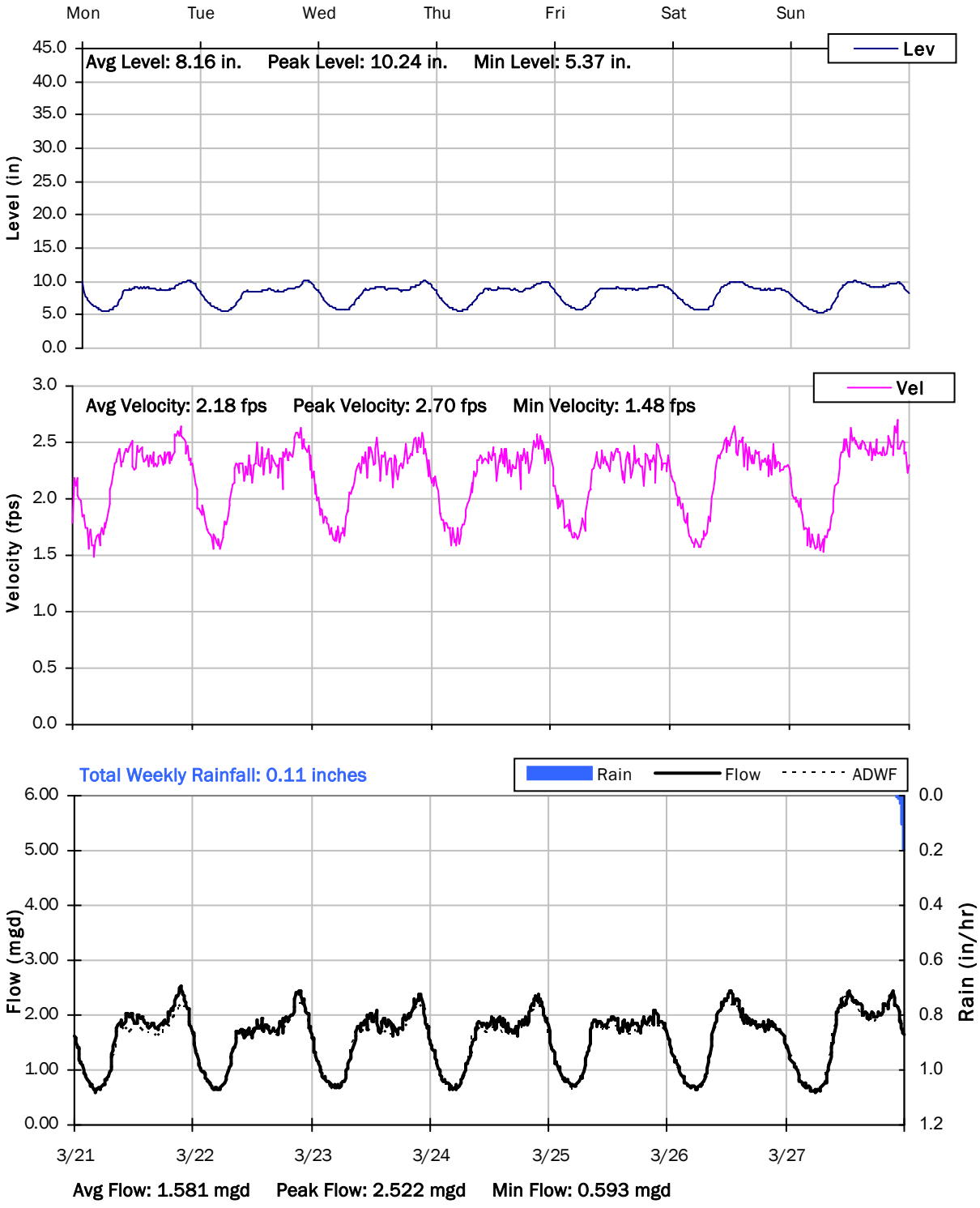
3/14/2022 to 3/21/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

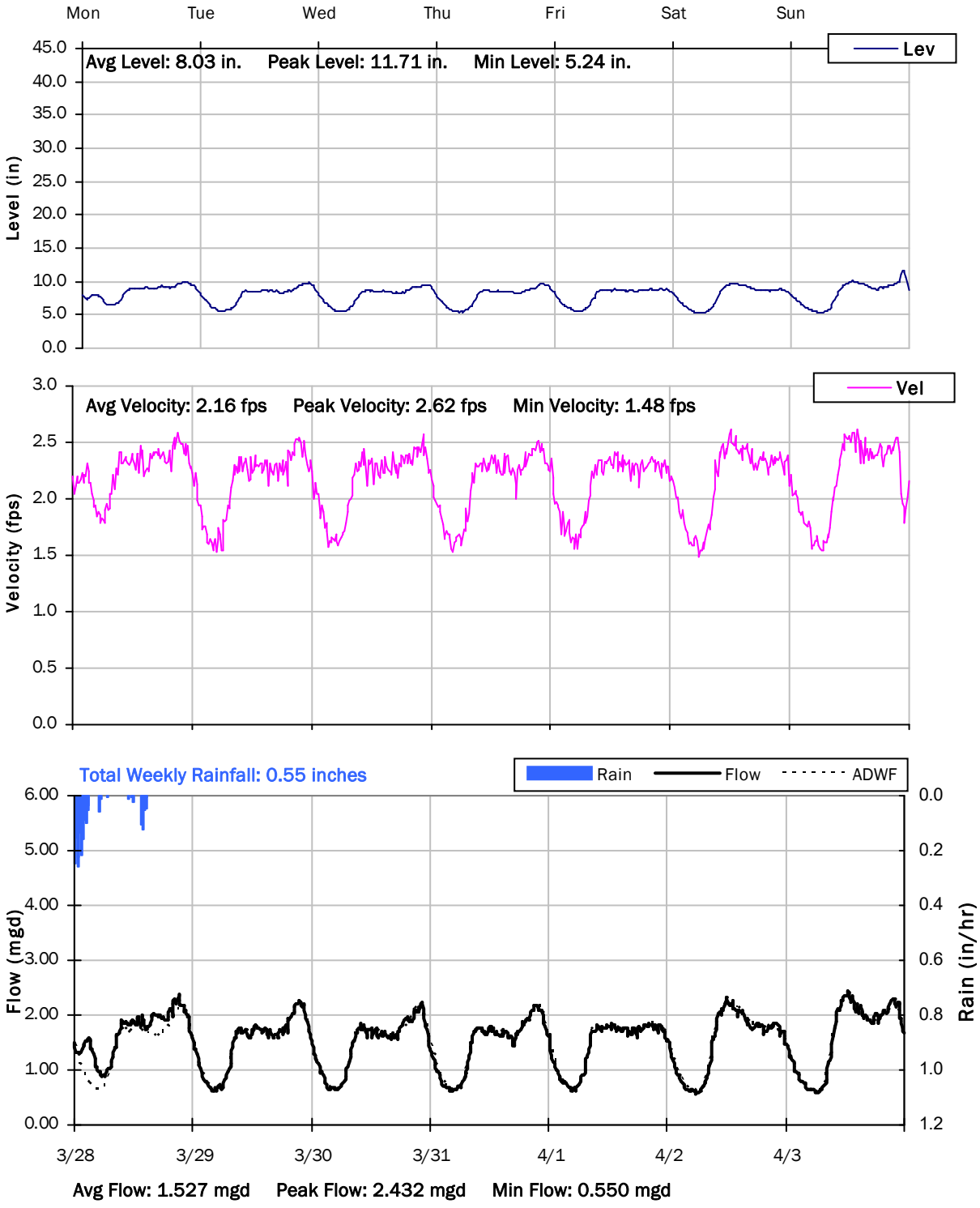
3/21/2022 to 3/28/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

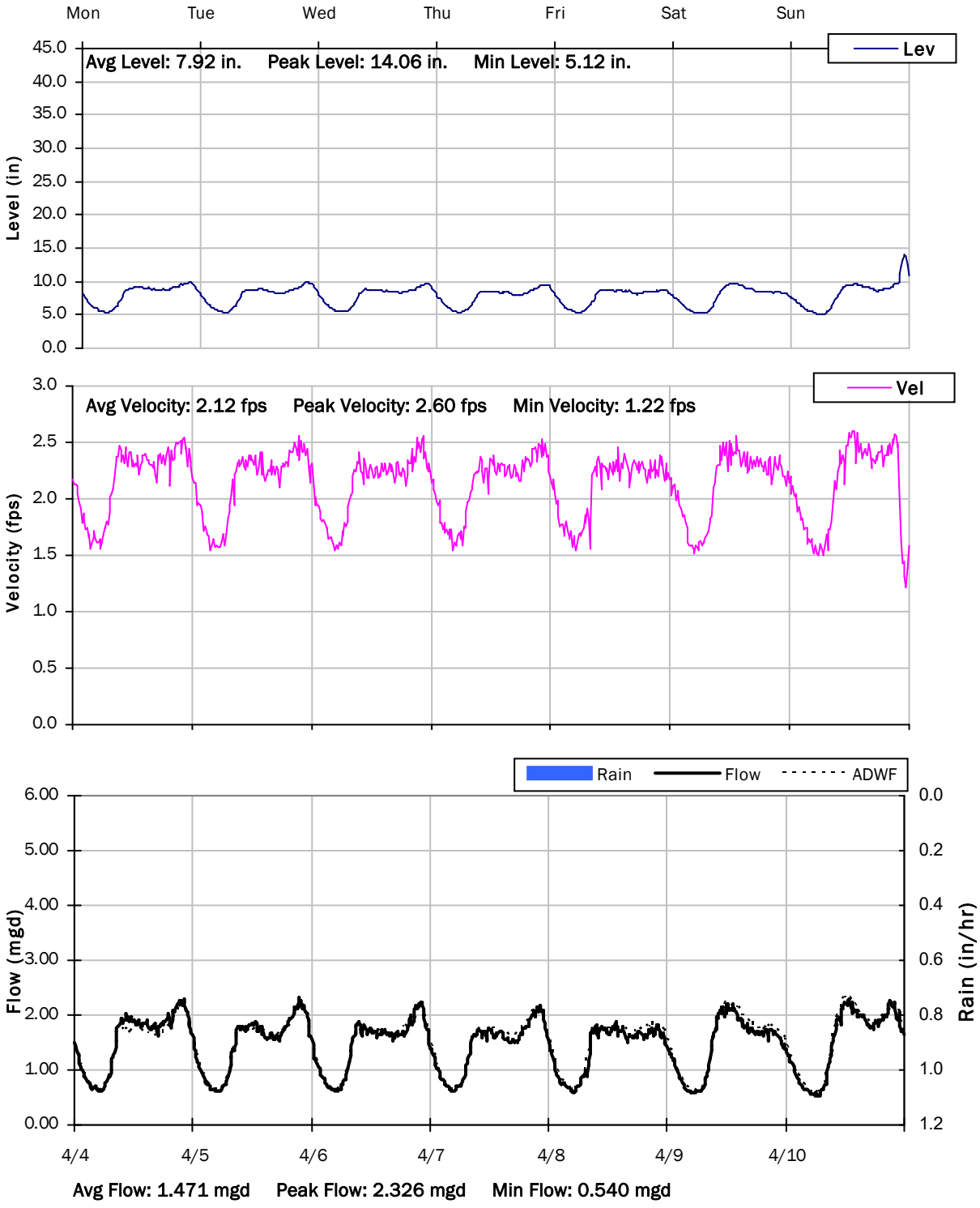
3/28/2022 to 4/4/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

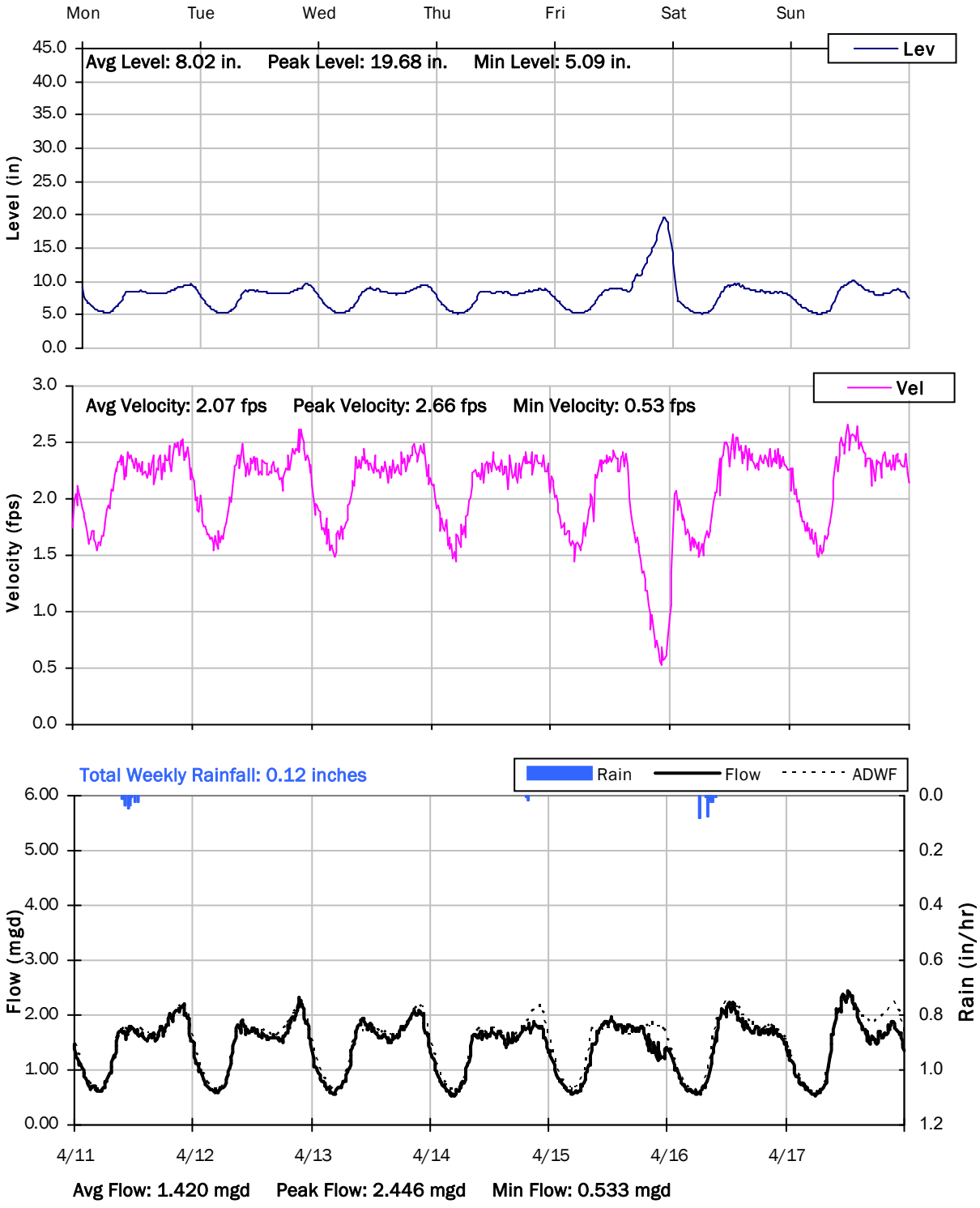
4/4/2022 to 4/11/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

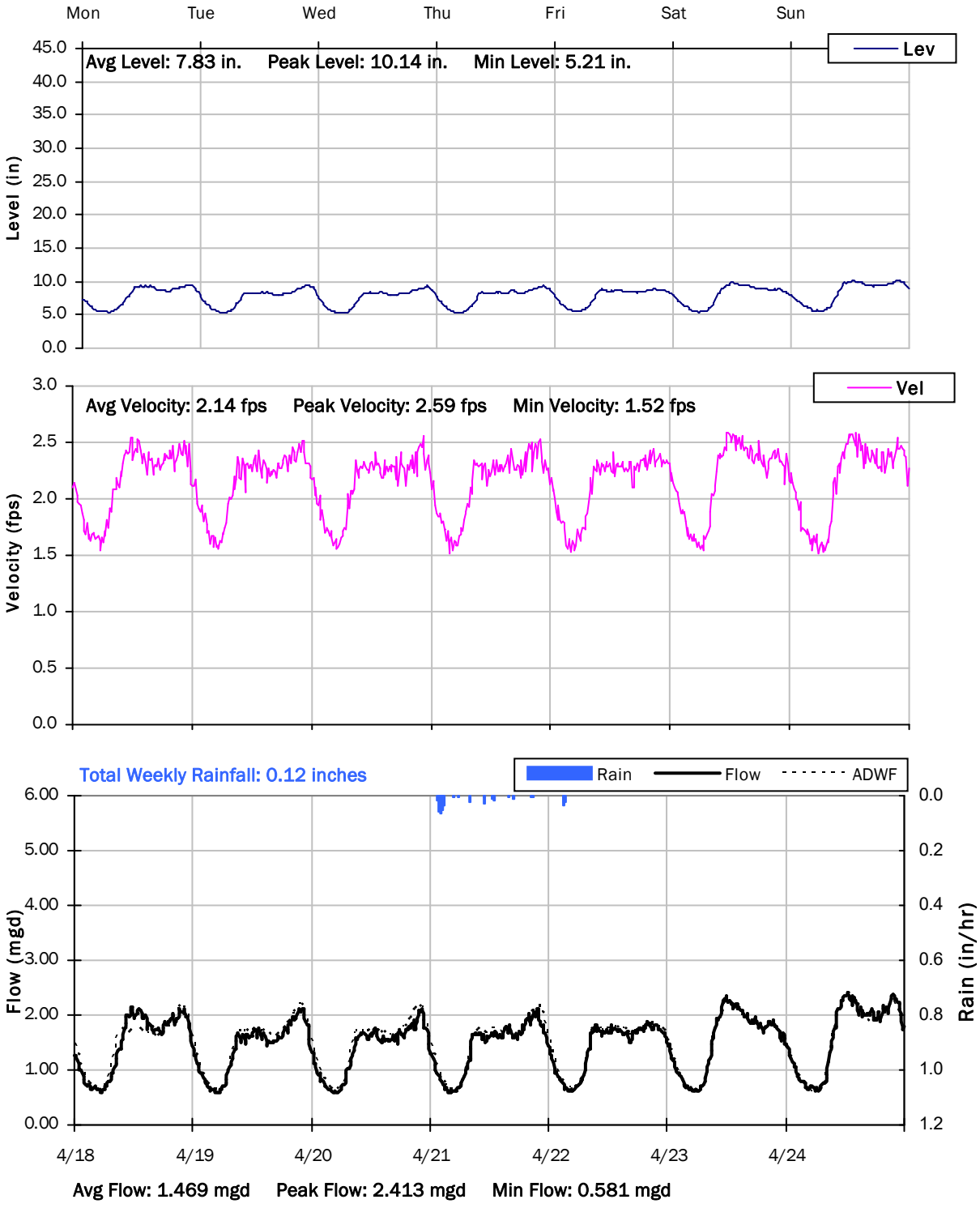
4/11/2022 to 4/18/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

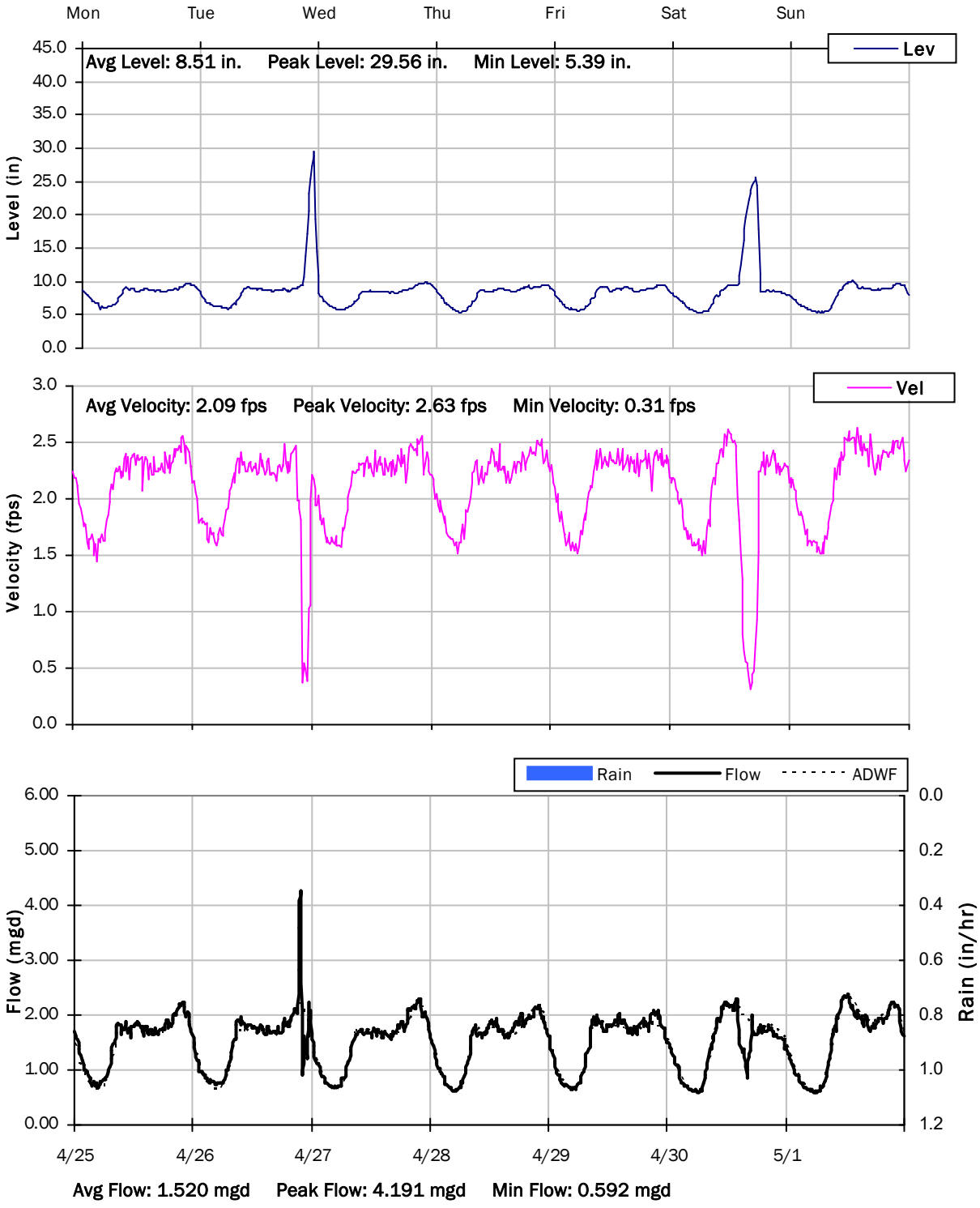
4/18/2022 to 4/25/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

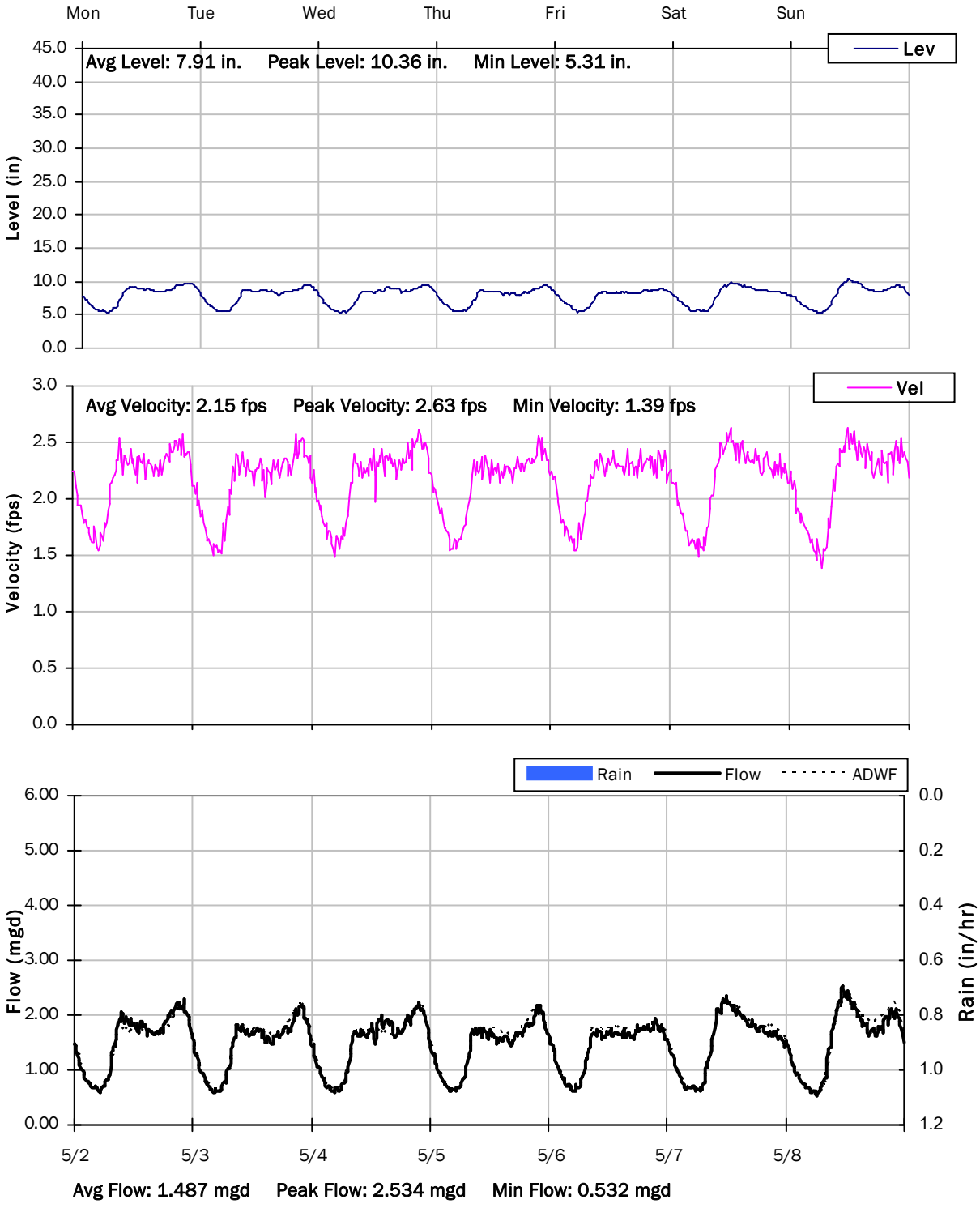
4/25/2022 to 5/2/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

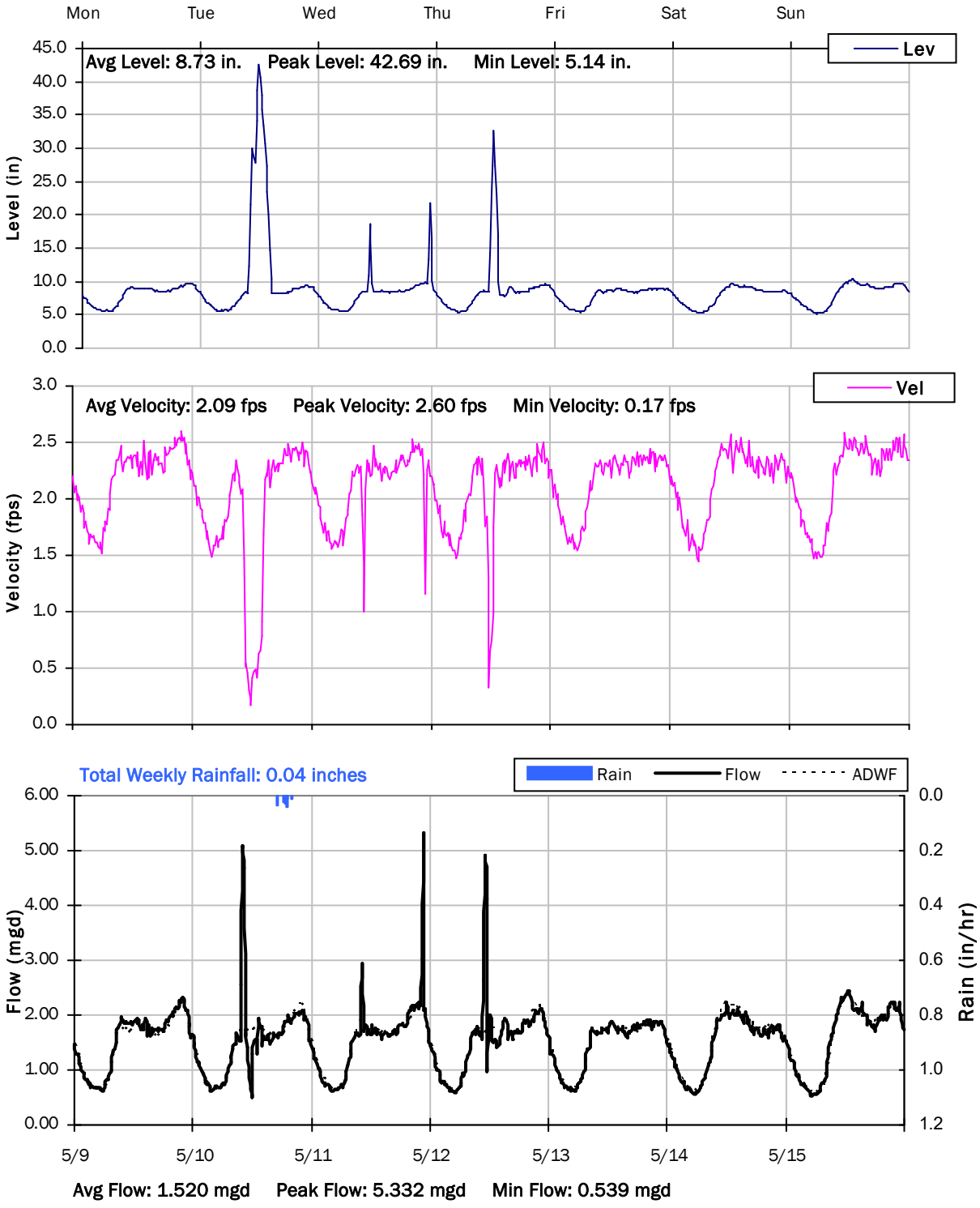
5/2/2022 to 5/9/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

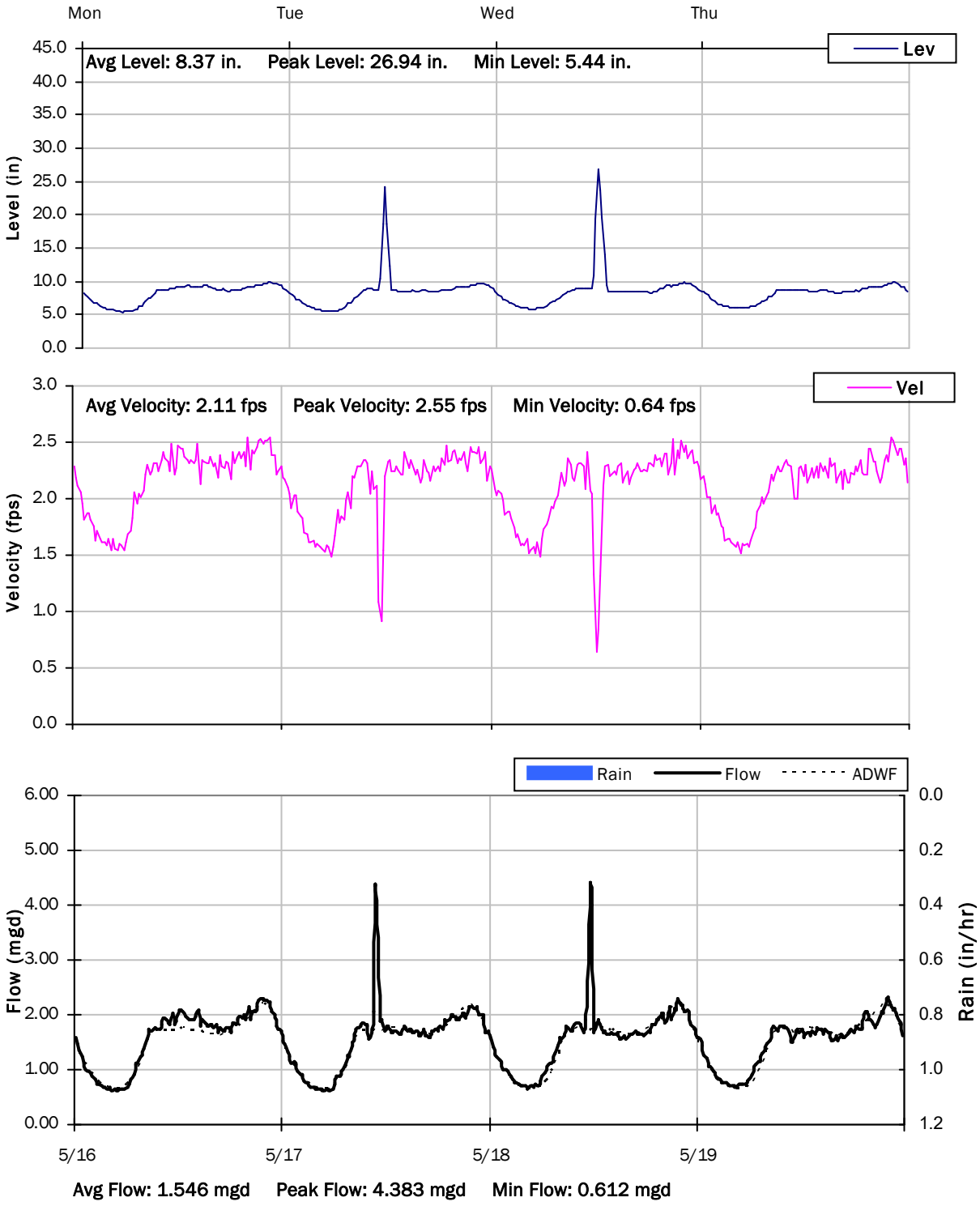
5/9/2022 to 5/16/2022



SITE 10

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 11

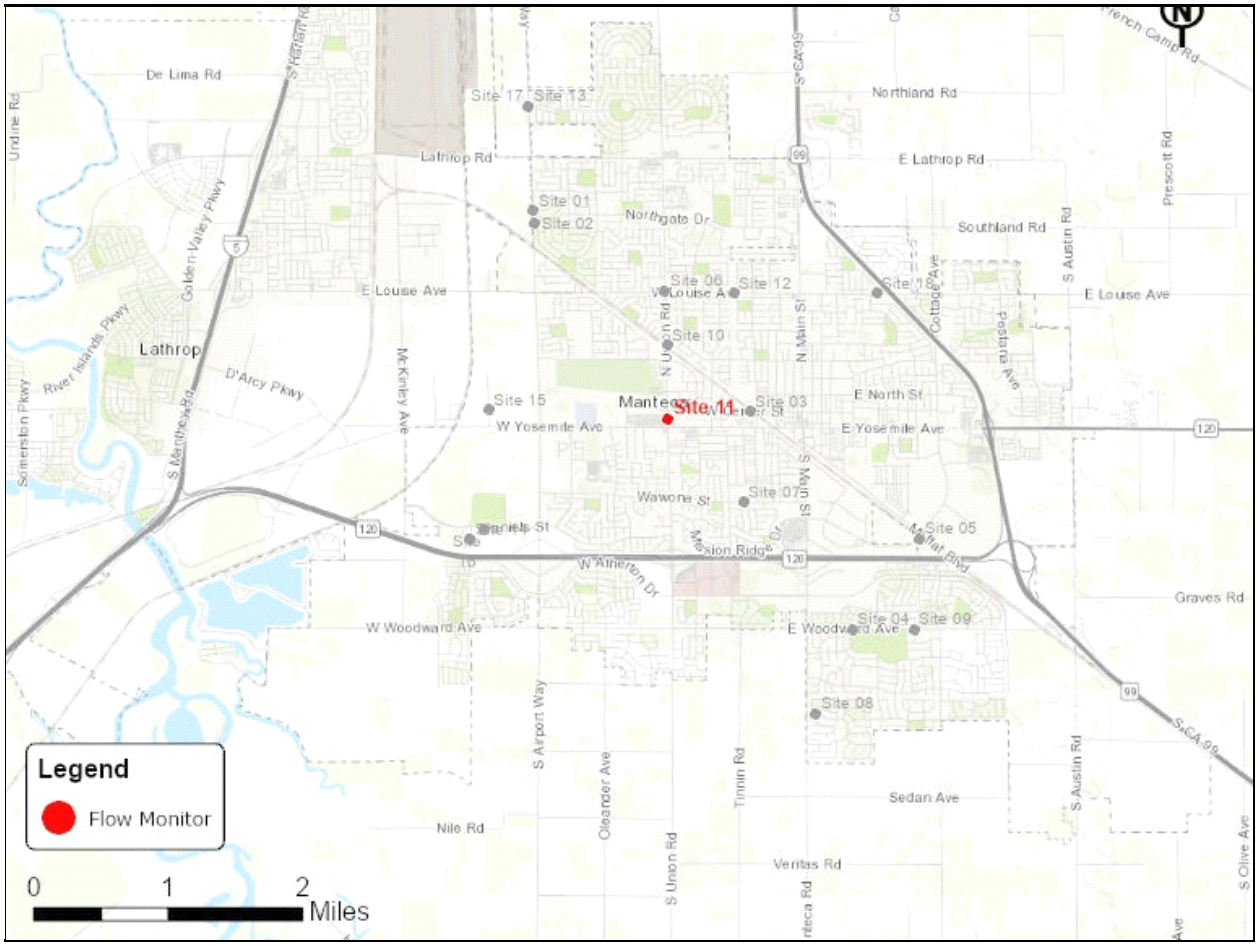
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: N. Union Road North of W. Yosemite Avenue

Data Summary Report



Vicinity Map: Site 11

SITE 11

Additional Site Photos

Effluent Pipe



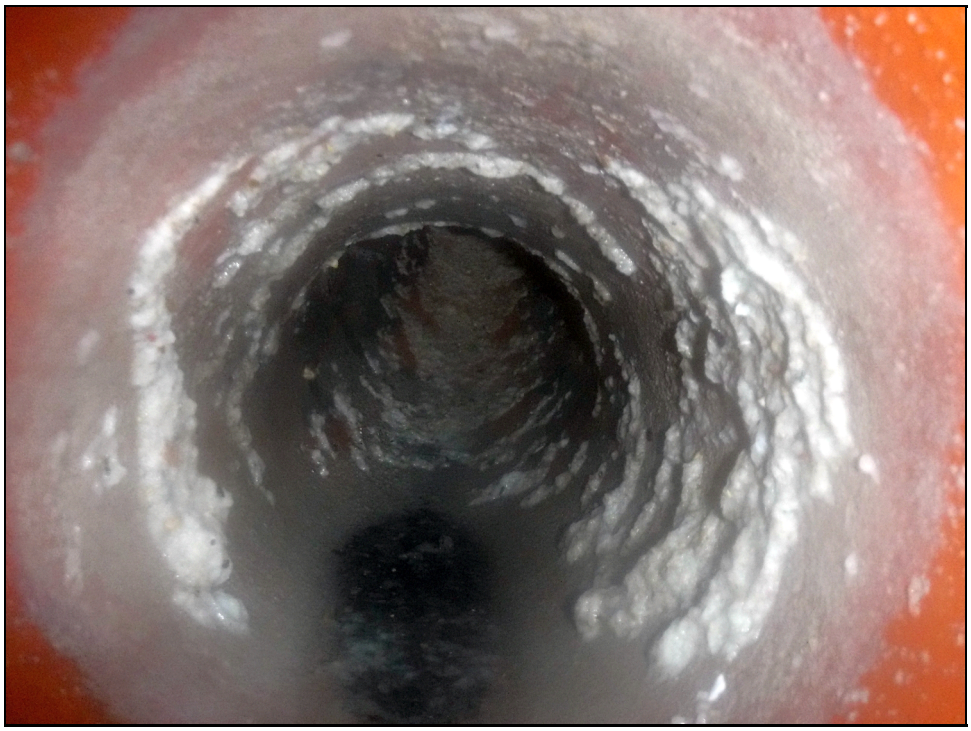
Monitored South Influent Pipe



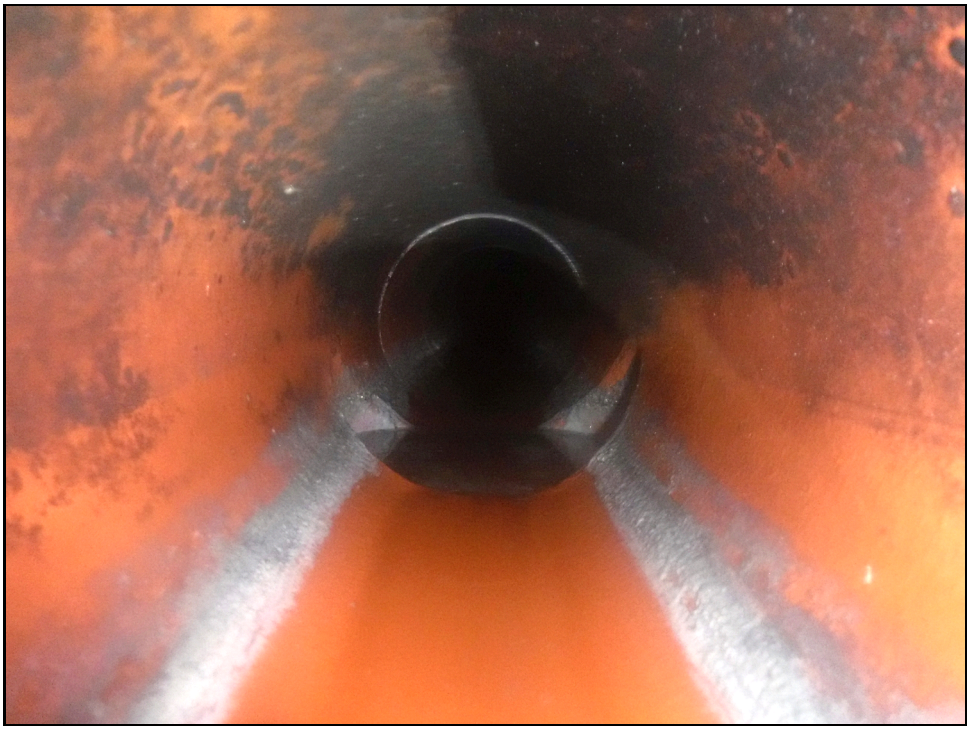
SITE 11

Additional Site Photos

West Influent Pipe (Lower)



West Influent Pipe (Upper)

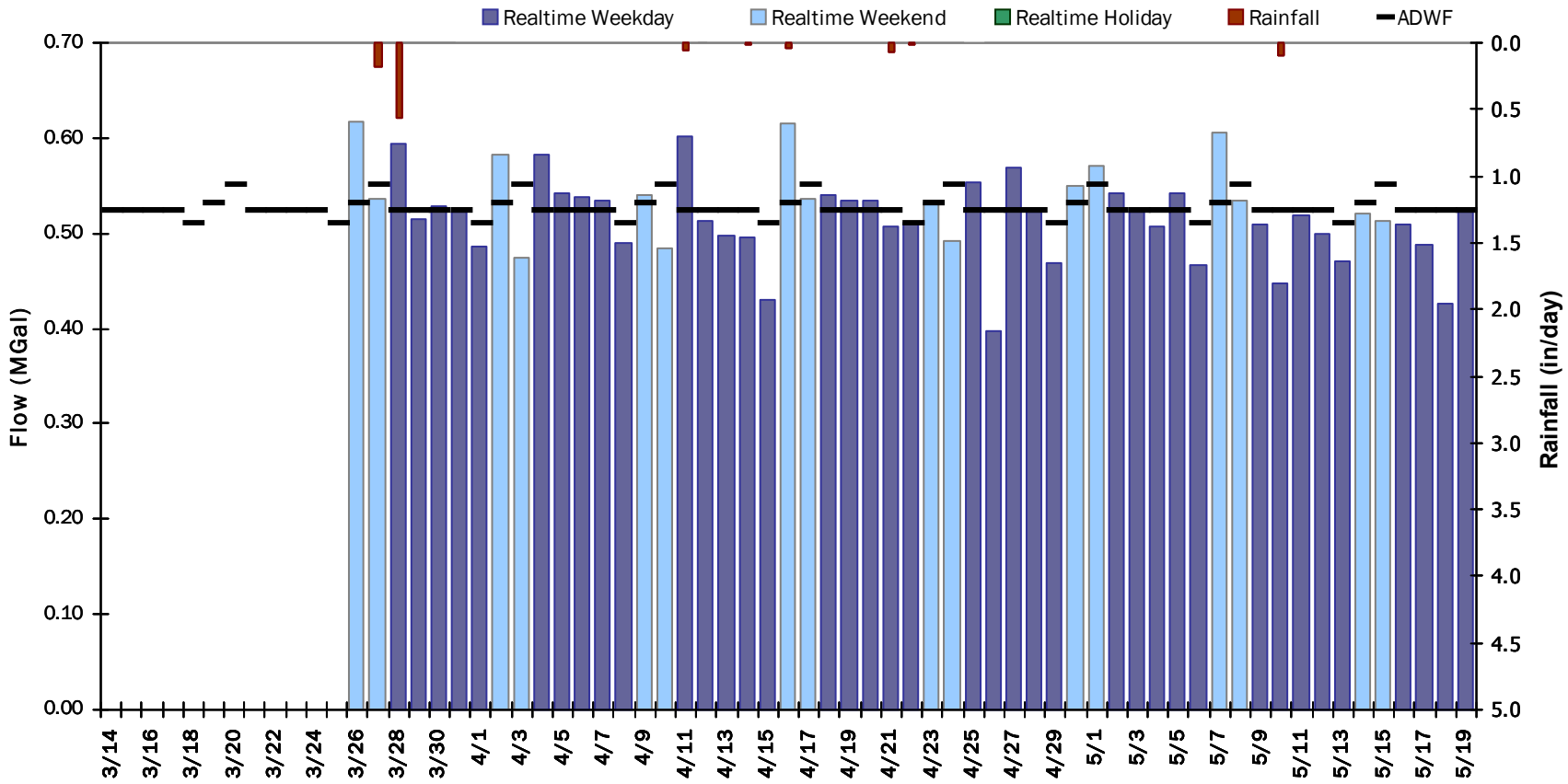


SITE 11

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.518 MGal Peak Daily Flow: 0.618 MGal Min Daily Flow: 0.355 MGal

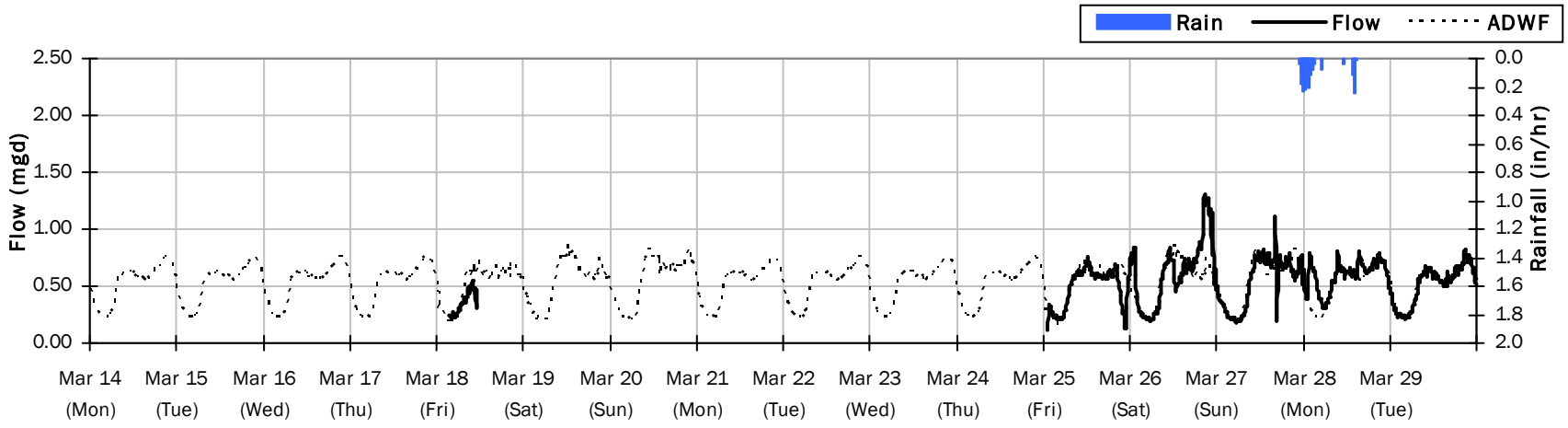
Total Rainfall: 1.04 inches

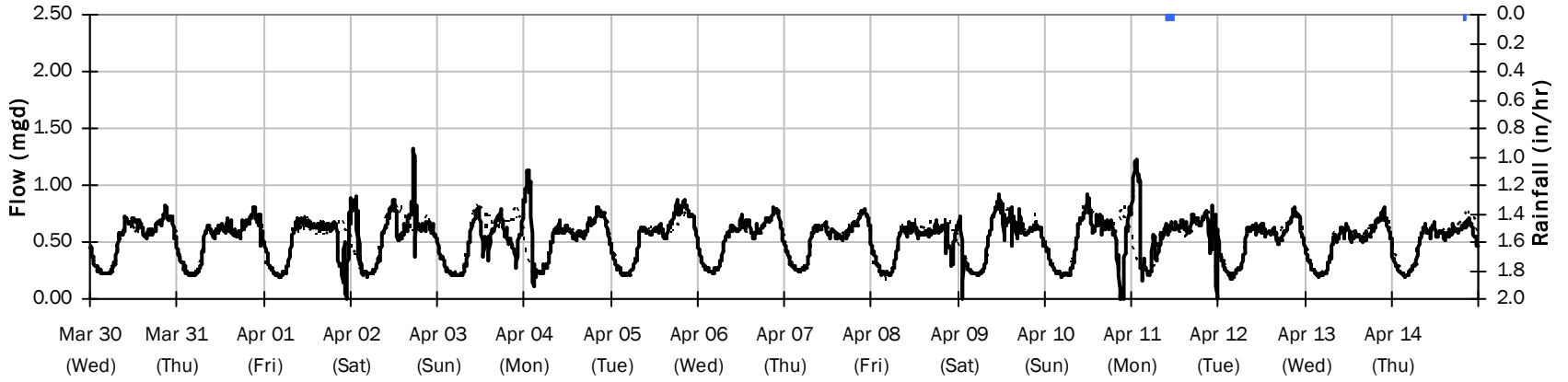


SITE 11

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.82 inches Period Avg Flow: 0.529 mgd Period Peak Flow: 1.315 mgd Period Min Flow: 0.000 mgd

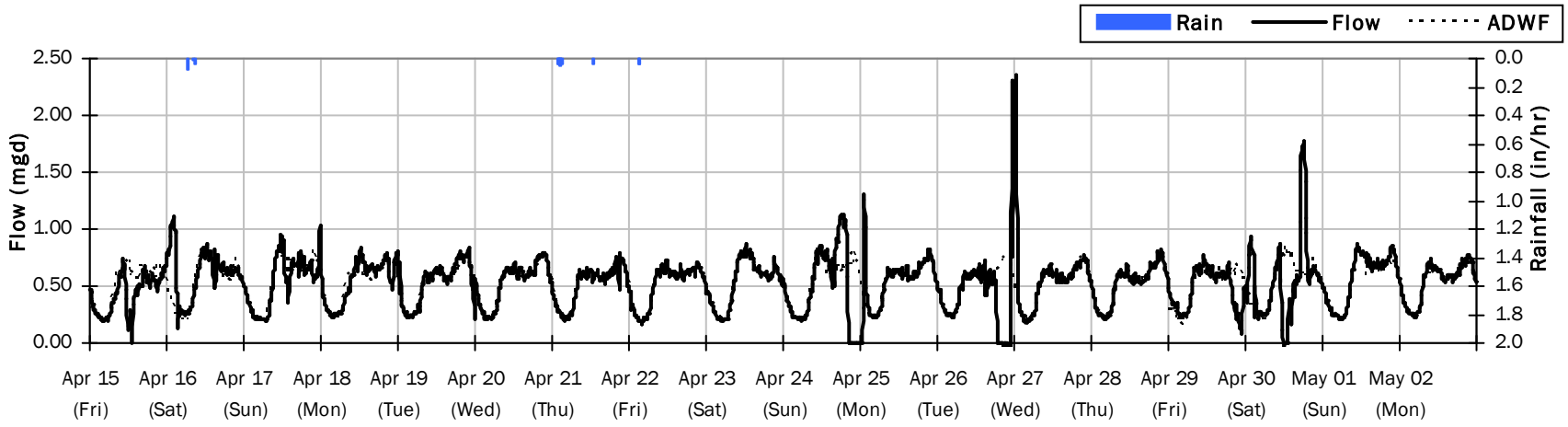


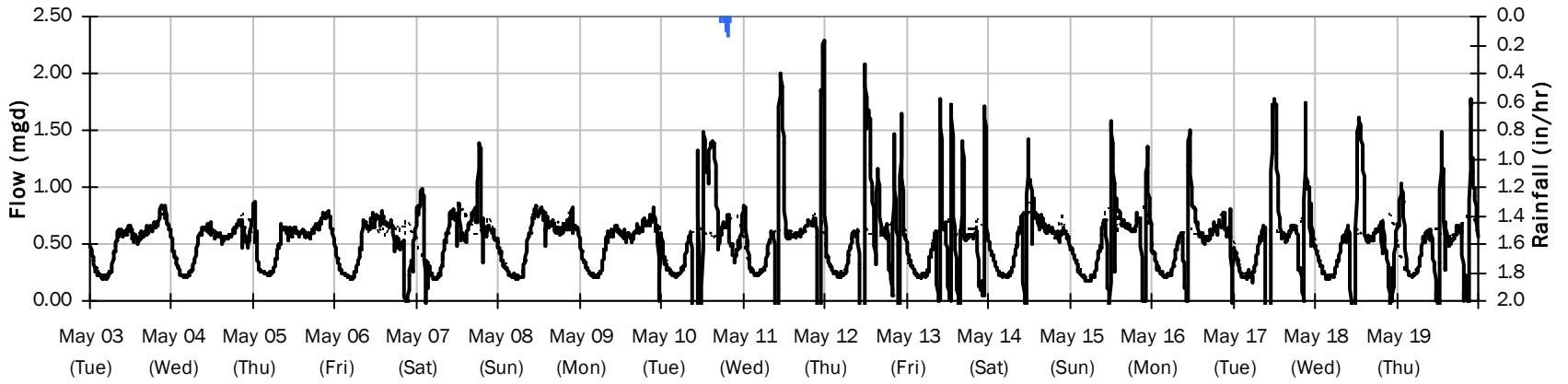


SITE 11

Flow Summary: 4/15/2022 to 5/19/2022

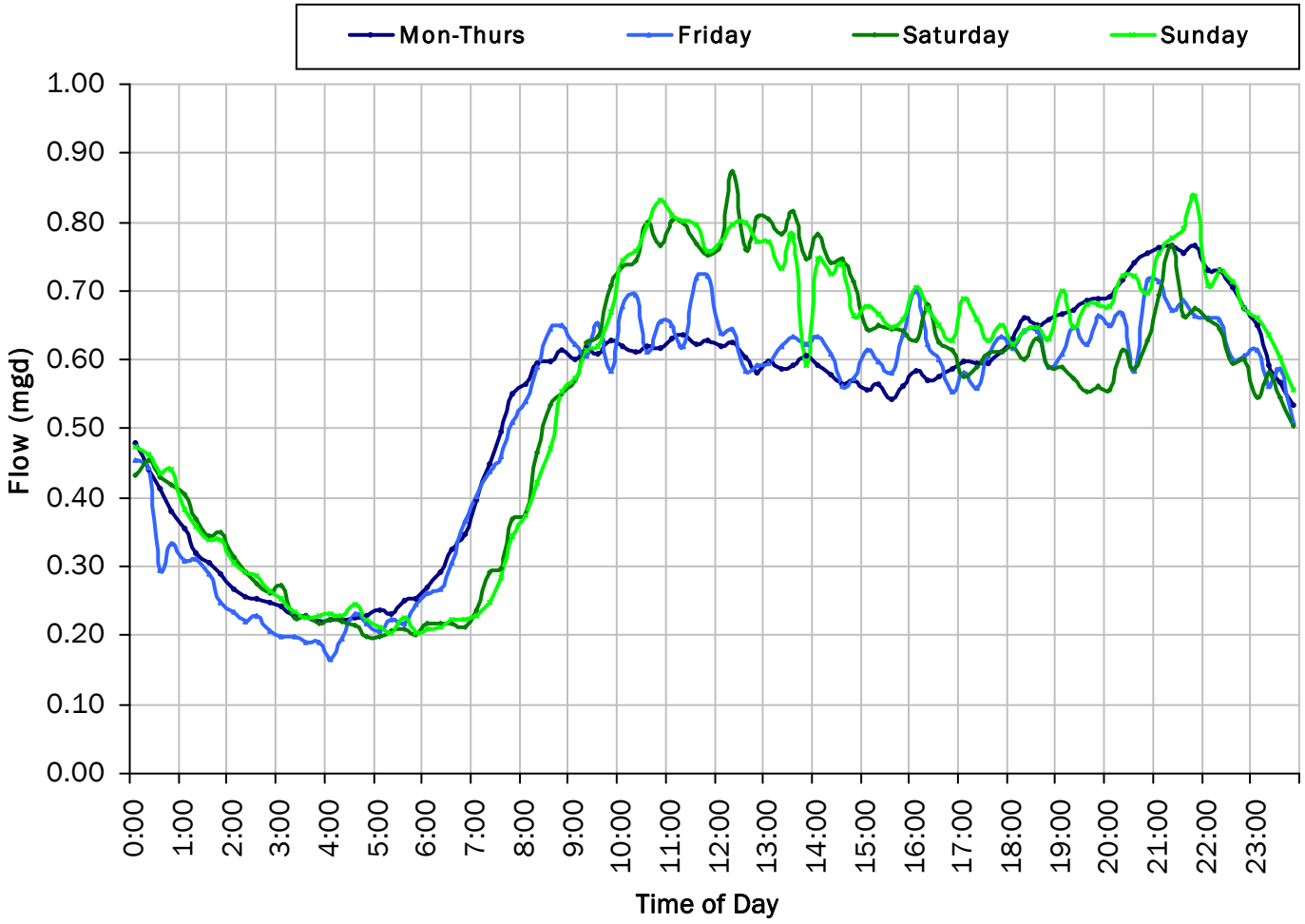
Period Rainfall: 0.22 inches Period Avg Flow: 0.515 mgd Period Peak Flow: 2.333 mgd Period Min Flow: -1.936 mgd





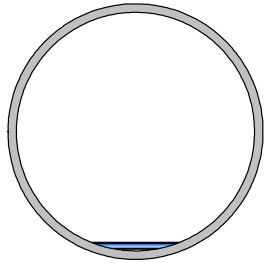
SITE 11

Average Dry Weather Flow Hydrographs



ADWF:

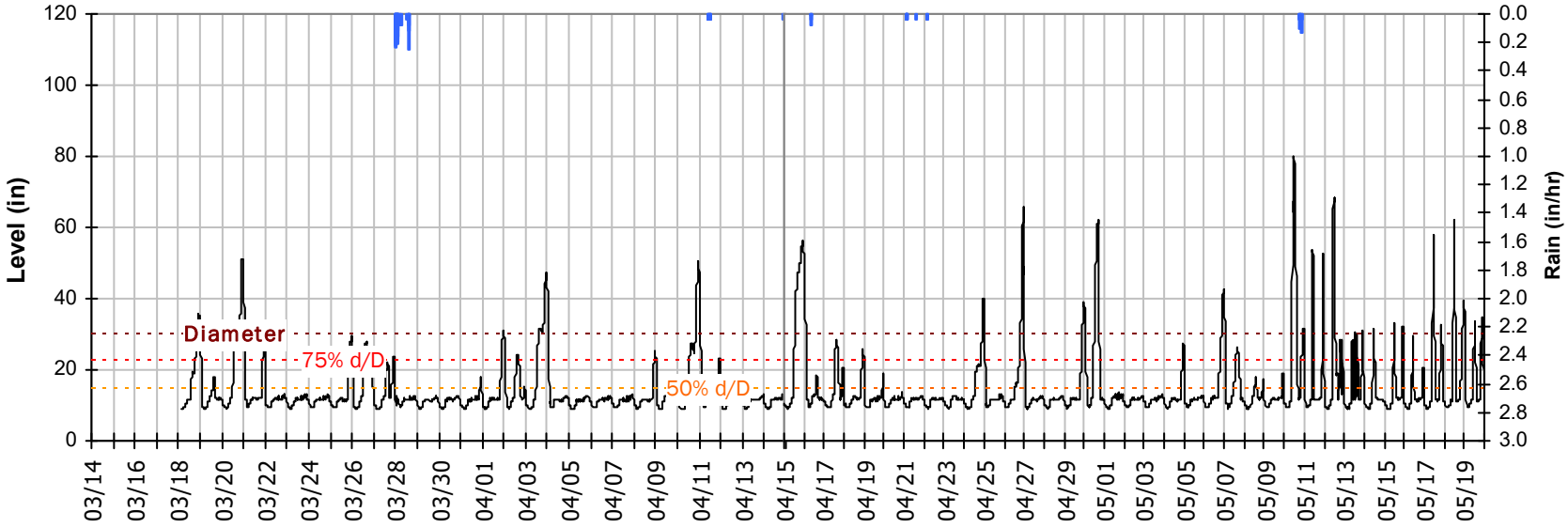
0.527 *mgd*

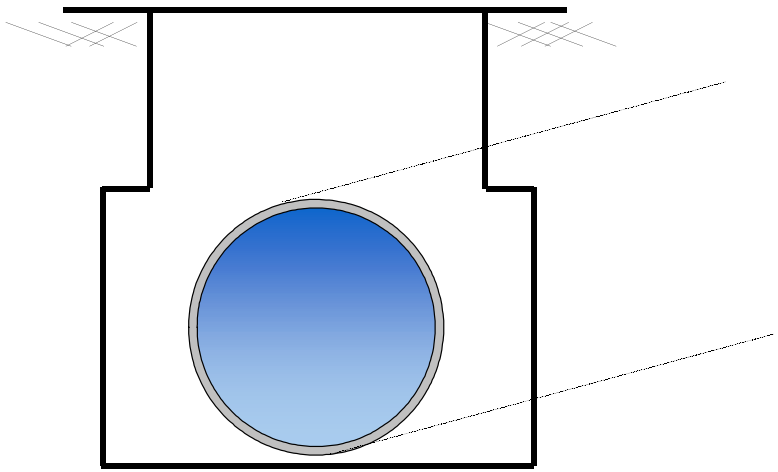


SITE 11

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period



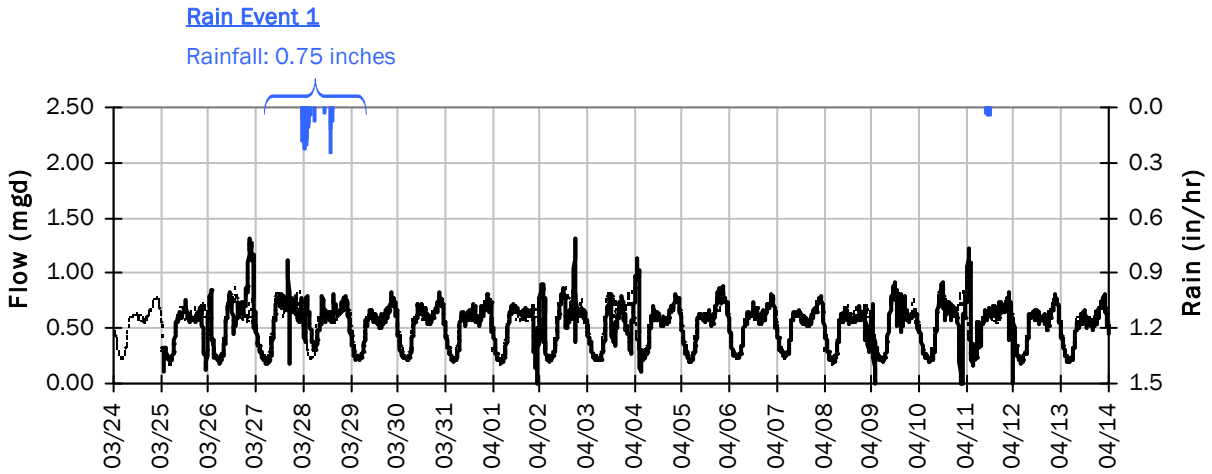


Pipe Diameter:	30	*inches*
Peak Measured Level:	80.1	*inches*
Peak d/D Ratio:	2.67	

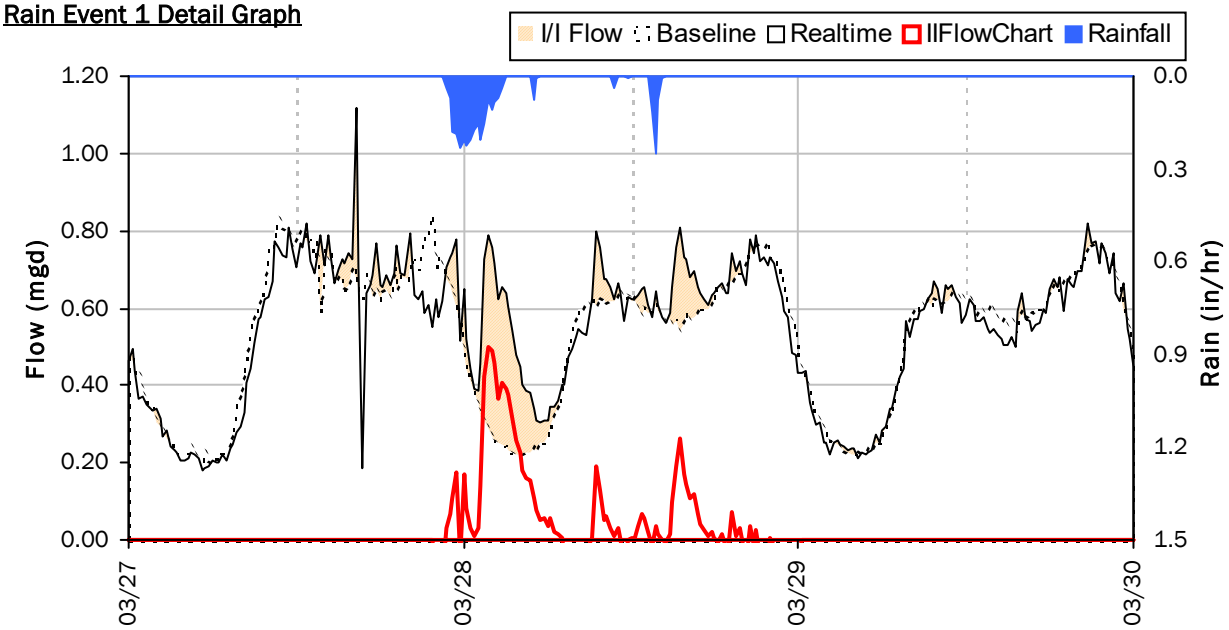
Surcharged 50.1 inches over crown

SITE 11
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



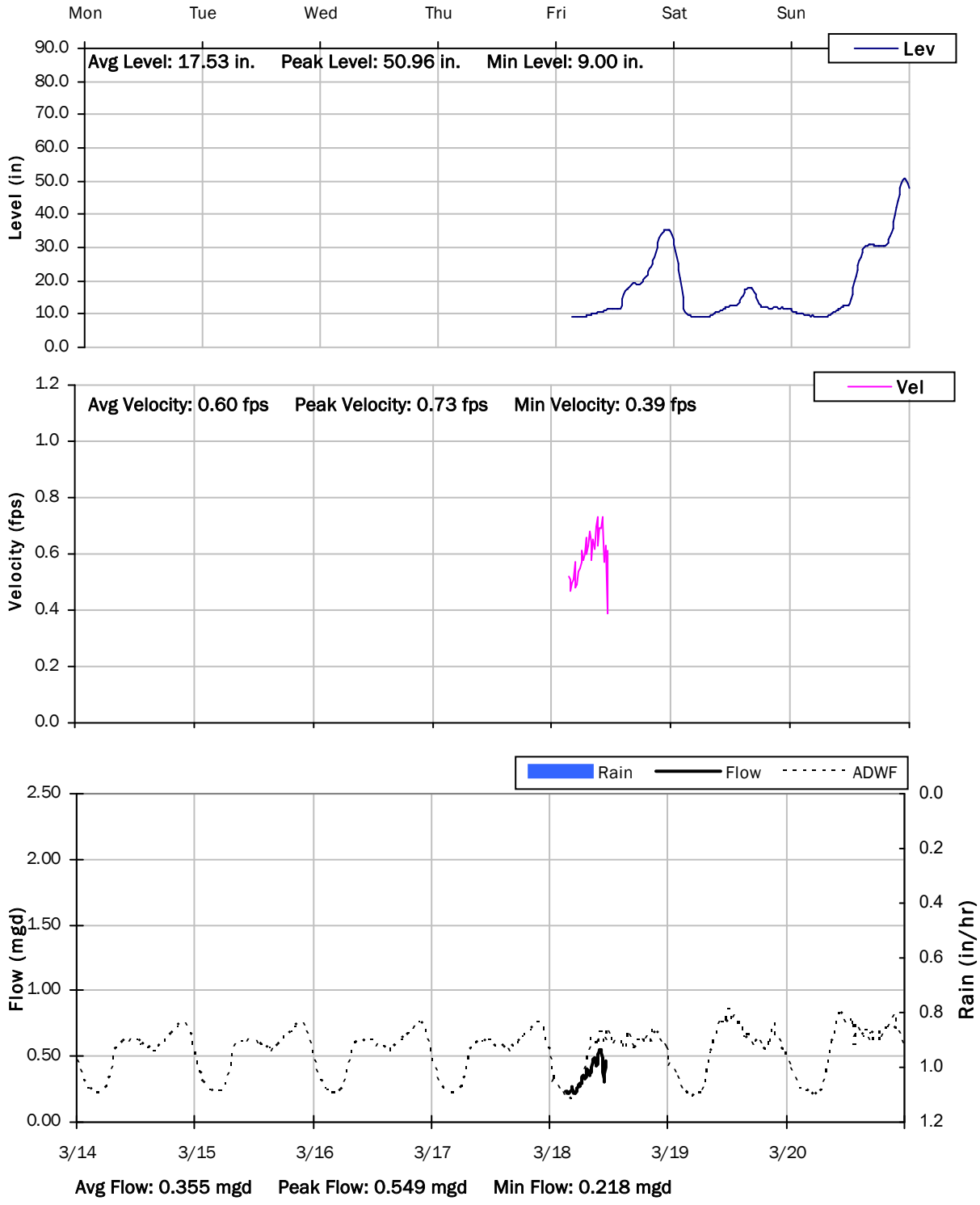
Storm Event I/I Analysis (Rain = 0.75 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.808 *mgd*	**Peak I/I Rate:**	0.501 *mgd*
PF:	1.53	**Total I/I:**	71,000 *gallons*
Peak Level:	23.87 *in*		
d/D Ratio:	0.80		

SITE 11

Weekly Level, Velocity and Flow Hydrographs

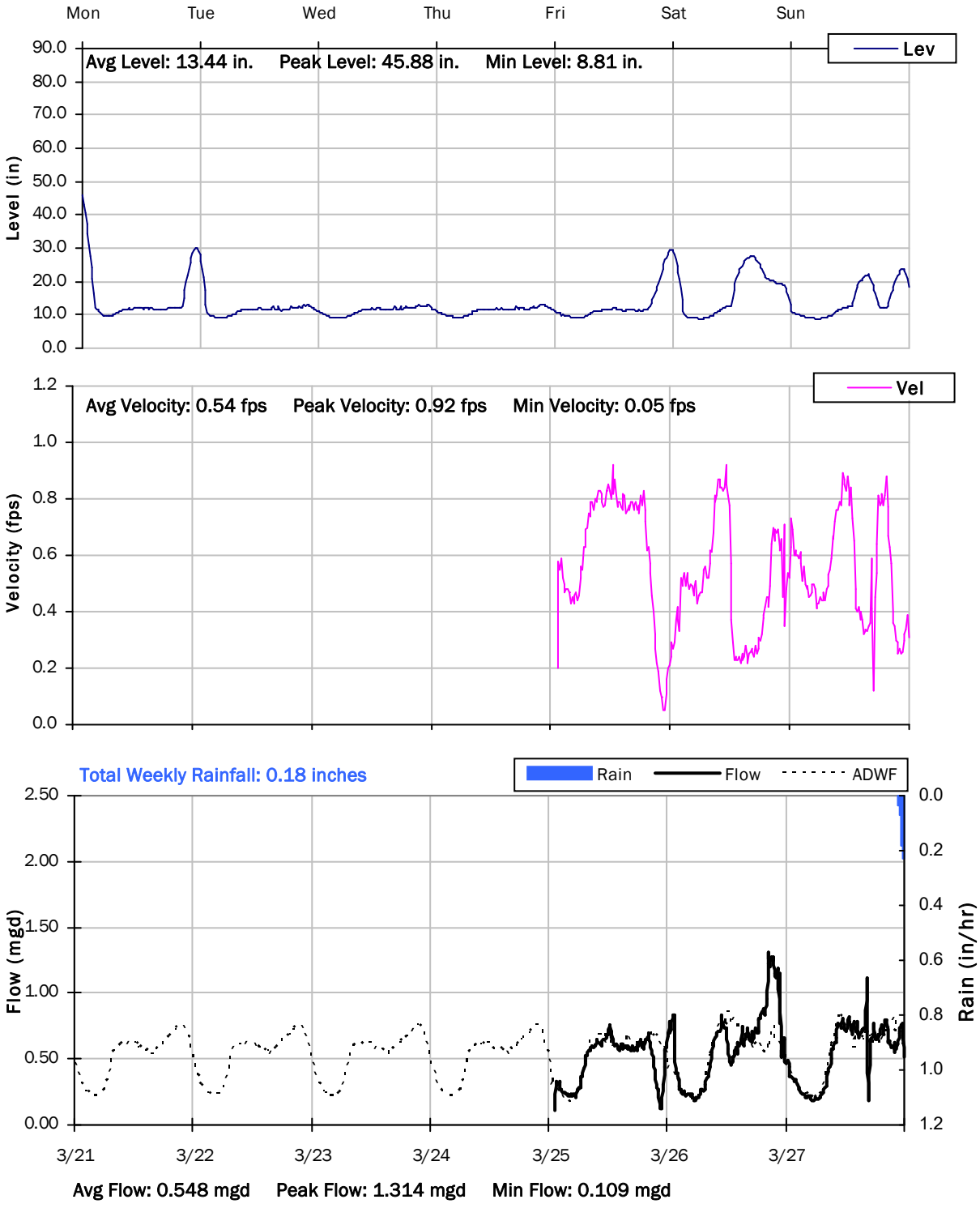
3/14/2022 to 3/21/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

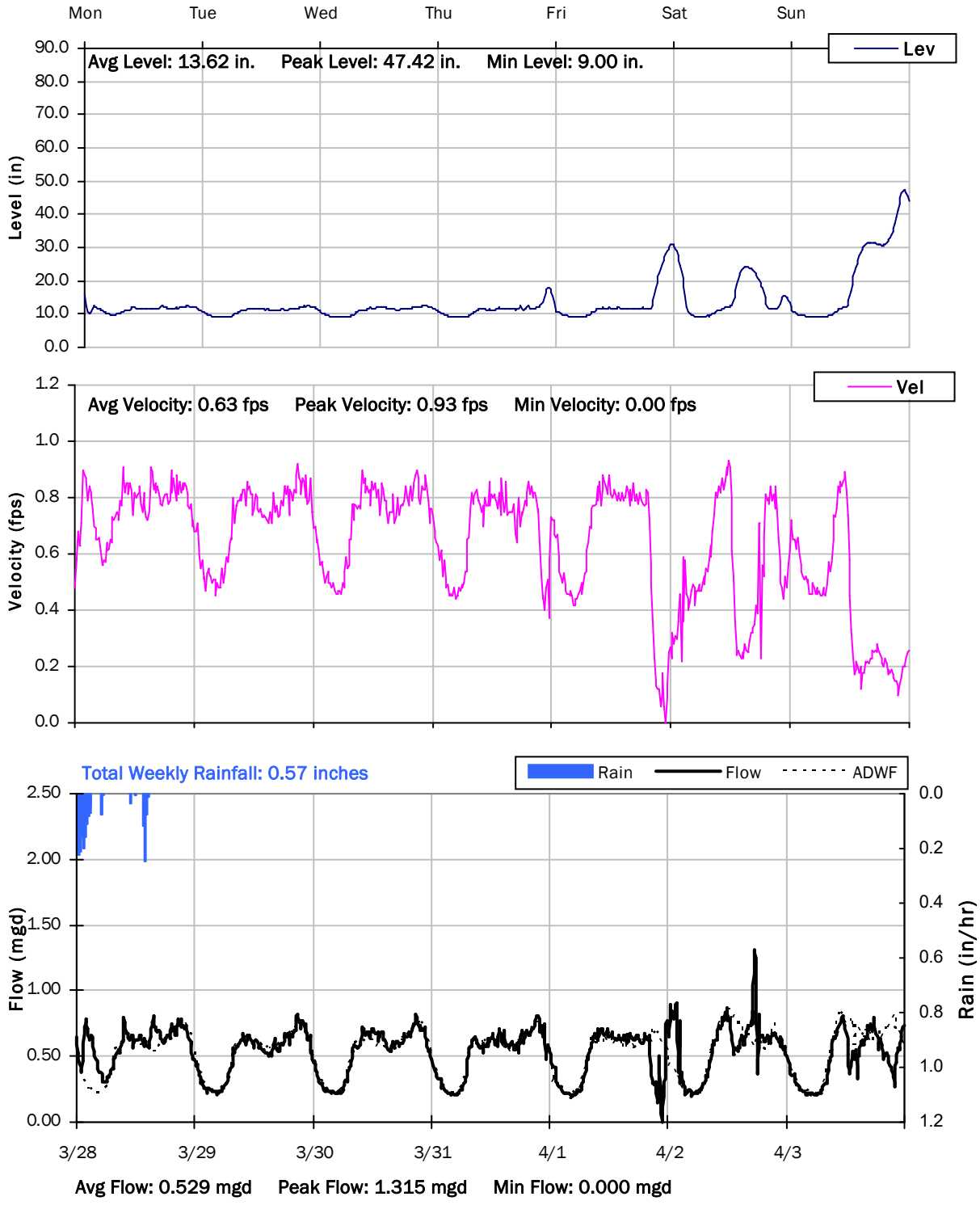
3/21/2022 to 3/28/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

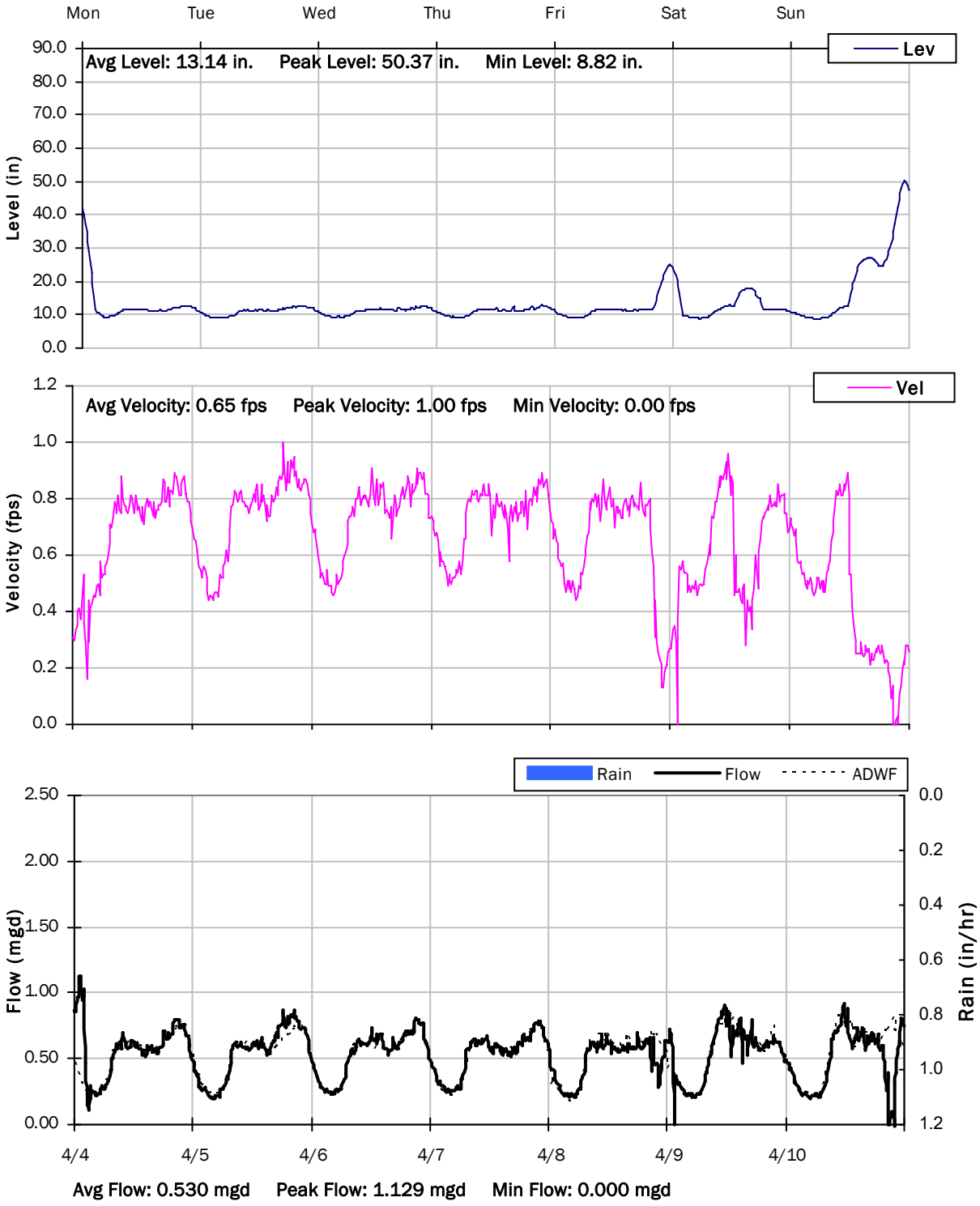
3/28/2022 to 4/4/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

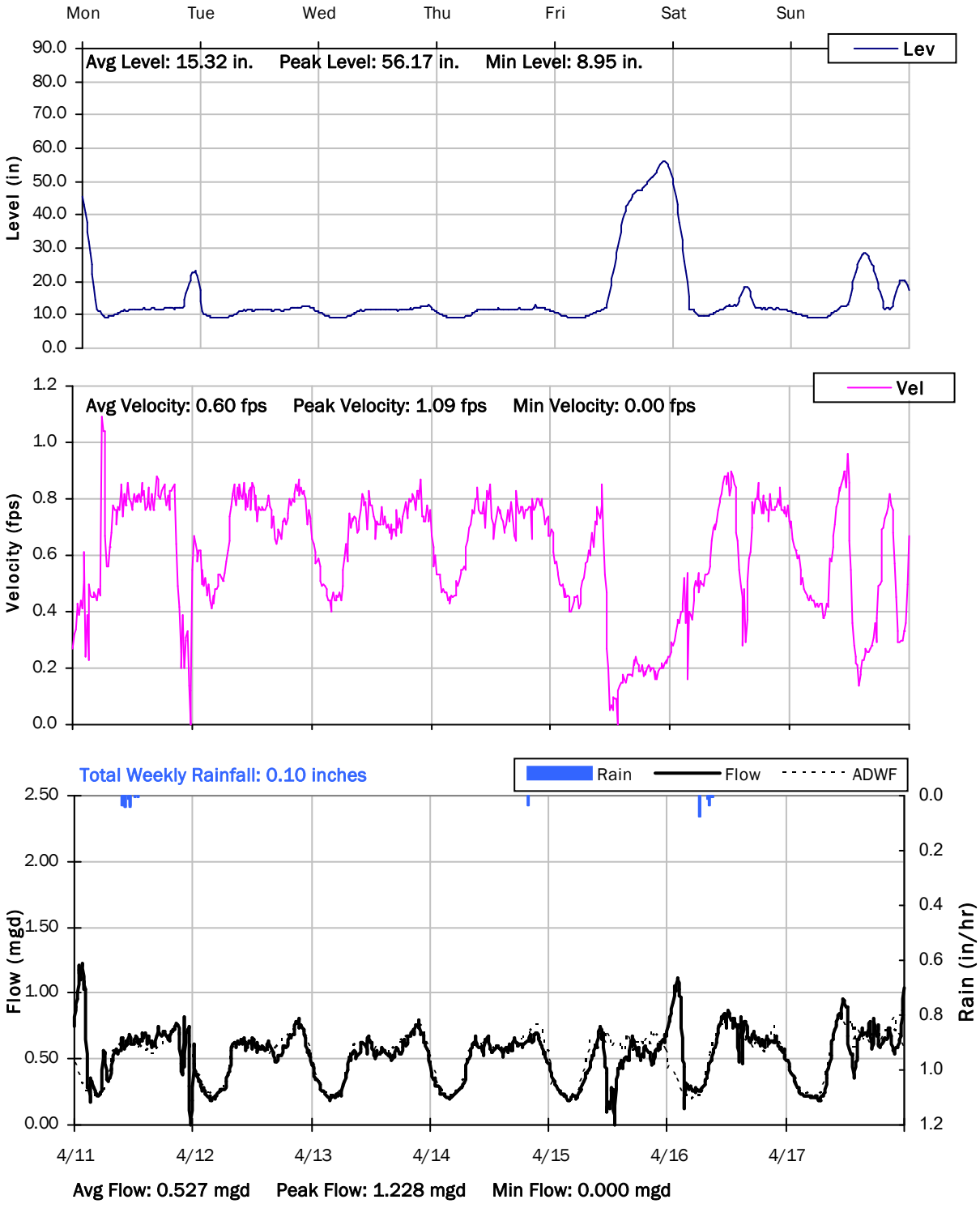
4/4/2022 to 4/11/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

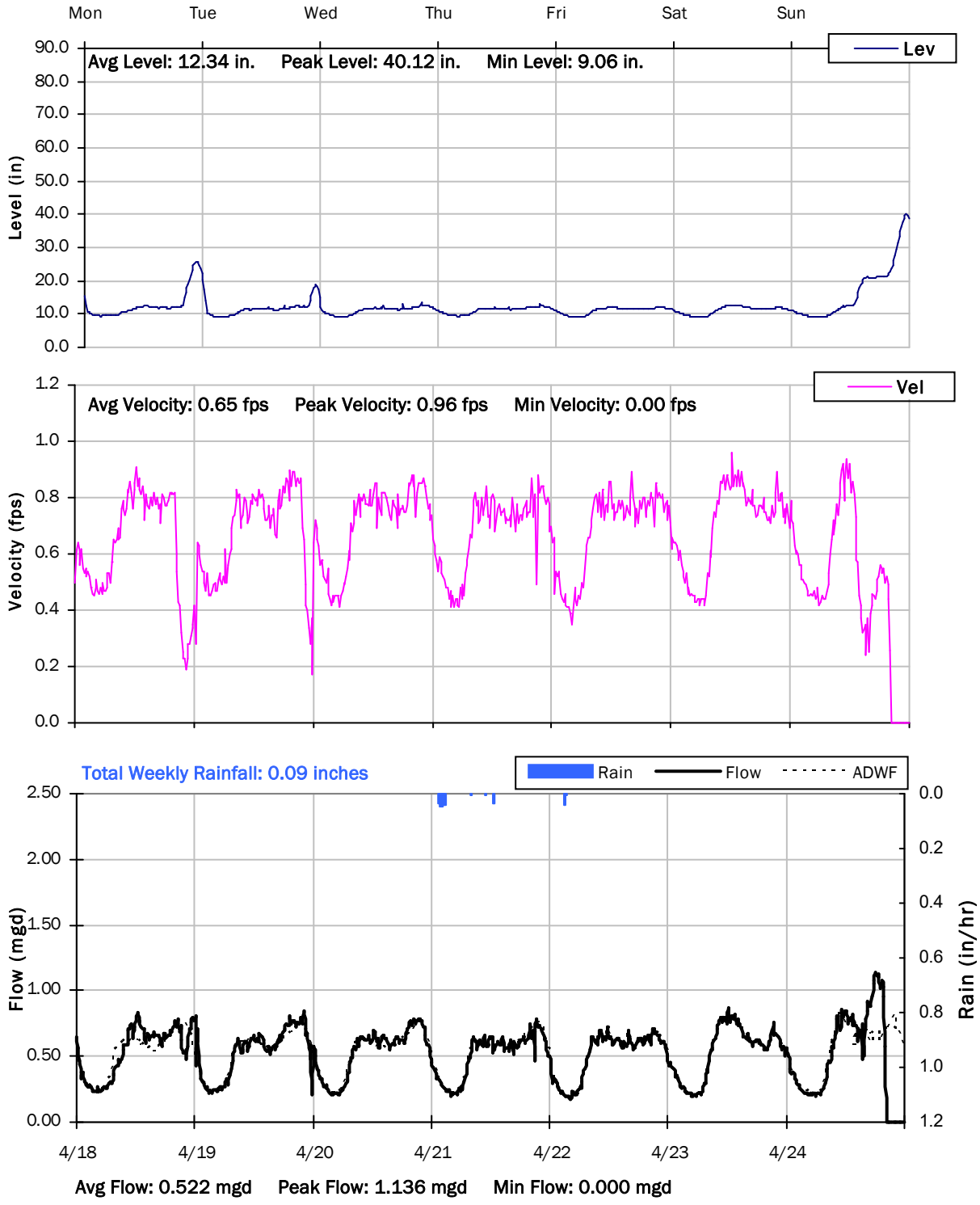
4/11/2022 to 4/18/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

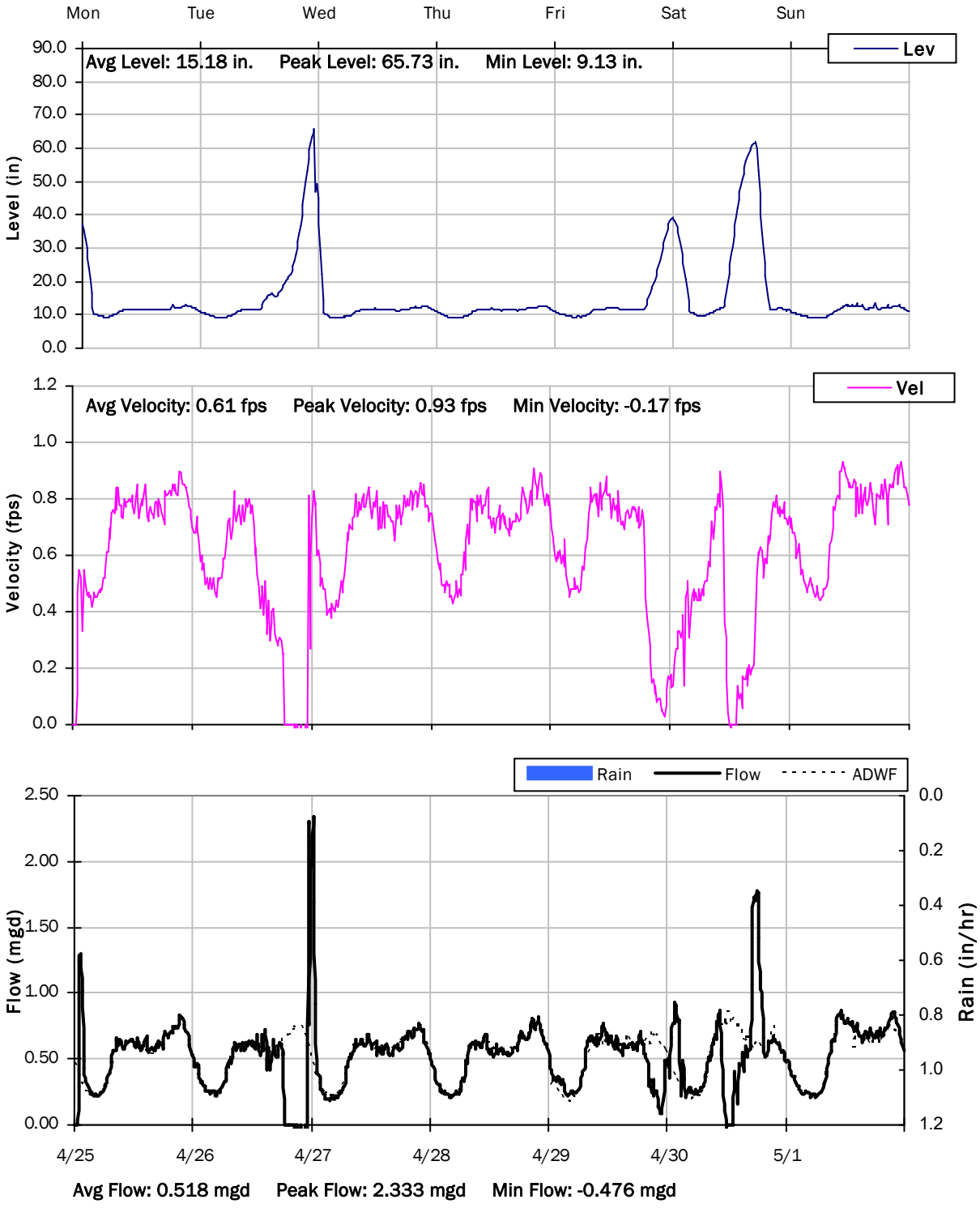
4/18/2022 to 4/25/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

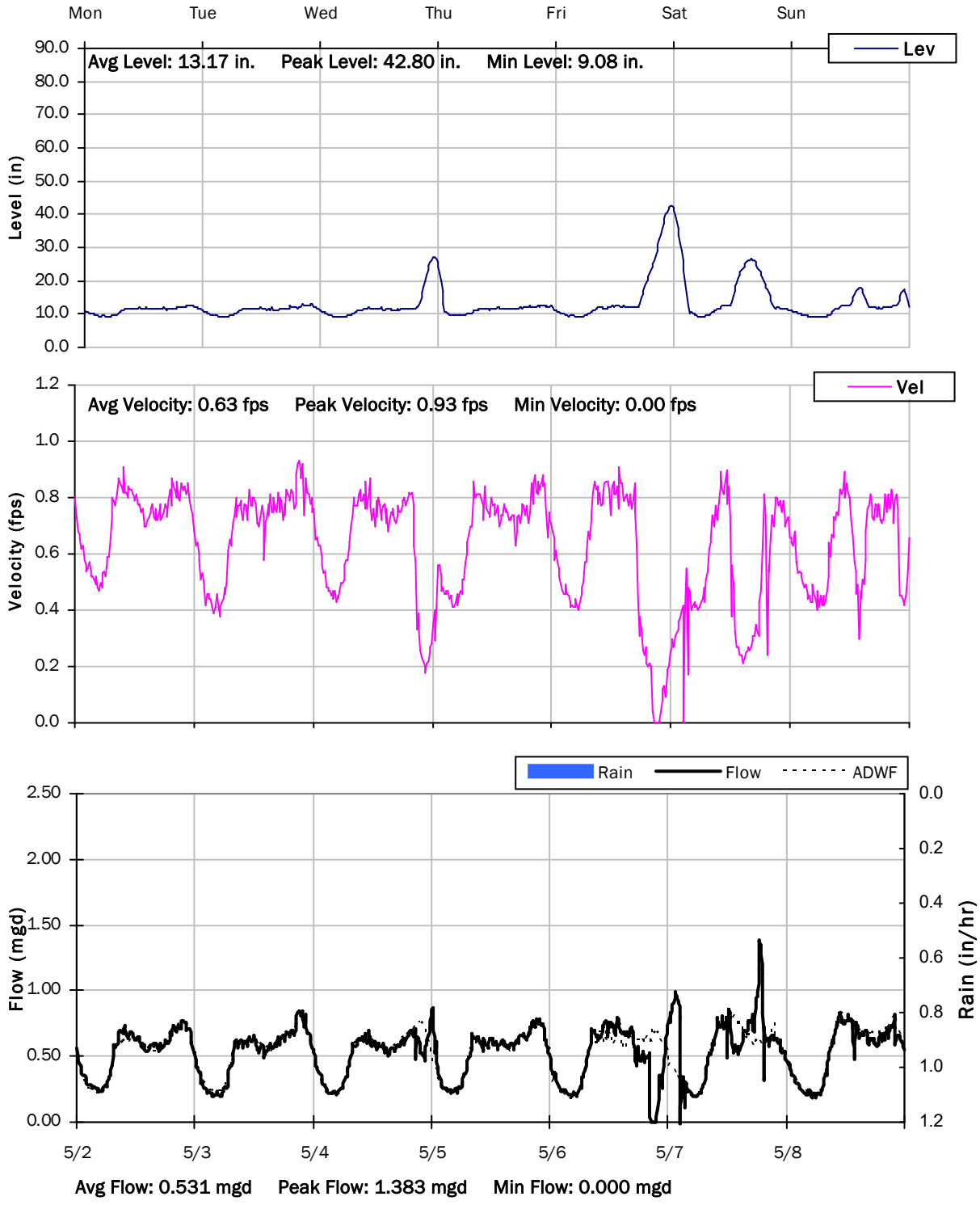
4/25/2022 to 5/2/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

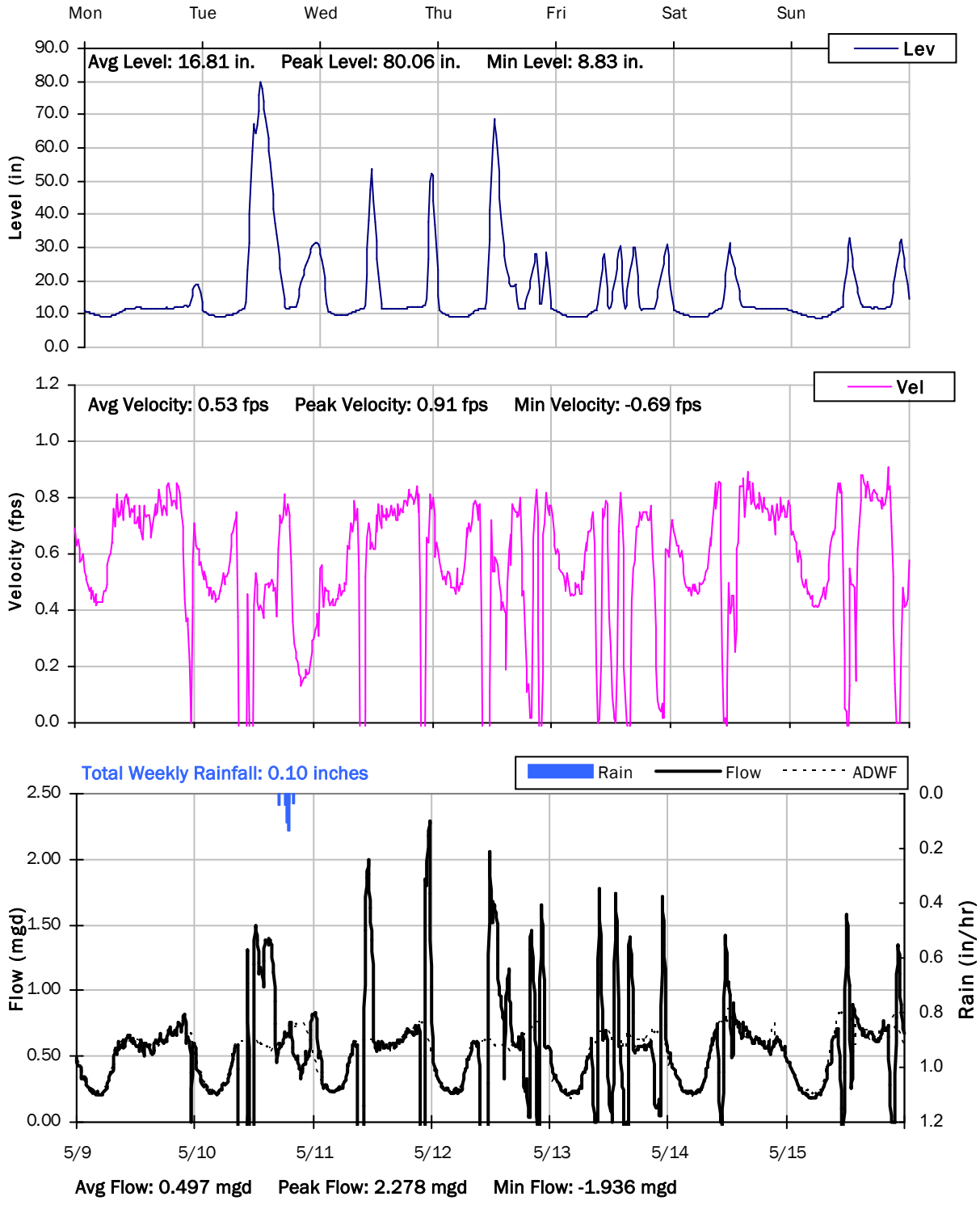
5/2/2022 to 5/9/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

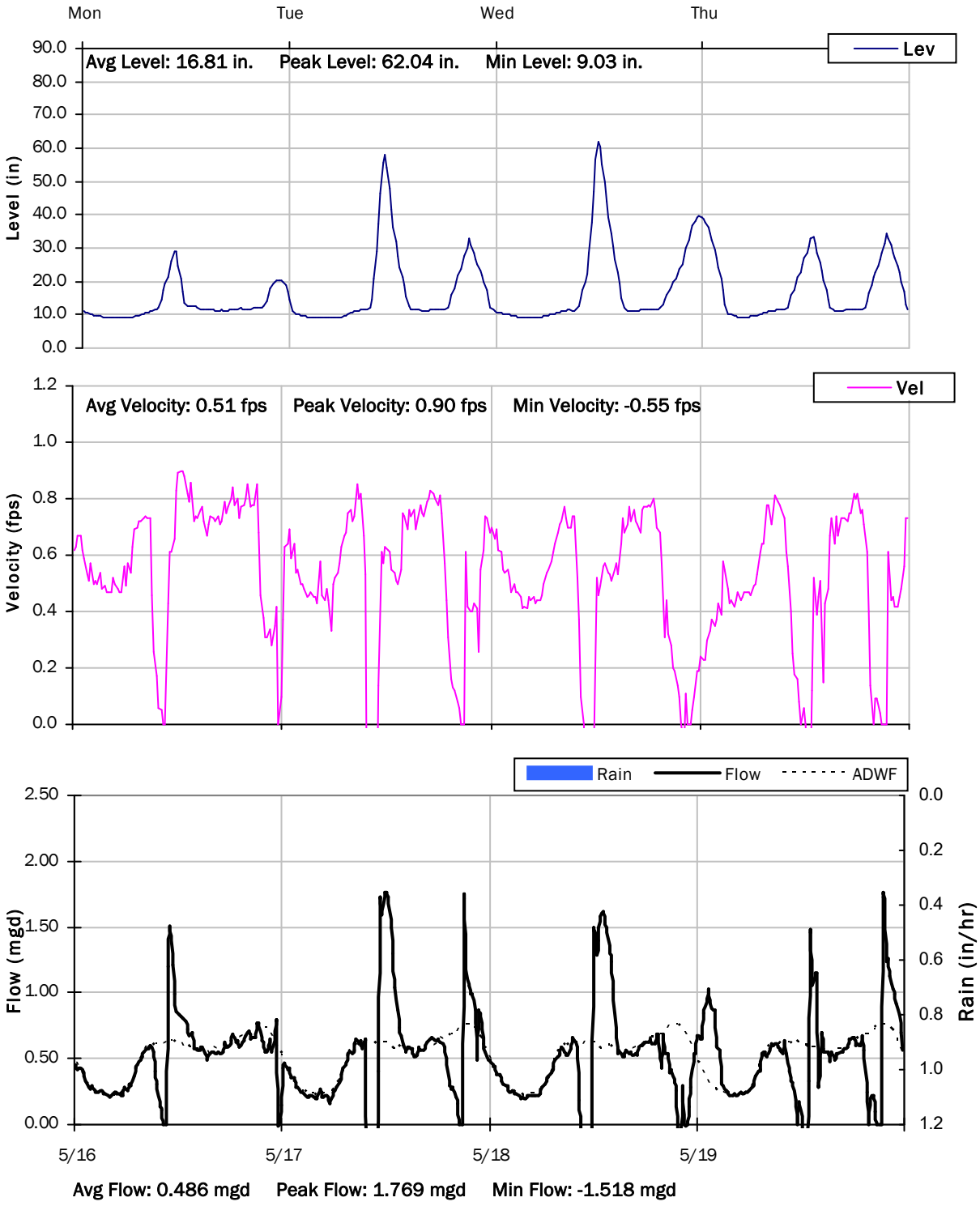
5/9/2022 to 5/16/2022



SITE 11

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 12

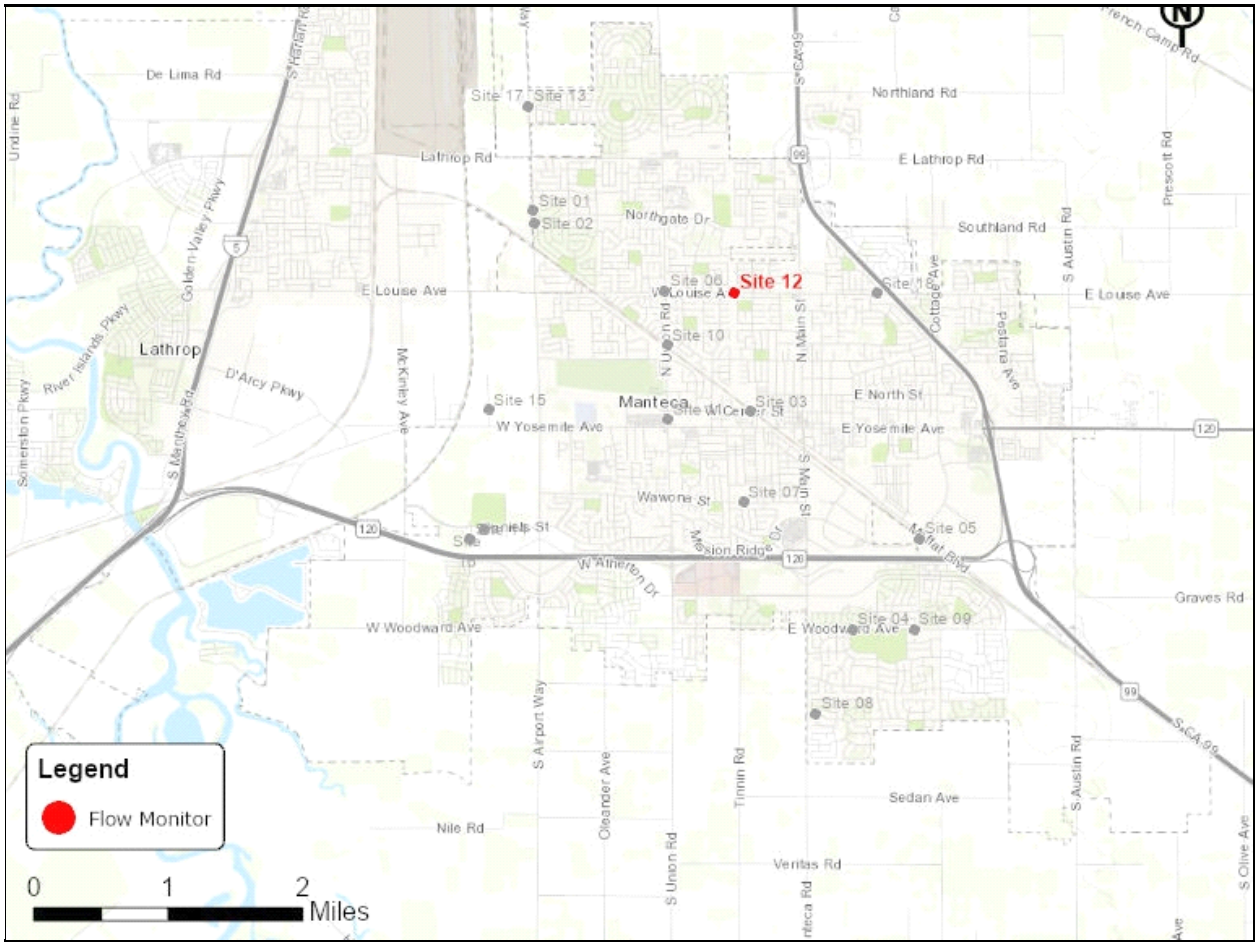
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: W. Louise Avenue West of Lorene Avenue

Data Summary Report



Vicinity Map: Site 12

SITE 12

Additional Site Photos

Effluent Pipe



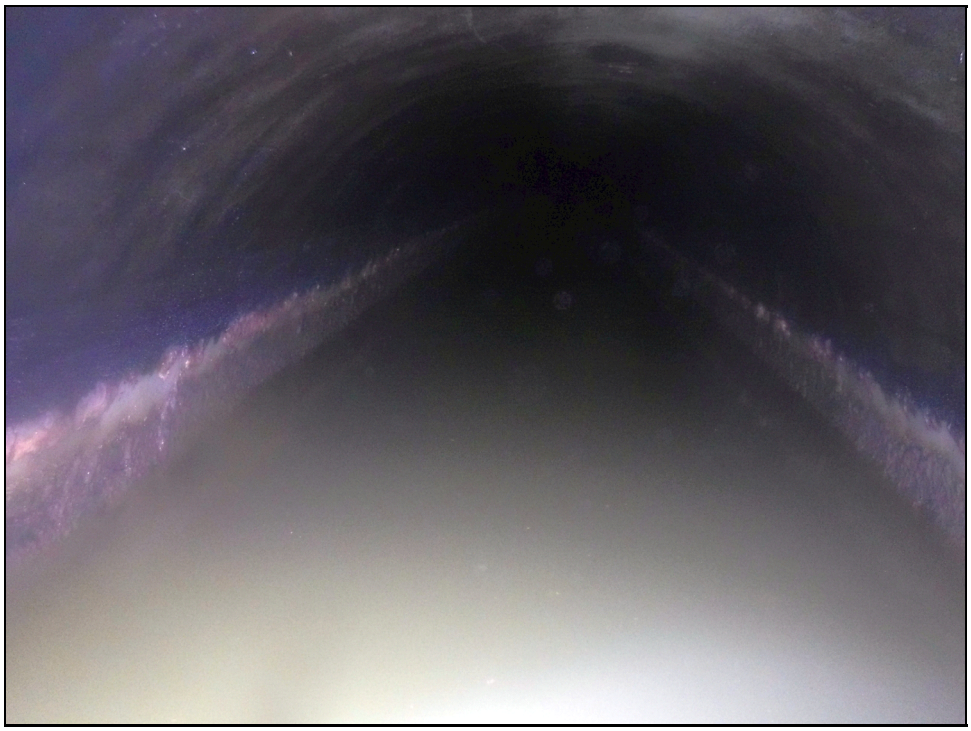
Monitored North Influent Pipe



SITE 12

Additional Site Photos

East Influent Pipe

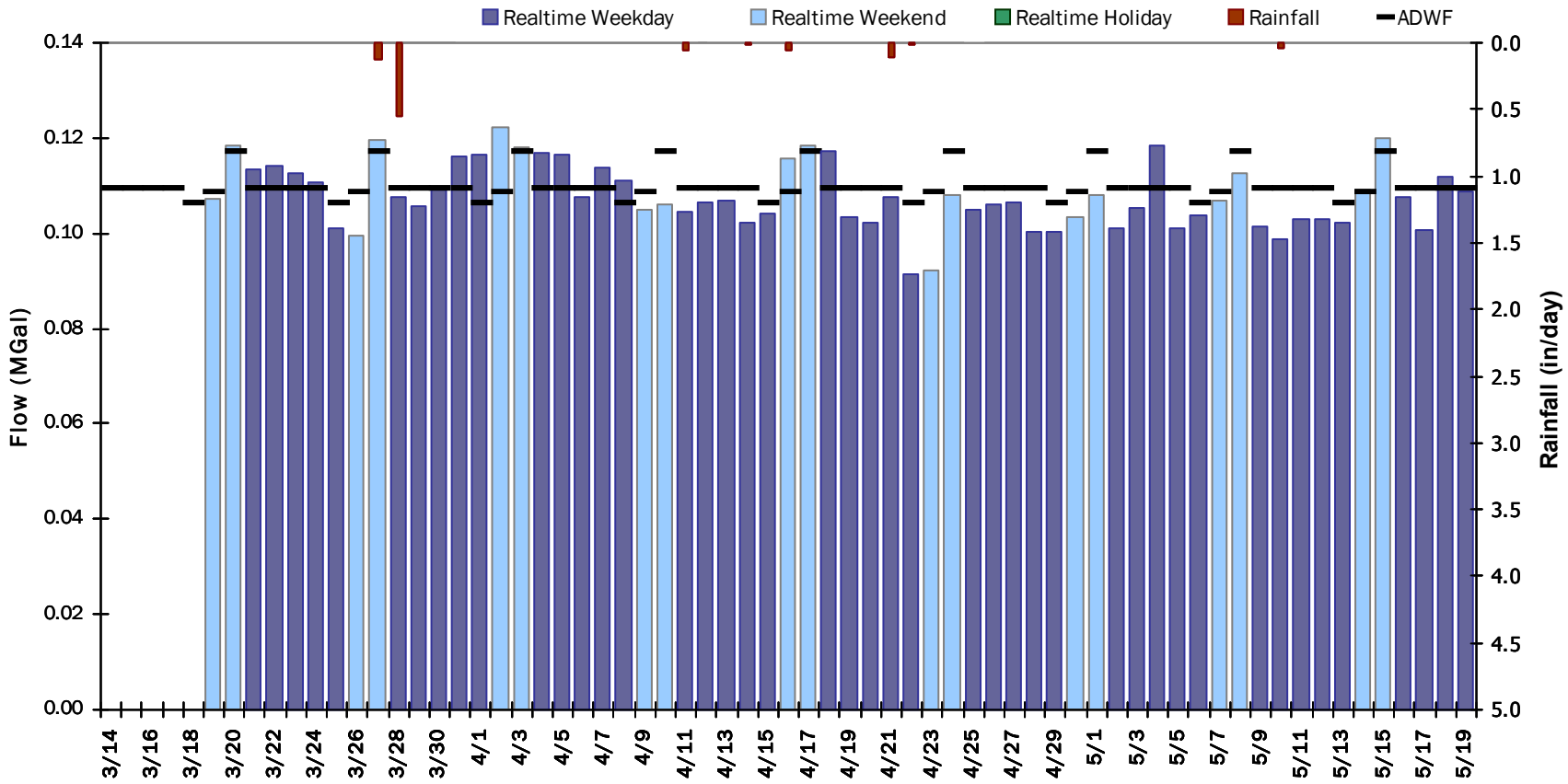


SITE 12

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.108 MGal Peak Daily Flow: 0.122 MGal Min Daily Flow: 0.091 MGal

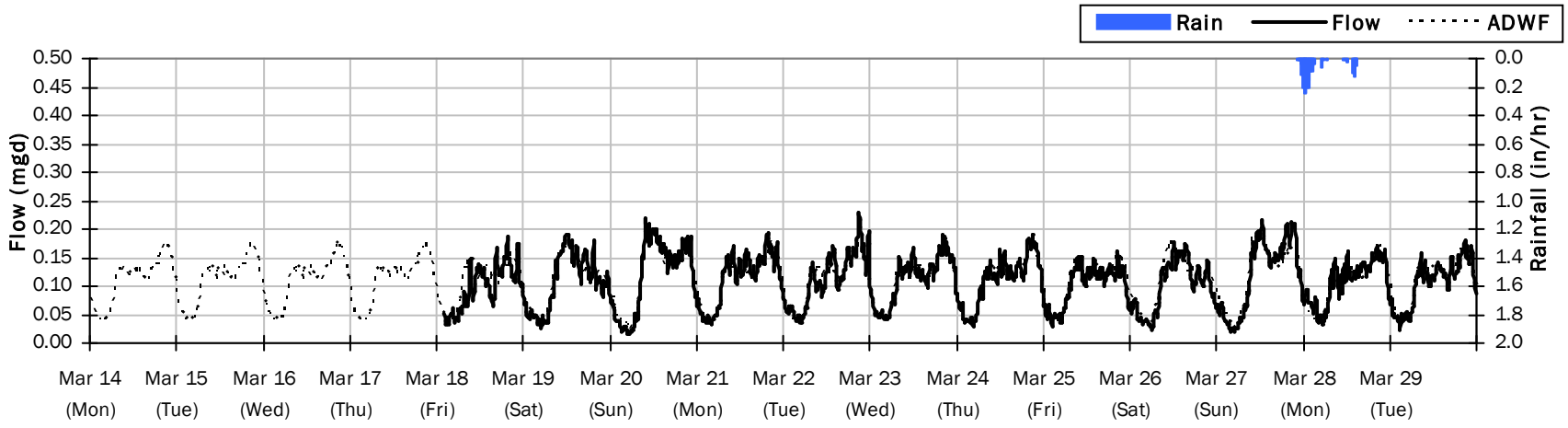
Total Rainfall: 0.97 inches

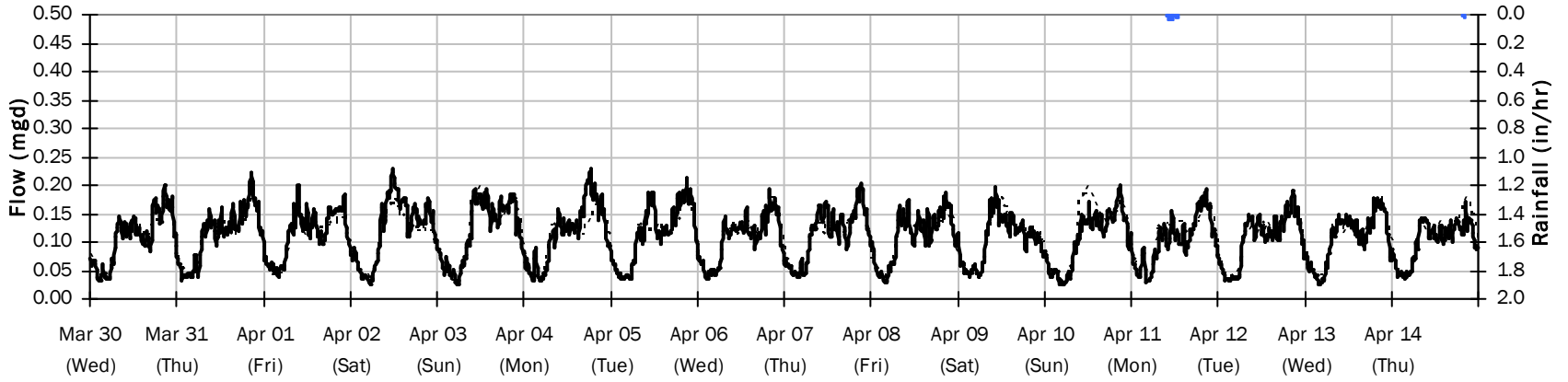


SITE 12

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.74 inches Period Avg Flow: 0.110 mgd Period Peak Flow: 0.230 mgd Period Min Flow: 0.016 mgd

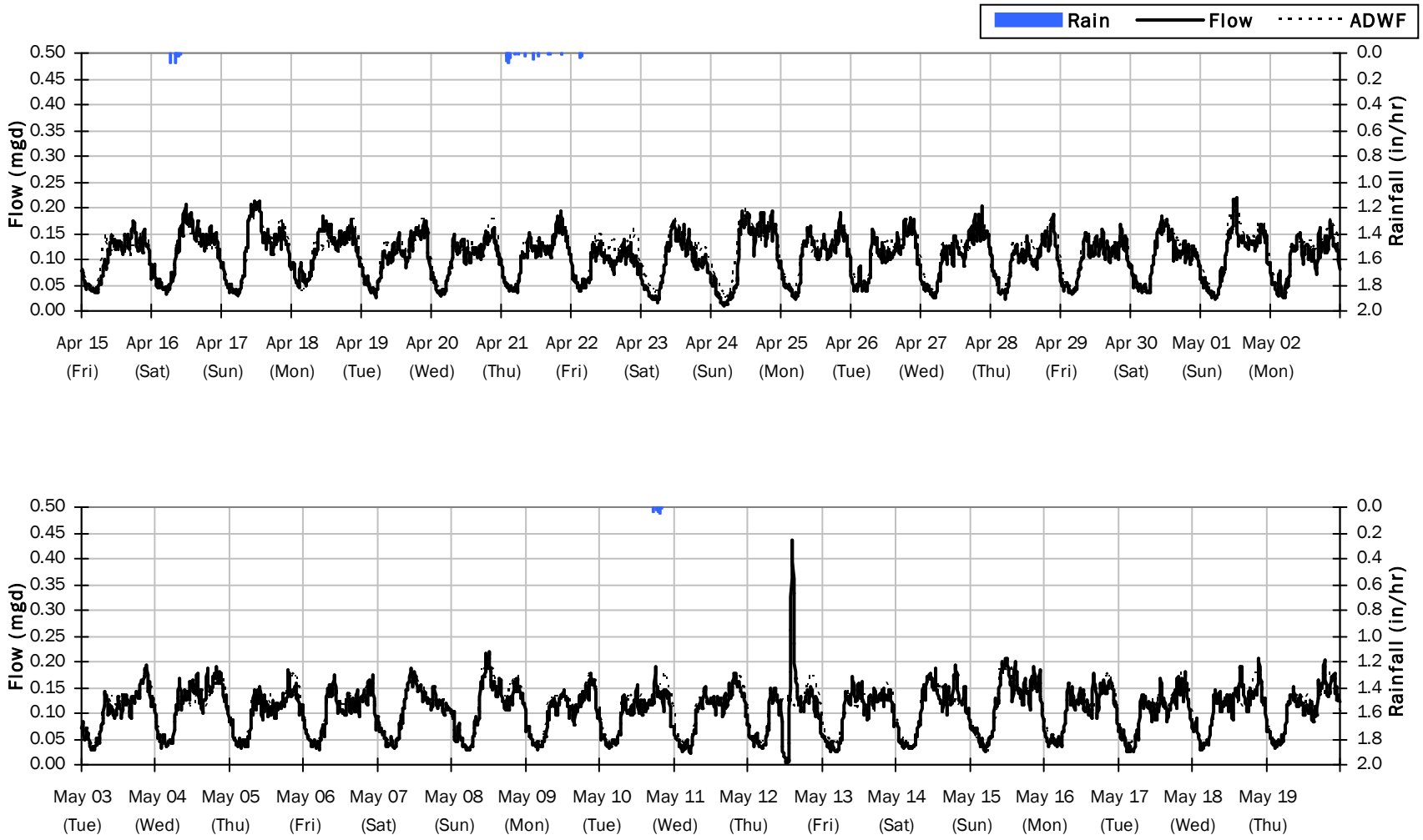




SITE 12

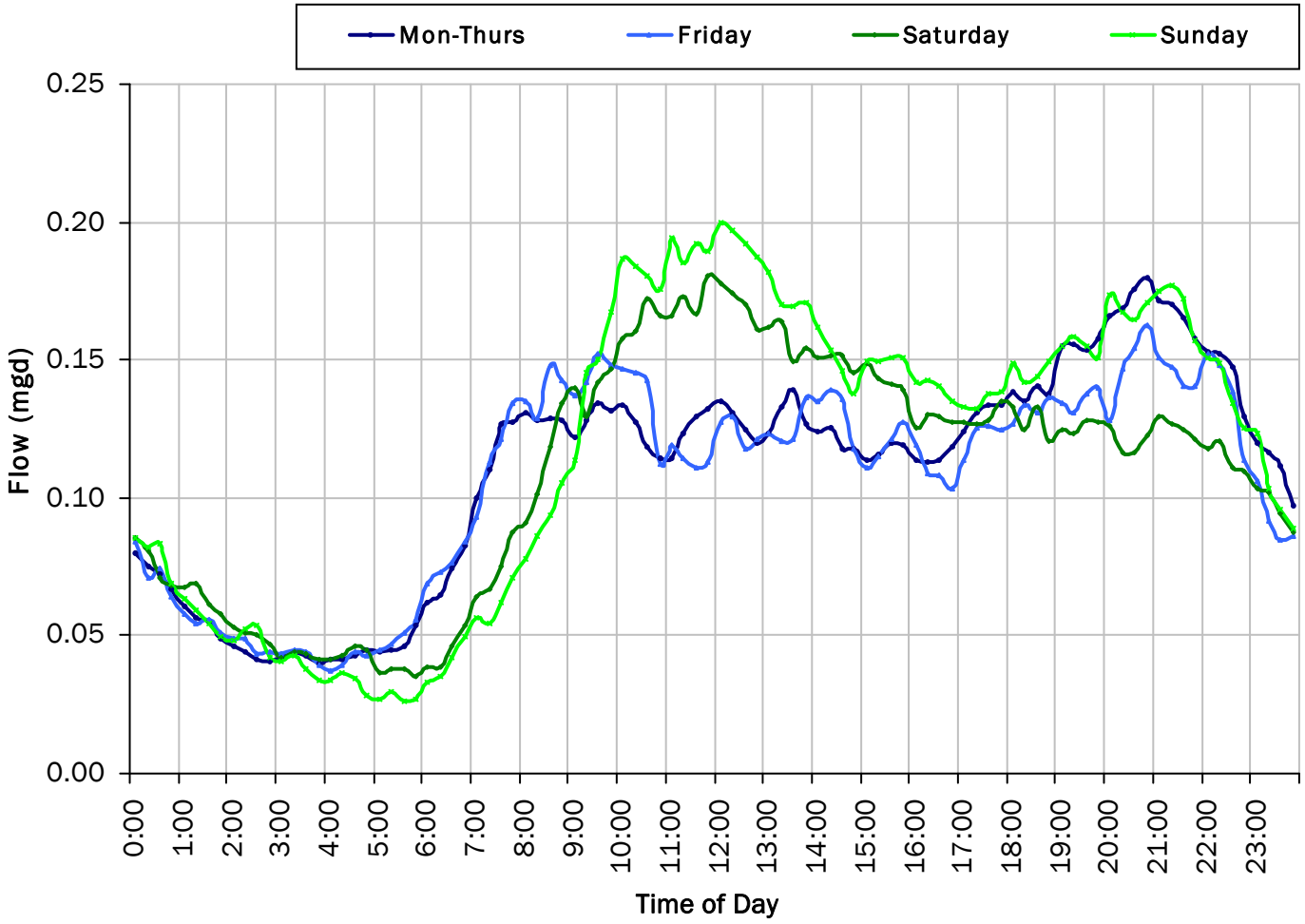
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.23 inches Period Avg Flow: 0.106 mgd Period Peak Flow: 0.436 mgd Period Min Flow: 0.004 mgd



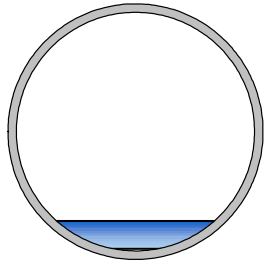
SITE 12

Average Dry Weather Flow Hydrographs



ADWF:

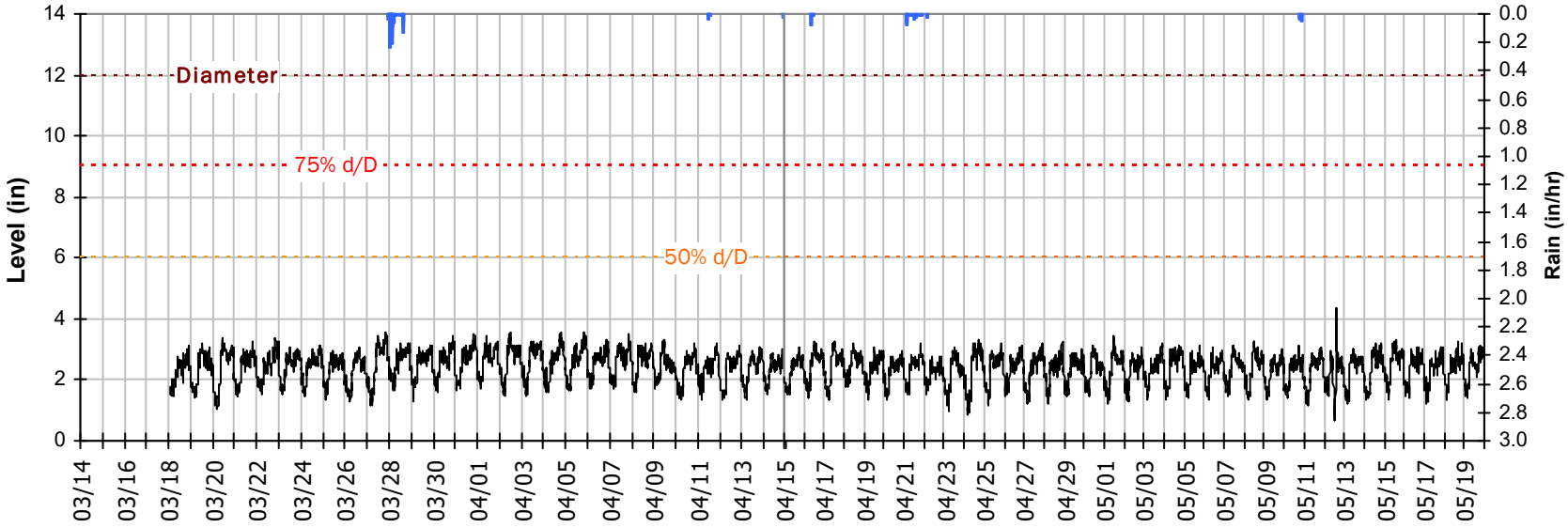
0.110 *mgd*

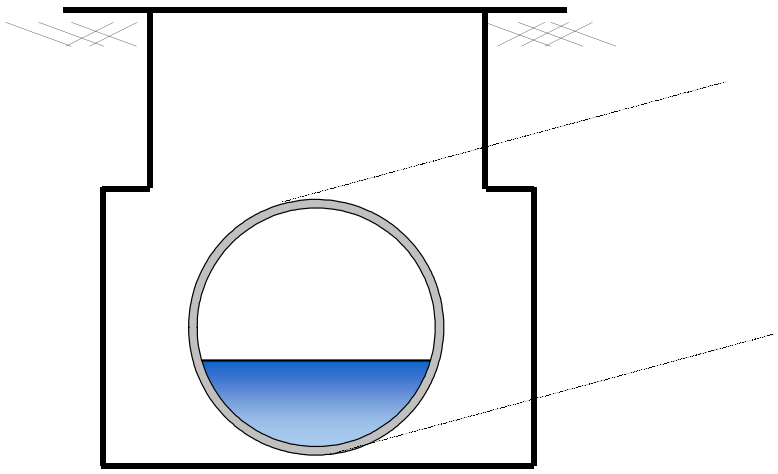


SITE 12

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

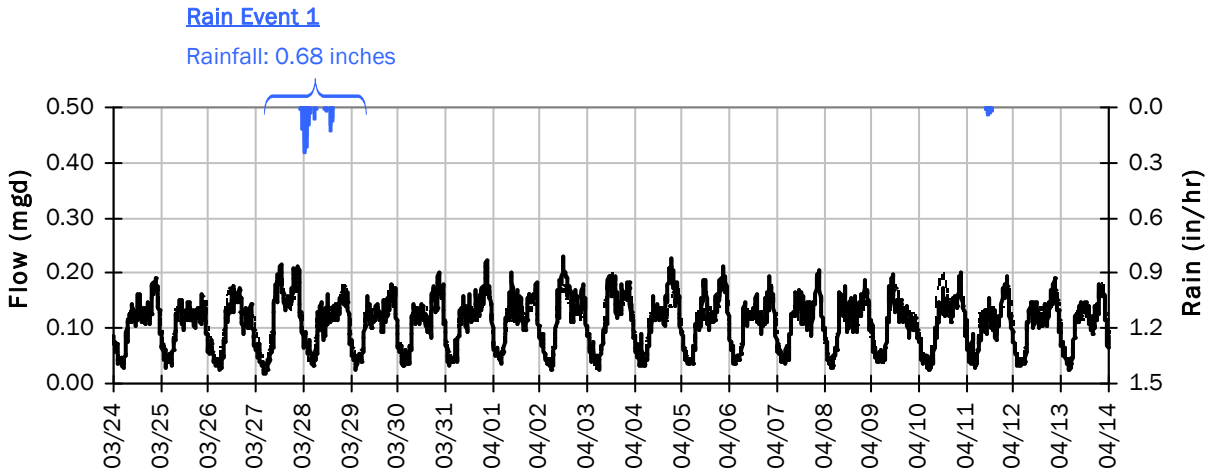




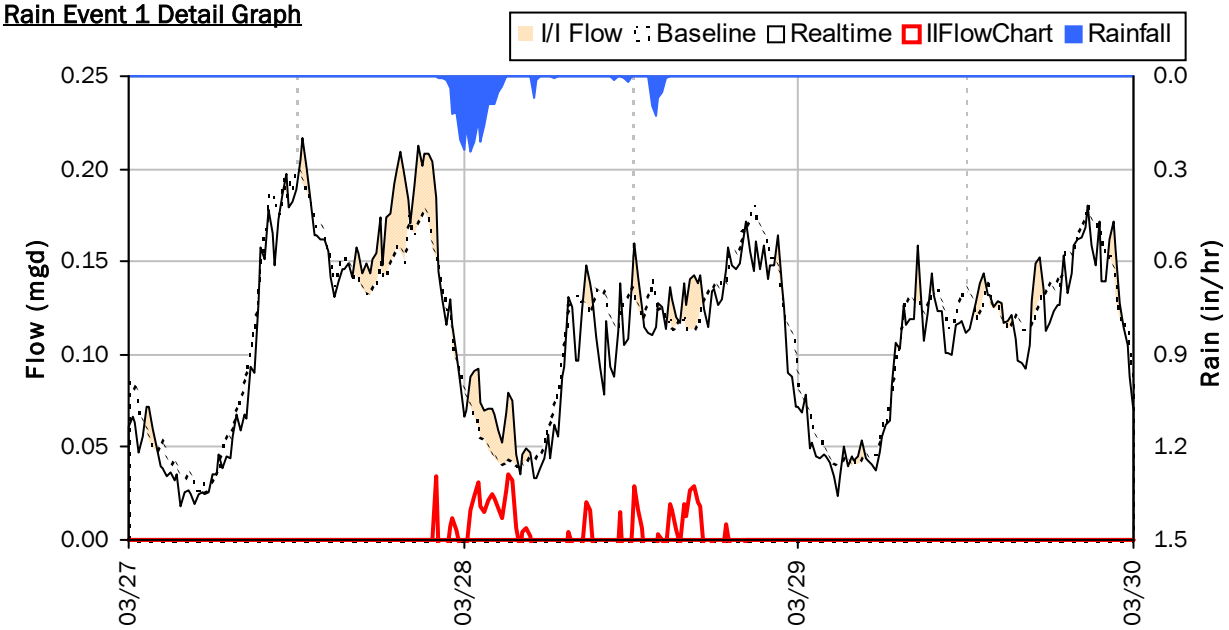
Pipe Diameter:	12	*inches*
Peak Measured Level:	4.38	*inches*
Peak d/D Ratio:	0.36	

SITE 12
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



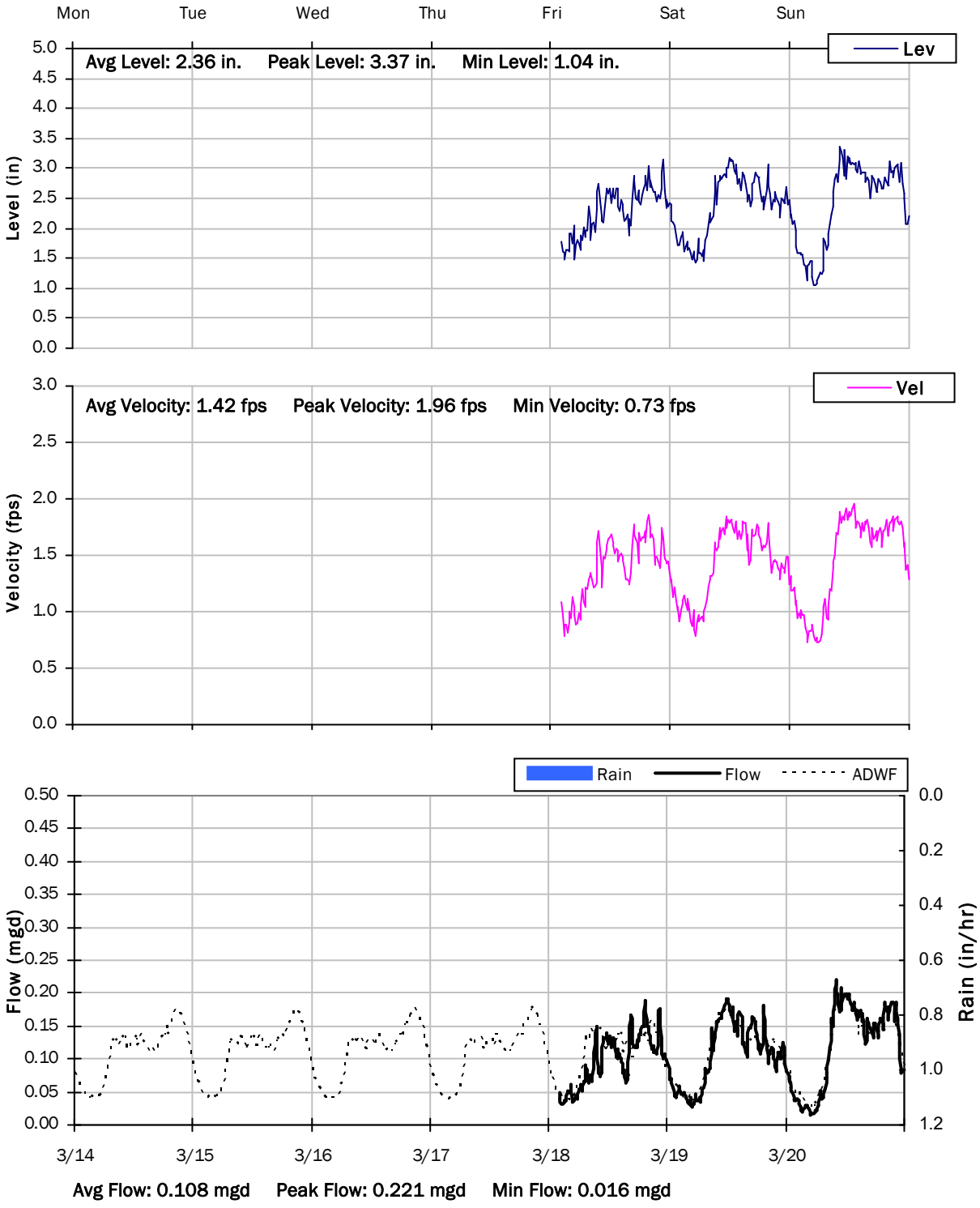
Storm Event I/I Analysis (Rain = 0.68 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.185 *mgd*	**Peak I/I Rate:**	0.036 *mgd*
PF:	1.68	**Total I/I:**	0 *gallons*
Peak Level:	3.31 *in*		
d/D Ratio:	0.28		

SITE 12

Weekly Level, Velocity and Flow Hydrographs

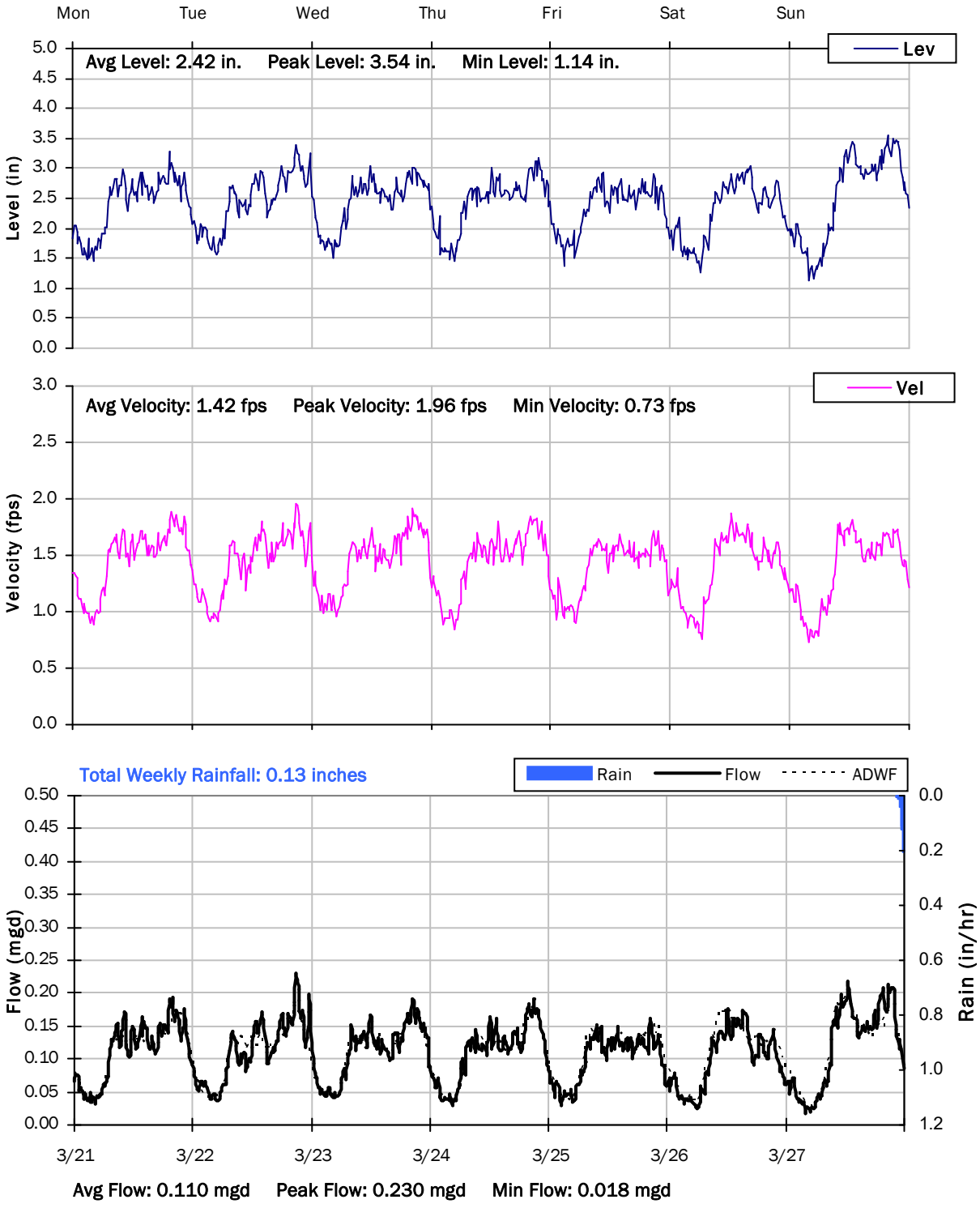
3/14/2022 to 3/21/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

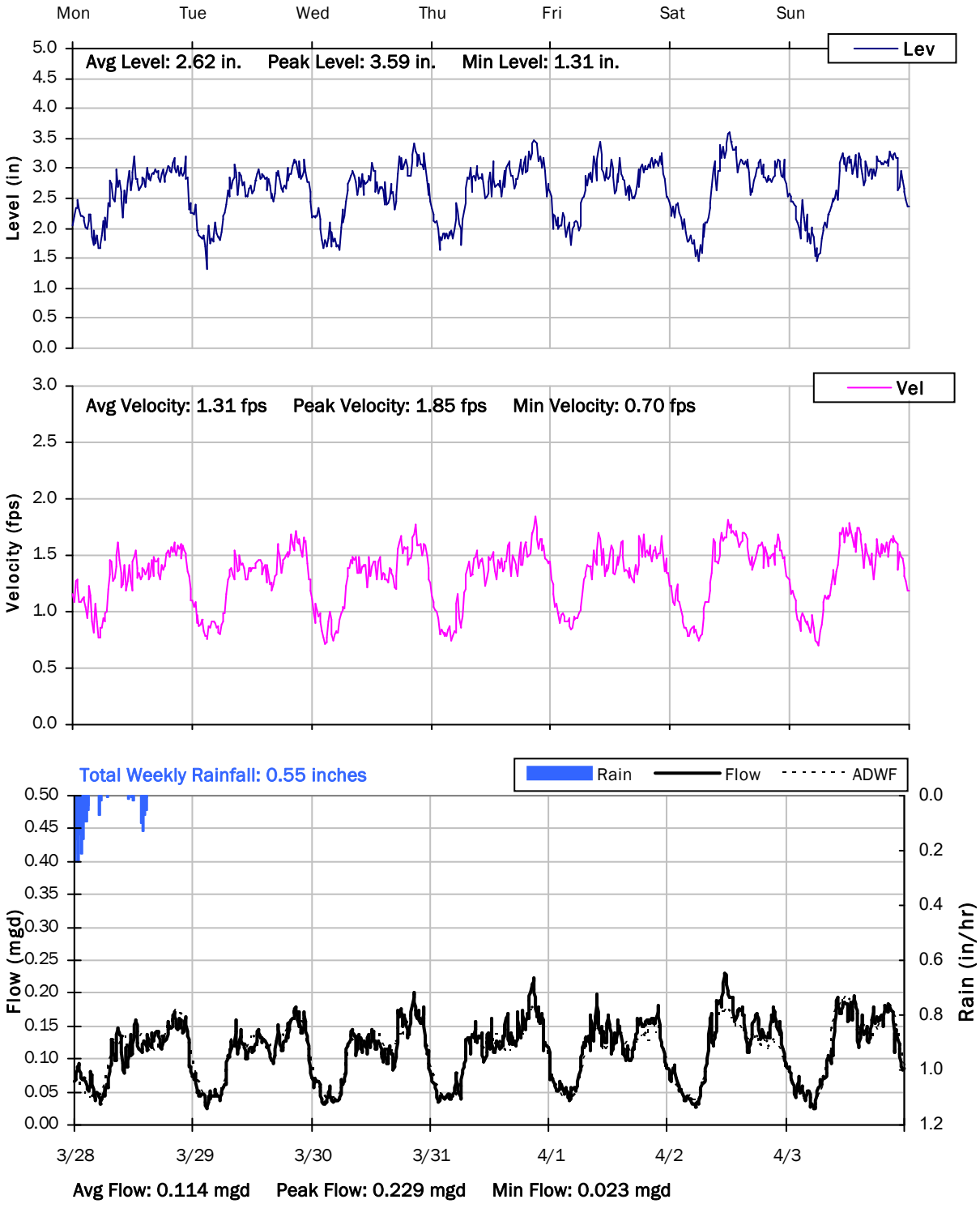
3/21/2022 to 3/28/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

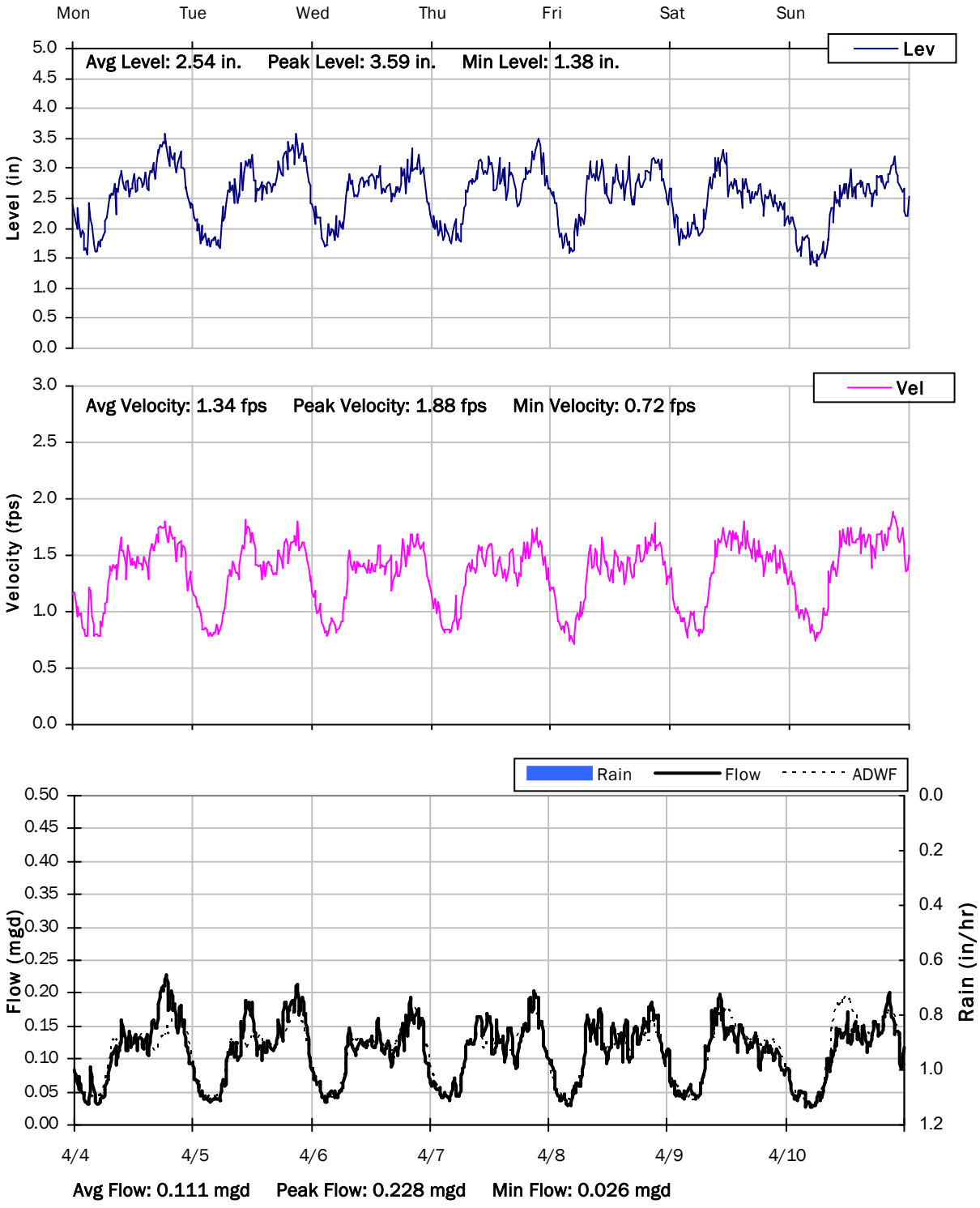
3/28/2022 to 4/4/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

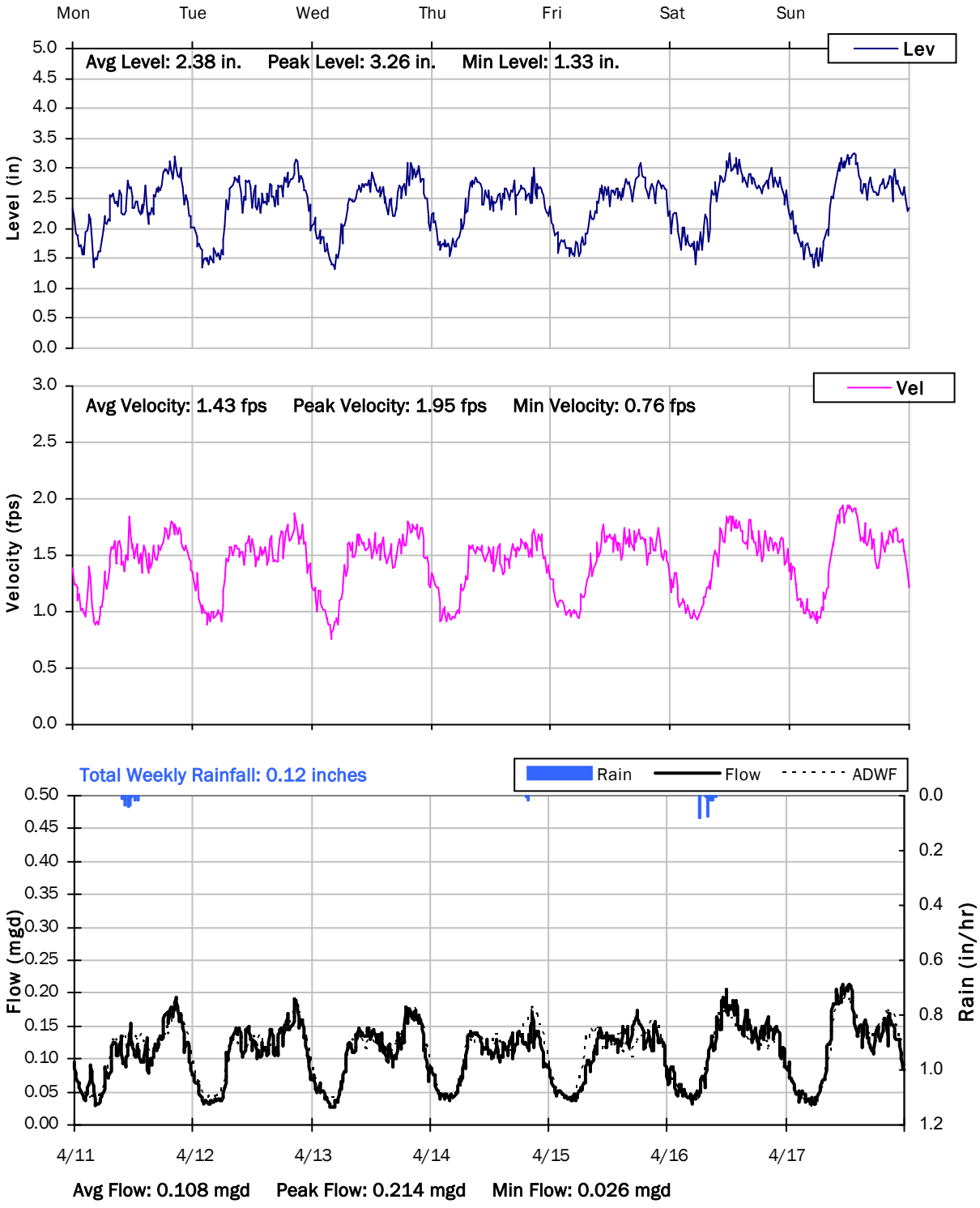
4/4/2022 to 4/11/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

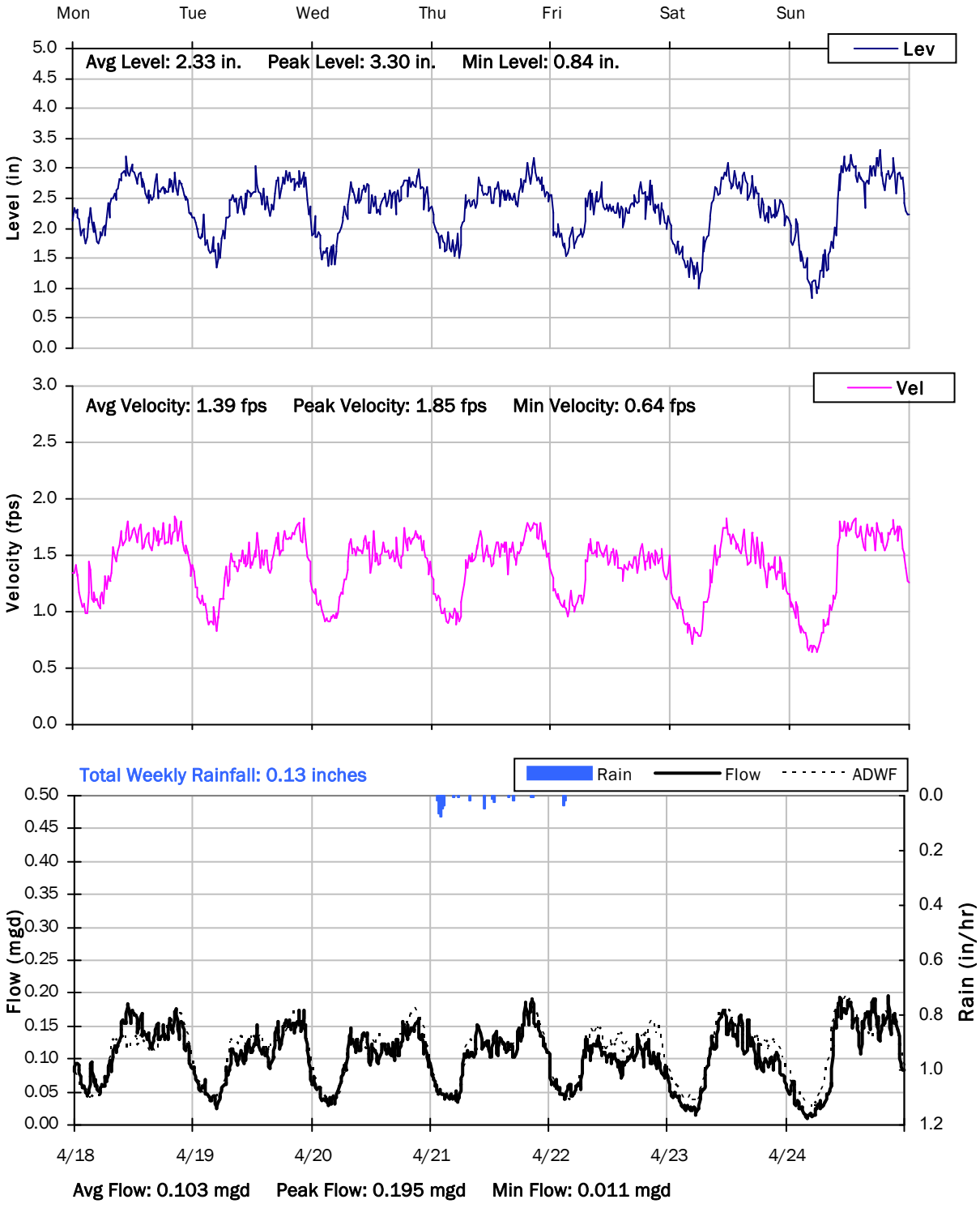
4/11/2022 to 4/18/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

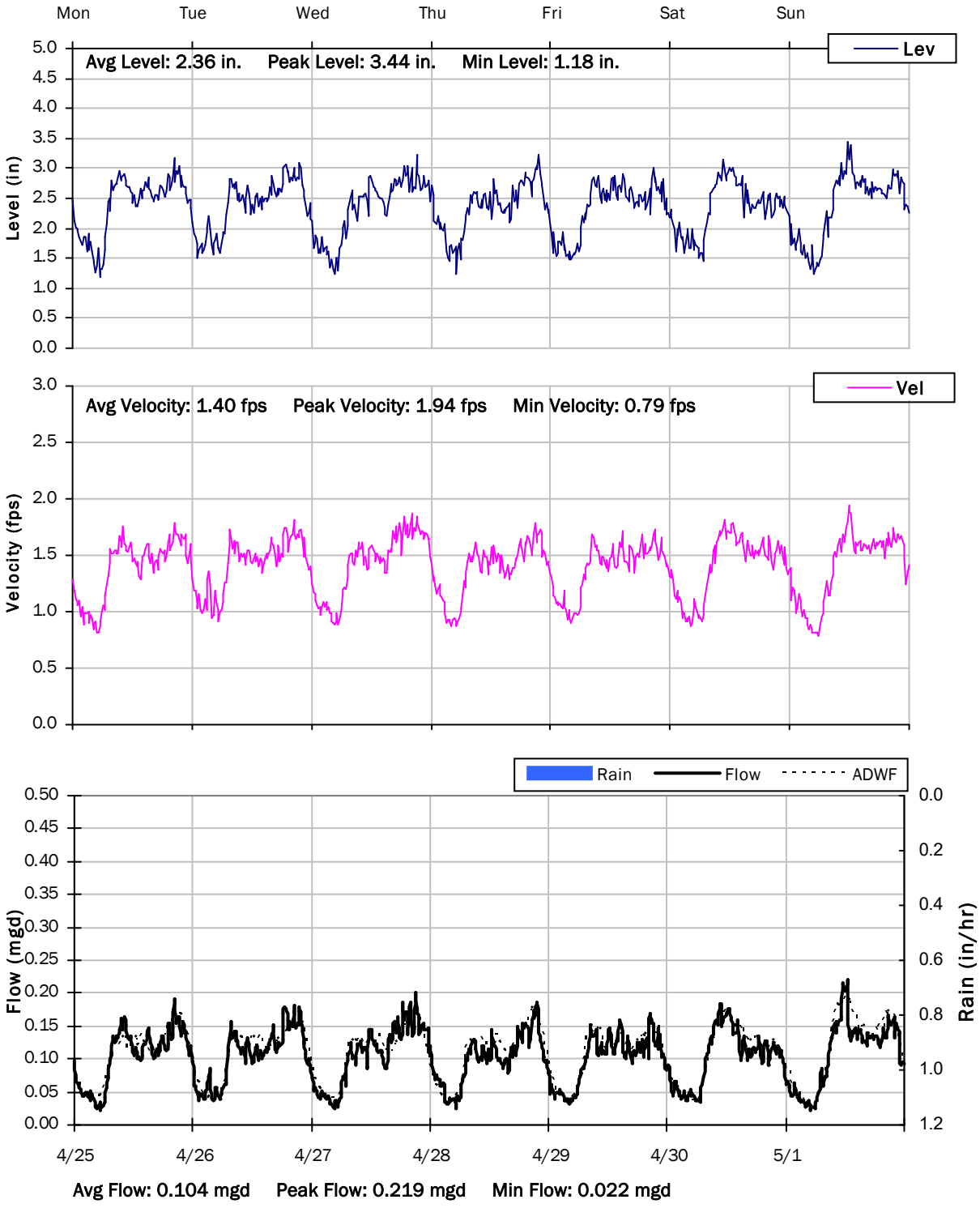
4/18/2022 to 4/25/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

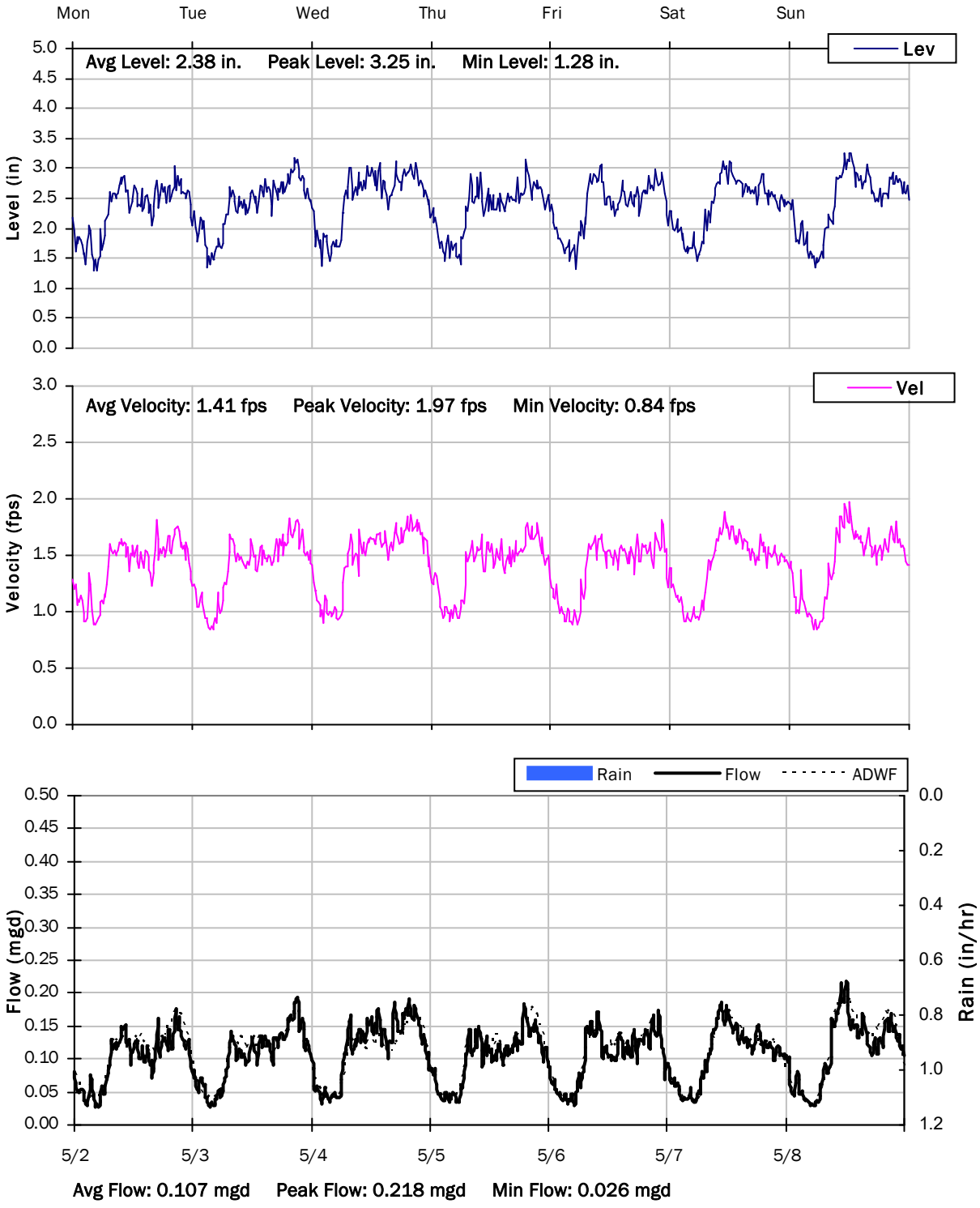
4/25/2022 to 5/2/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

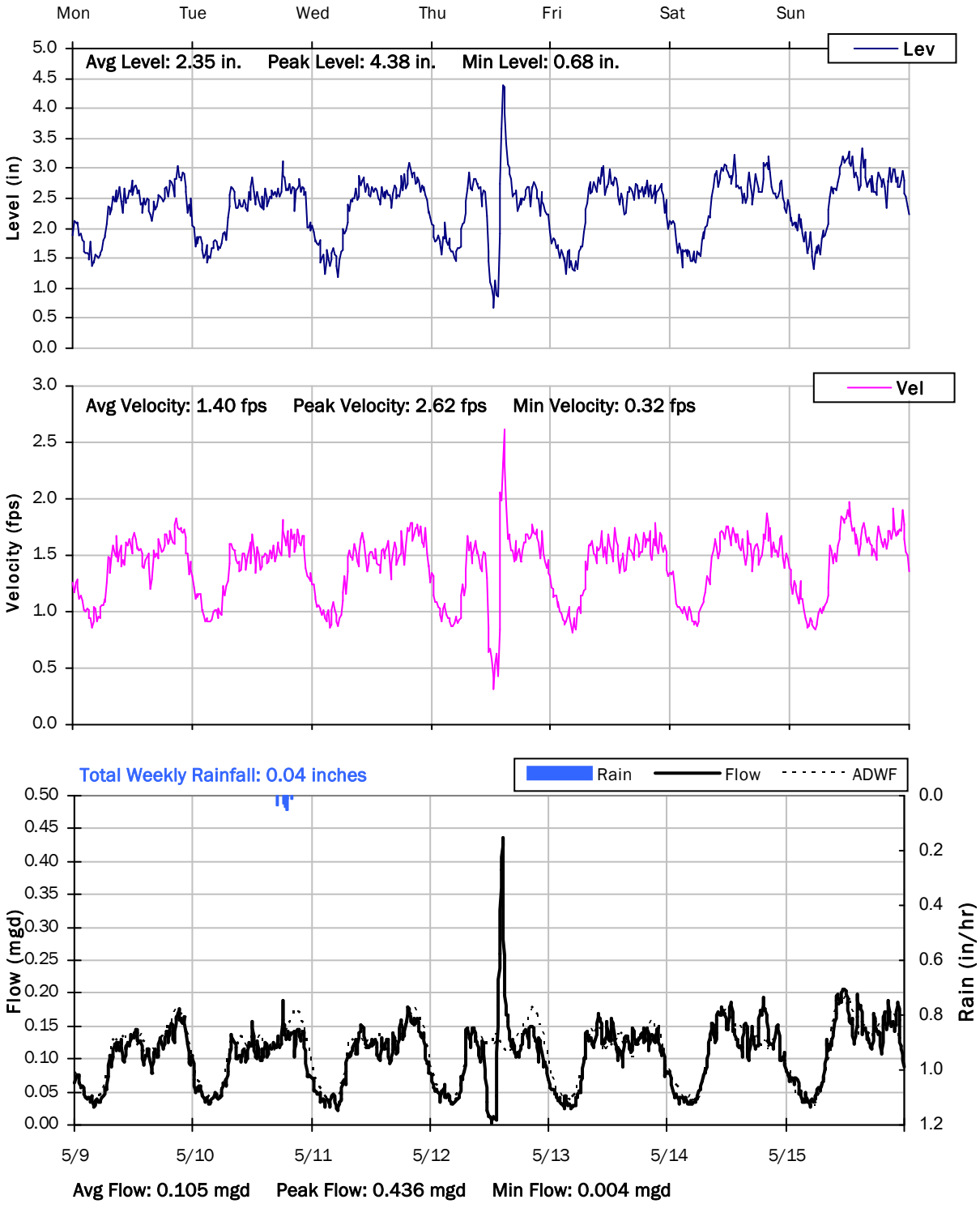
5/2/2022 to 5/9/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

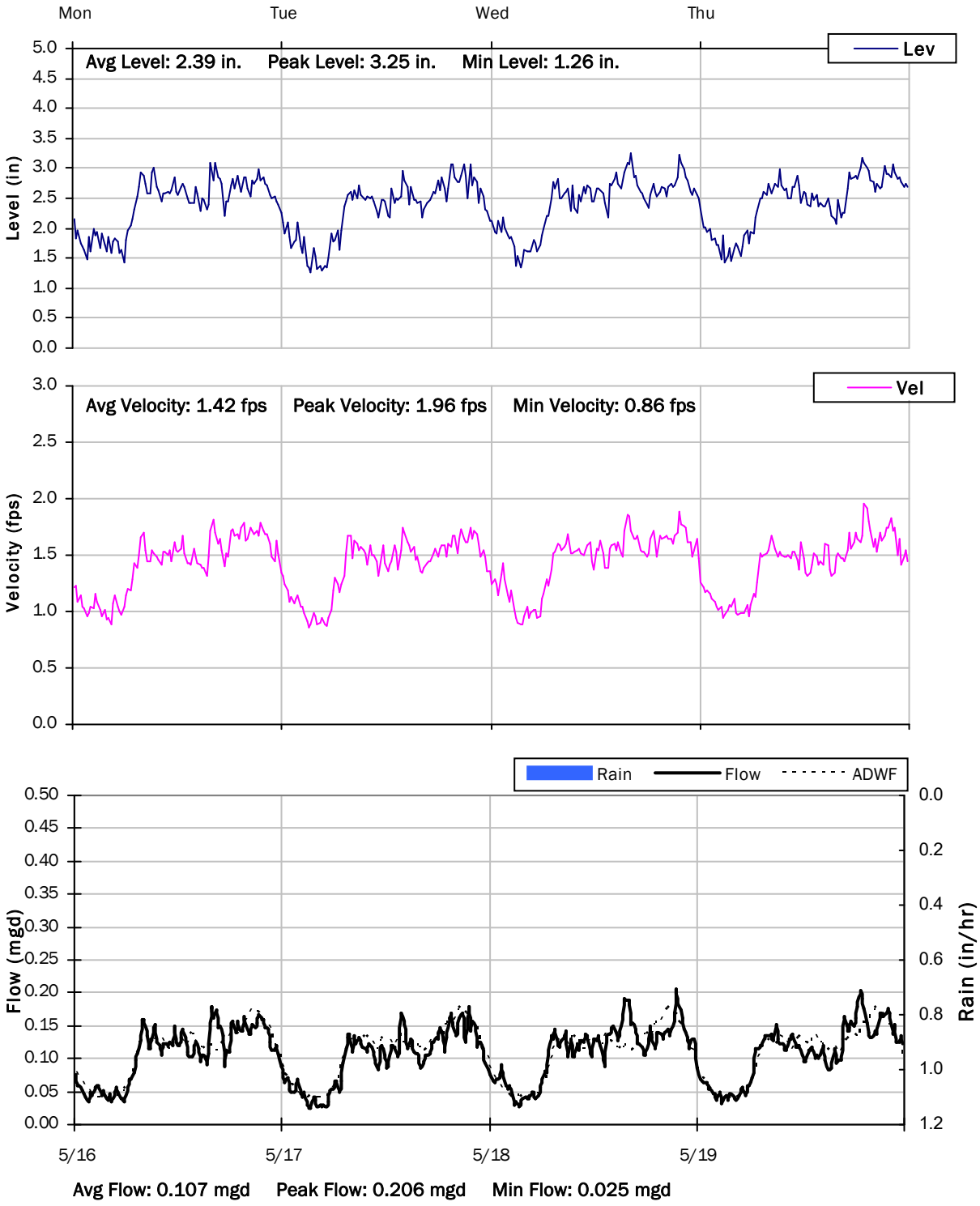
5/9/2022 to 5/16/2022



SITE 12

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 13

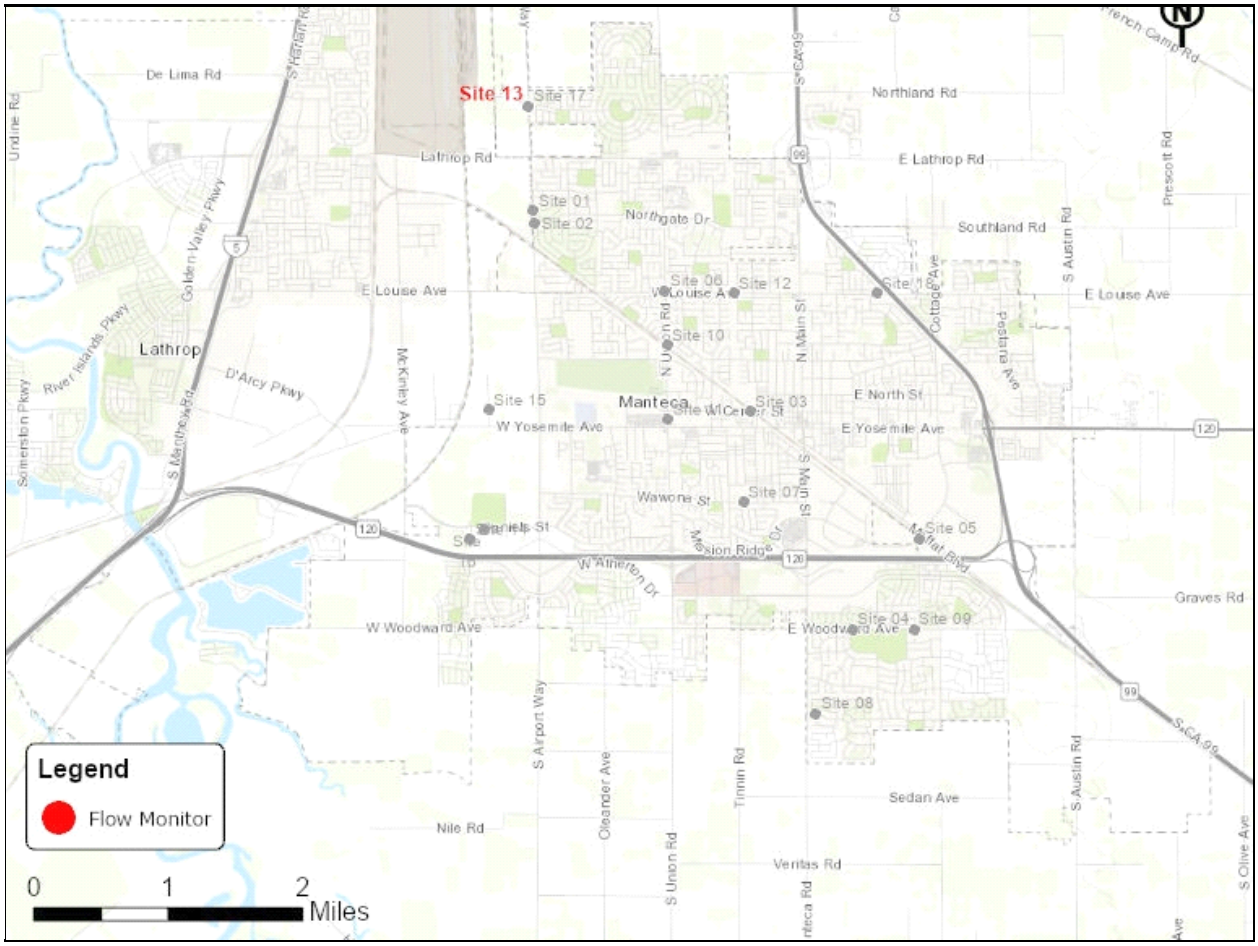
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Airport Way at Daisywood Drive

Data Summary Report



Vicinity Map: Site 13

SITE 13

Additional Site Photos

Effluent Pipe



Monitored Northwest Influent Pipe



SITE 13

Additional Site Photos

East Influent Pipe

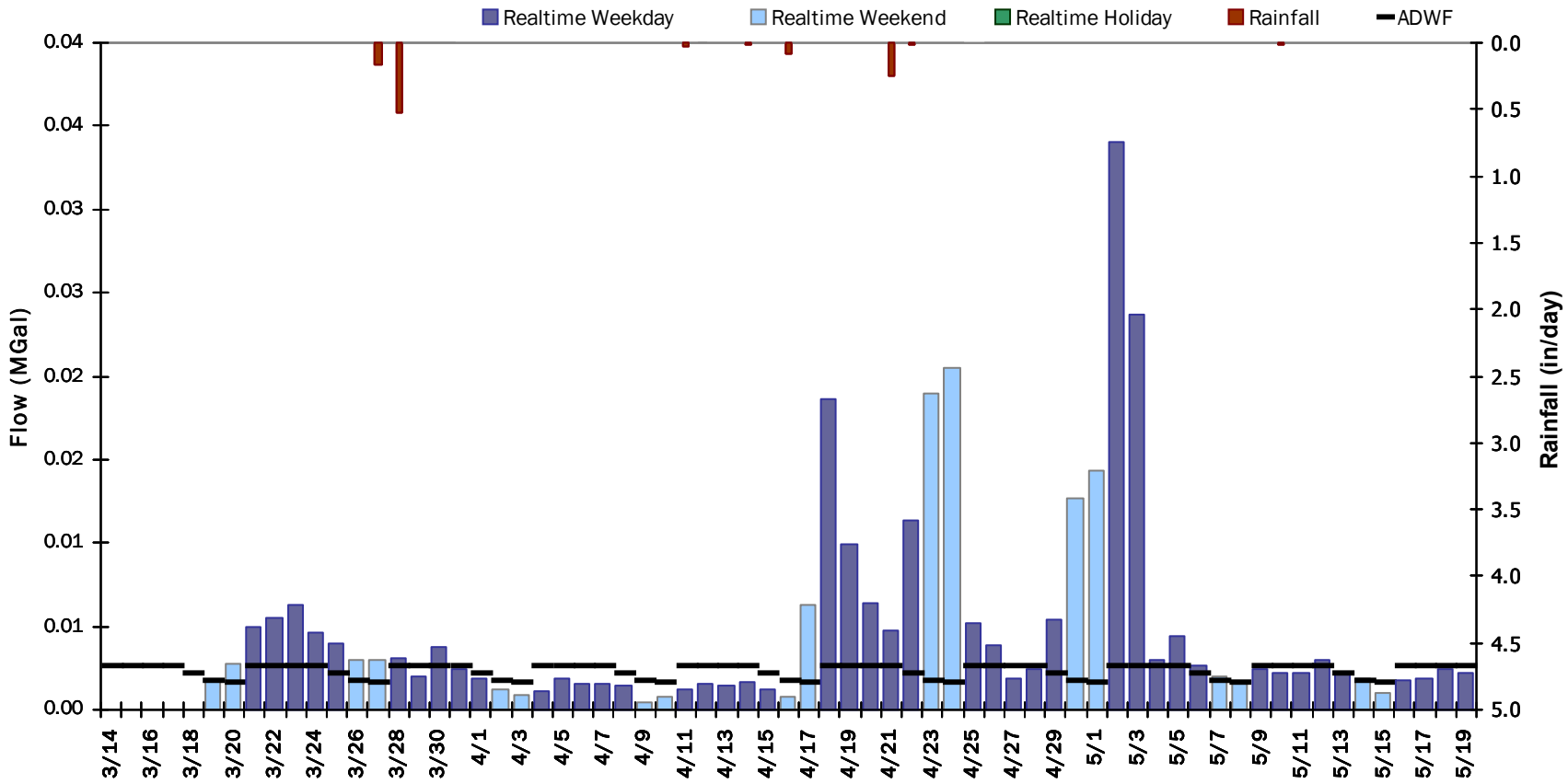


SITE 13

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.005 MGal Peak Daily Flow: 0.034 MGal Min Daily Flow: 0.000 MGal

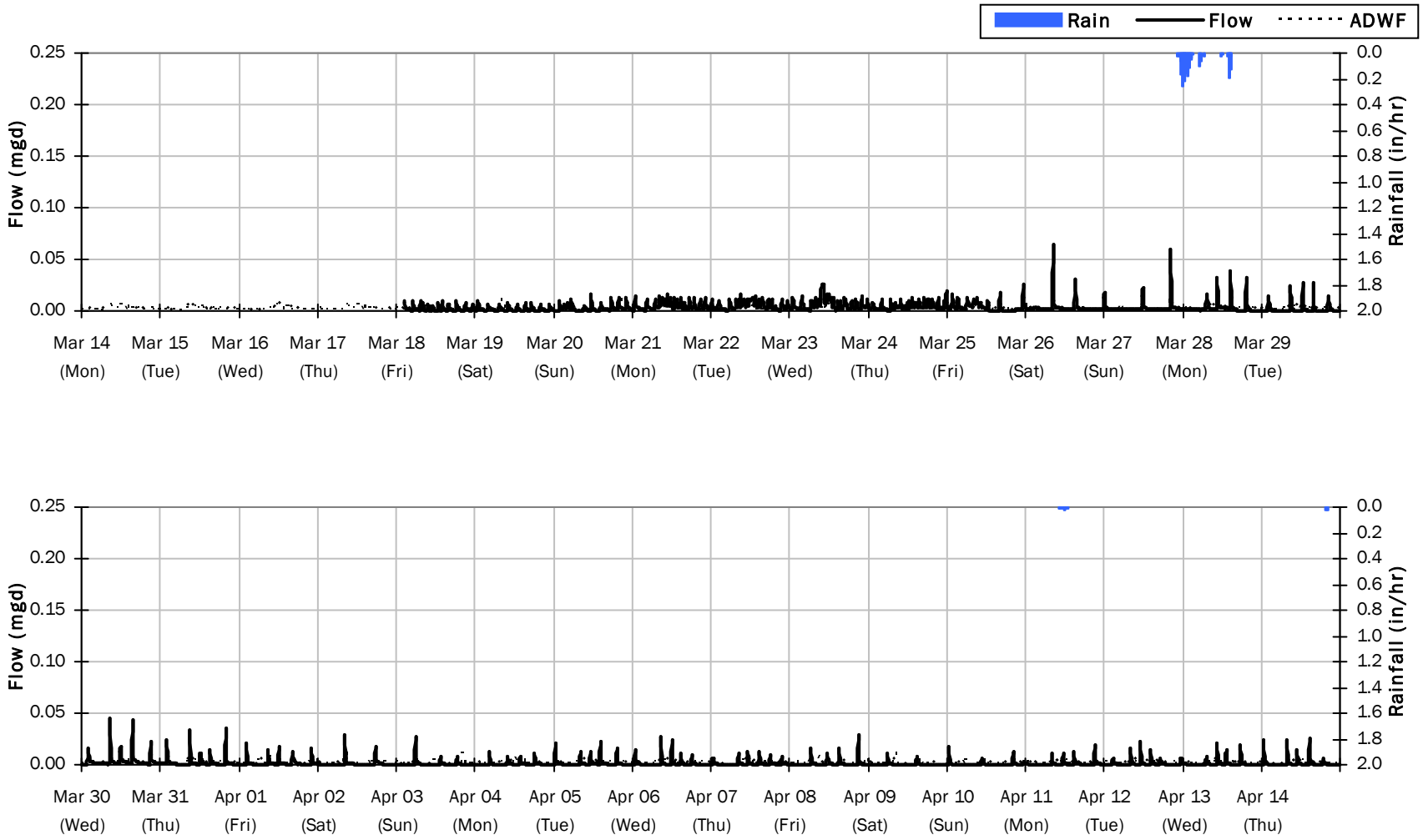
Total Rainfall: 1.10 inches



SITE 13

Flow Summary: 3/14/2022 to 4/14/2022

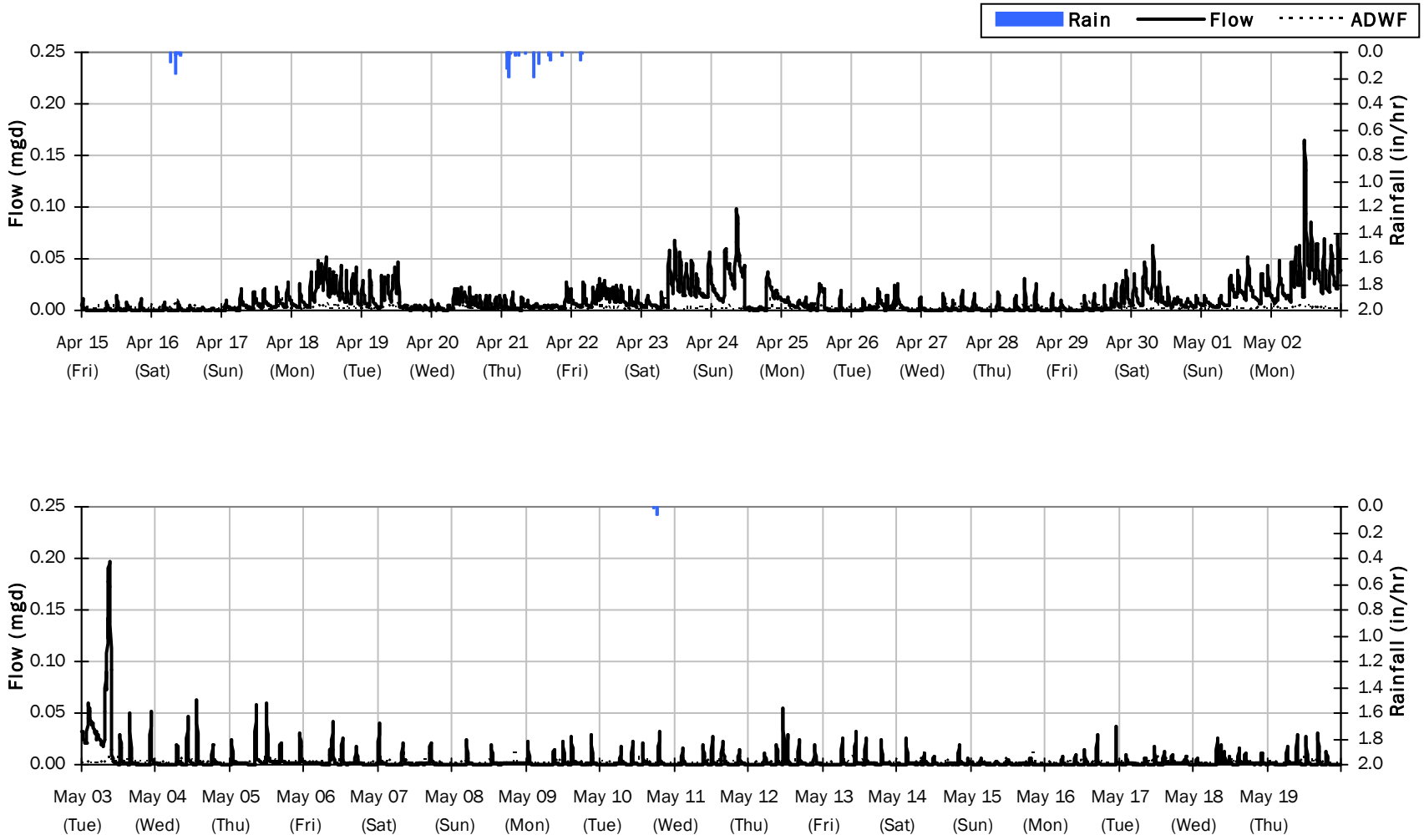
Period Rainfall: 0.73 inches Period Avg Flow: 0.002 mgd Period Peak Flow: 0.064 mgd Period Min Flow: 0.000 mgd



SITE 13

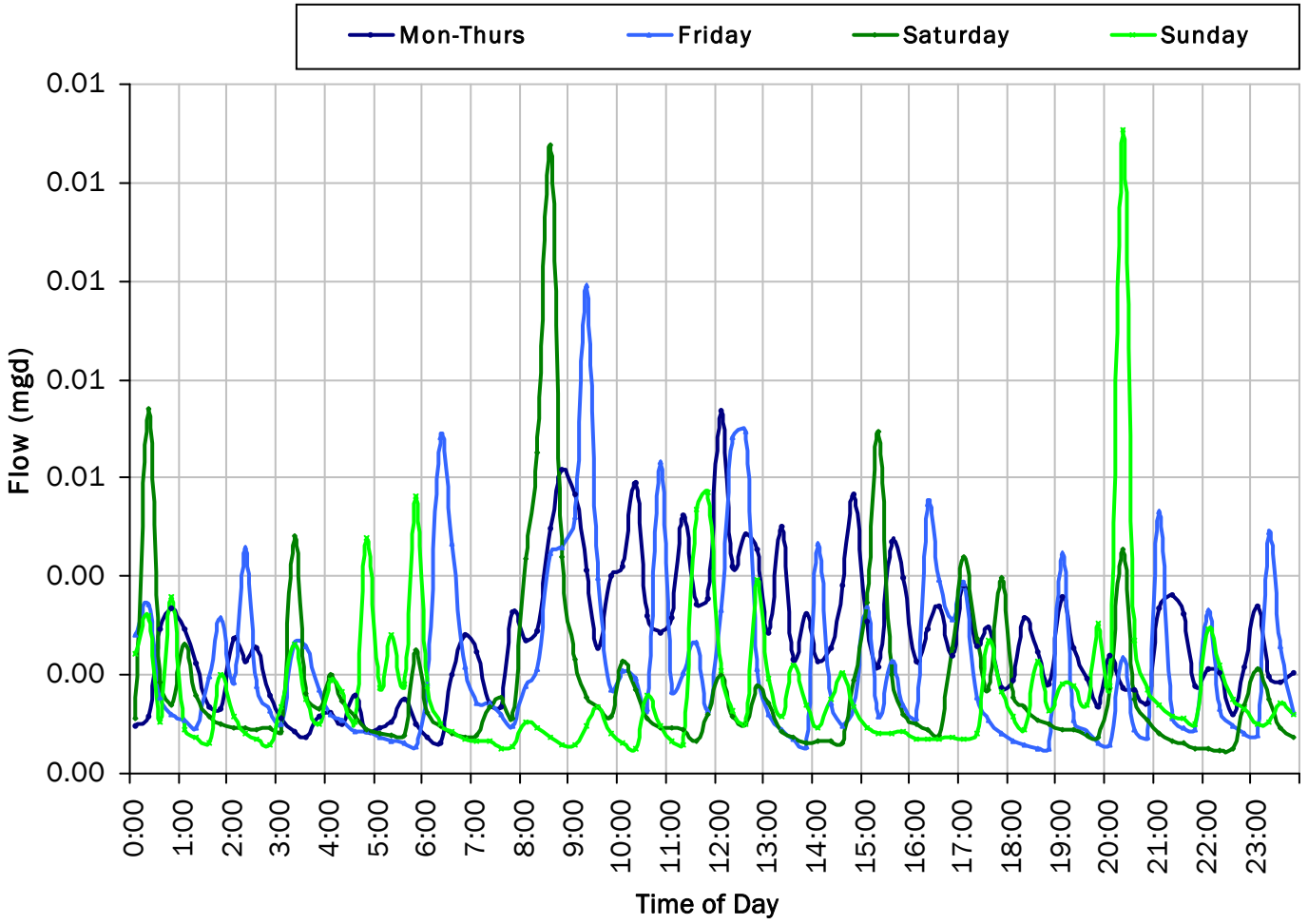
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.37 inches Period Avg Flow: 0.007 mgd Period Peak Flow: 0.196 mgd Period Min Flow: 0.000 mgd



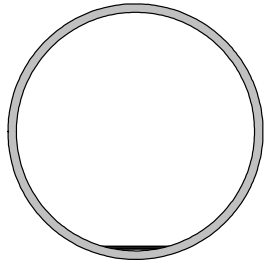
SITE 13

Average Dry Weather Flow Hydrographs



ADWF:

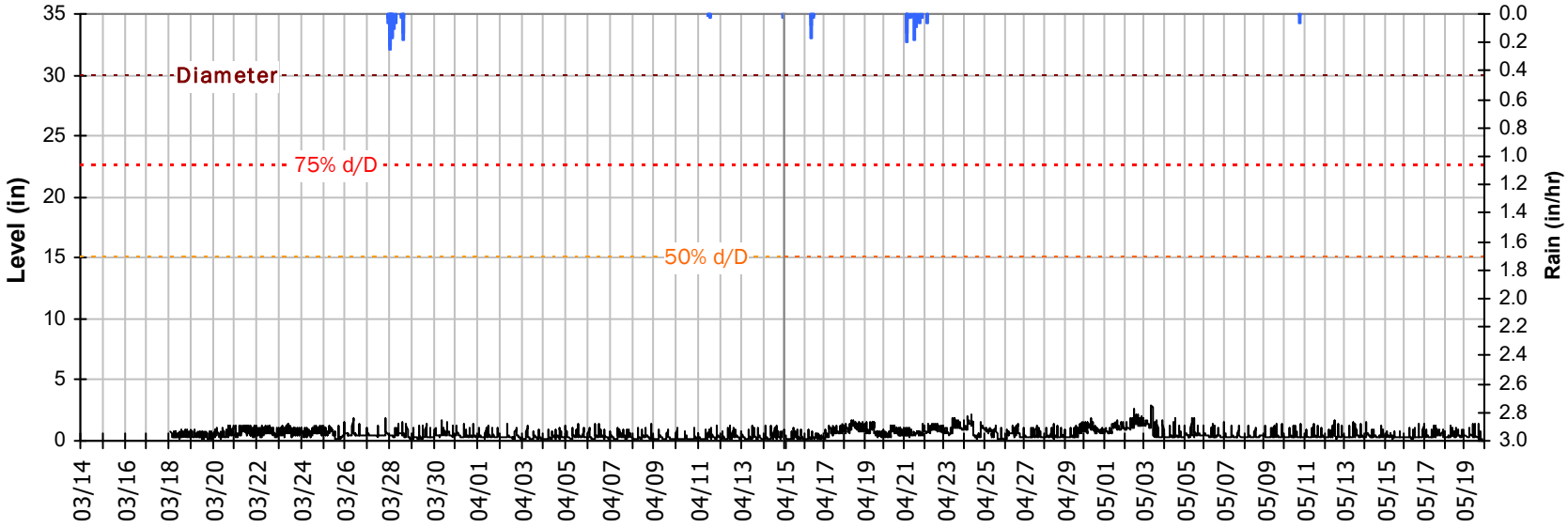
0.002 *mgd*

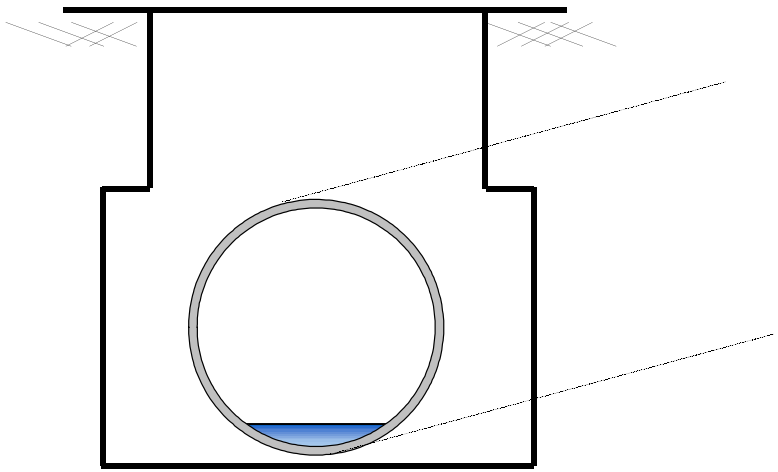


SITE 13

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period



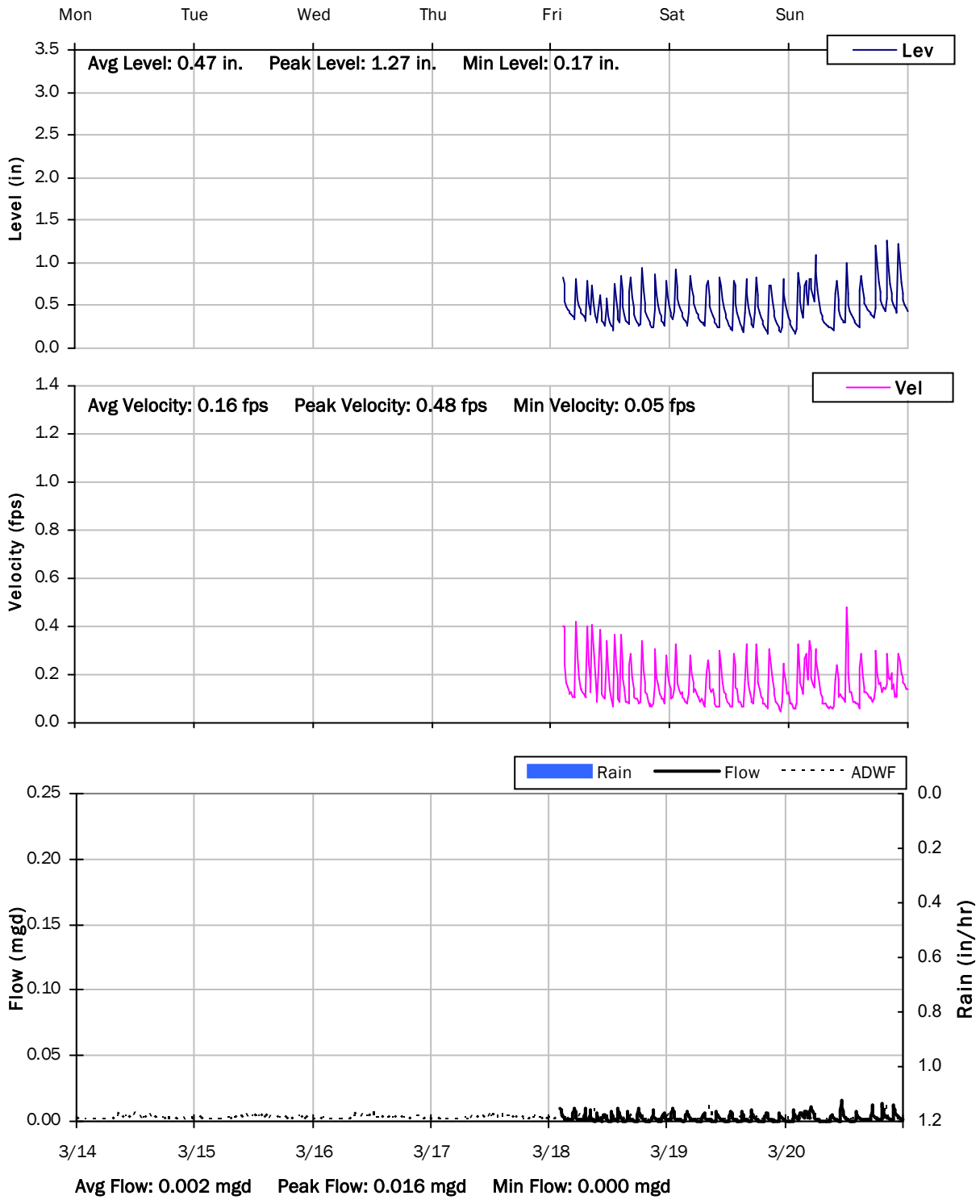


Pipe Diameter:	30	*inches*
Peak Measured Level:	2.86	*inches*
Peak d/D Ratio:	0.10	

SITE 13

Weekly Level, Velocity and Flow Hydrographs

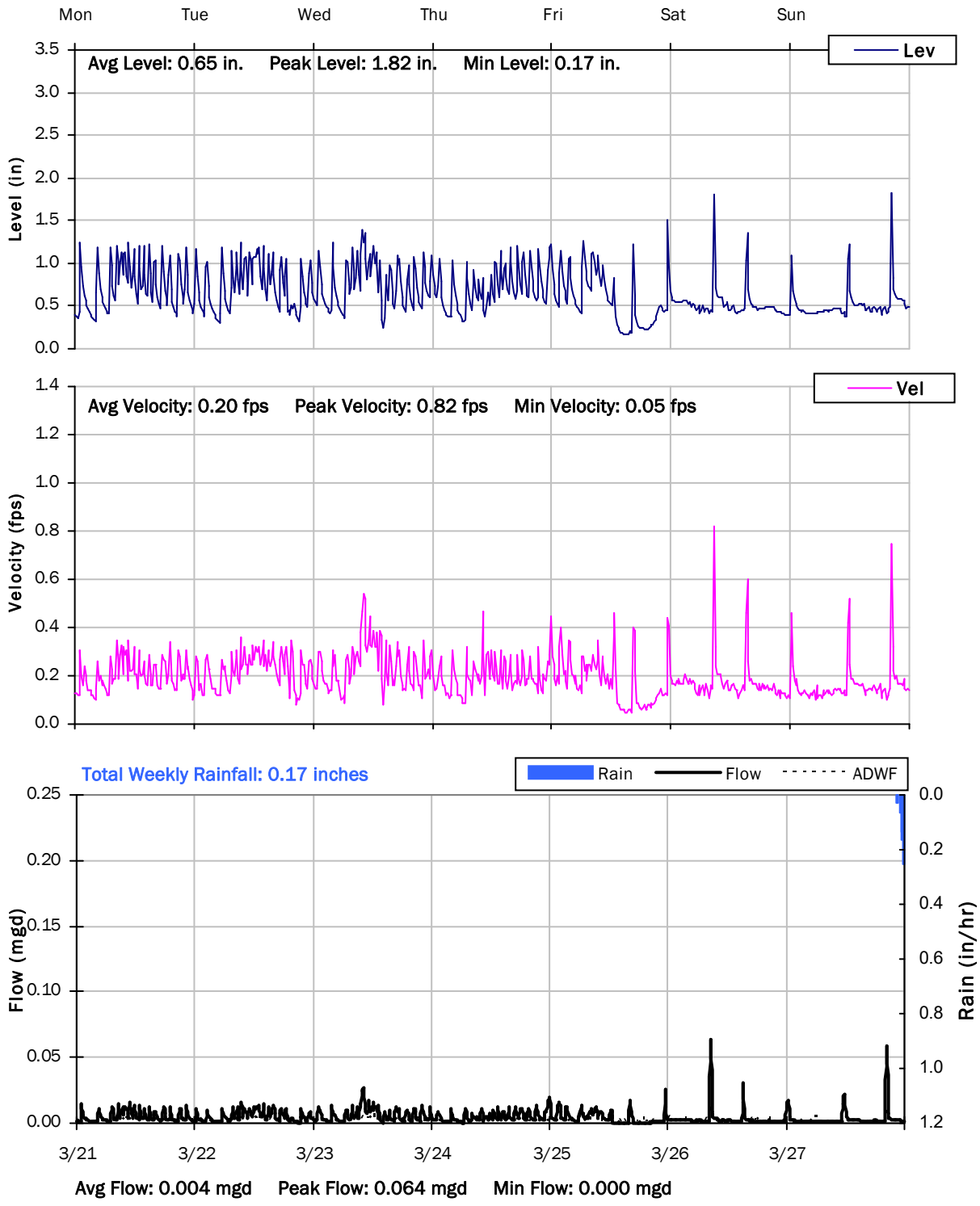
3/14/2022 to 3/21/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

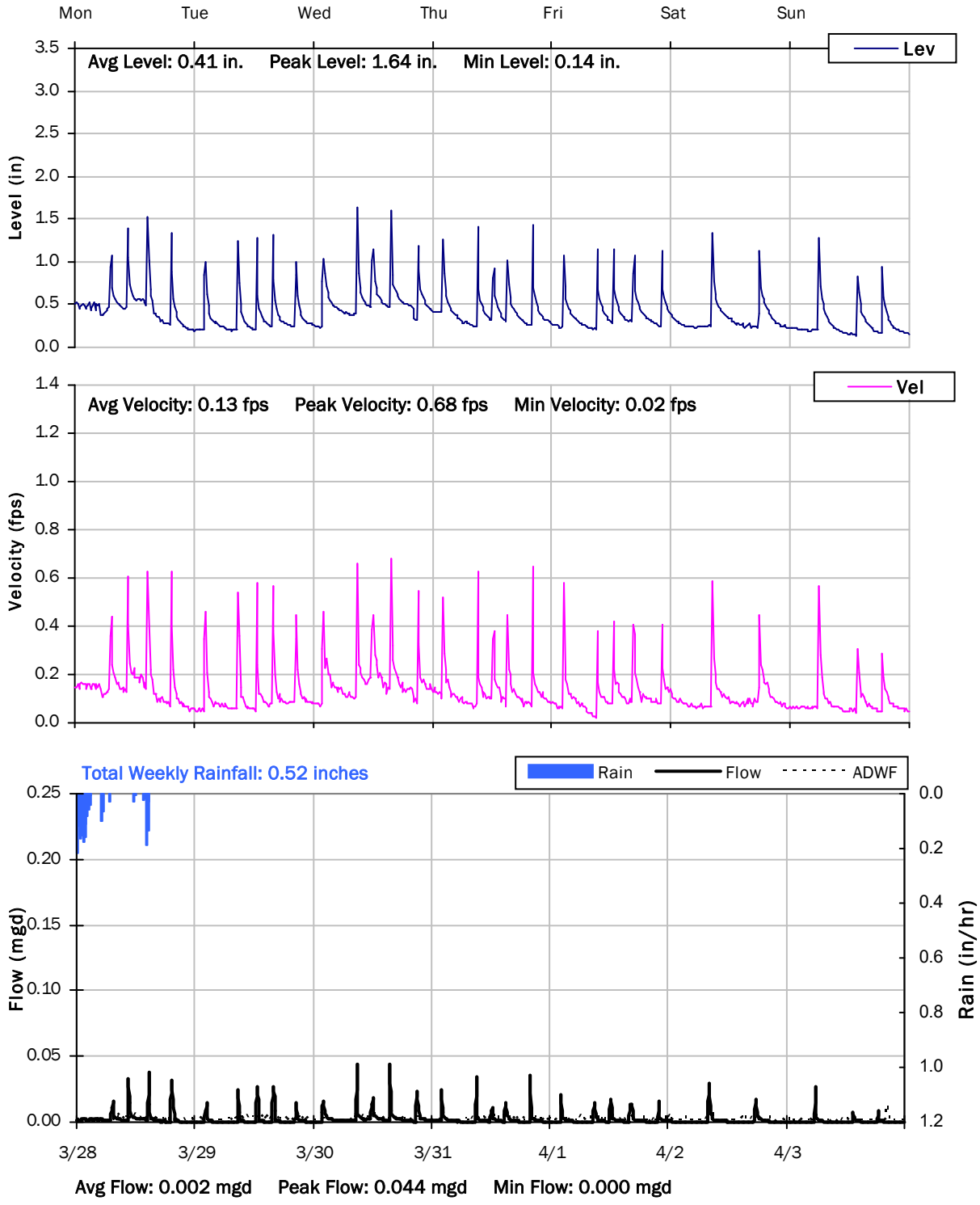
3/21/2022 to 3/28/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

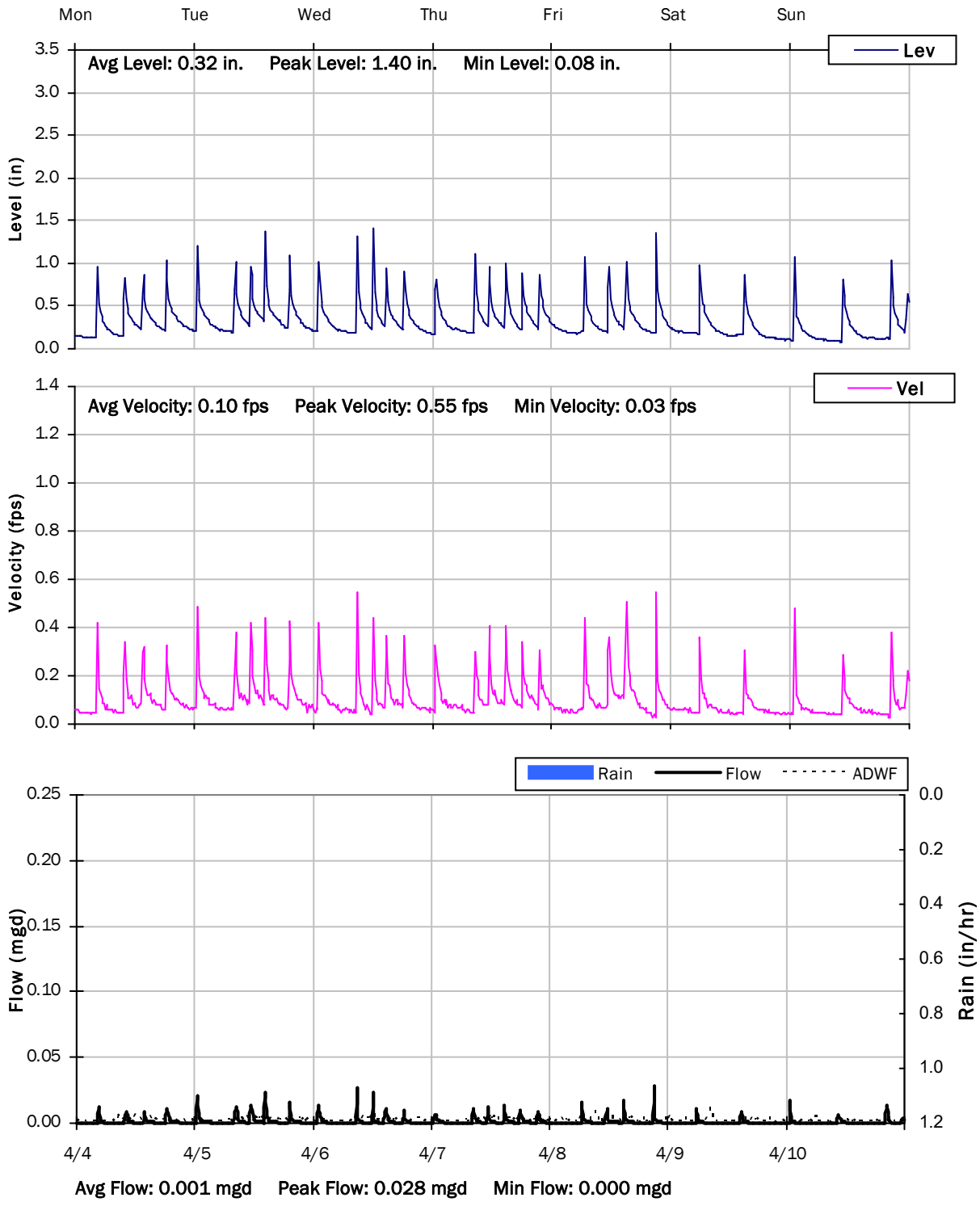
3/28/2022 to 4/4/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

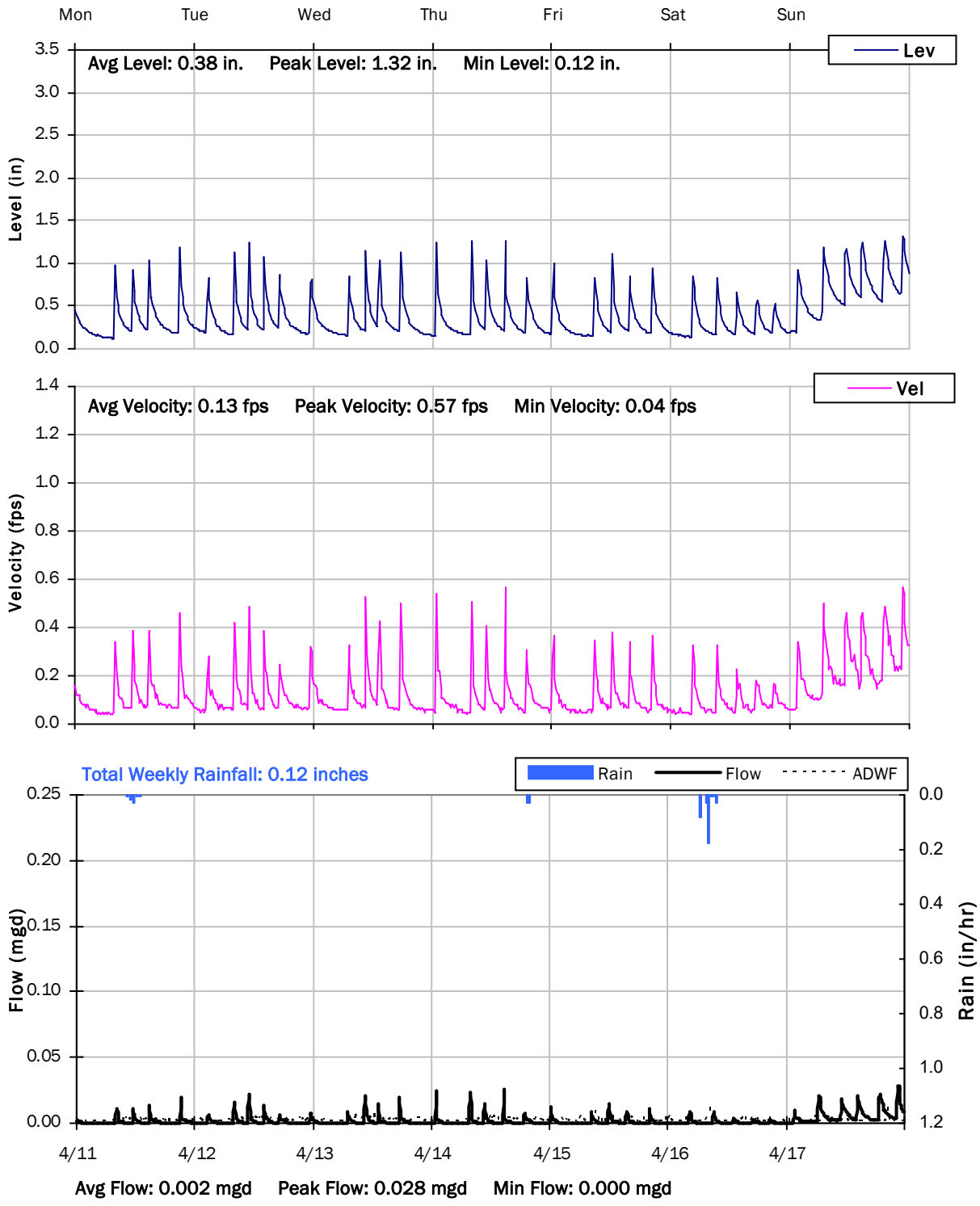
4/4/2022 to 4/11/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

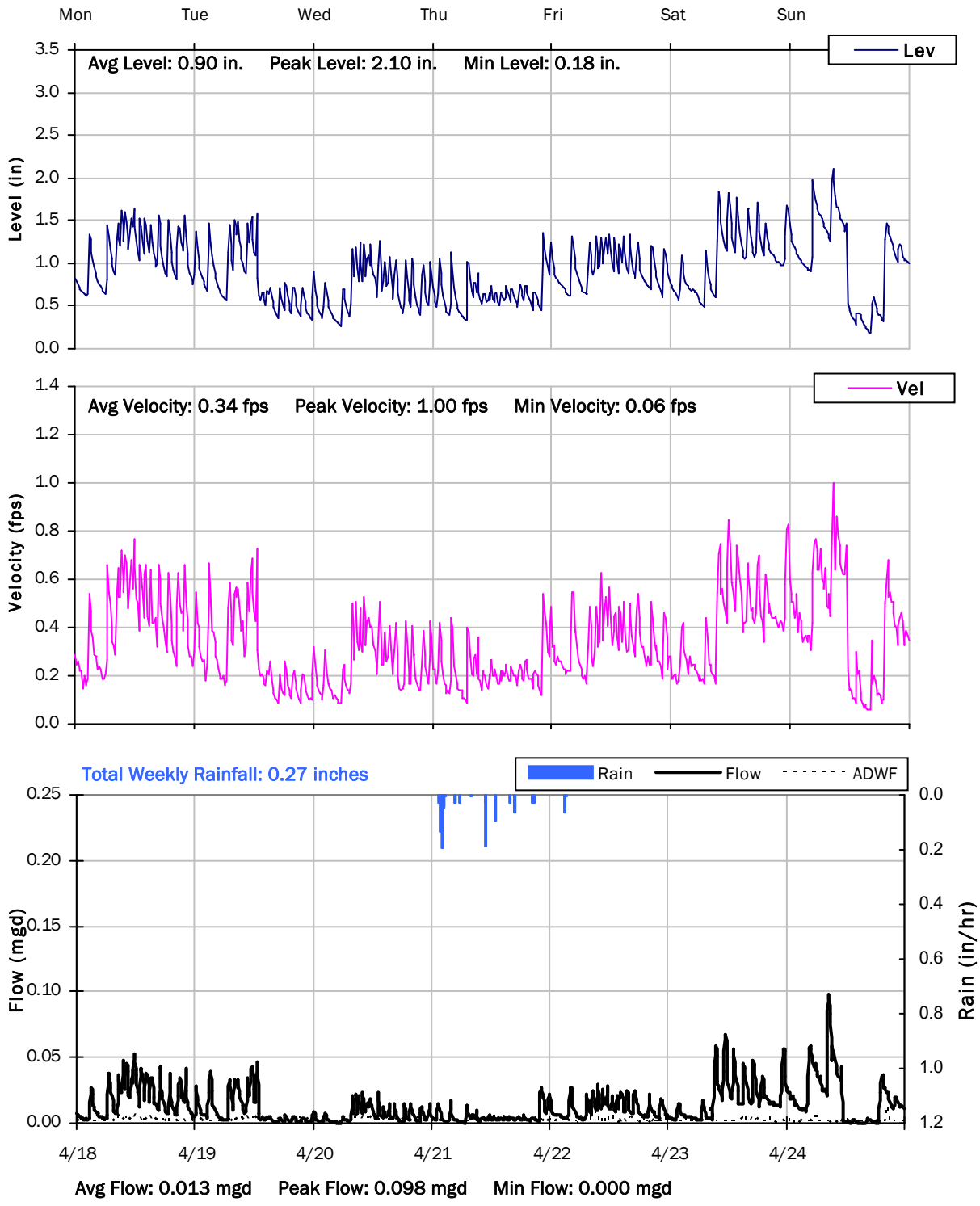
4/11/2022 to 4/18/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

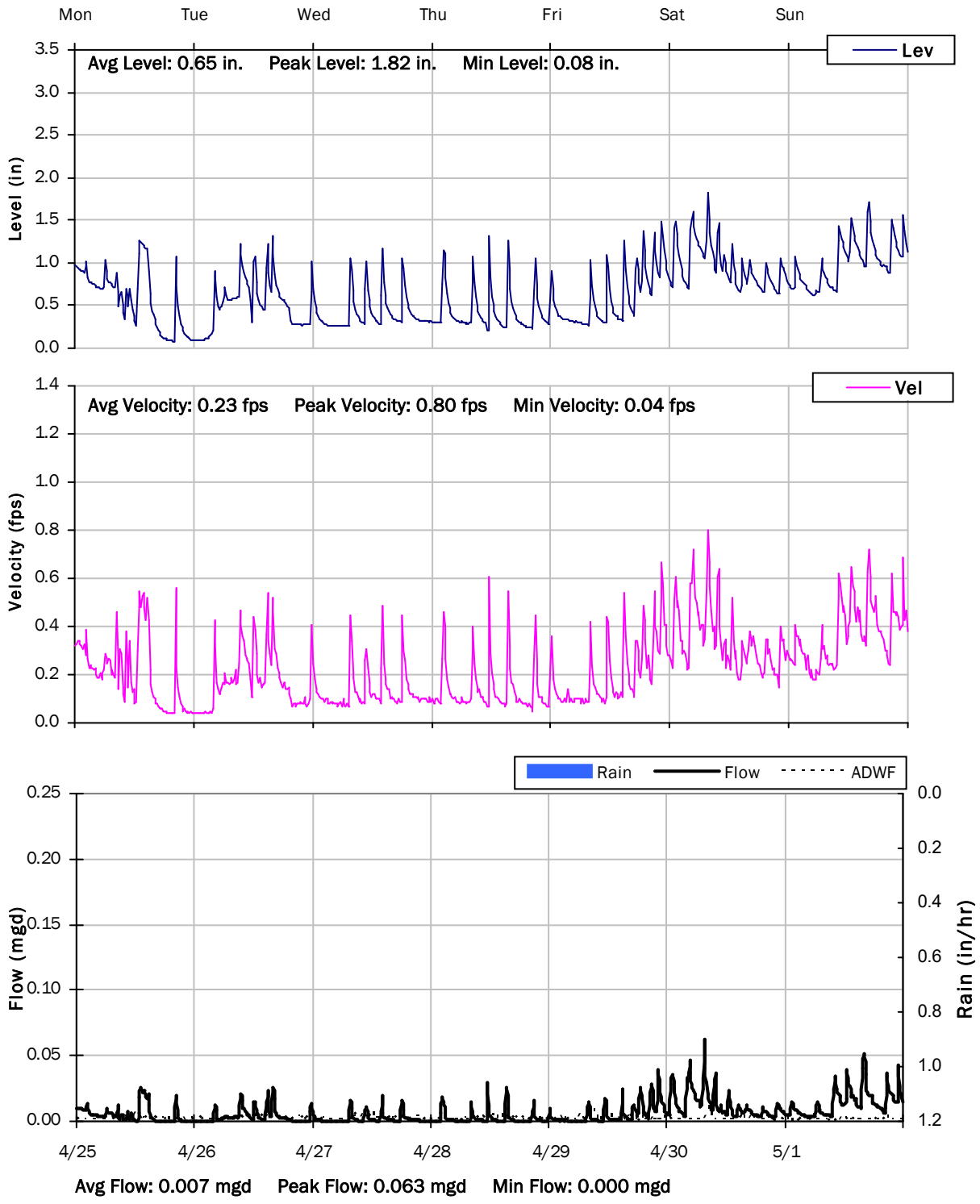
4/18/2022 to 4/25/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

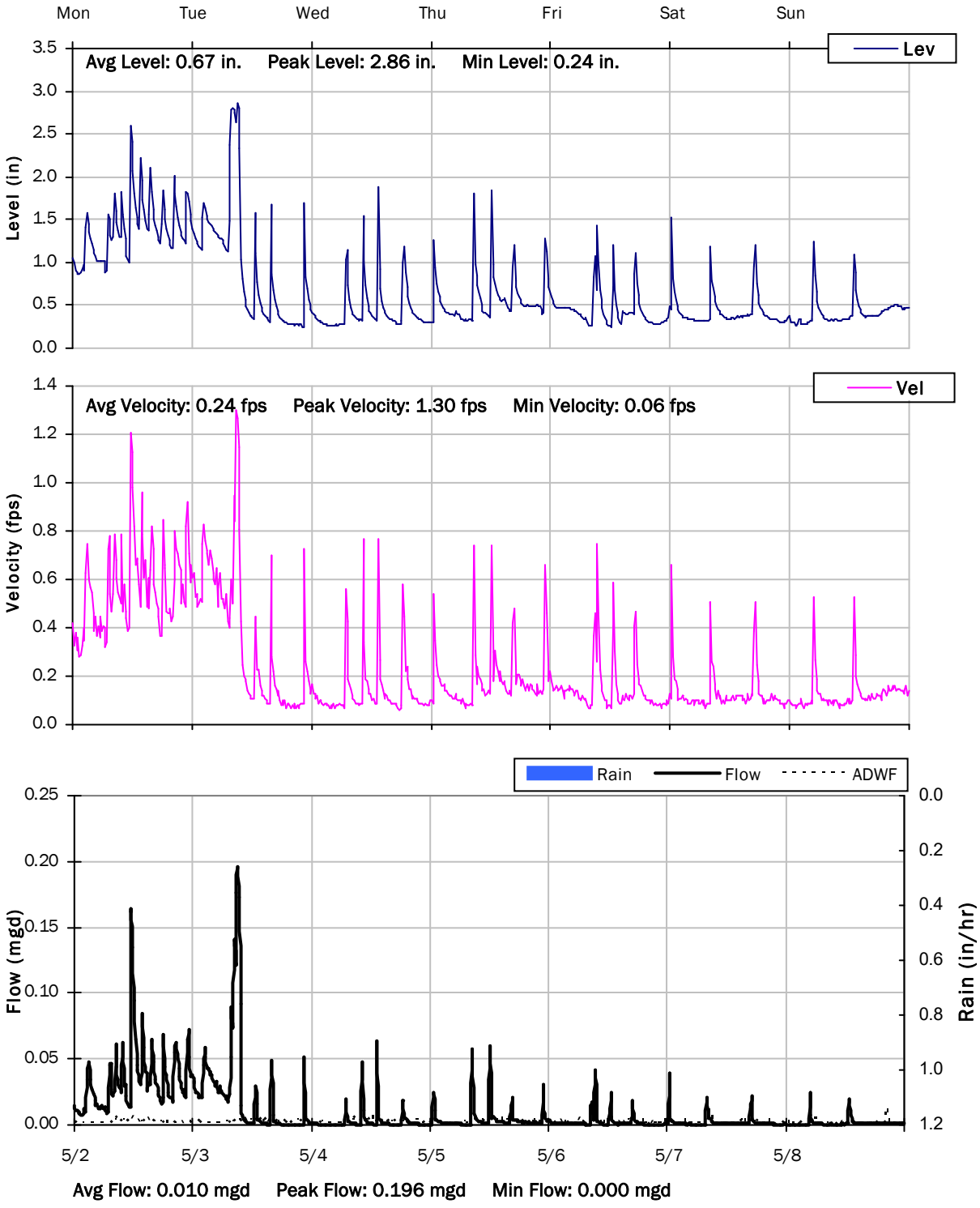
4/25/2022 to 5/2/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

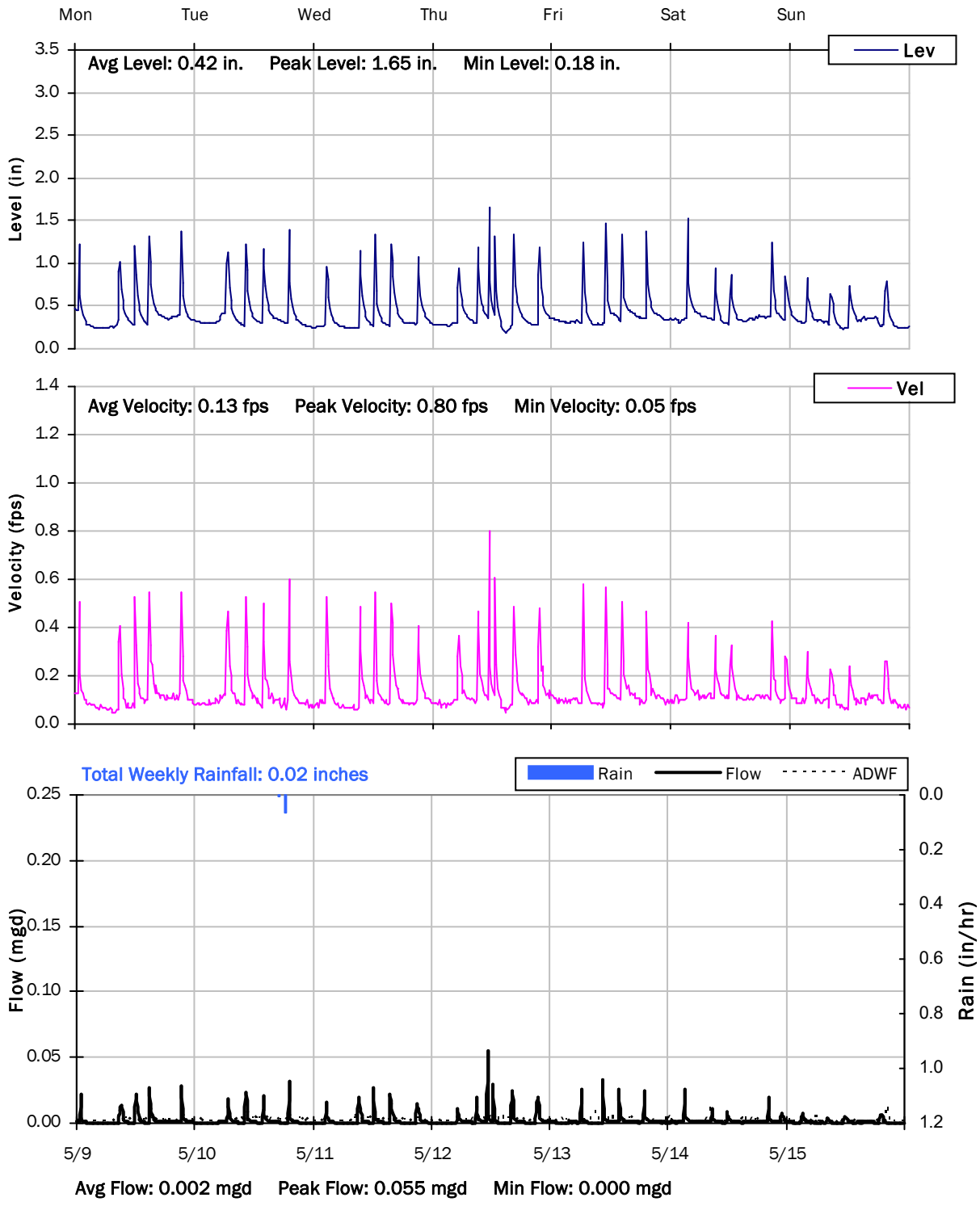
5/2/2022 to 5/9/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

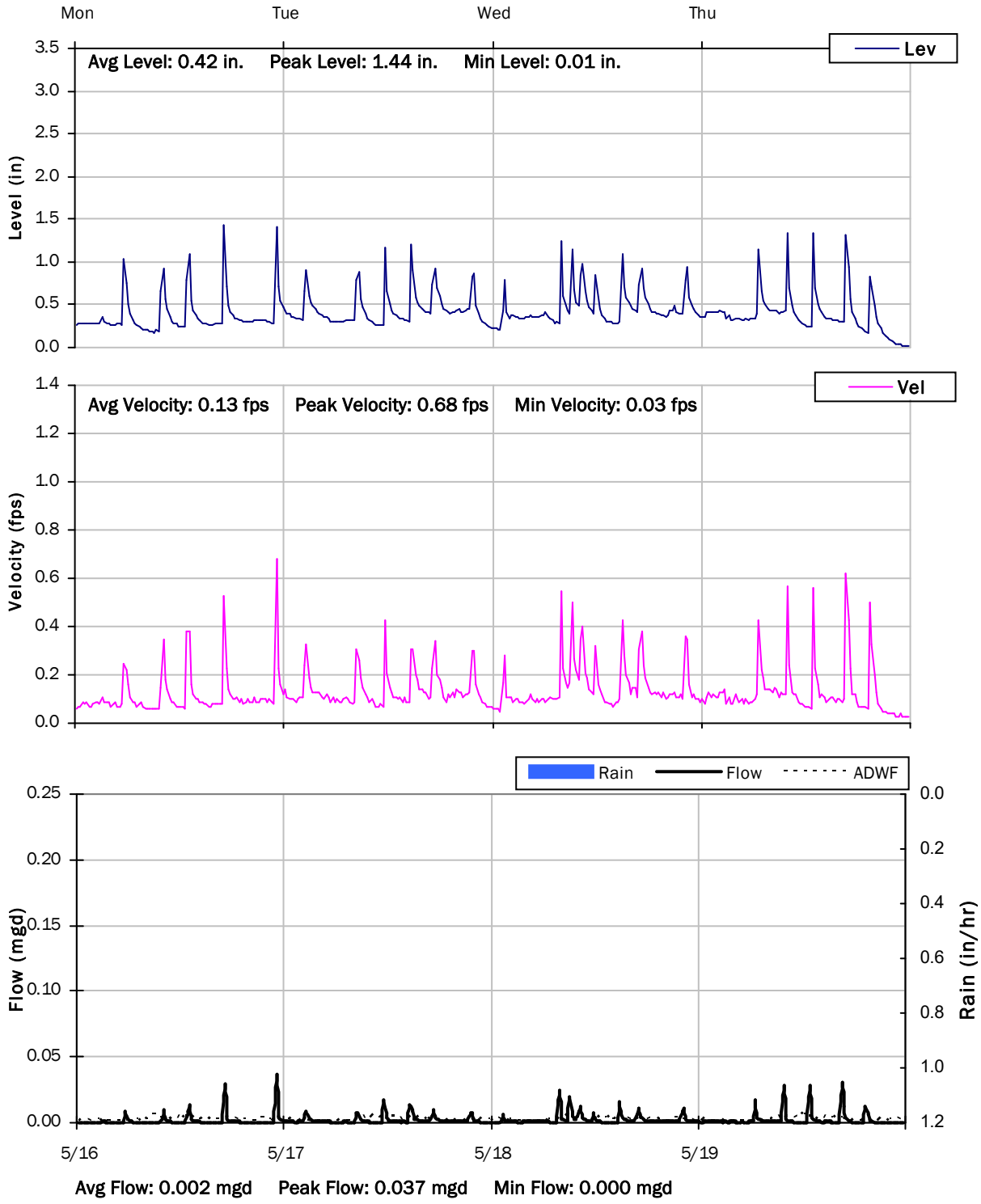
5/9/2022 to 5/16/2022



SITE 13

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 14

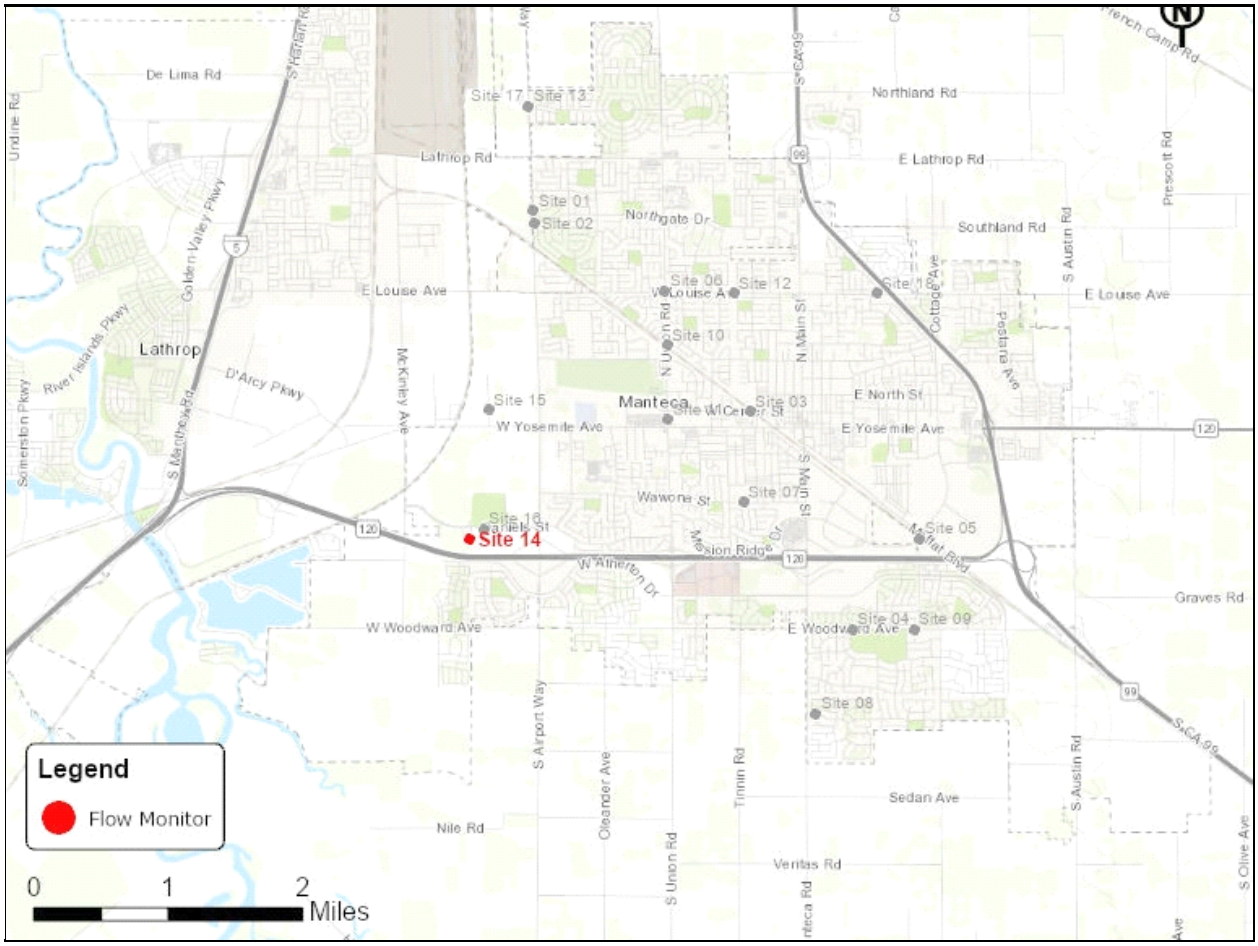
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Parking Lot West of Entertainment Way

Data Summary Report



Vicinity Map: Site 14

SITE 14

Additional Site Photos

Effluent Pipe



Monitored South Influent Pipe



SITE 14

Additional Site Photos

Northwest Drop Influent Pipe

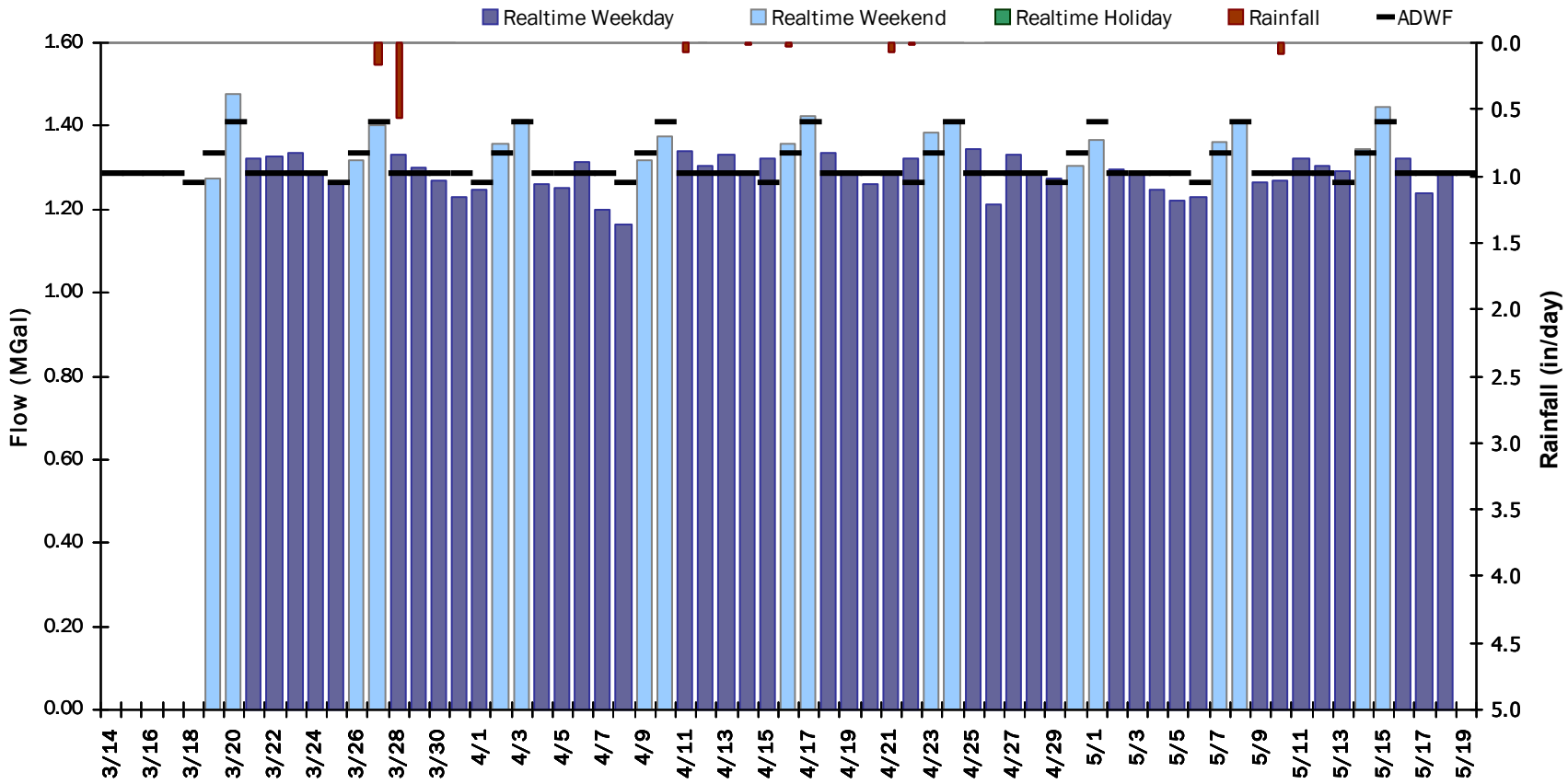


SITE 14

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 1.310 MGal Peak Daily Flow: 1.475 MGal Min Daily Flow: 1.162 MGal

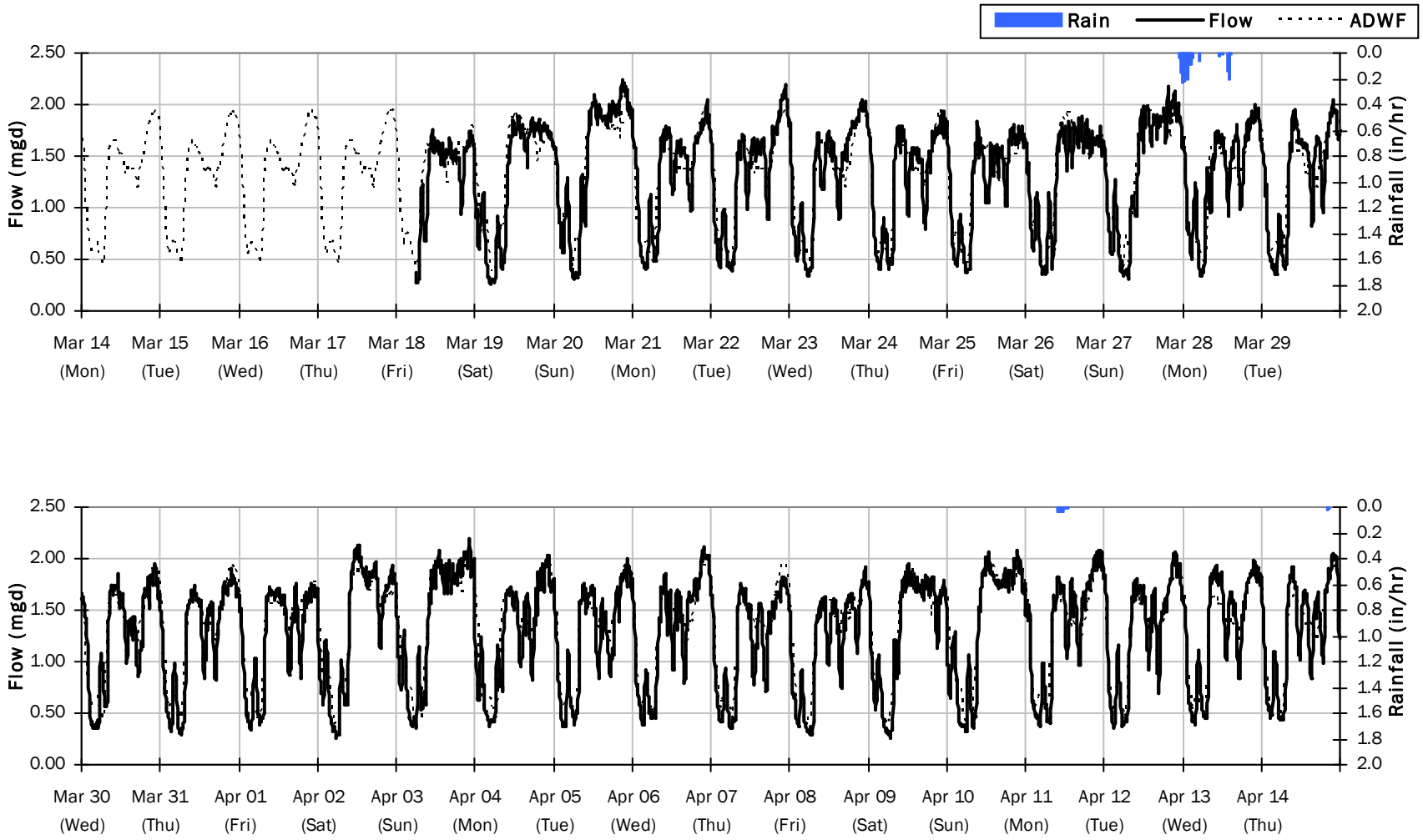
Total Rainfall: 1.01 inches



SITE 14

Flow Summary: 3/14/2022 to 4/14/2022

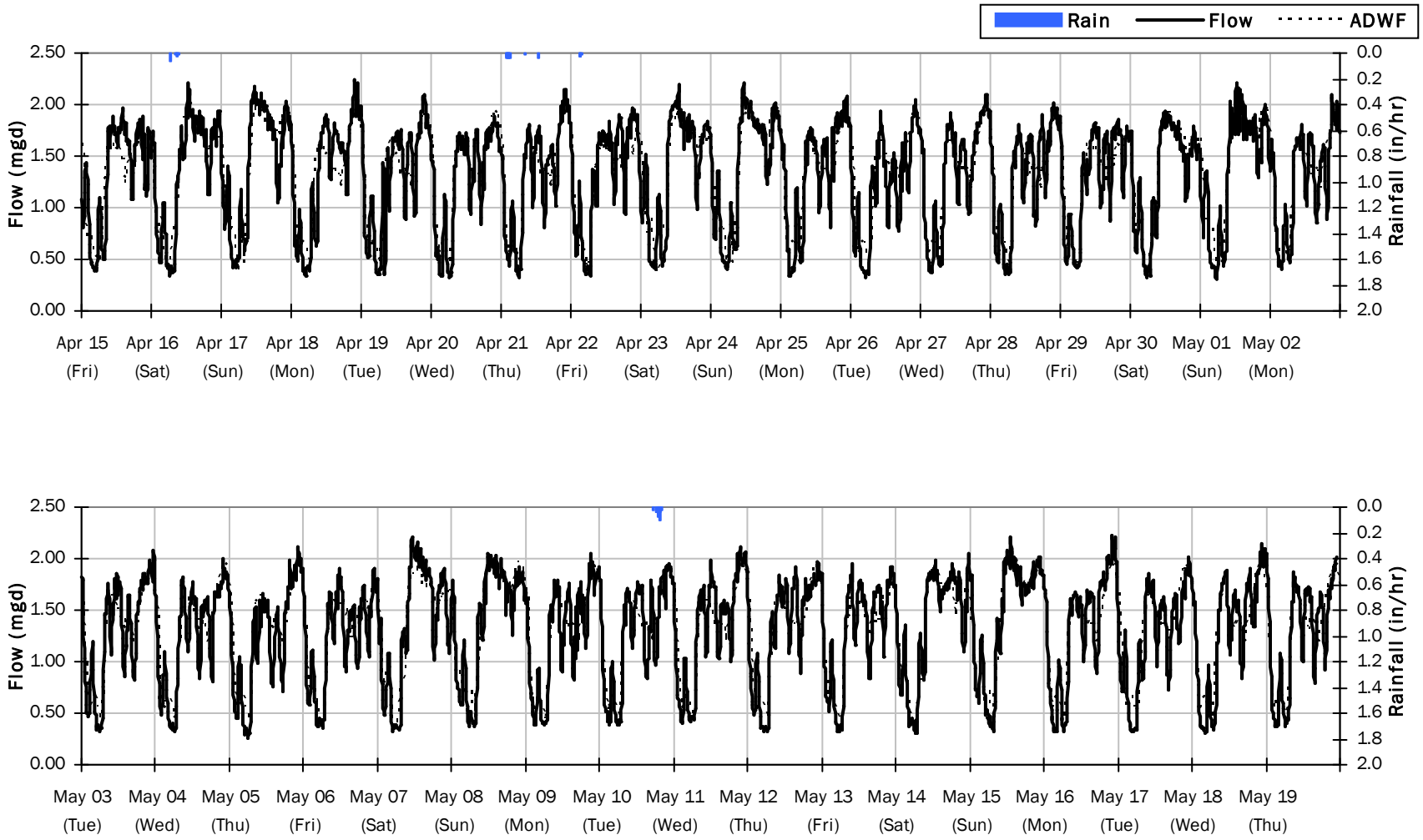
Period Rainfall: 0.81 inches Period Avg Flow: 1.308 mgd Period Peak Flow: 2.238 mgd Period Min Flow: 0.252 mgd



SITE 14

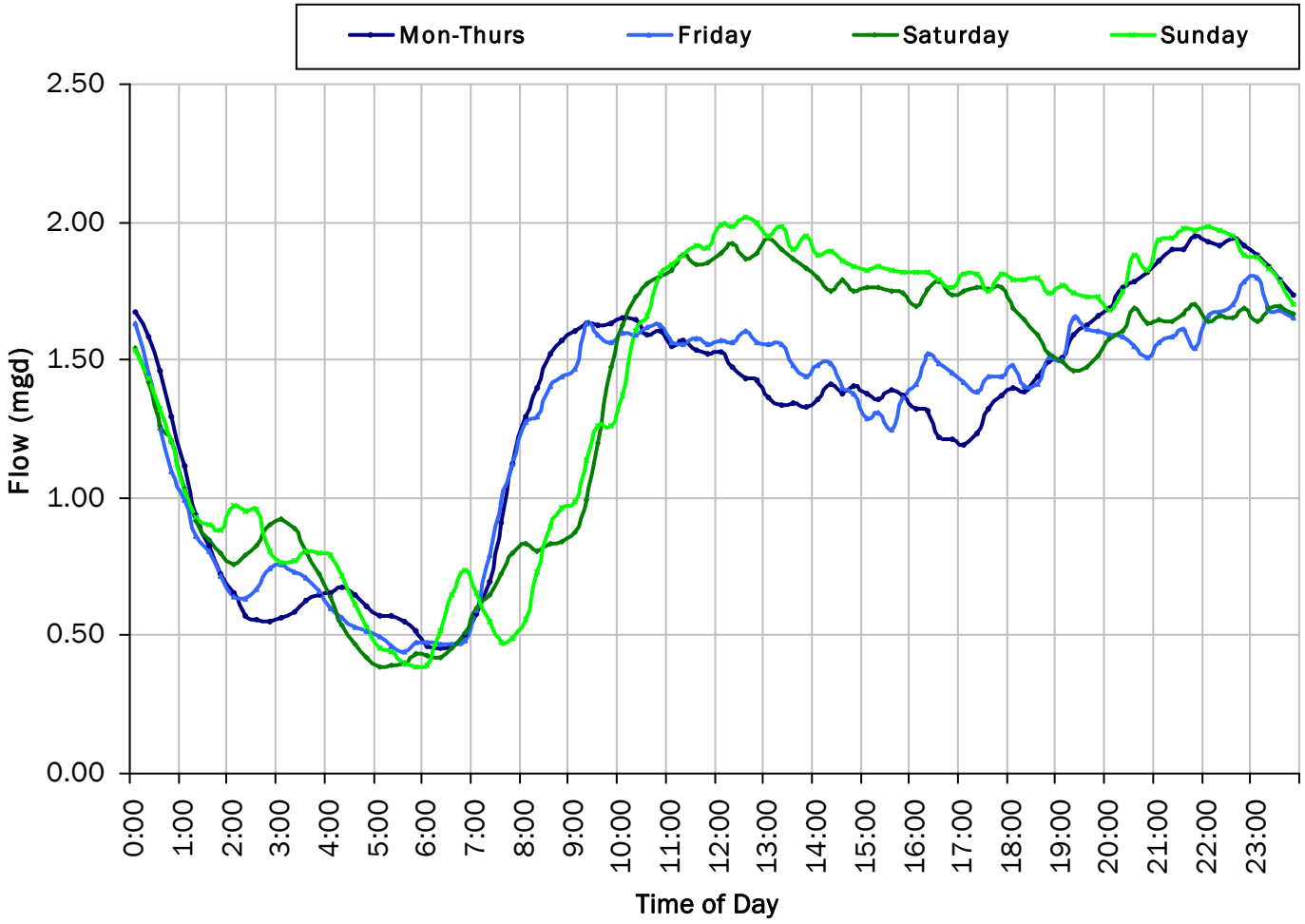
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.20 inches Period Avg Flow: 1.312 mgd Period Peak Flow: 2.240 mgd Period Min Flow: 0.266 mgd



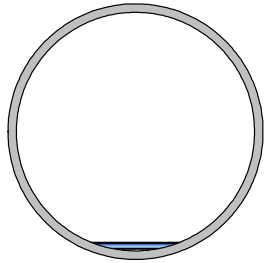
SITE 14

Average Dry Weather Flow Hydrographs



ADWF:

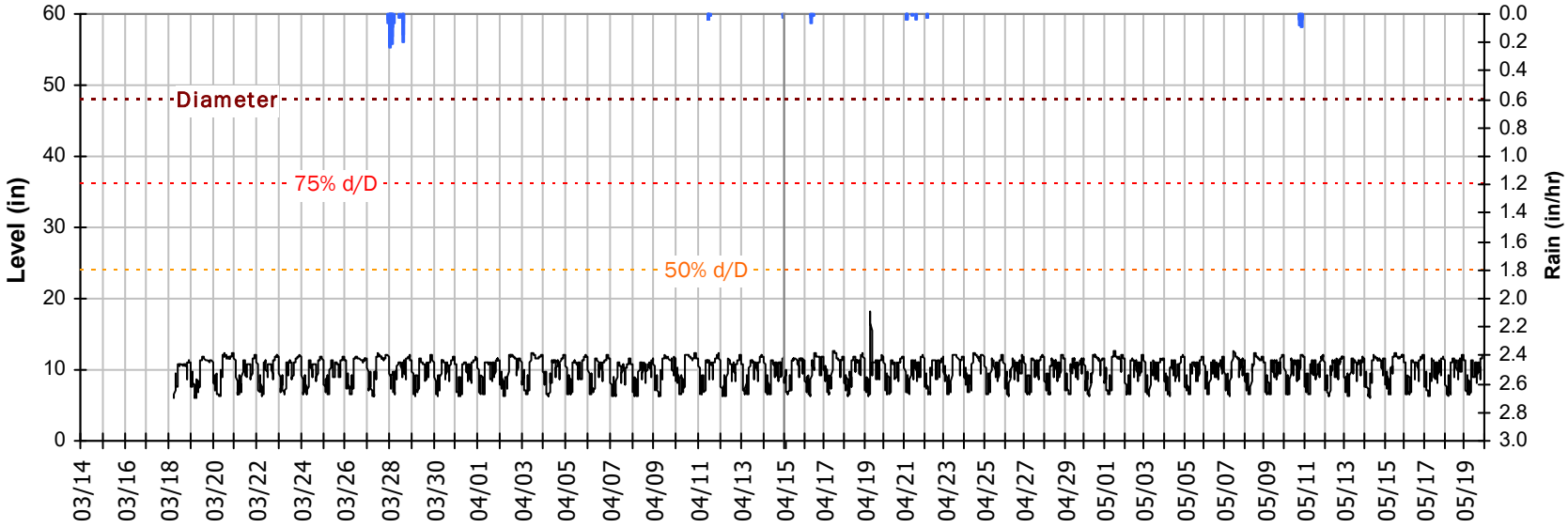
1.307 *mgd*

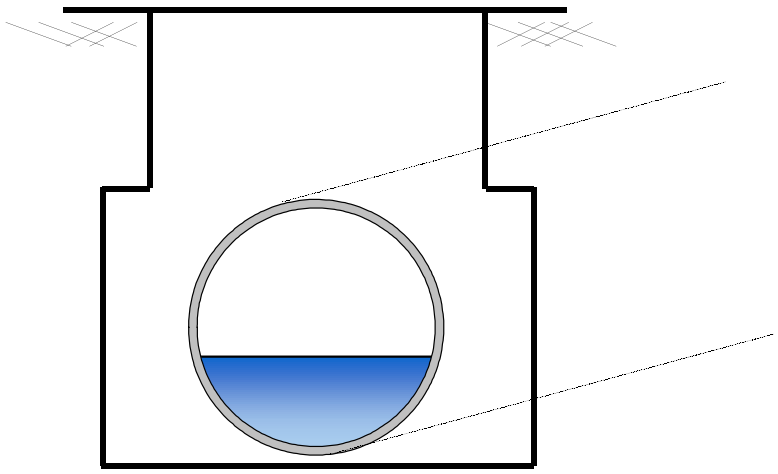


SITE 14

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period



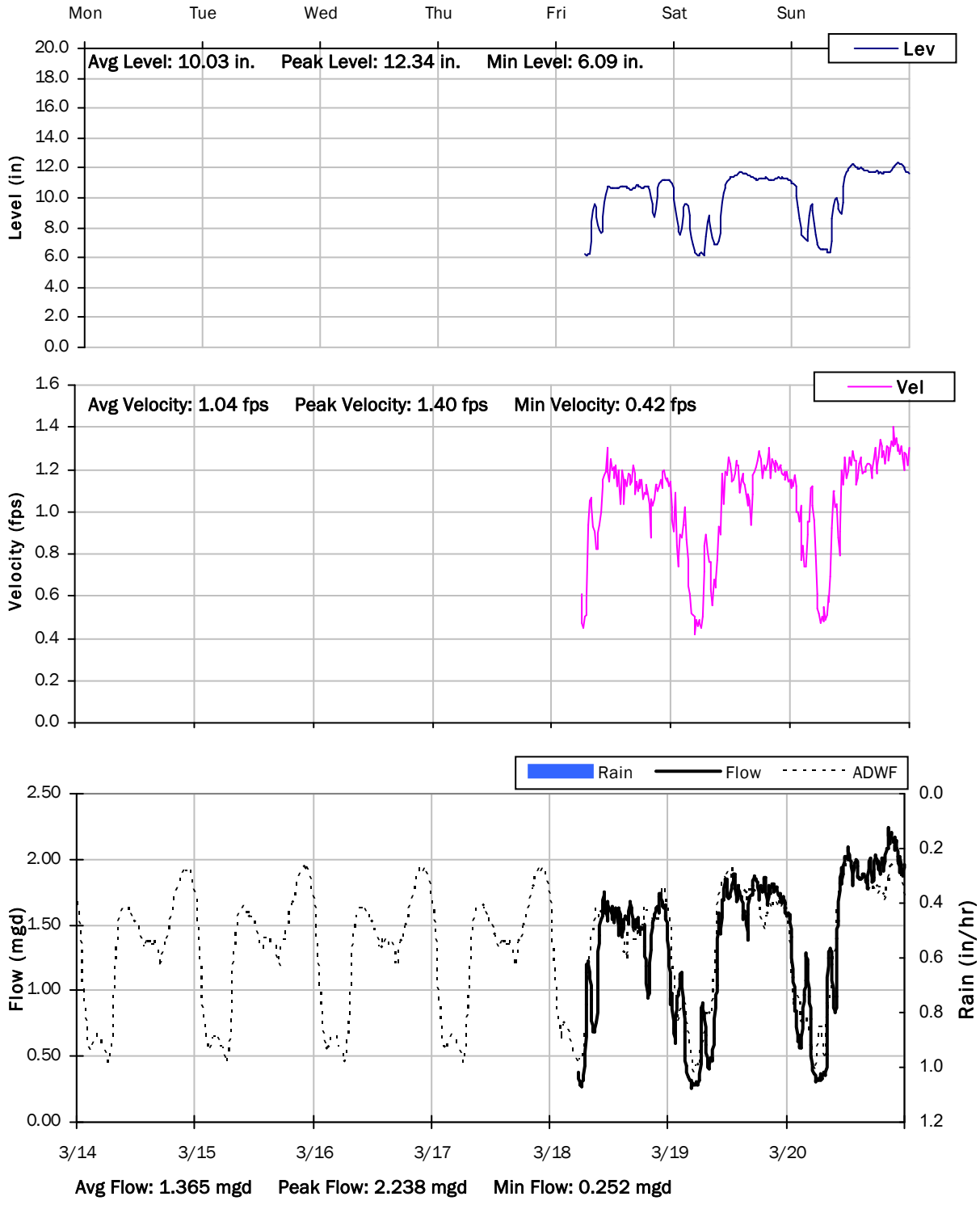


Pipe Diameter:	48	*inches*
Peak Measured Level:	18.2	*inches*
Peak d/D Ratio:	0.38	

SITE 14

Weekly Level, Velocity and Flow Hydrographs

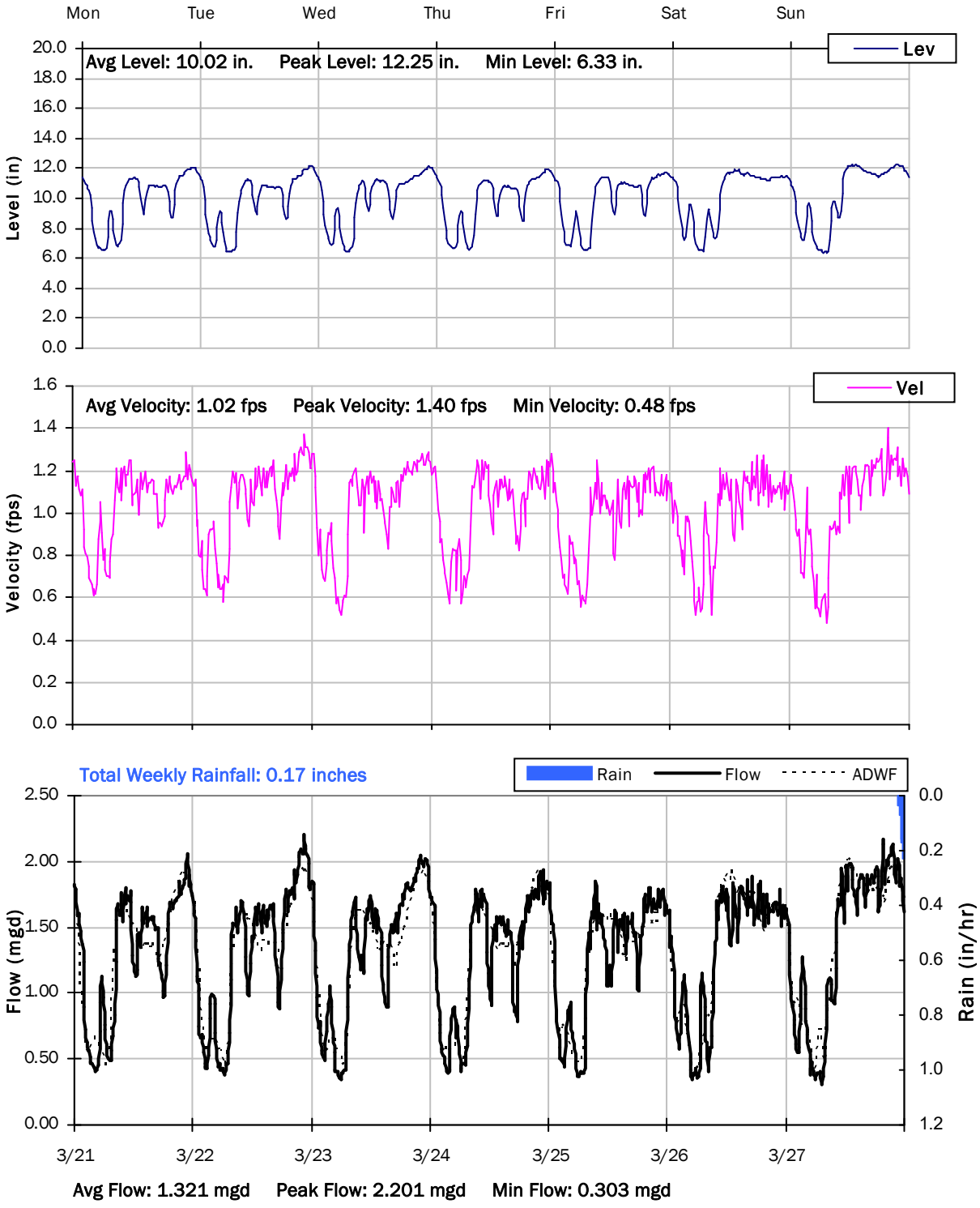
3/14/2022 to 3/21/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

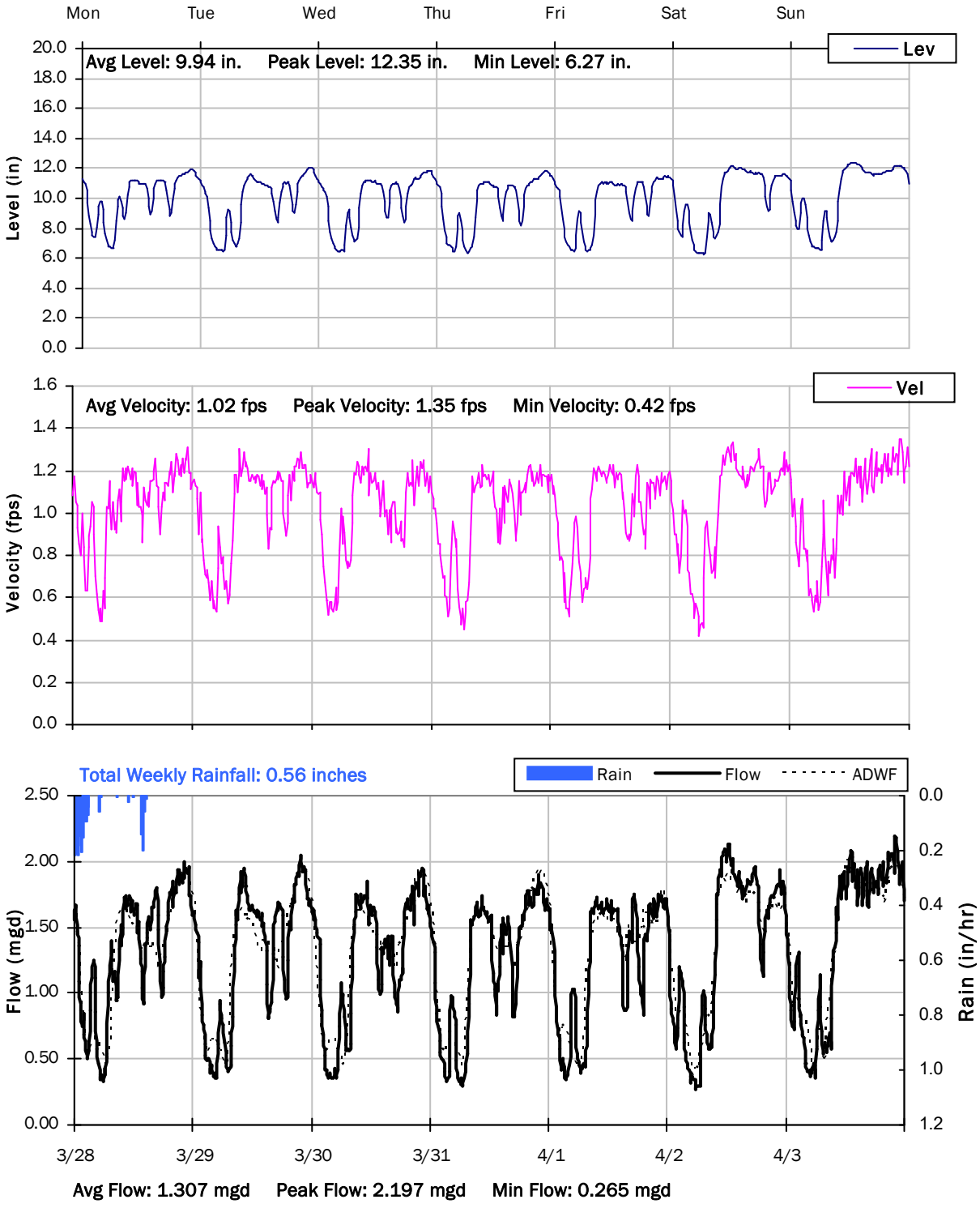
3/21/2022 to 3/28/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

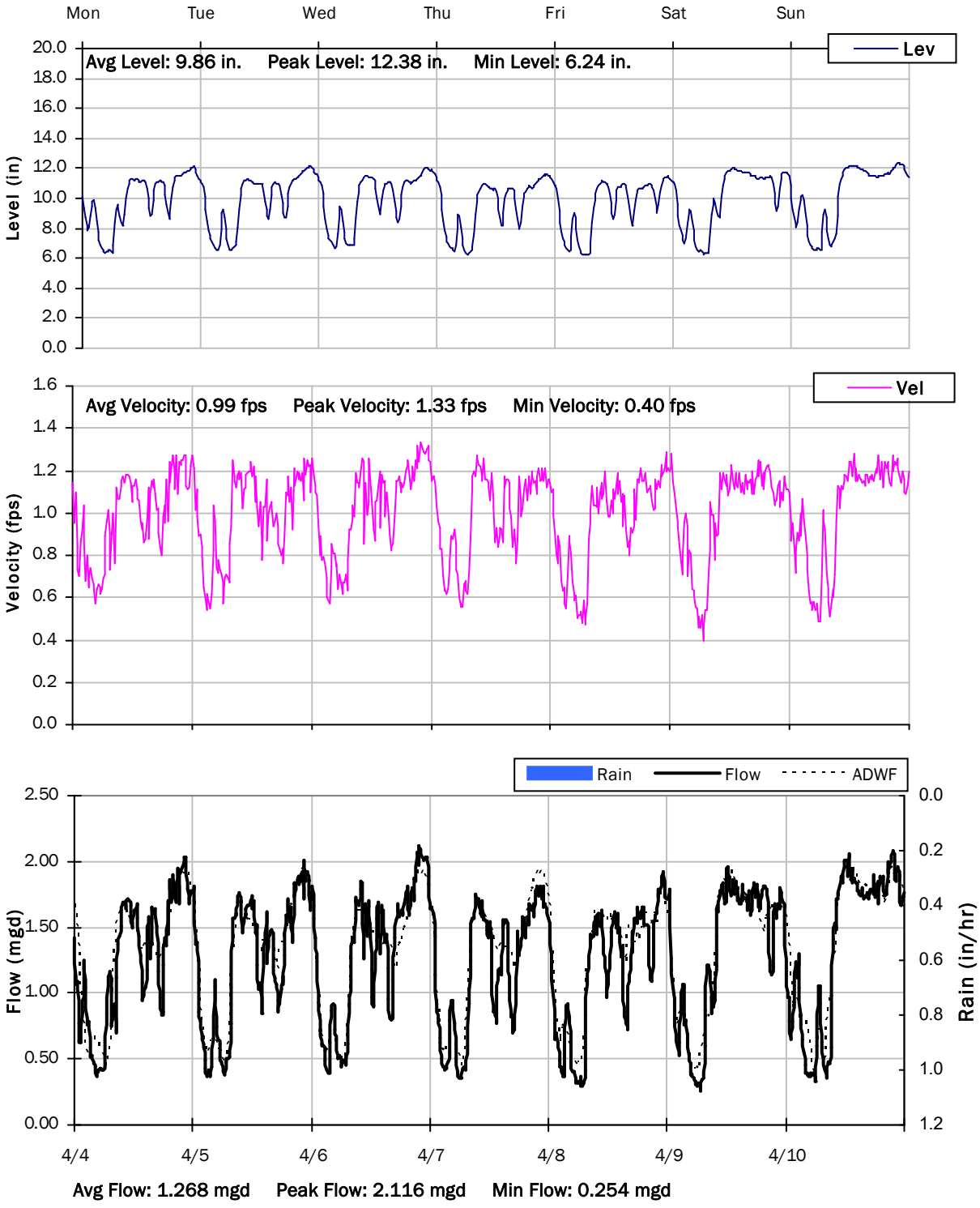
3/28/2022 to 4/4/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

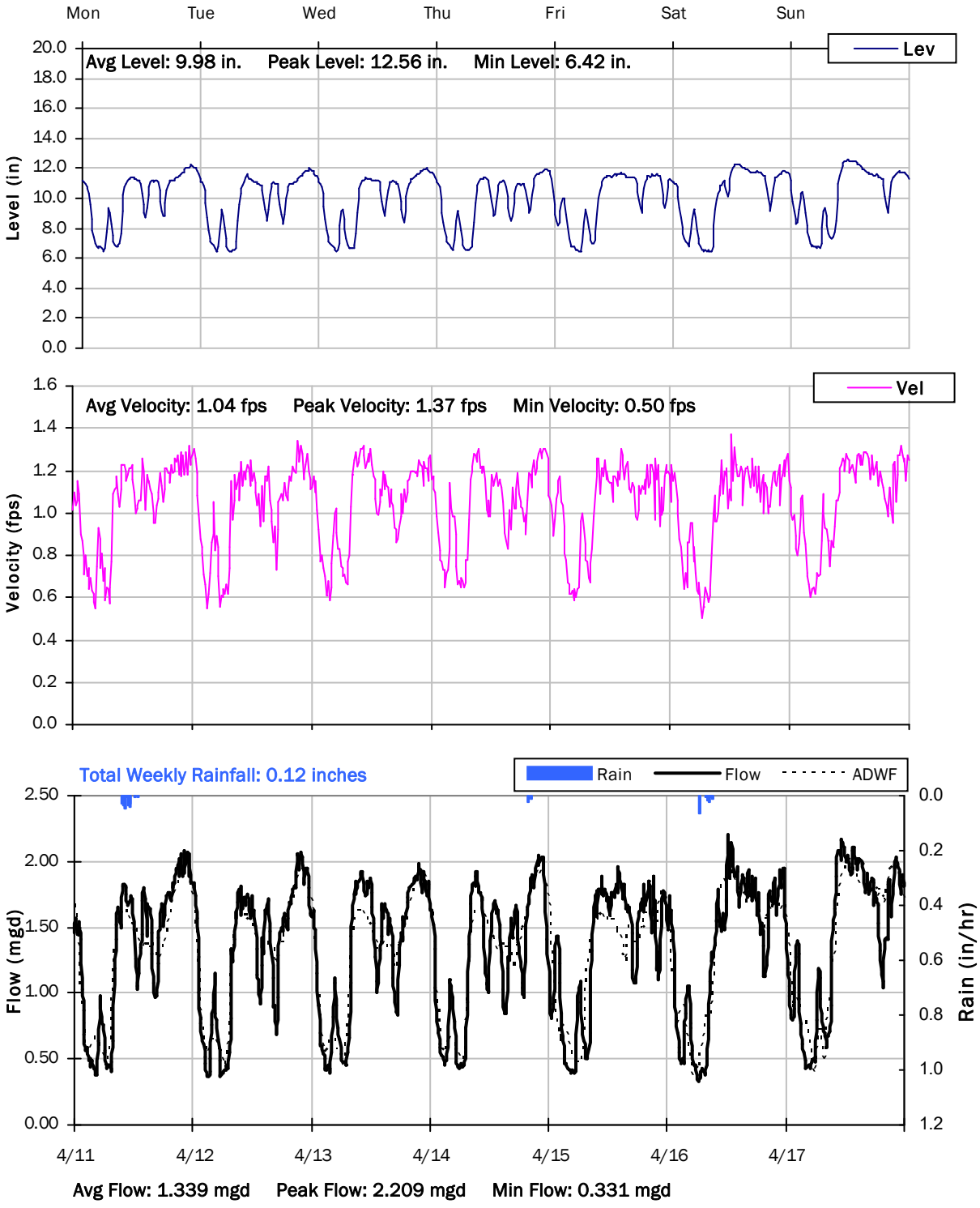
4/4/2022 to 4/11/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

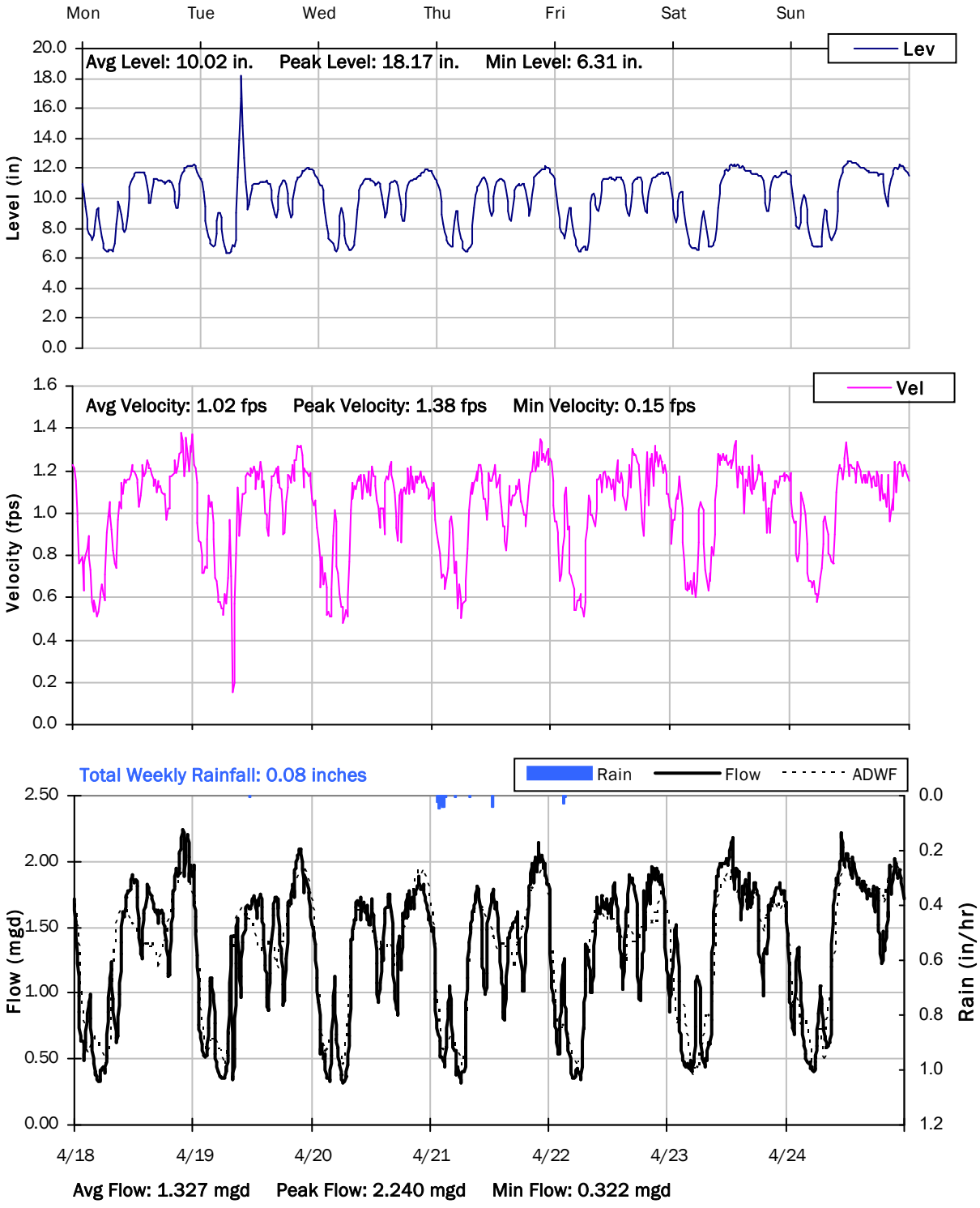
4/11/2022 to 4/18/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

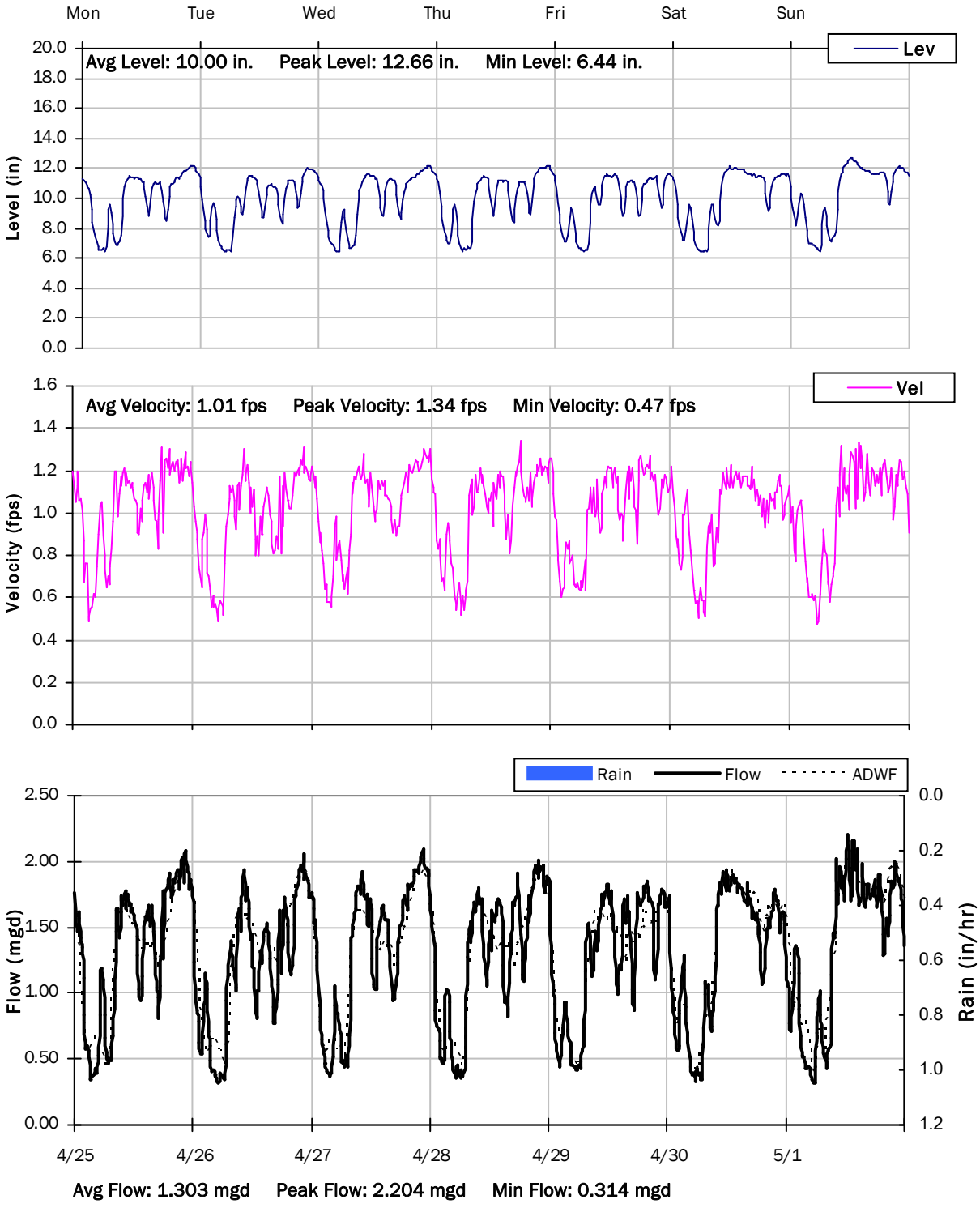
4/18/2022 to 4/25/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

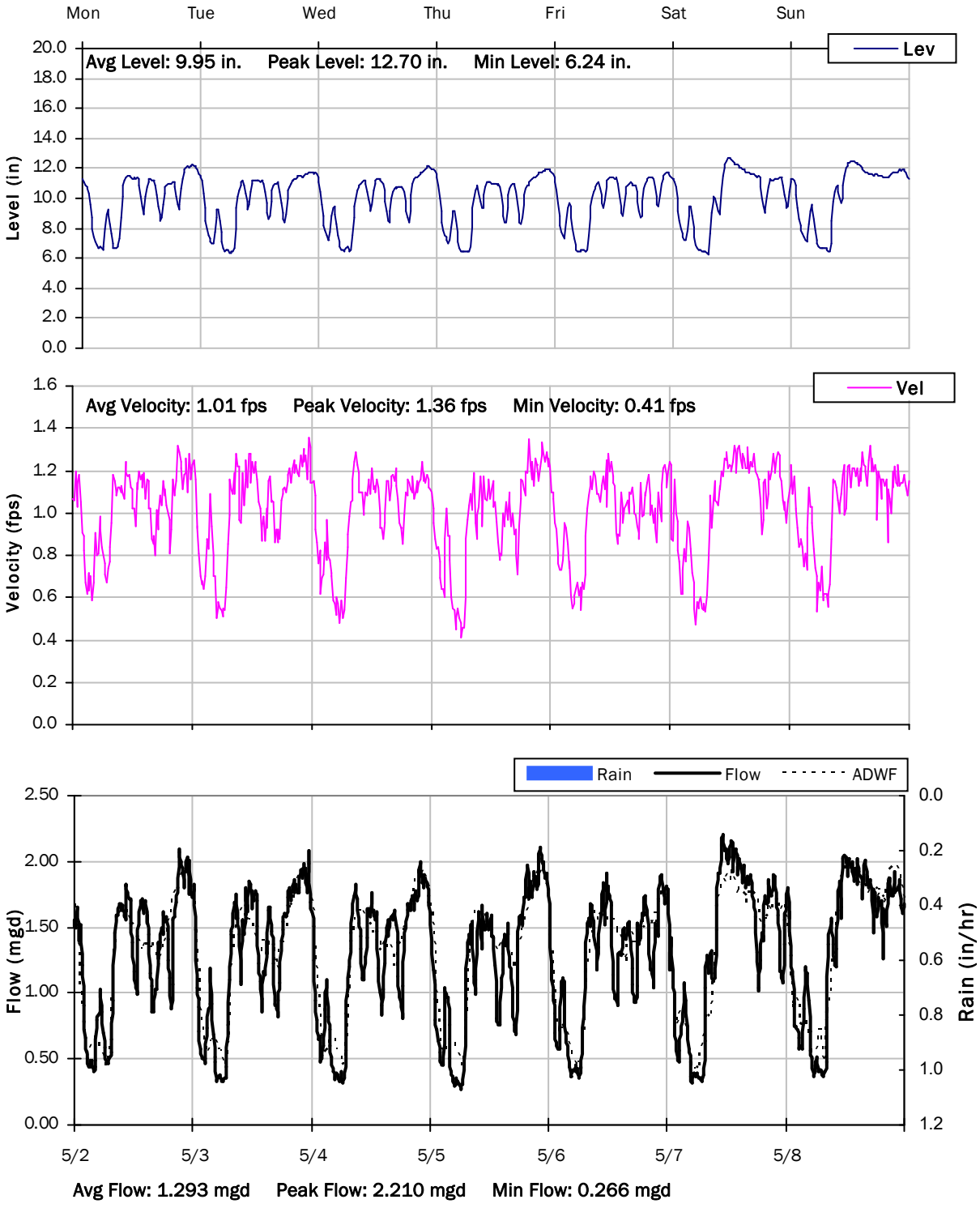
4/25/2022 to 5/2/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

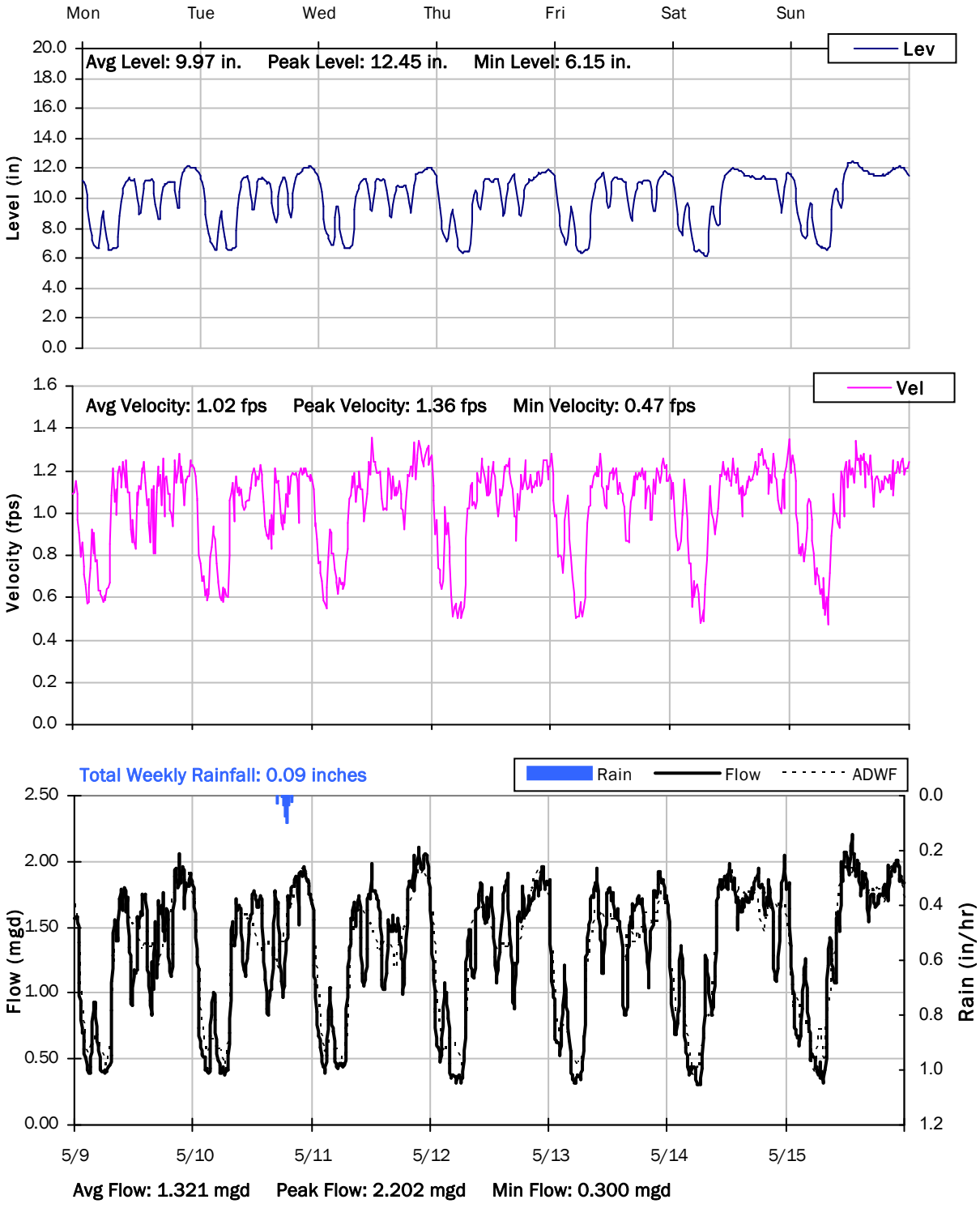
5/2/2022 to 5/9/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

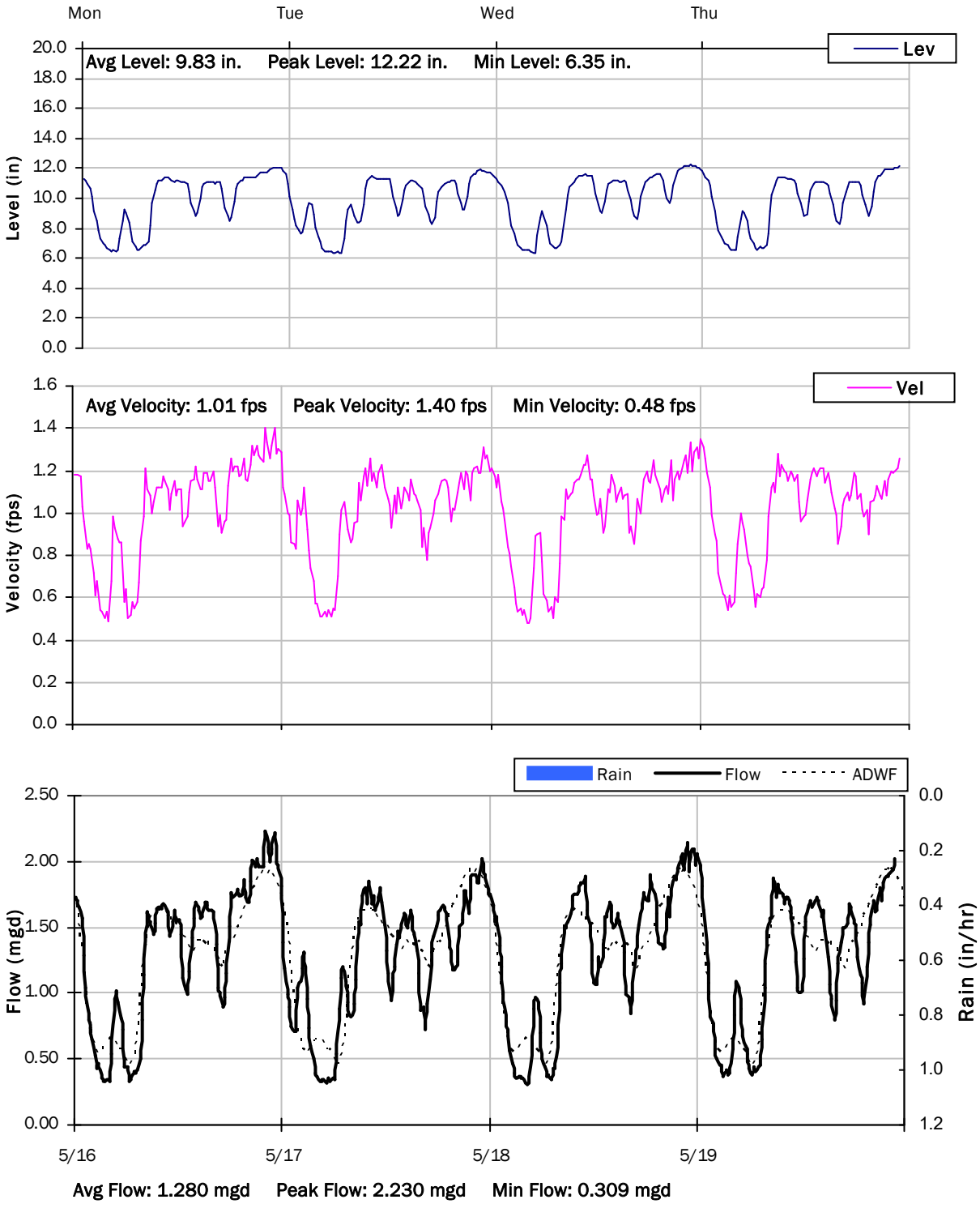
5/9/2022 to 5/16/2022



SITE 14

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 15

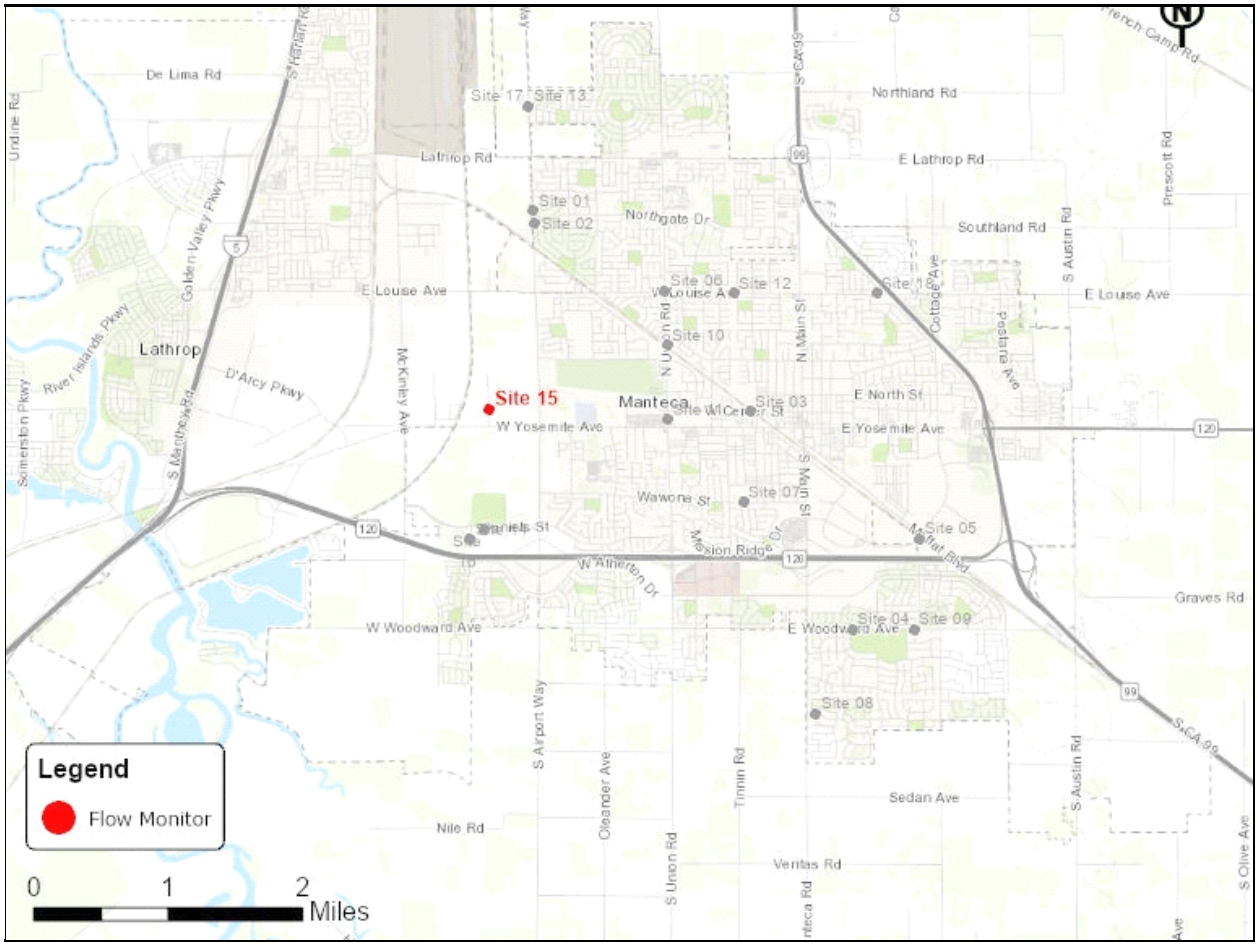
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Swanson Road North of W. Yosemite Avenue

Data Summary Report

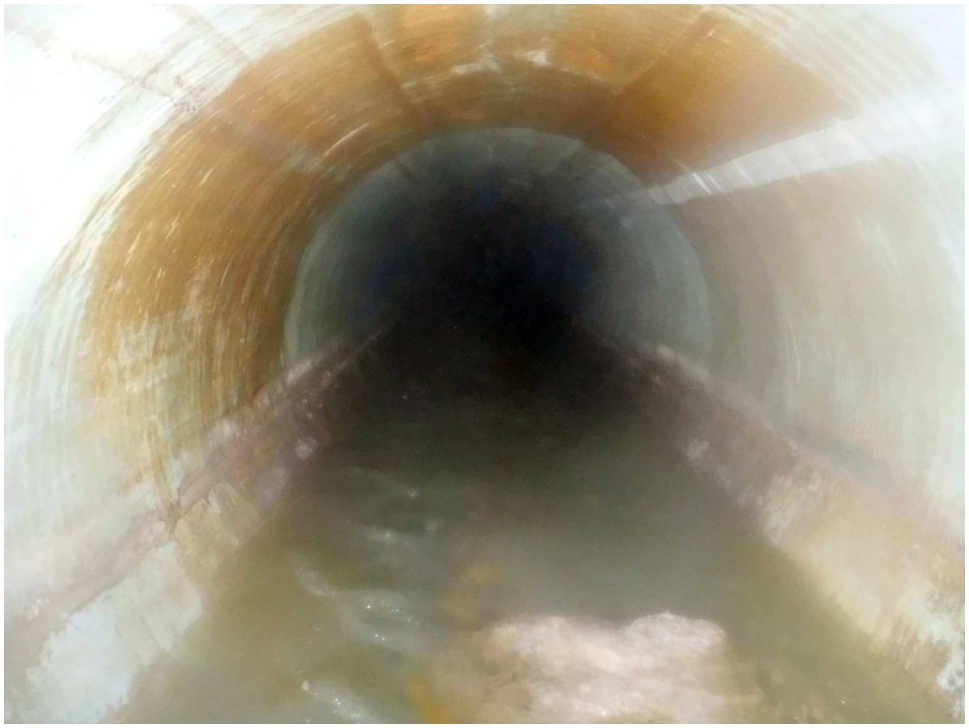


Vicinity Map: Site 15

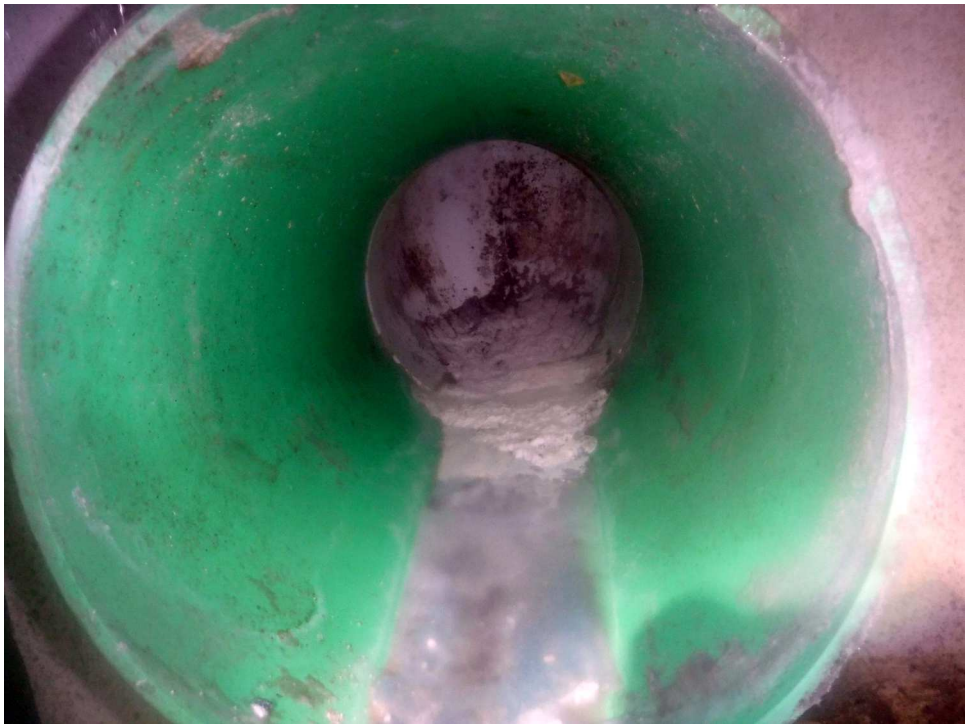
SITE 15

Additional Site Photos

Effluent Pipe



West Influent Pipe (Lower)



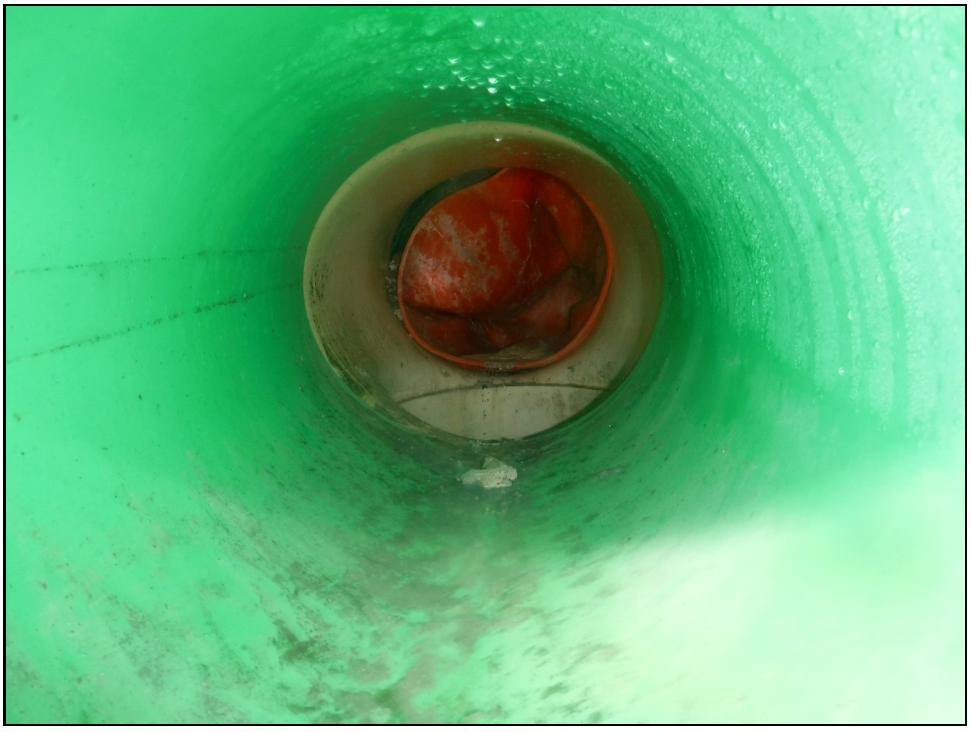
SITE 15

Additional Site Photos

Monitored North Influent Pipe



East Influent Pipe (Lower)

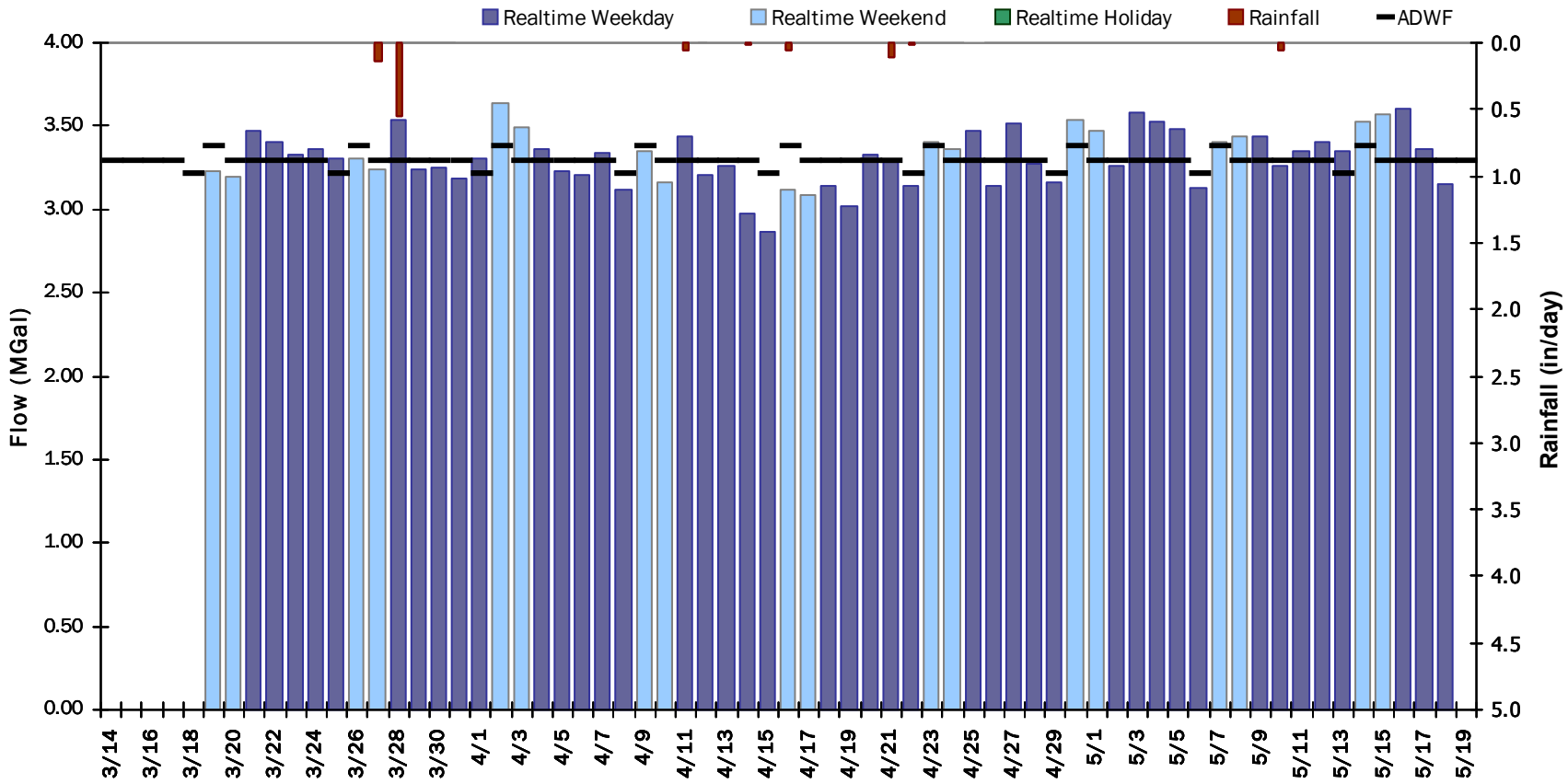


SITE 15

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 3.316 MGal Peak Daily Flow: 3.642 MGal Min Daily Flow: 2.870 MGal

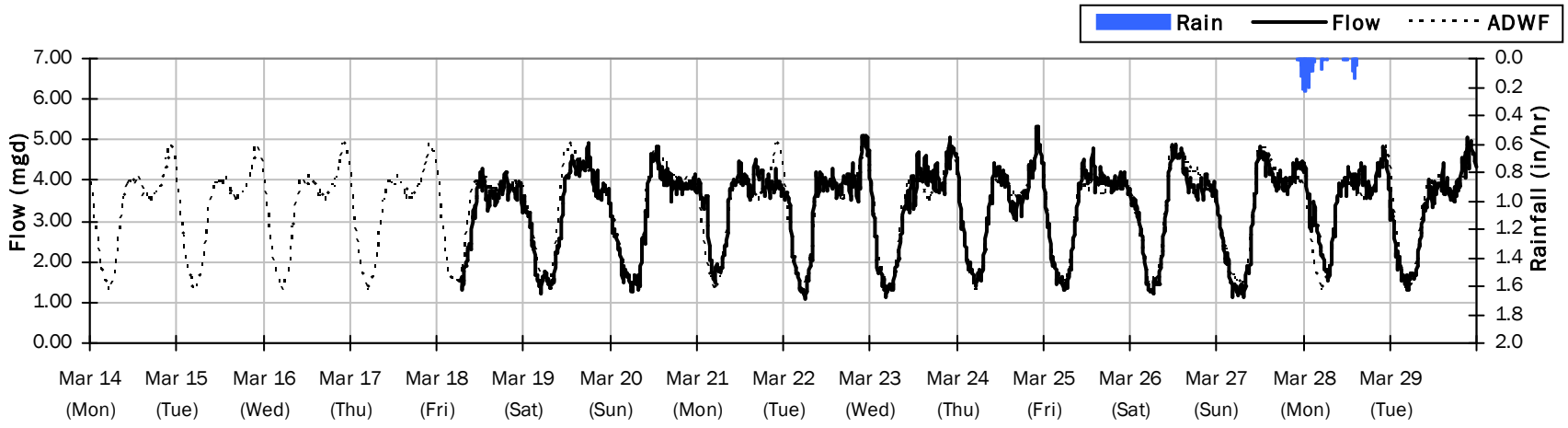
Total Rainfall: 0.99 inches

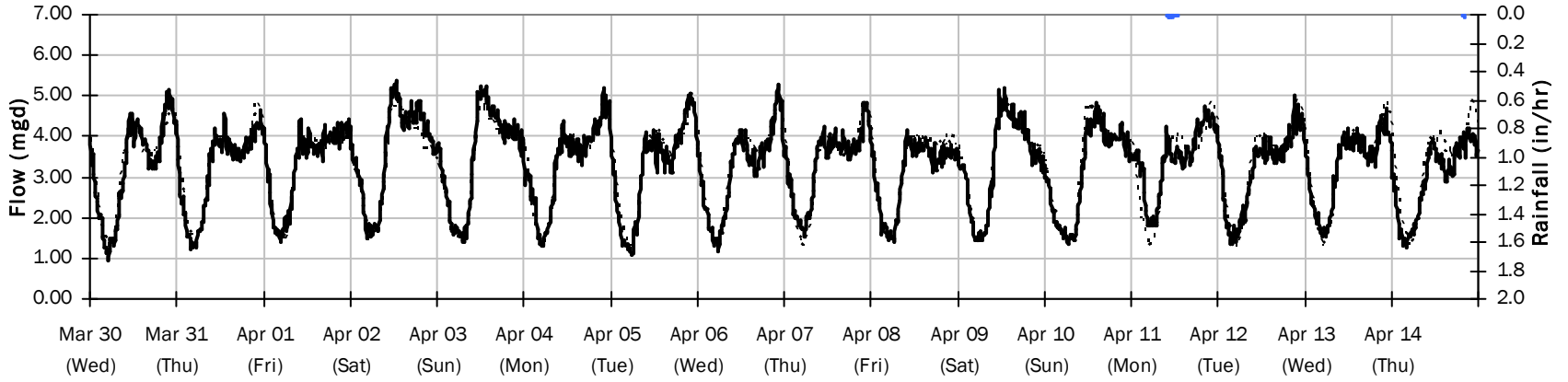


SITE 15

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.75 inches Period Avg Flow: 3.304 mgd Period Peak Flow: 5.380 mgd Period Min Flow: 0.950 mgd

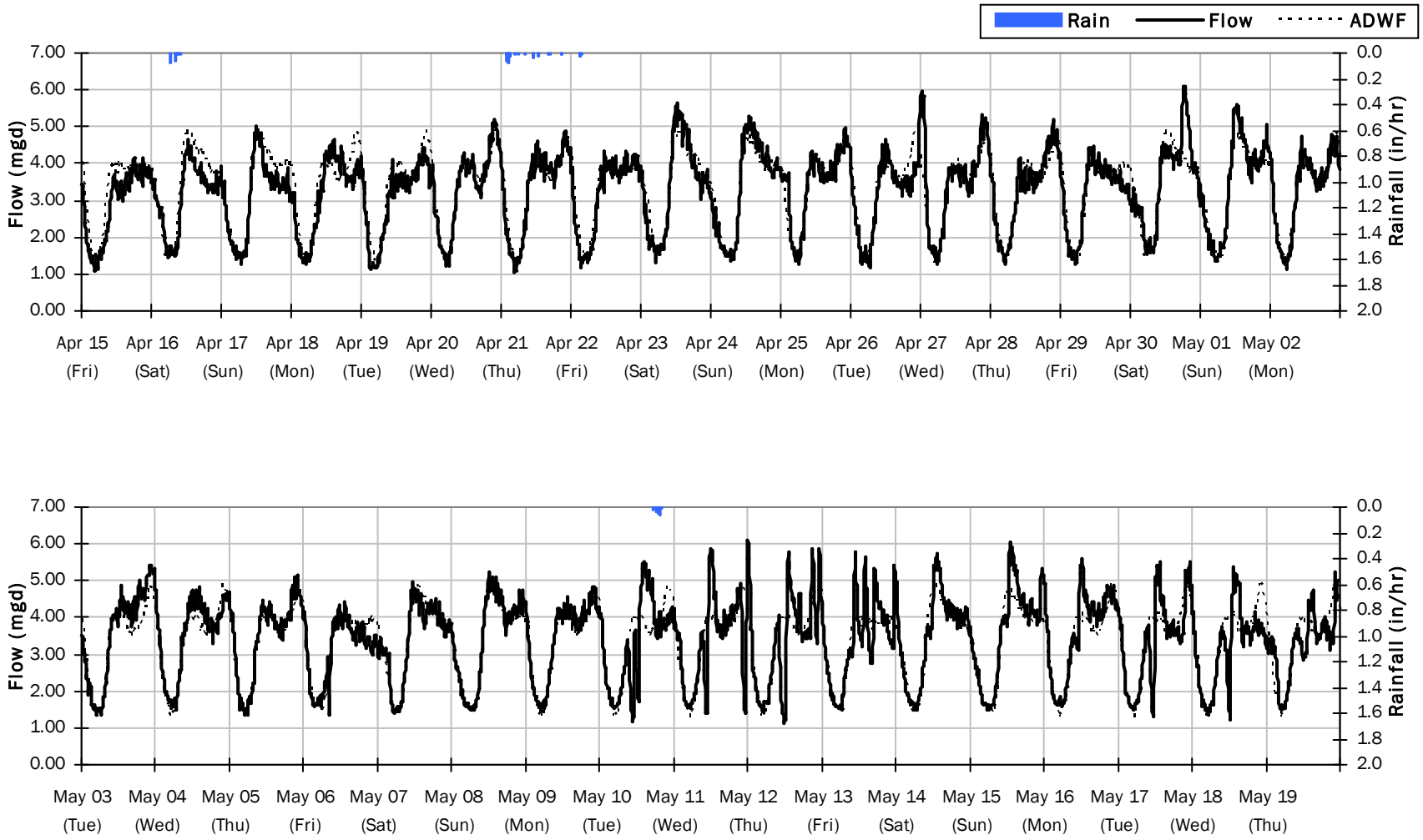




SITE 15

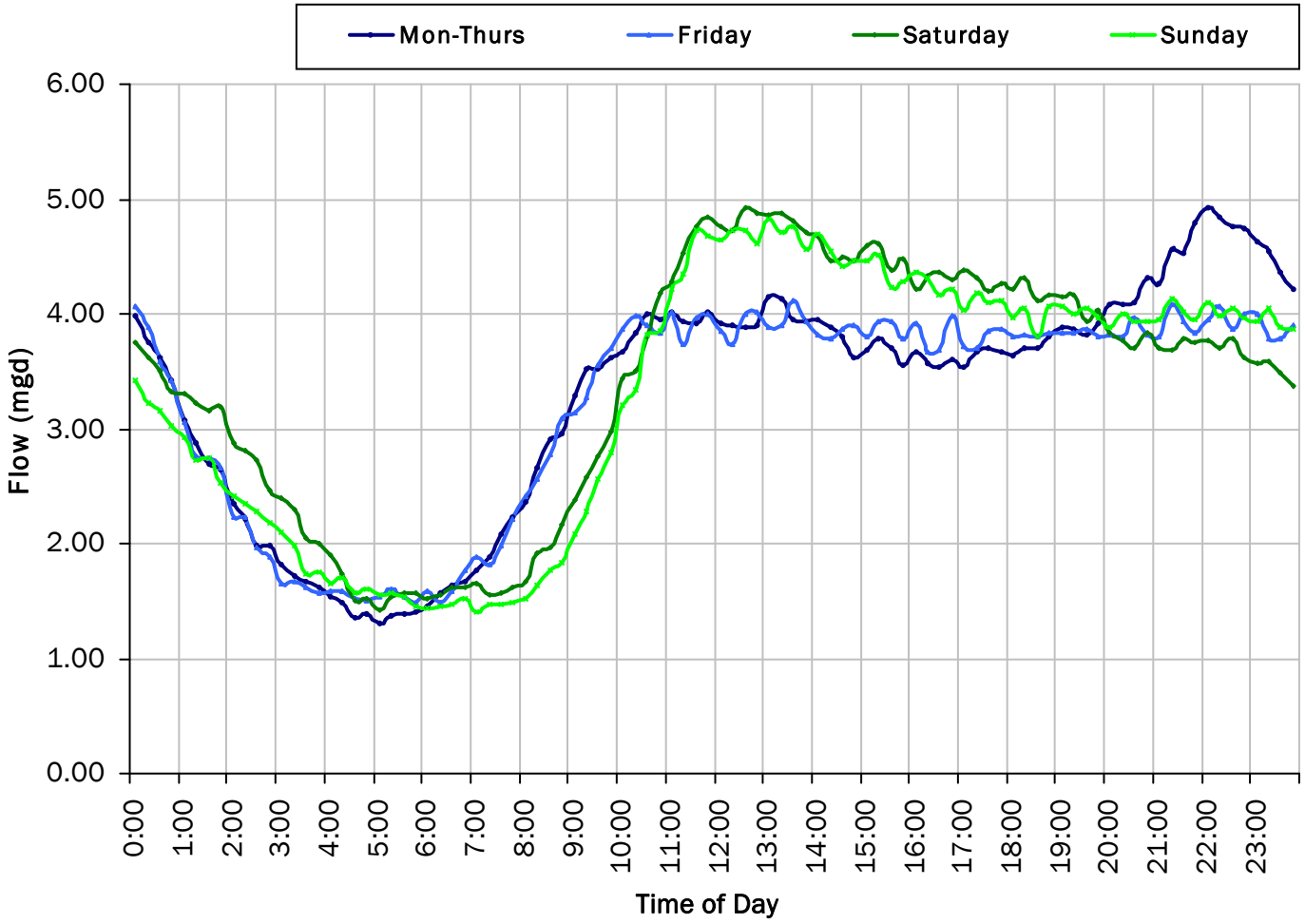
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.24 inches Period Avg Flow: 3.325 mgd Period Peak Flow: 6.108 mgd Period Min Flow: 1.032 mgd



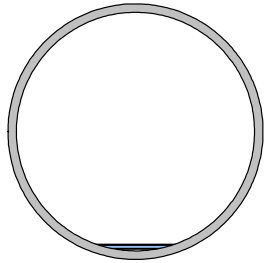
SITE 15

Average Dry Weather Flow Hydrographs



ADWF:

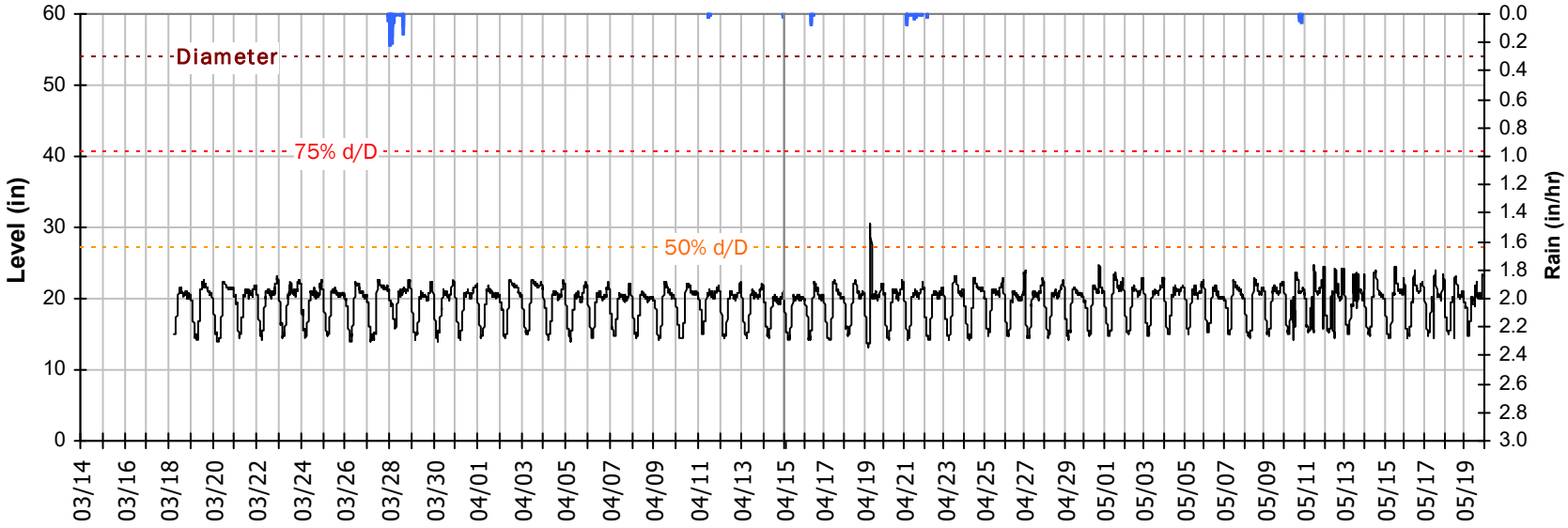
3.294 *mgd*

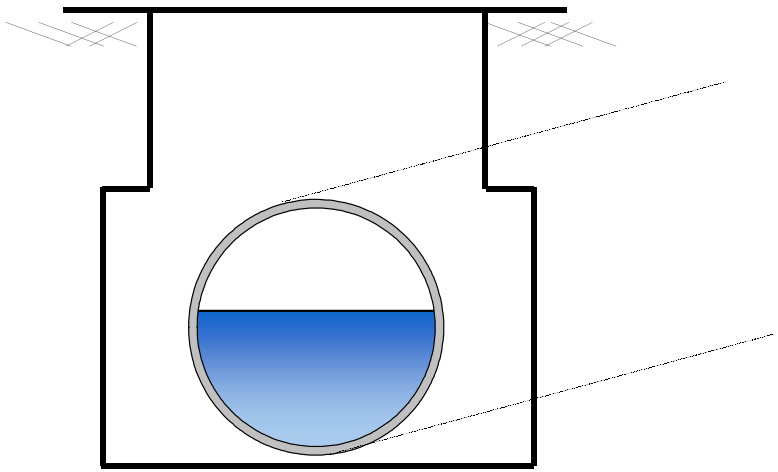


SITE 15

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

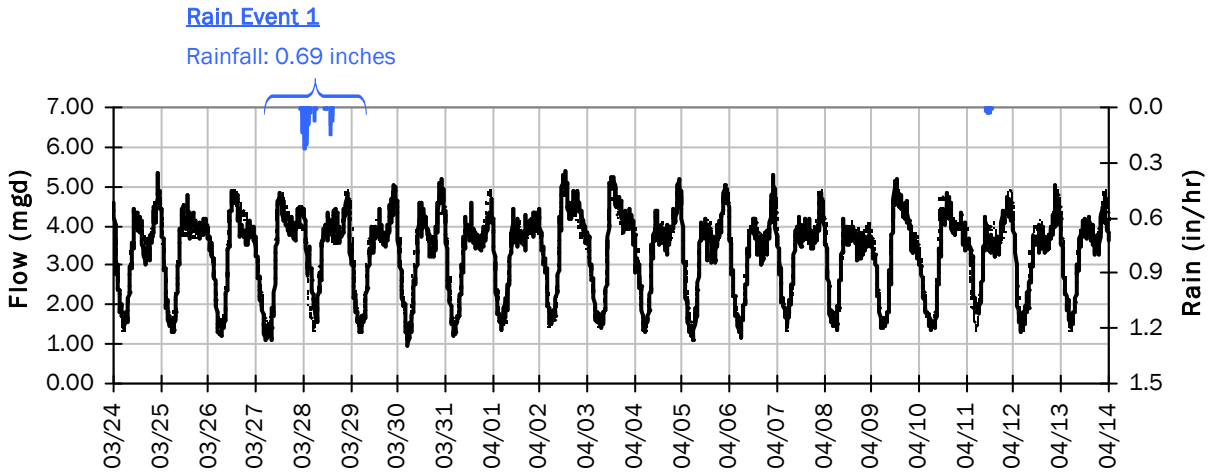




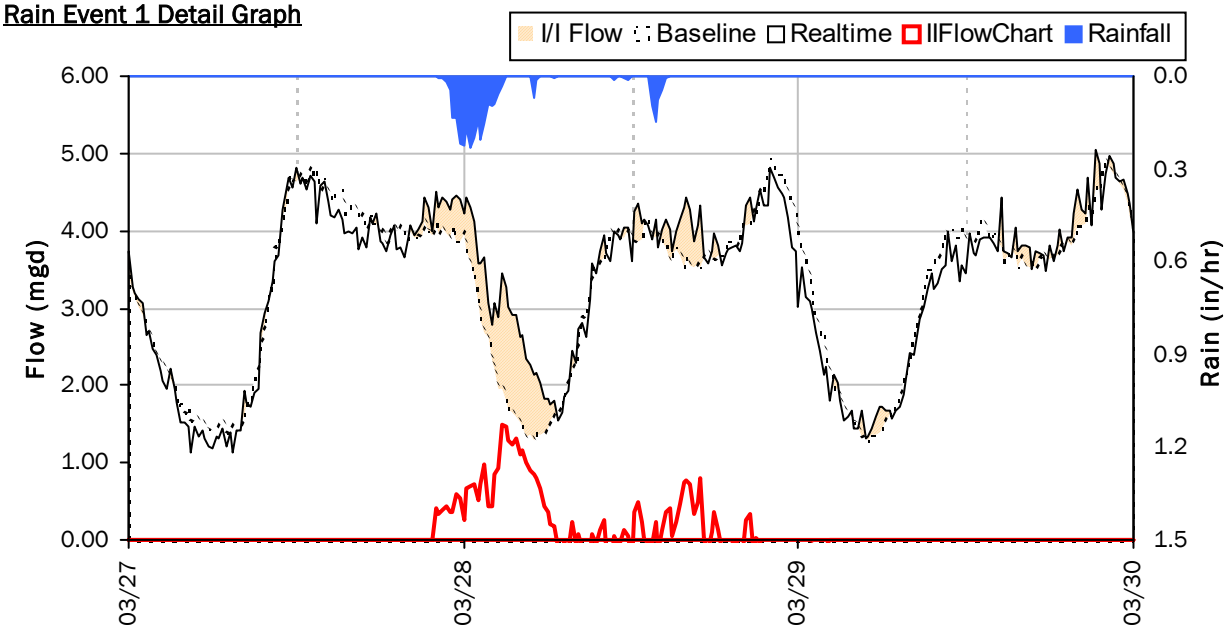
Pipe Diameter:	54	*inches*
Peak Measured Level:	30.6	*inches*
Peak d/D Ratio:	0.57	

SITE 15
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



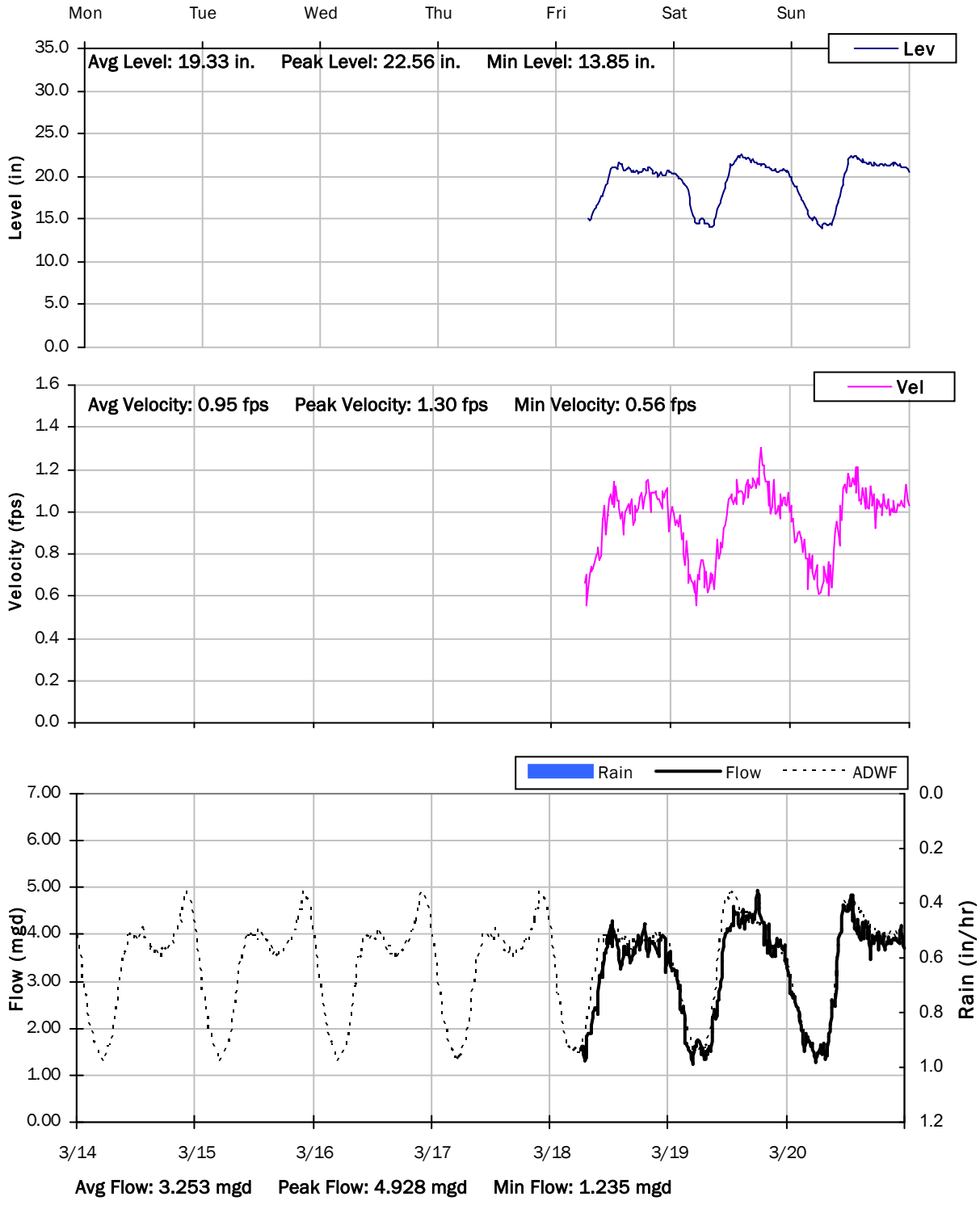
Storm Event I/I Analysis (Rain = 0.69 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	4.825 *mgd*	**Peak I/I Rate:**	1.493 *mgd*
PF:	1.46	**Total I/I:**	261,000 *gallons*
Peak Level:	22.68 *in*		
d/D Ratio:	0.42		

SITE 15

Weekly Level, Velocity and Flow Hydrographs

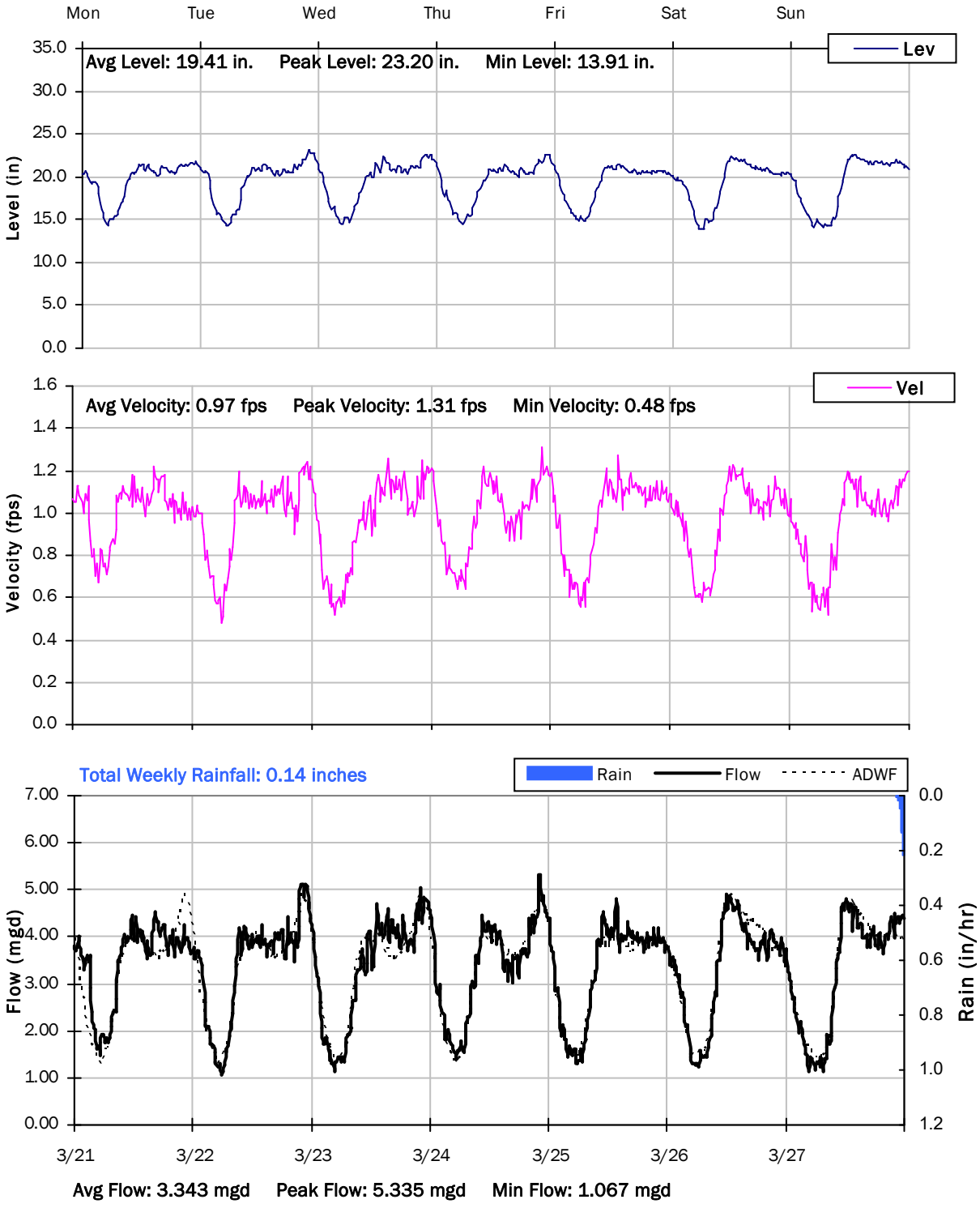
3/14/2022 to 3/21/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

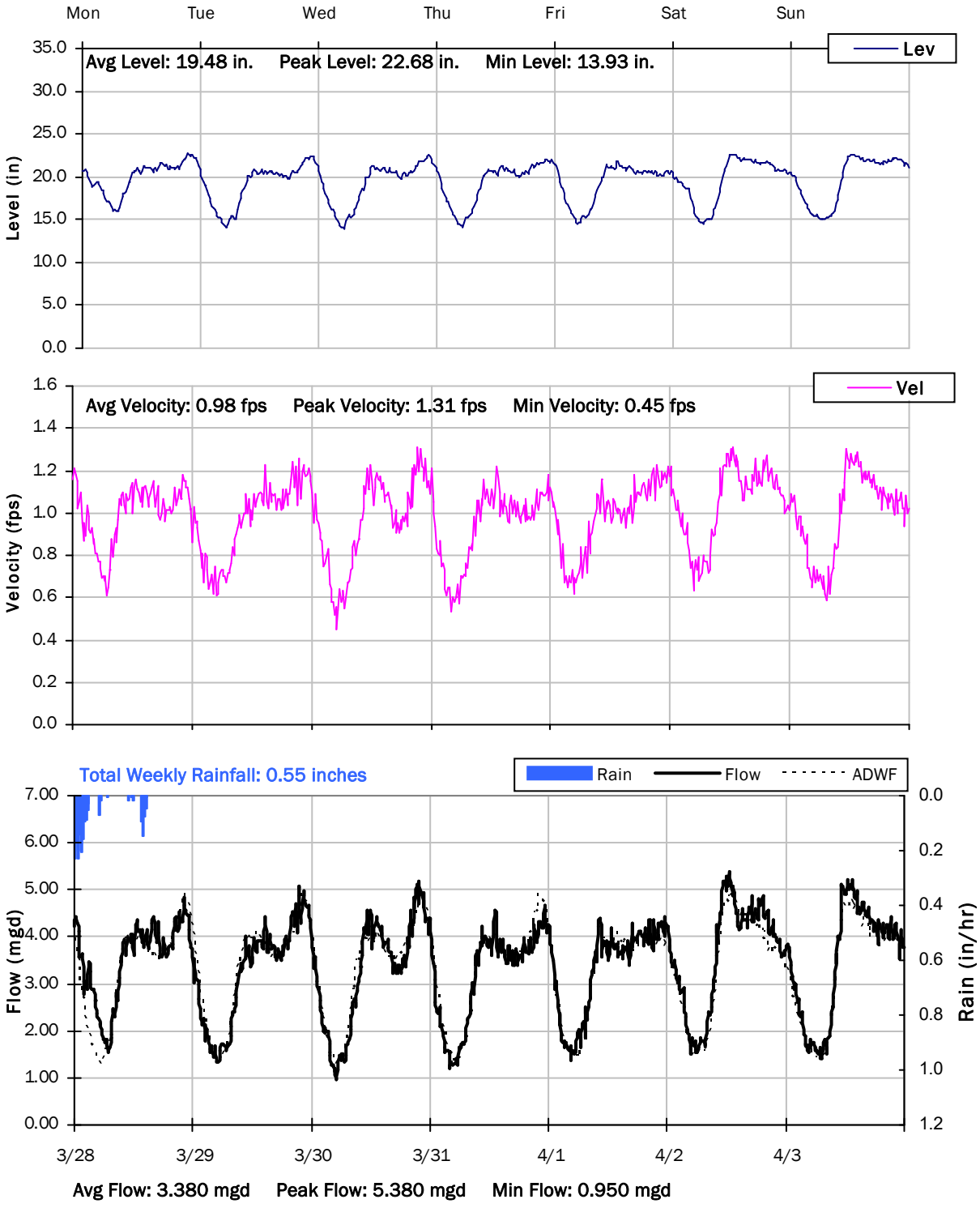
3/21/2022 to 3/28/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

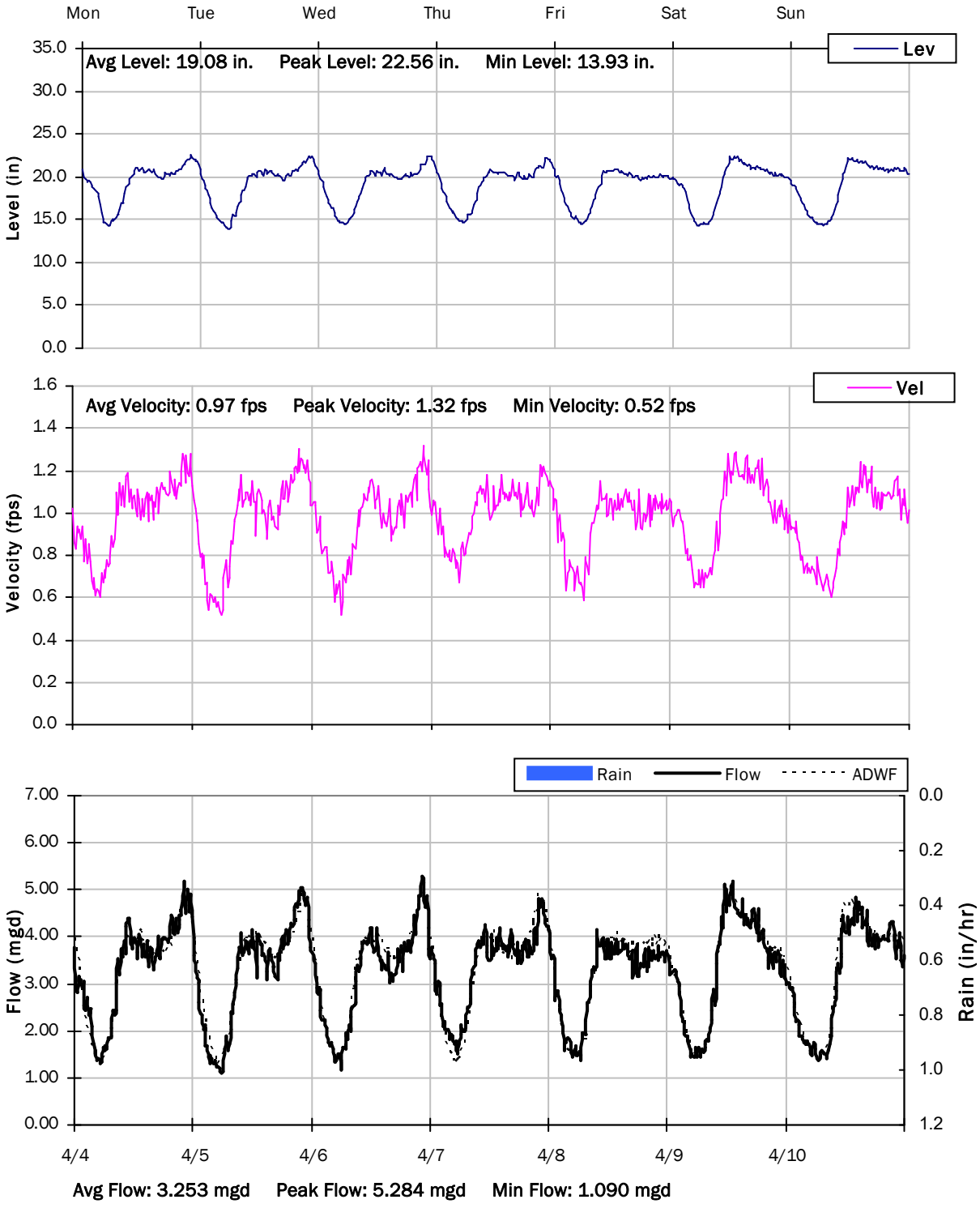
3/28/2022 to 4/4/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

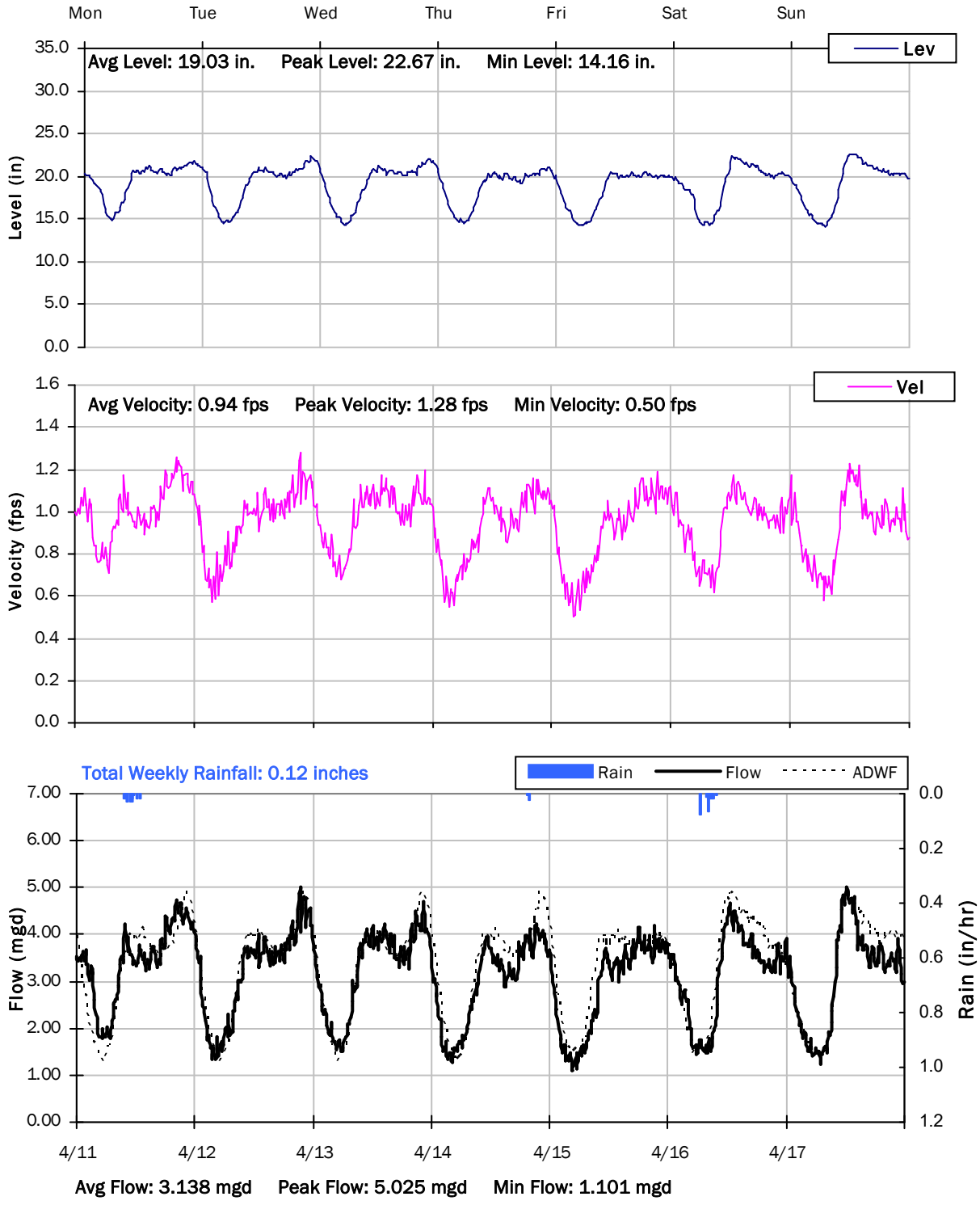
4/4/2022 to 4/11/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

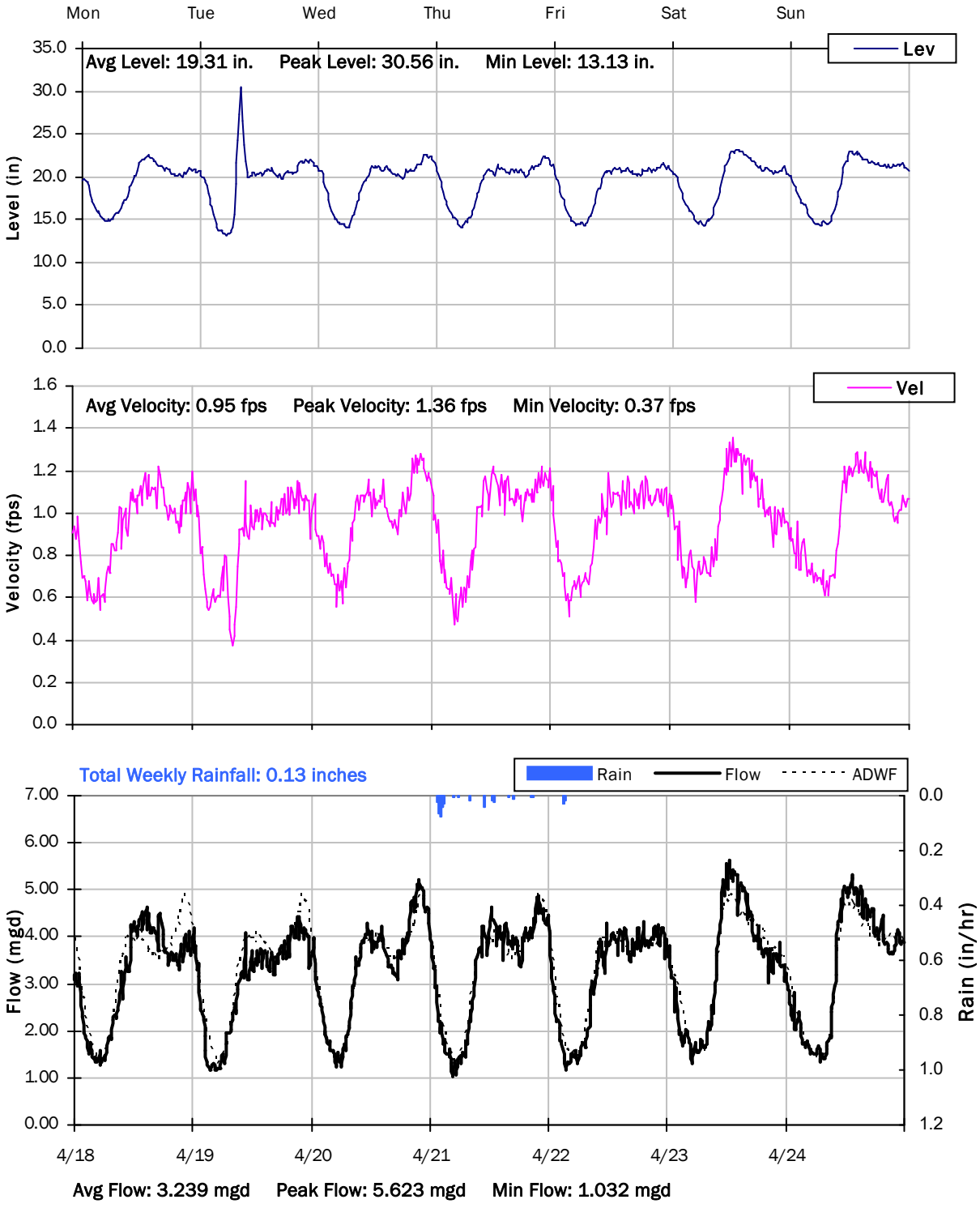
4/11/2022 to 4/18/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

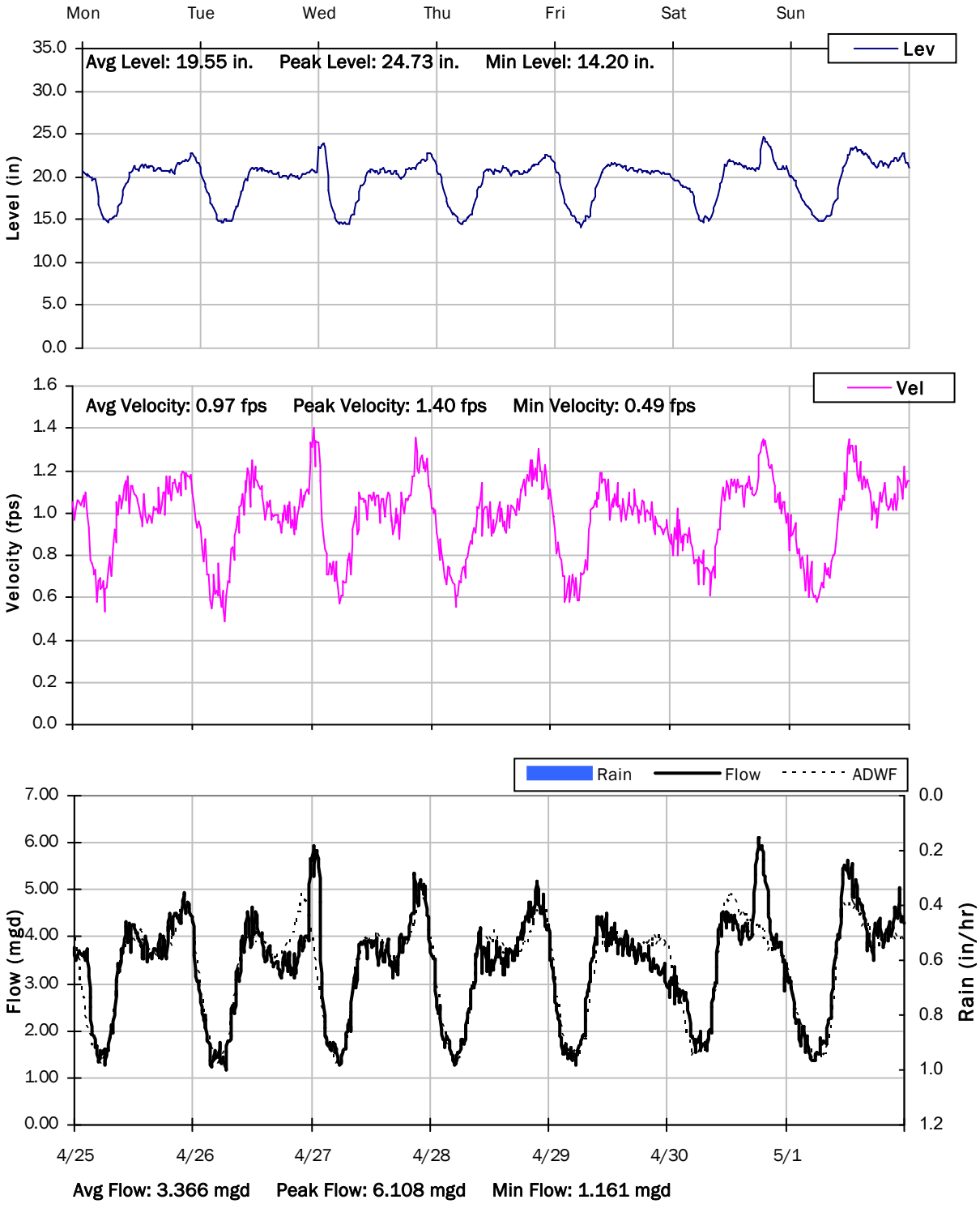
4/18/2022 to 4/25/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

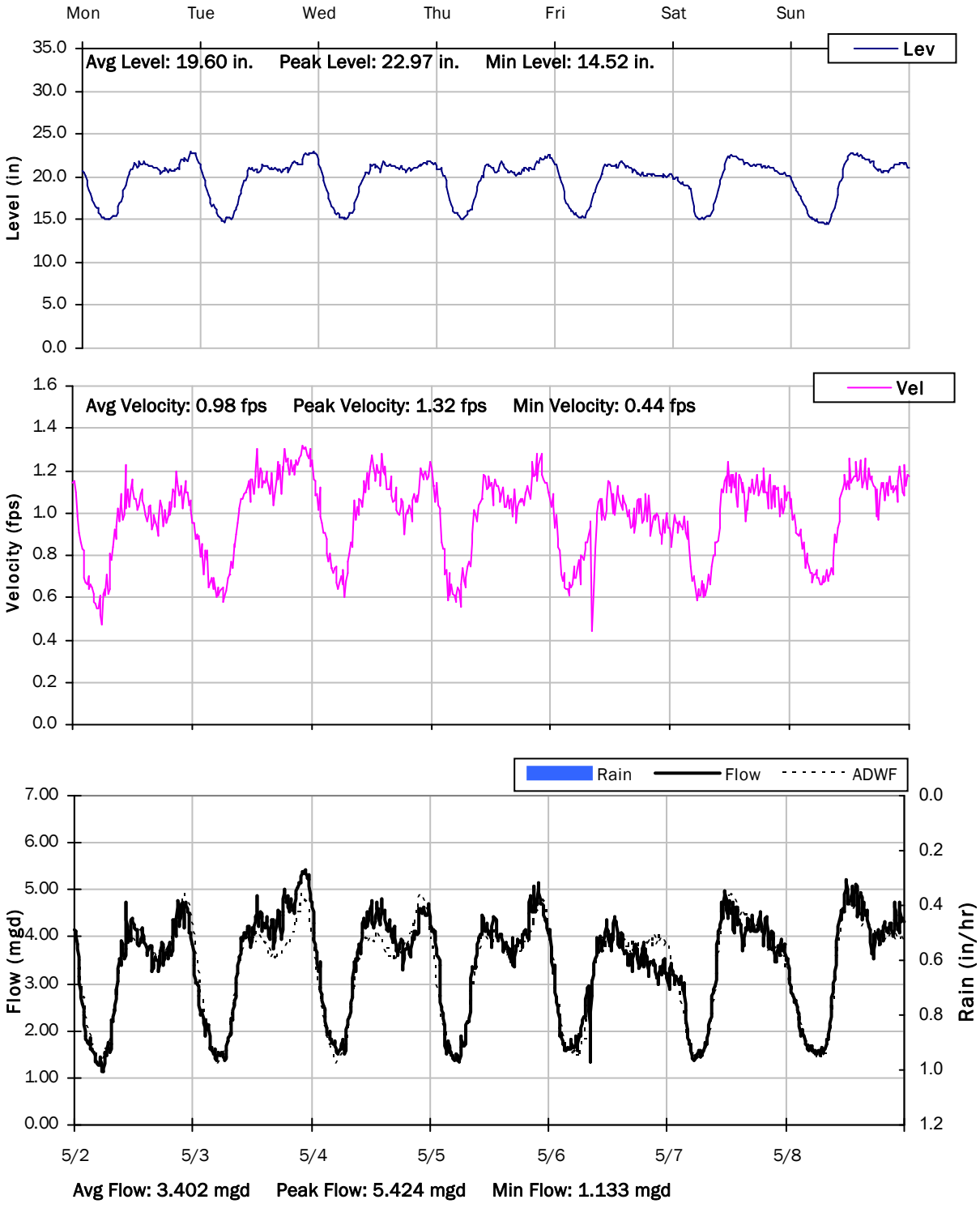
4/25/2022 to 5/2/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

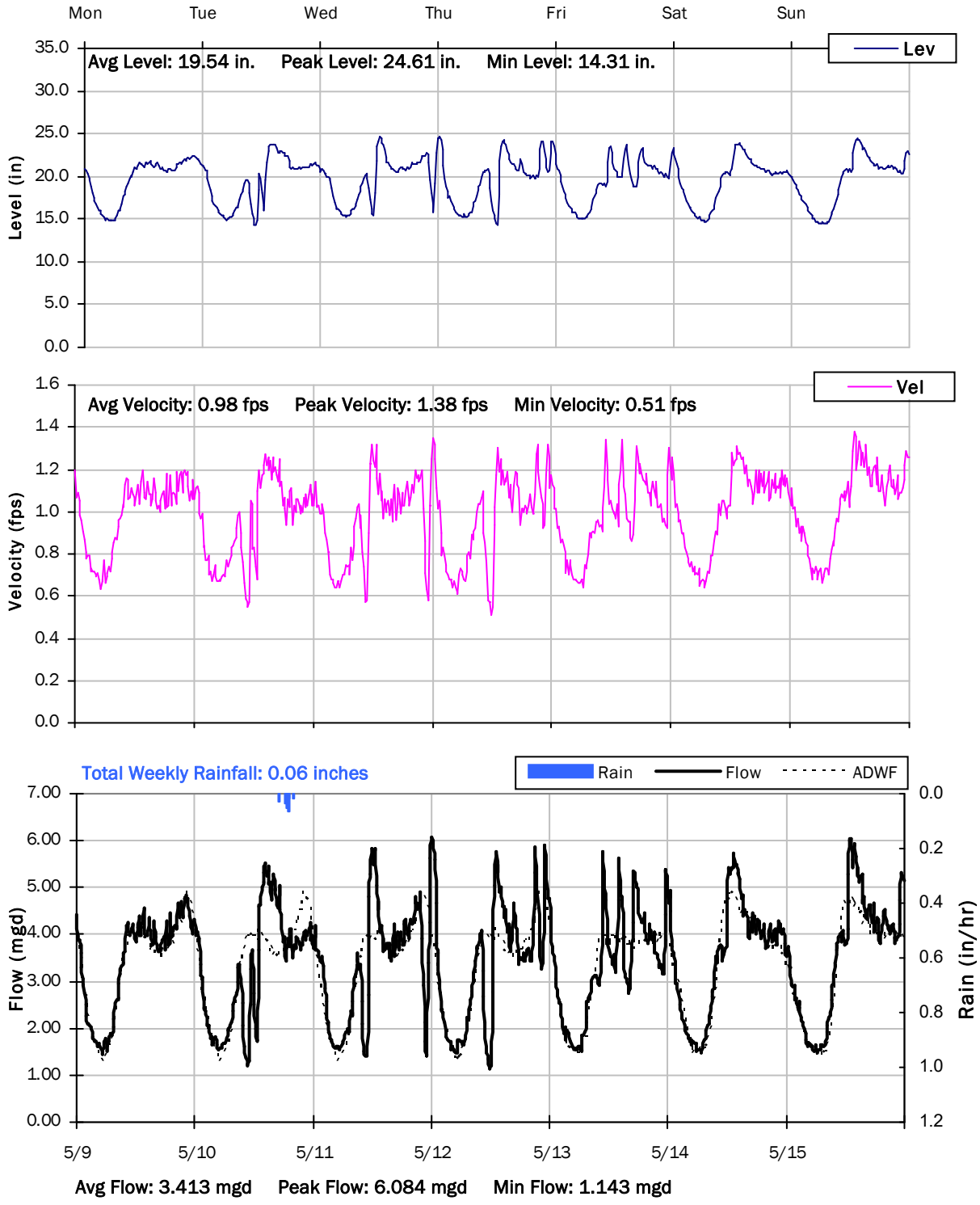
5/2/2022 to 5/9/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

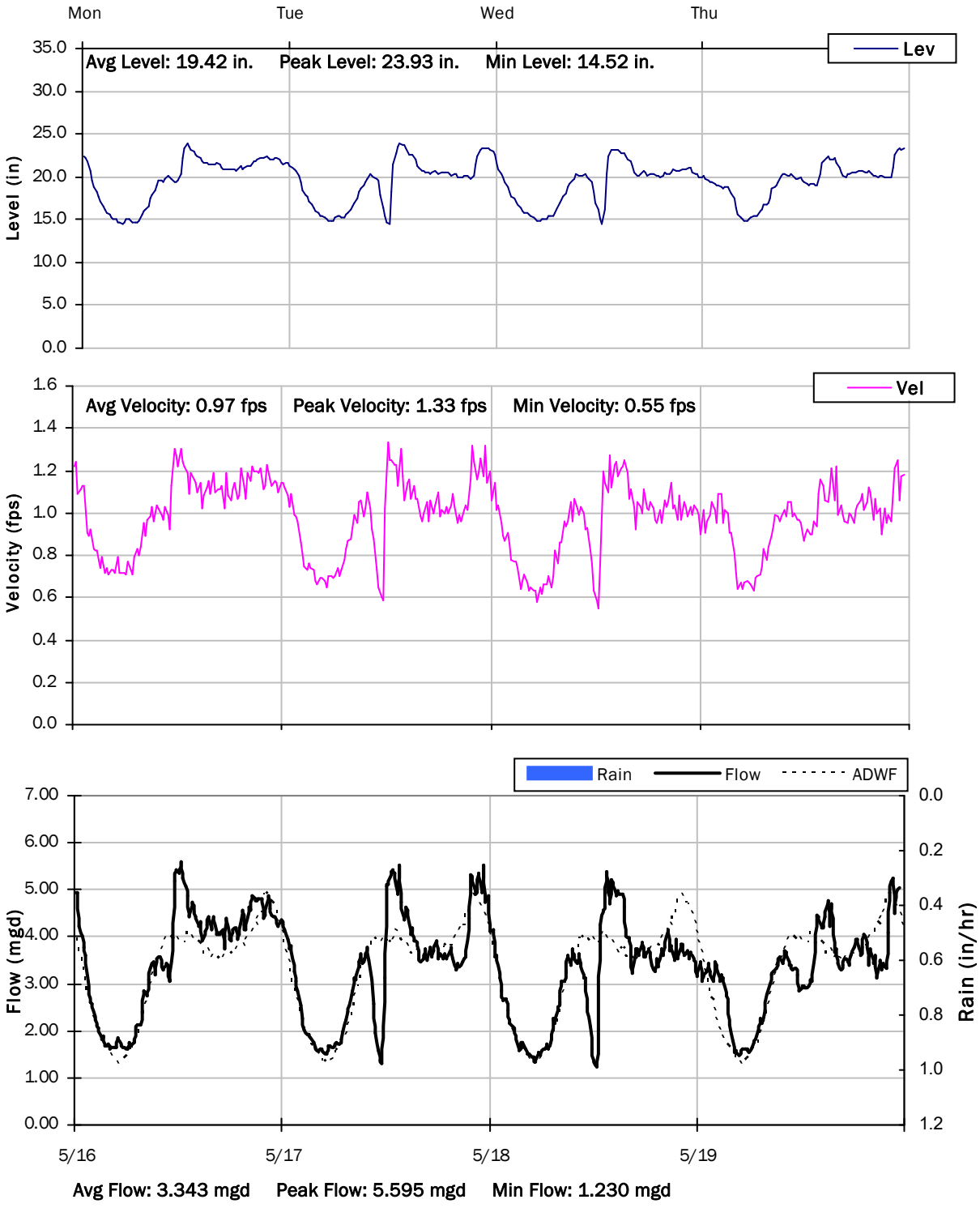
5/9/2022 to 5/16/2022



SITE 15

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 16

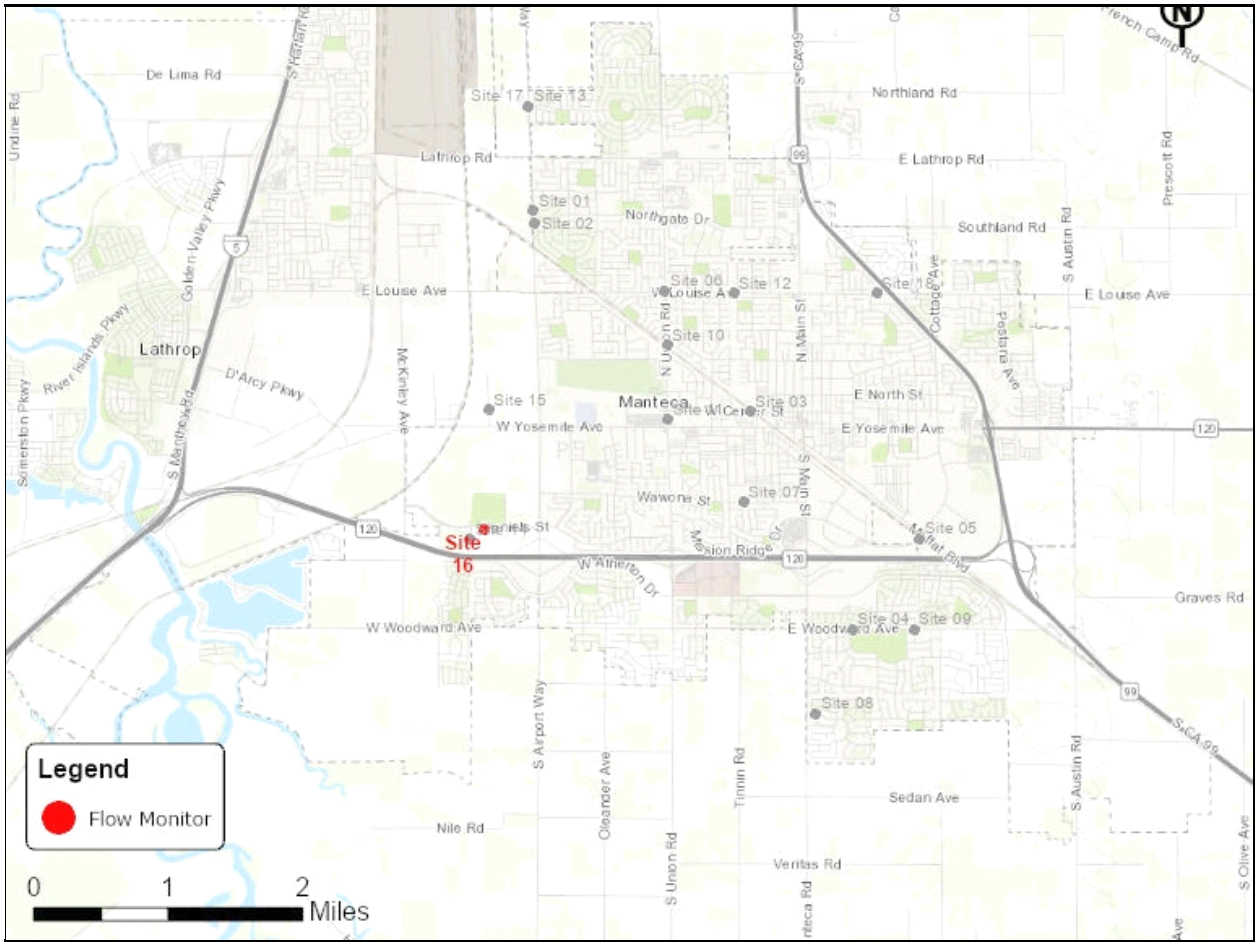
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Daniels Street East of Entertainment Way

Data Summary Report



Vicinity Map: Site 16

SITE 16

Additional Site Photos

Effluent Pipe



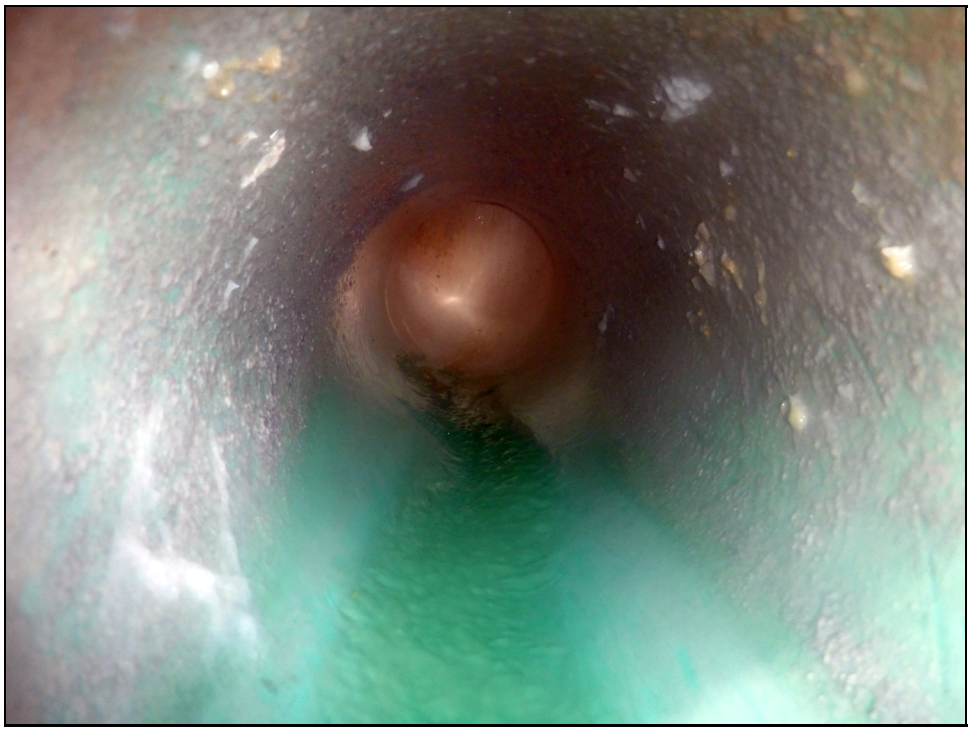
Monitored East Influent Pipe



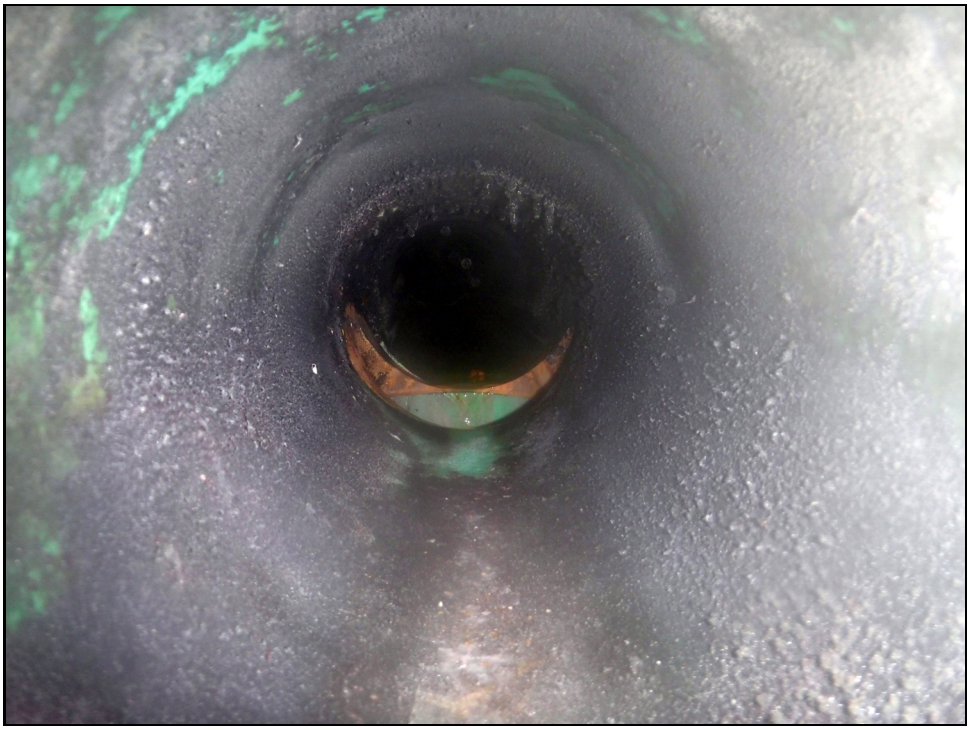
SITE 16

Additional Site Photos

South Influent Pipe (Lower)



South Influent Pipe (Upper)

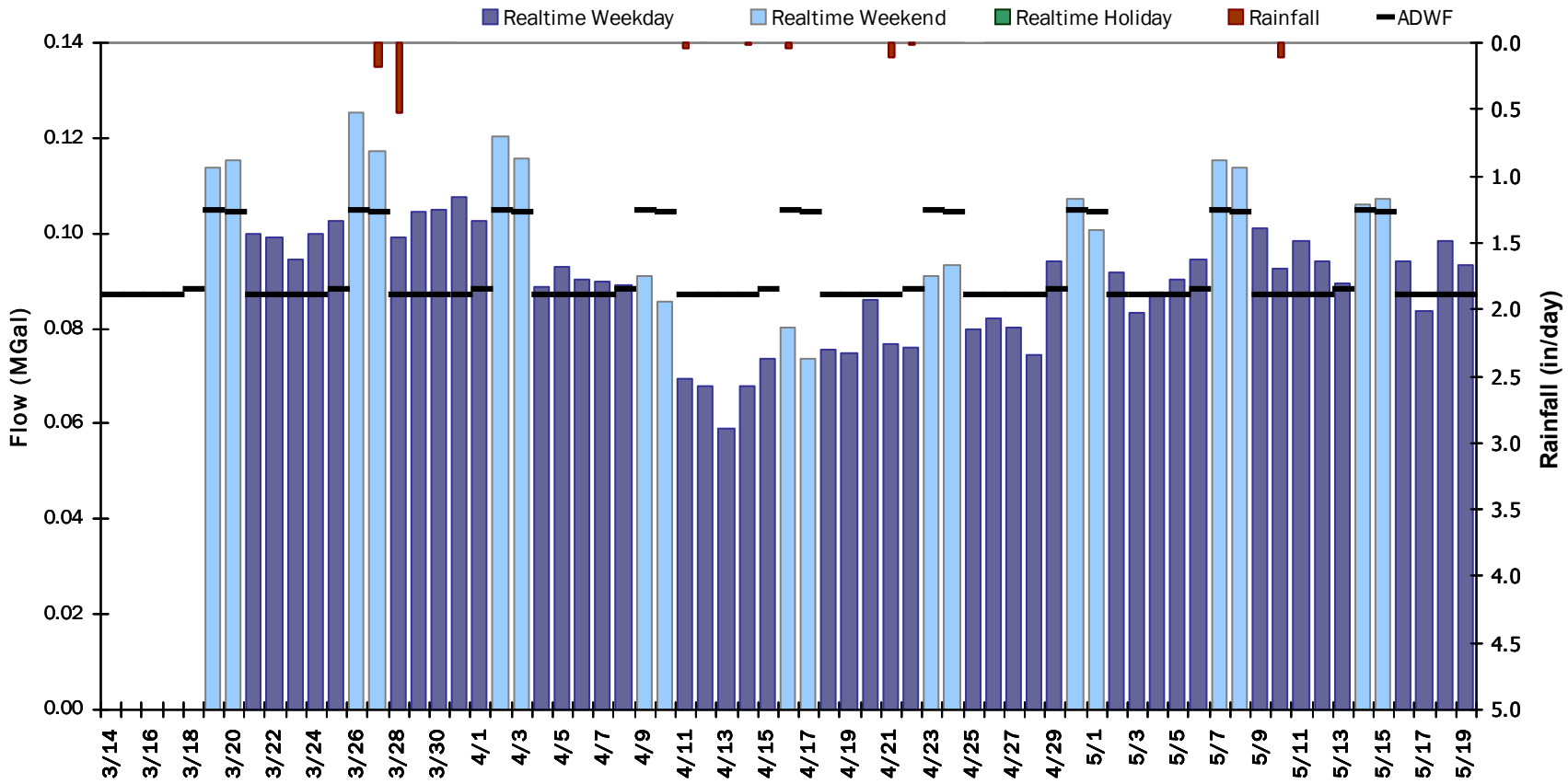


SITE 16

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.094 MGal Peak Daily Flow: 0.127 MGal Min Daily Flow: 0.059 MGal

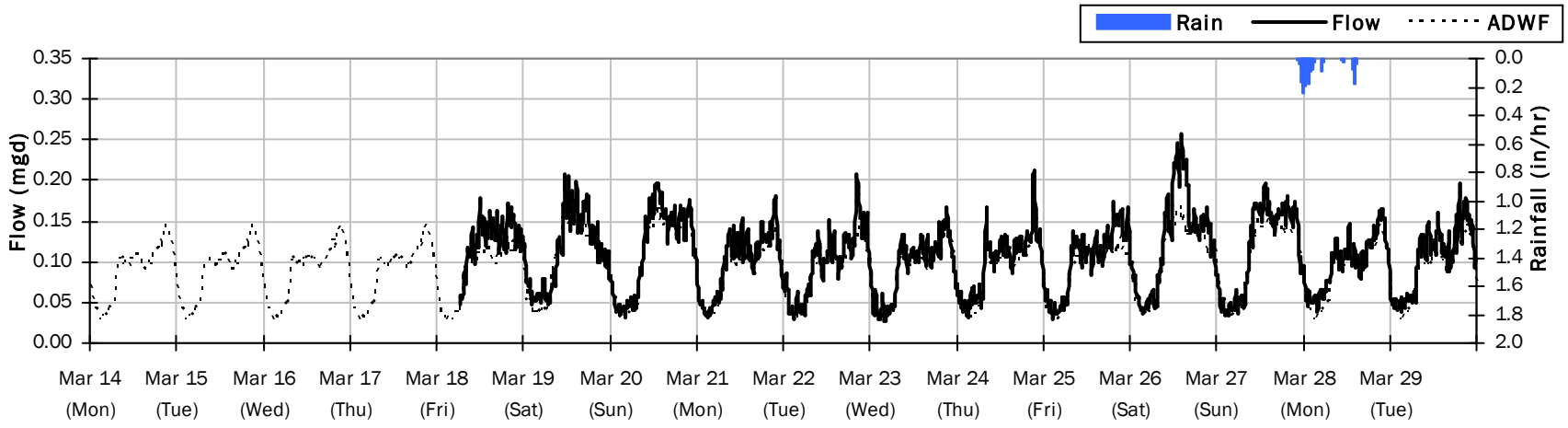
Total Rainfall: 1.04 inches

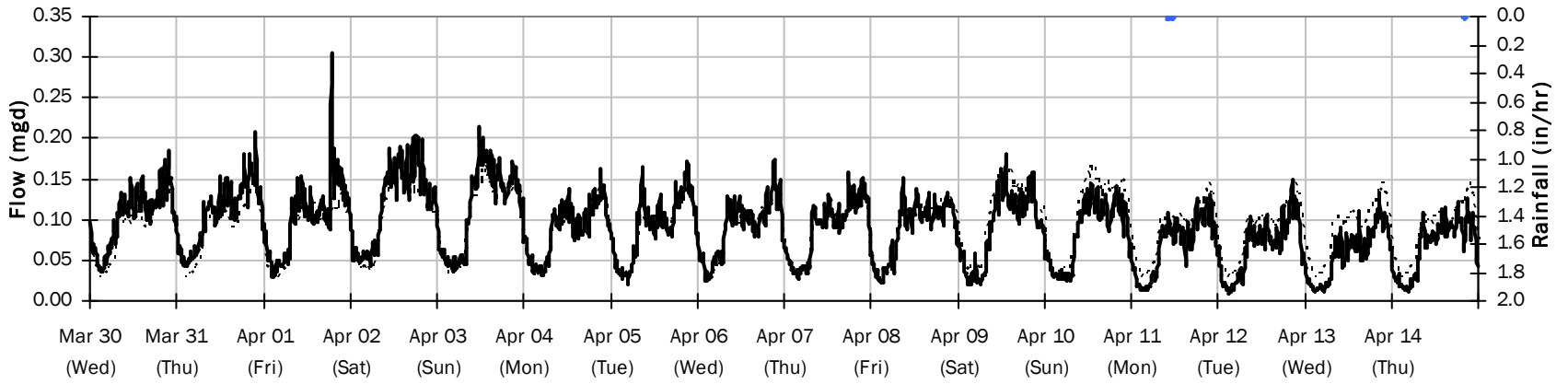


SITE 16

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.76 inches Period Avg Flow: 0.098 mgd Period Peak Flow: 0.305 mgd Period Min Flow: 0.009 mgd

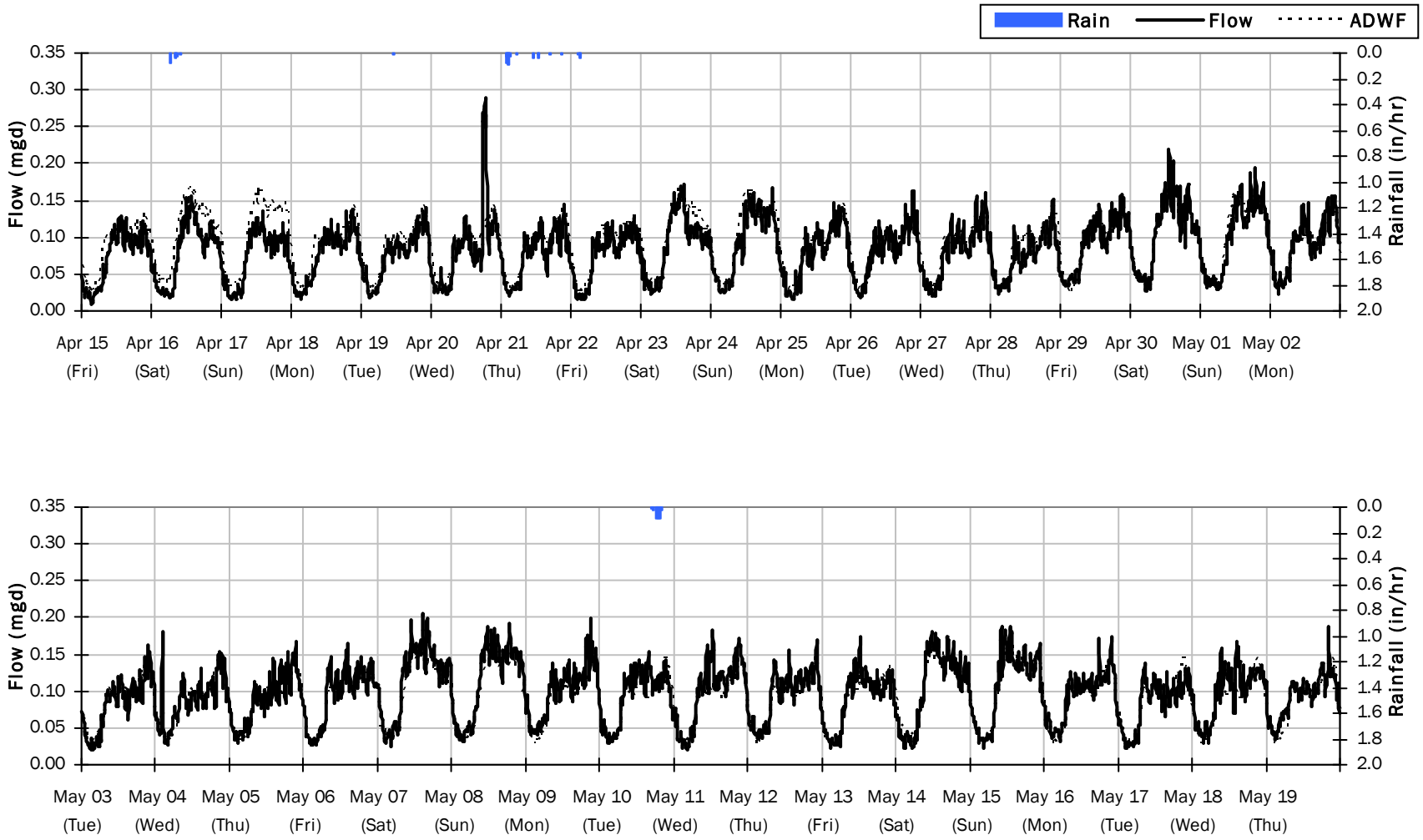




SITE 16

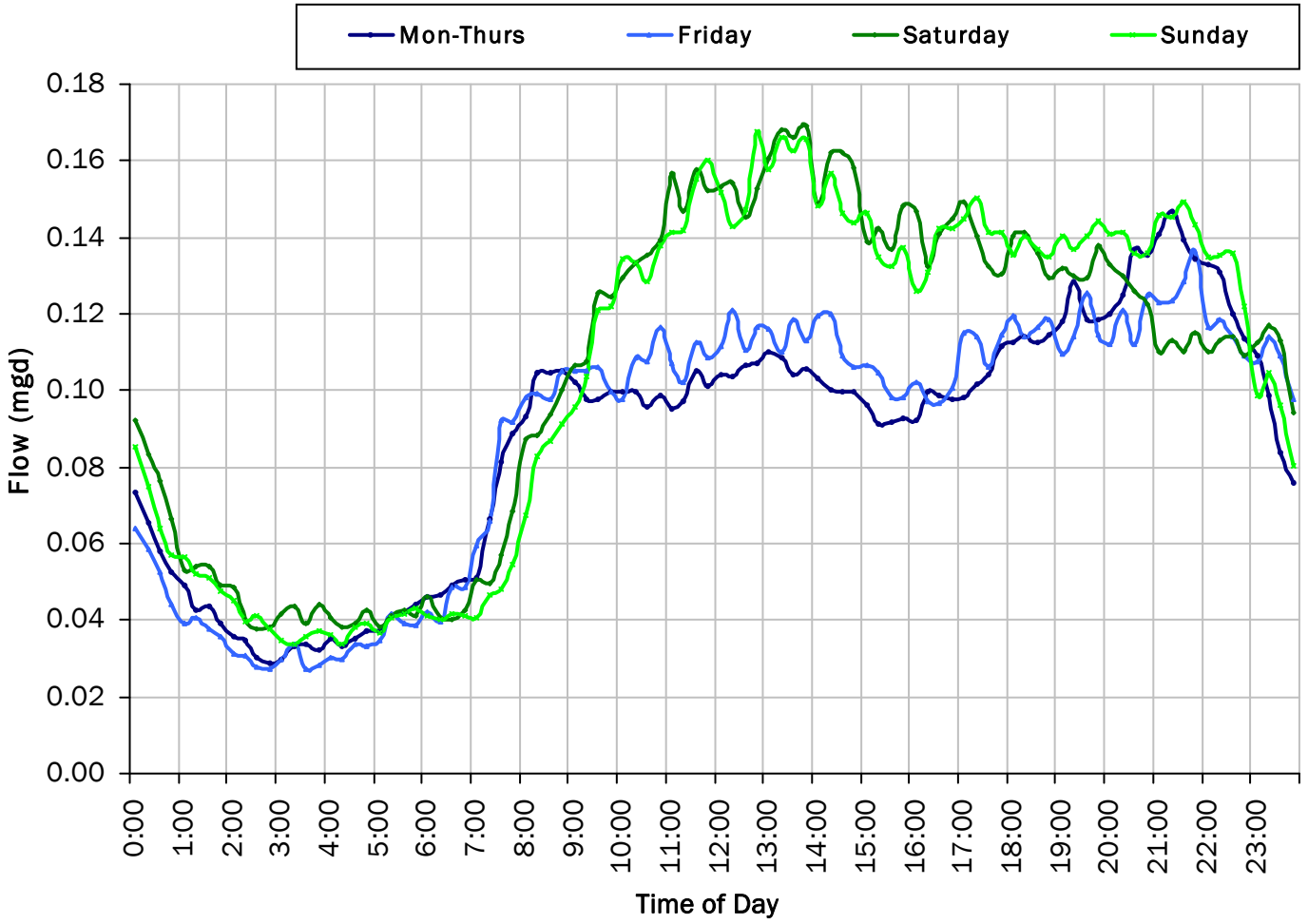
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.28 inches Period Avg Flow: 0.090 mgd Period Peak Flow: 0.290 mgd Period Min Flow: 0.009 mgd



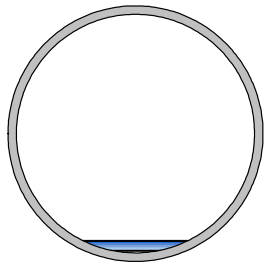
SITE 16

Average Dry Weather Flow Hydrographs



ADWF:

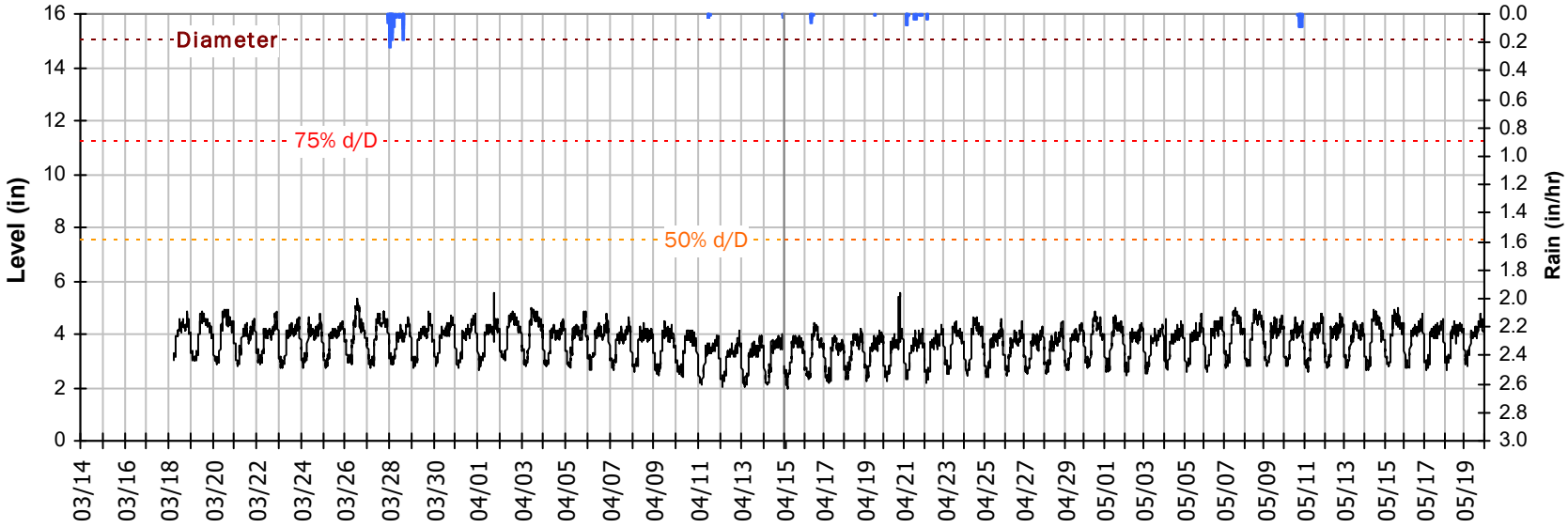
0.092 *mgd*

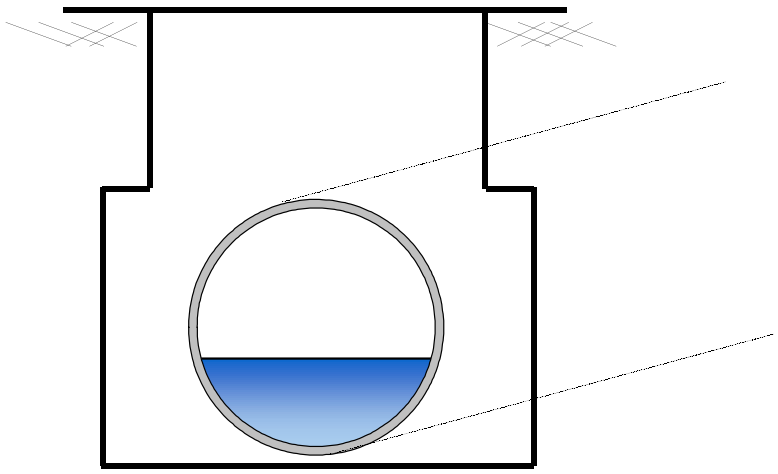


SITE 16

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

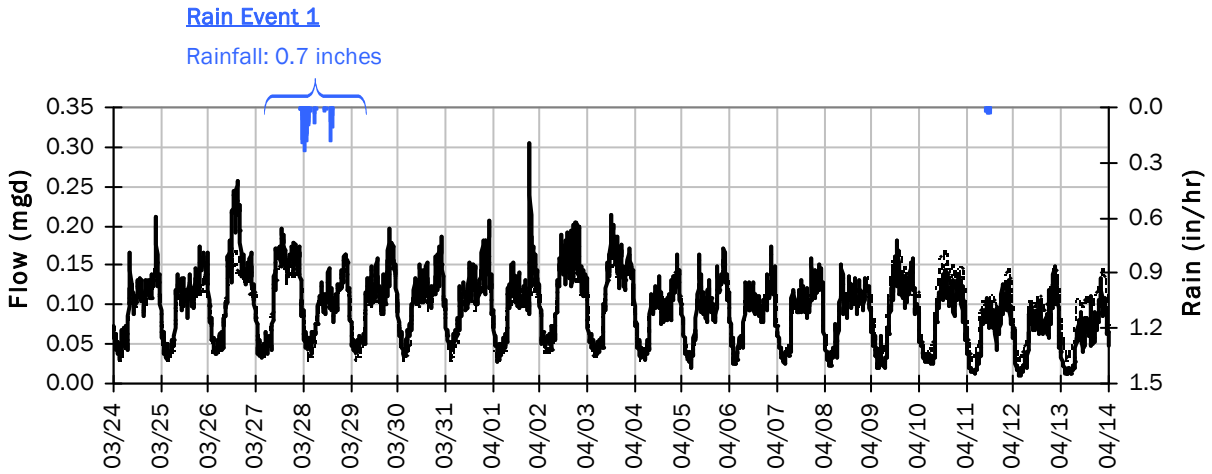




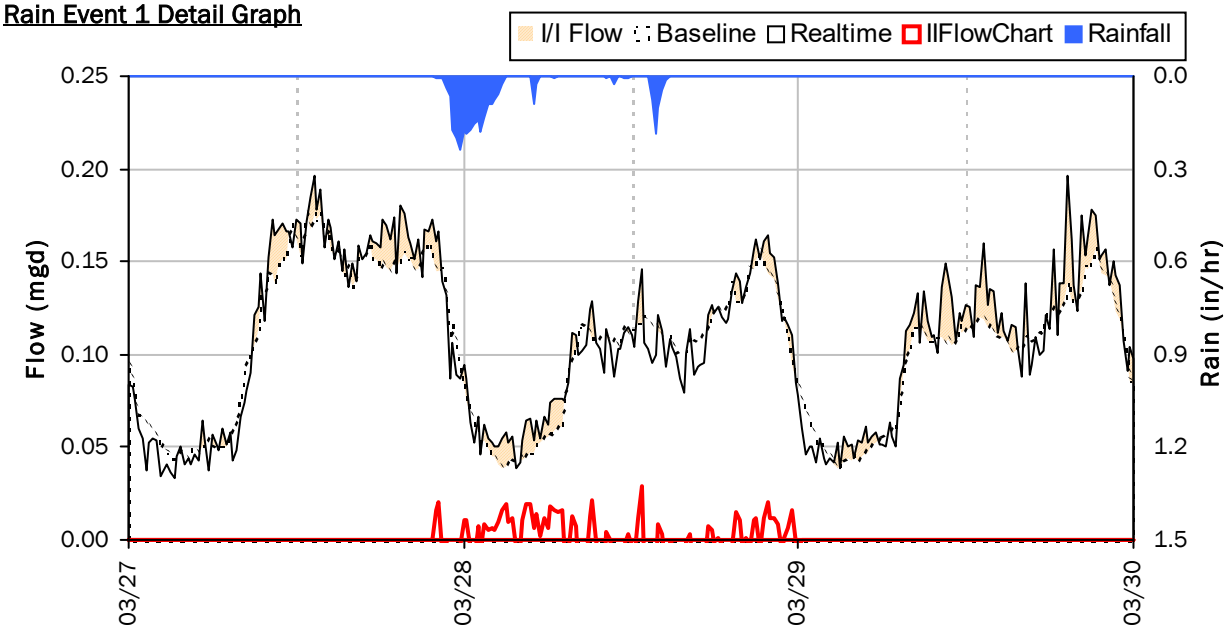
Pipe Diameter:	15	*inches*
Peak Measured Level:	5.57	*inches*
Peak d/D Ratio:	0.37	

SITE 16
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



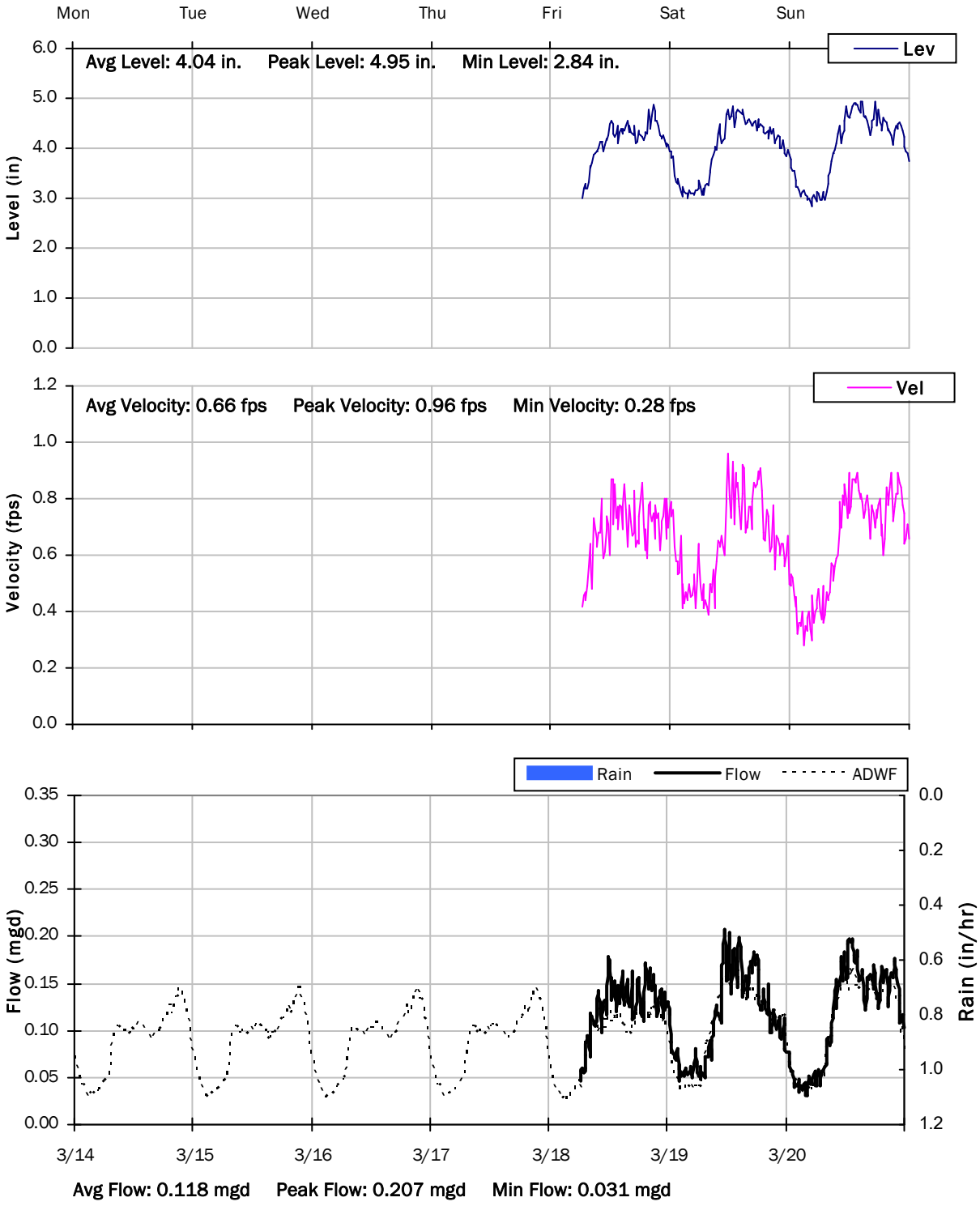
Storm Event I/I Analysis (Rain = 0.70 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.166 *mgd*	**Peak I/I Rate:**	0.029 *mgd*
PF:	1.80	**Total I/I:**	2,000 *gallons*
Peak Level:	4.65 *in*		
d/D Ratio:	0.31		

SITE 16

Weekly Level, Velocity and Flow Hydrographs

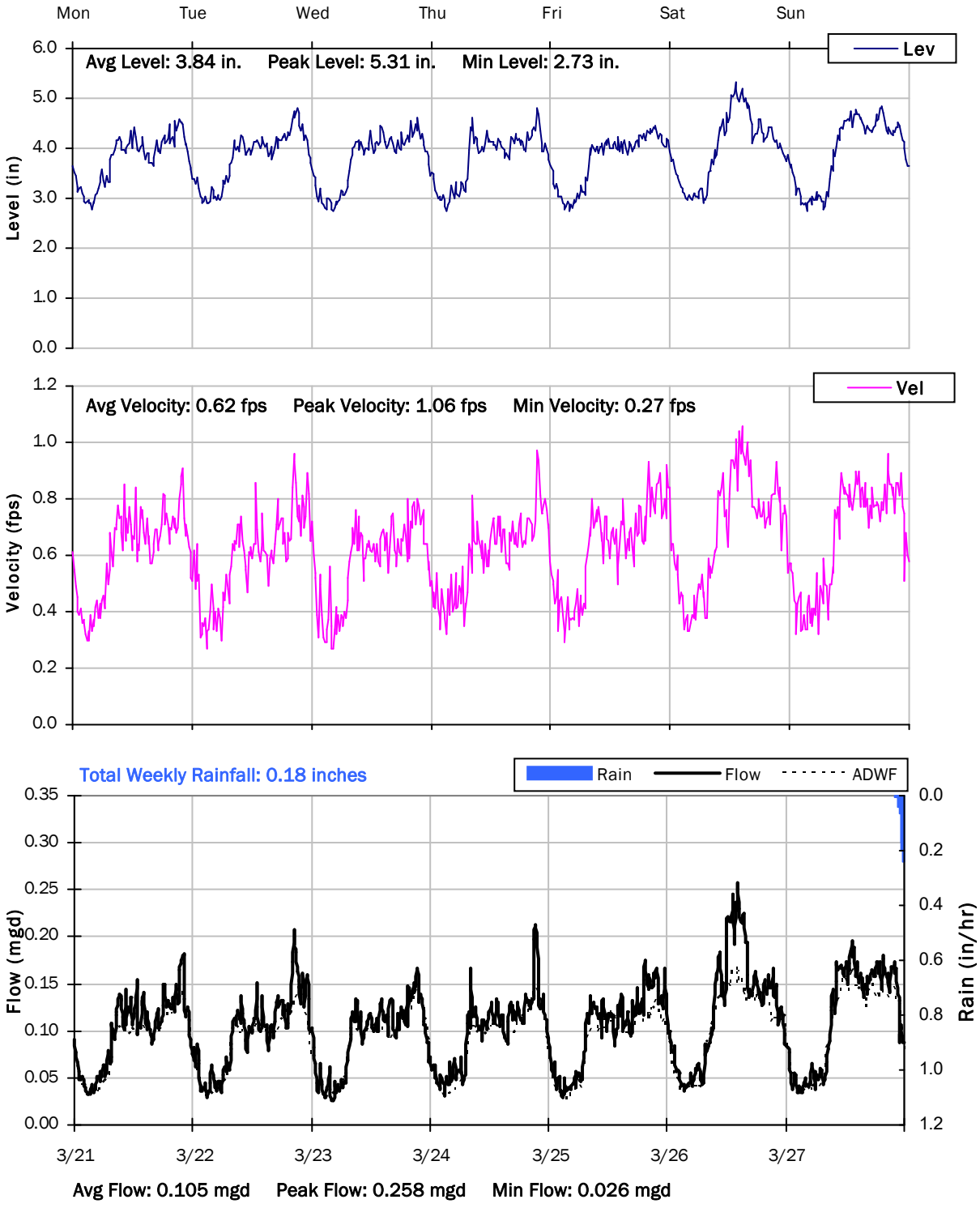
3/14/2022 to 3/21/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

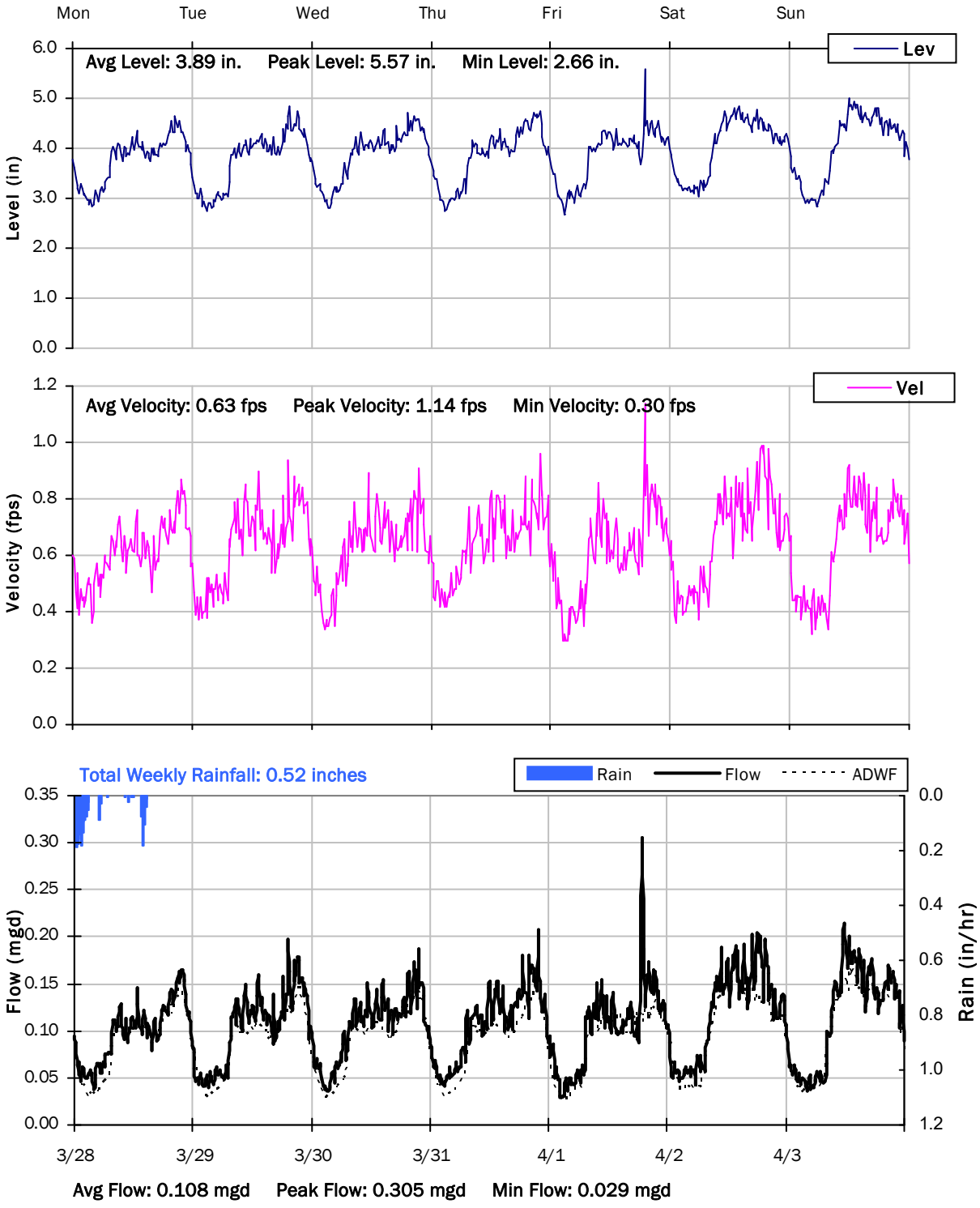
3/21/2022 to 3/28/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

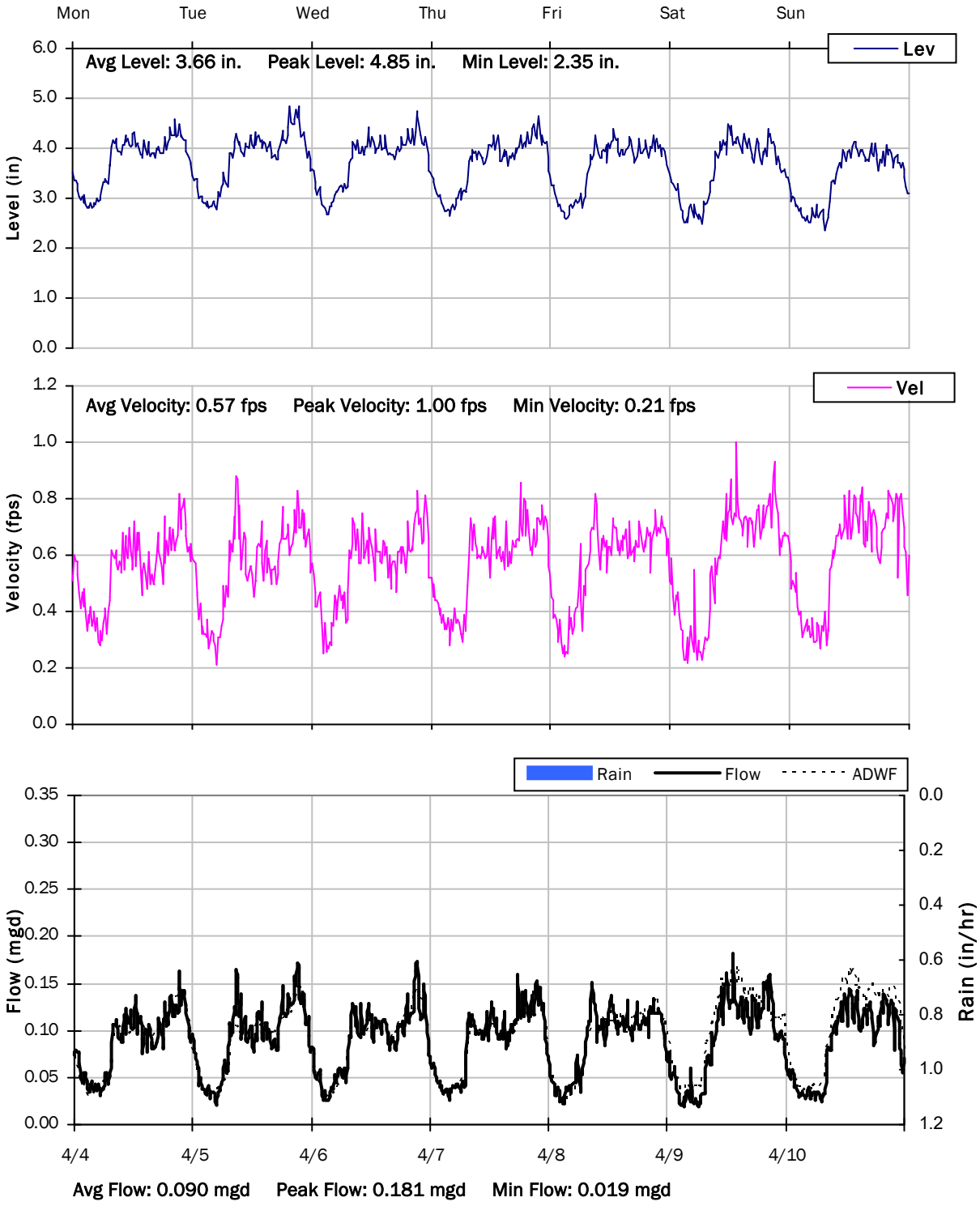
3/28/2022 to 4/4/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

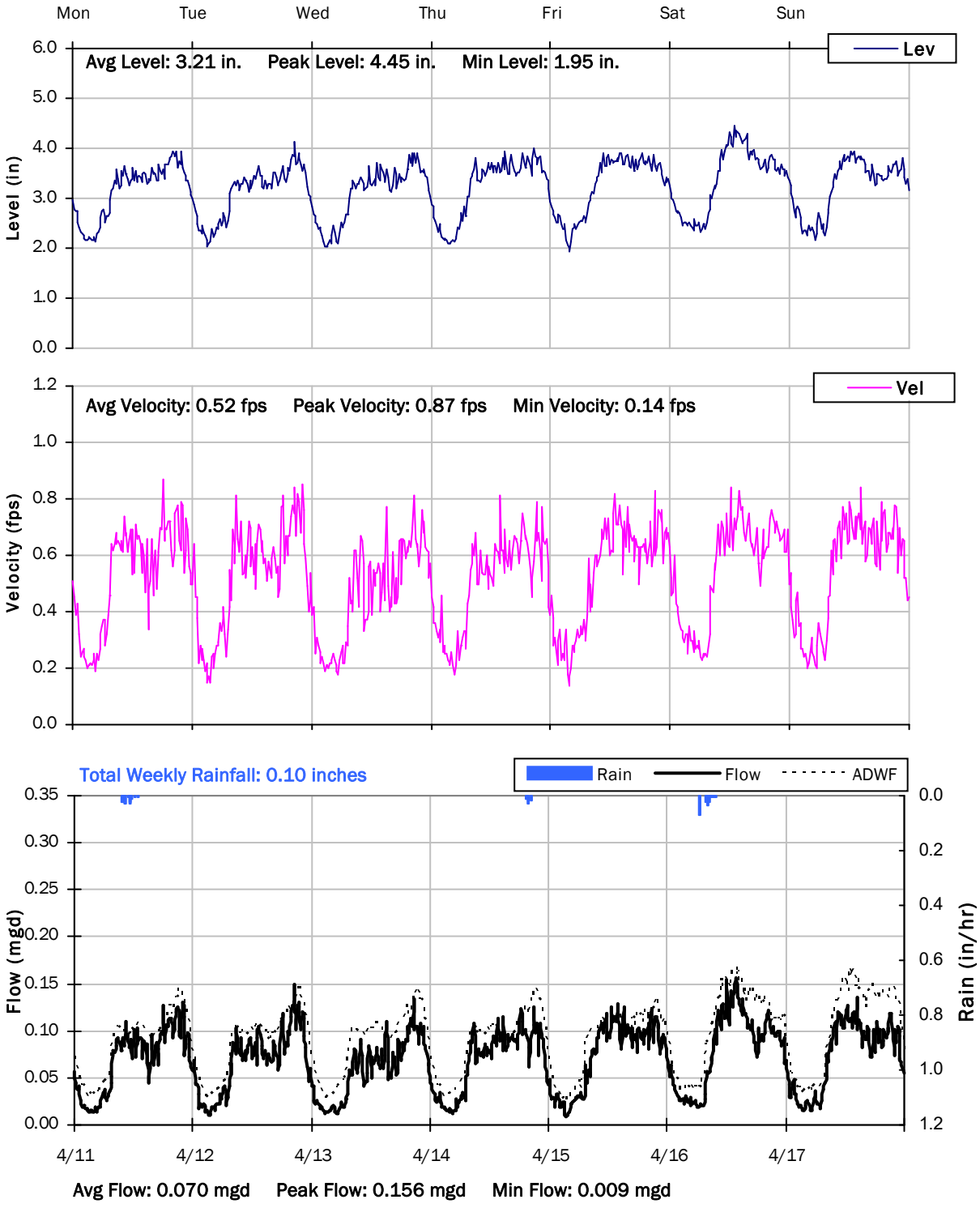
4/4/2022 to 4/11/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

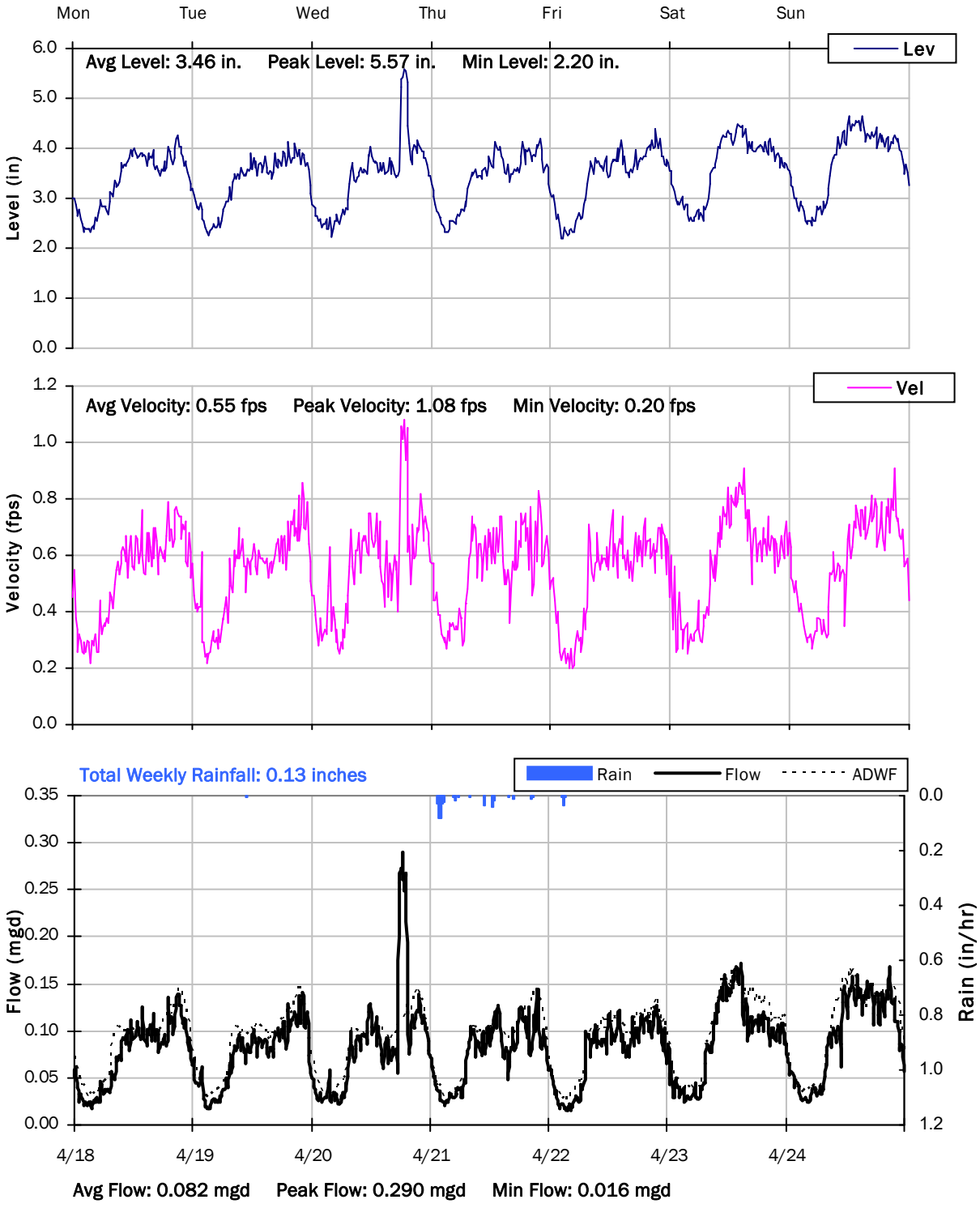
4/11/2022 to 4/18/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

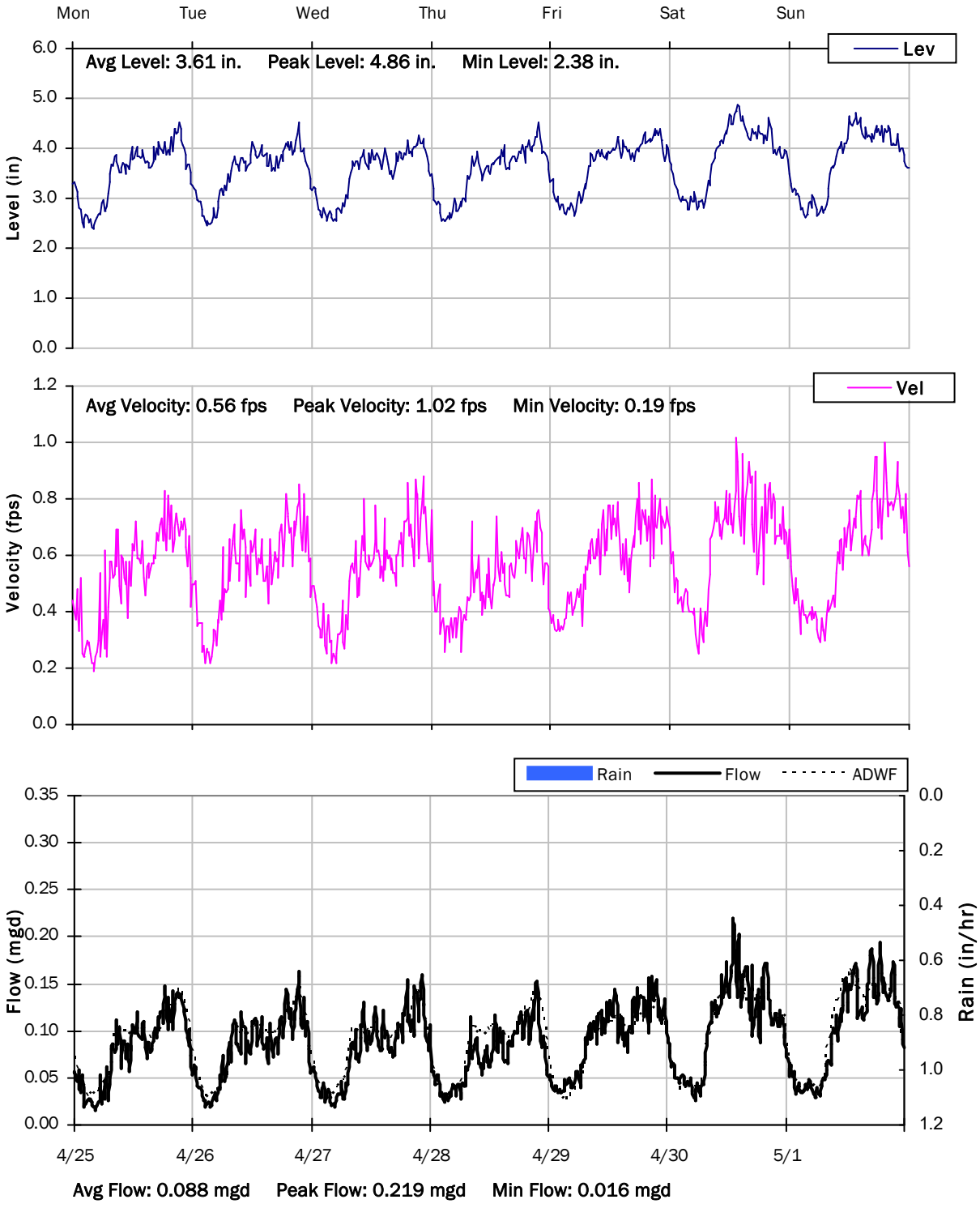
4/18/2022 to 4/25/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

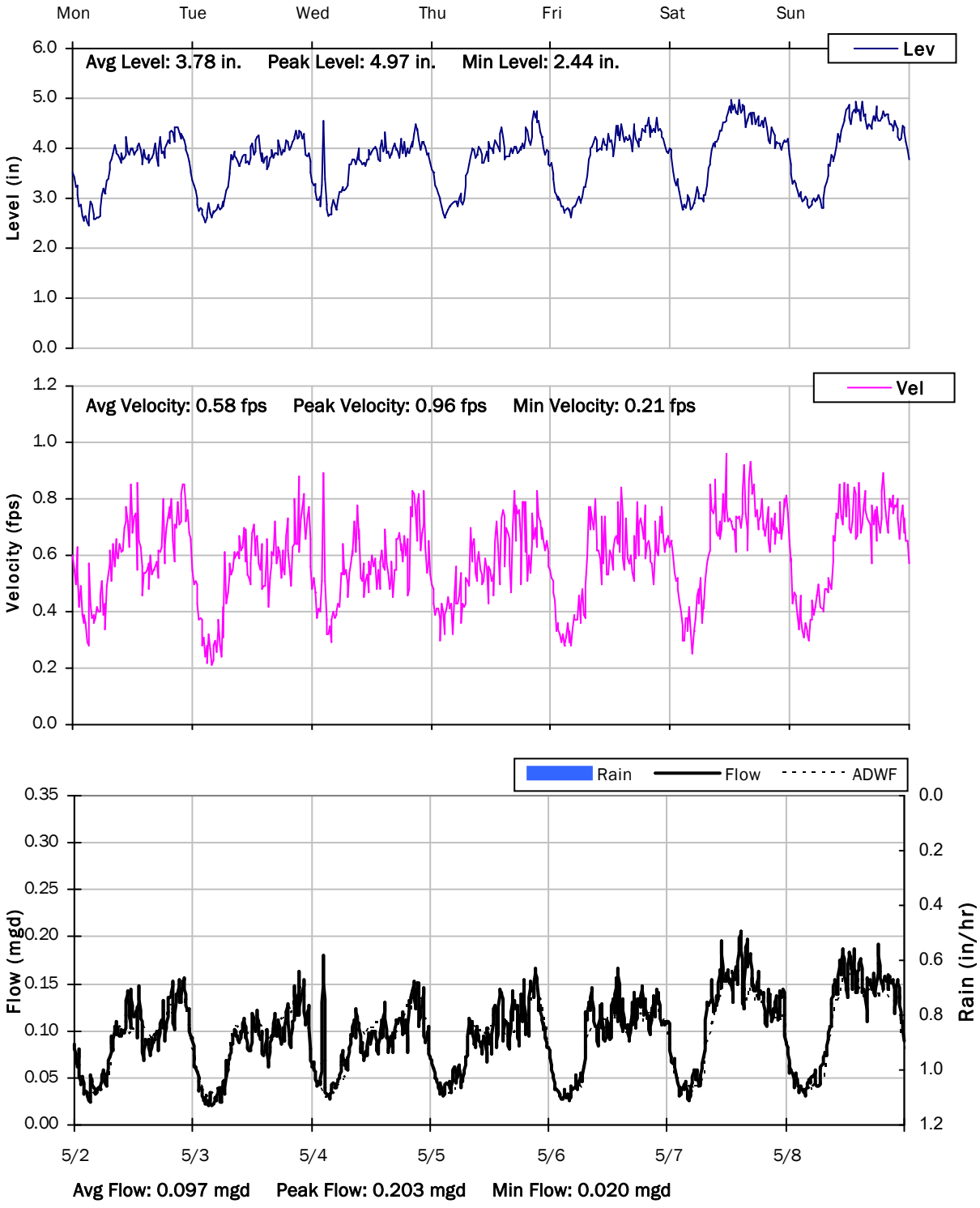
4/25/2022 to 5/2/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

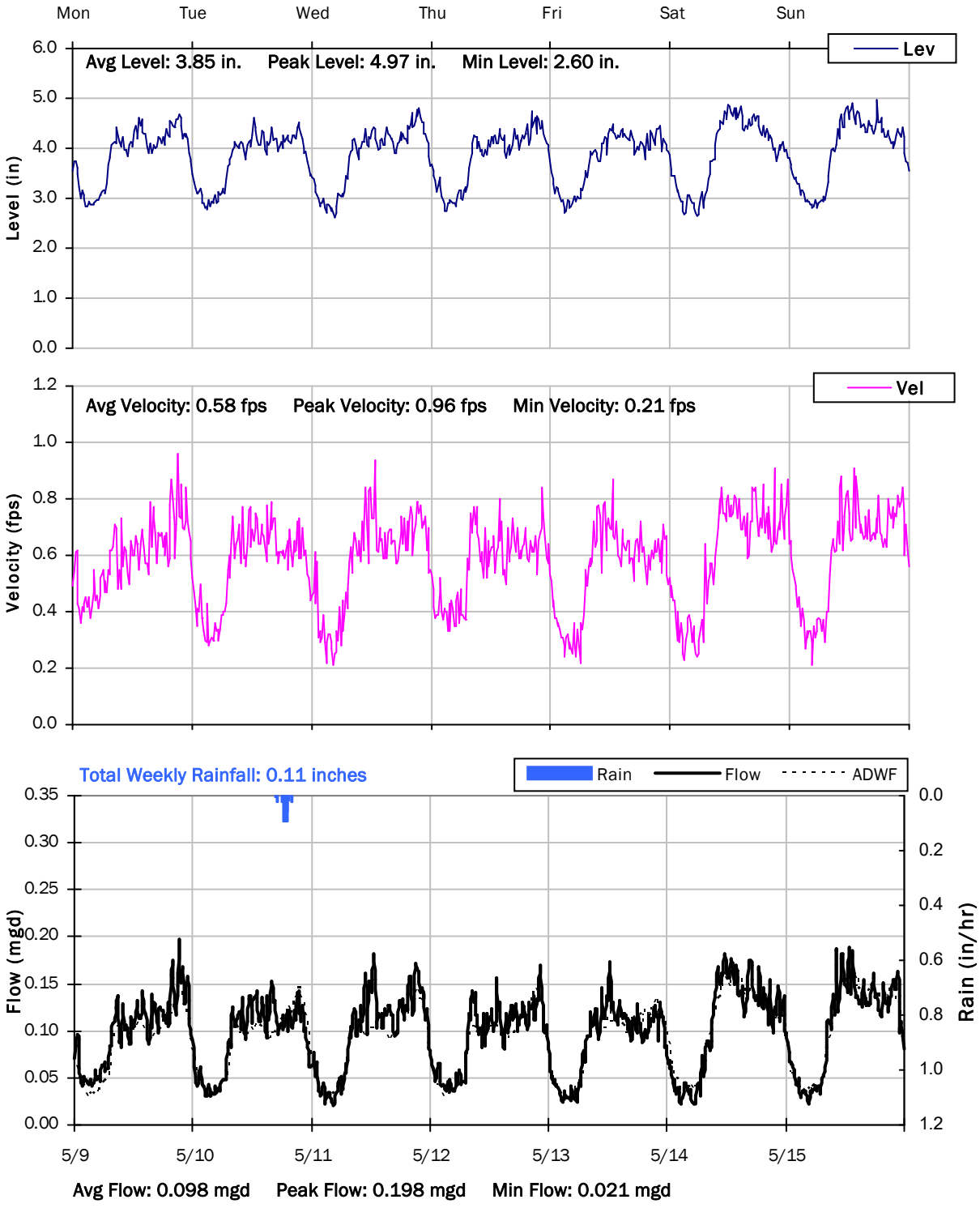
5/2/2022 to 5/9/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

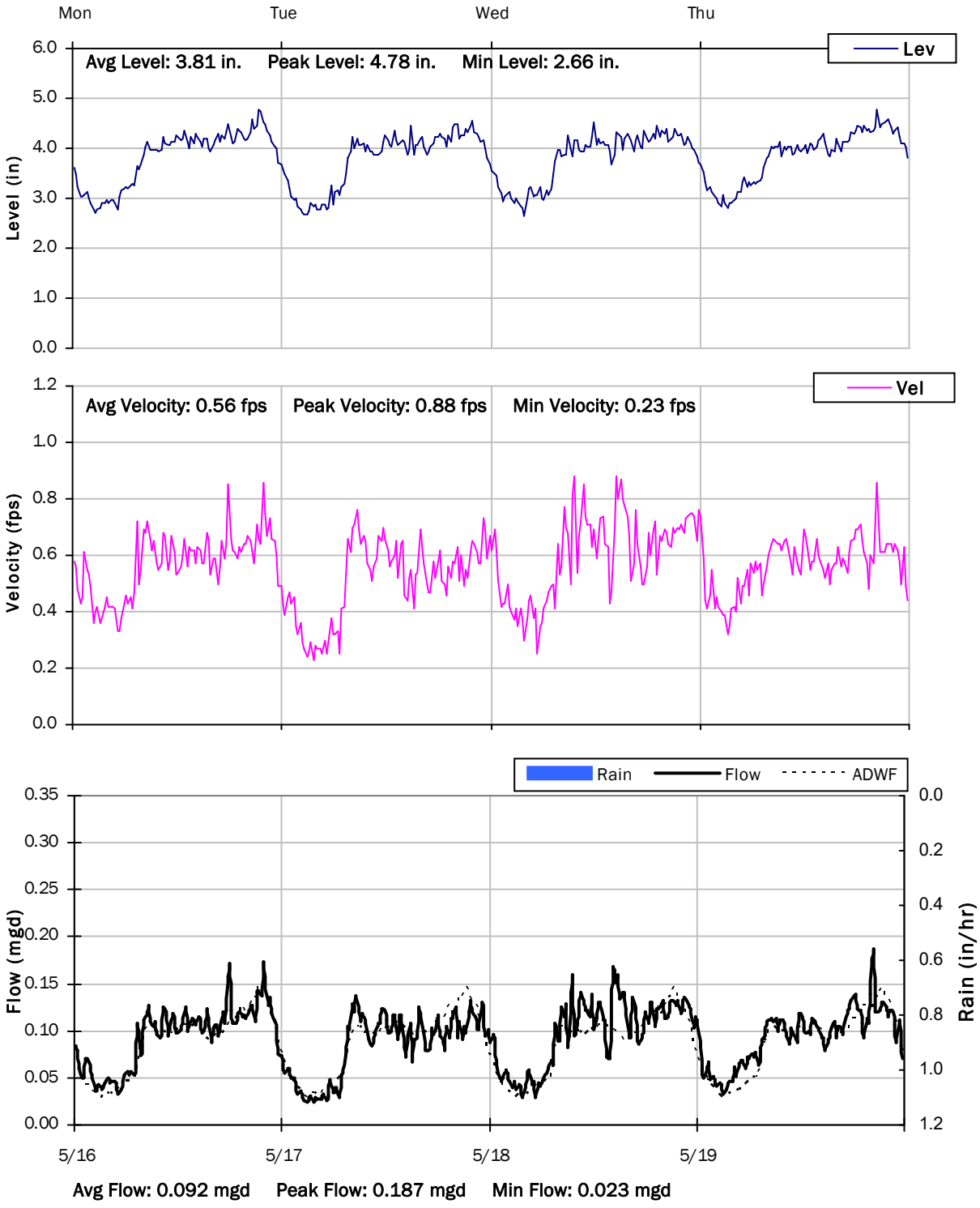
5/9/2022 to 5/16/2022



SITE 16

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 17

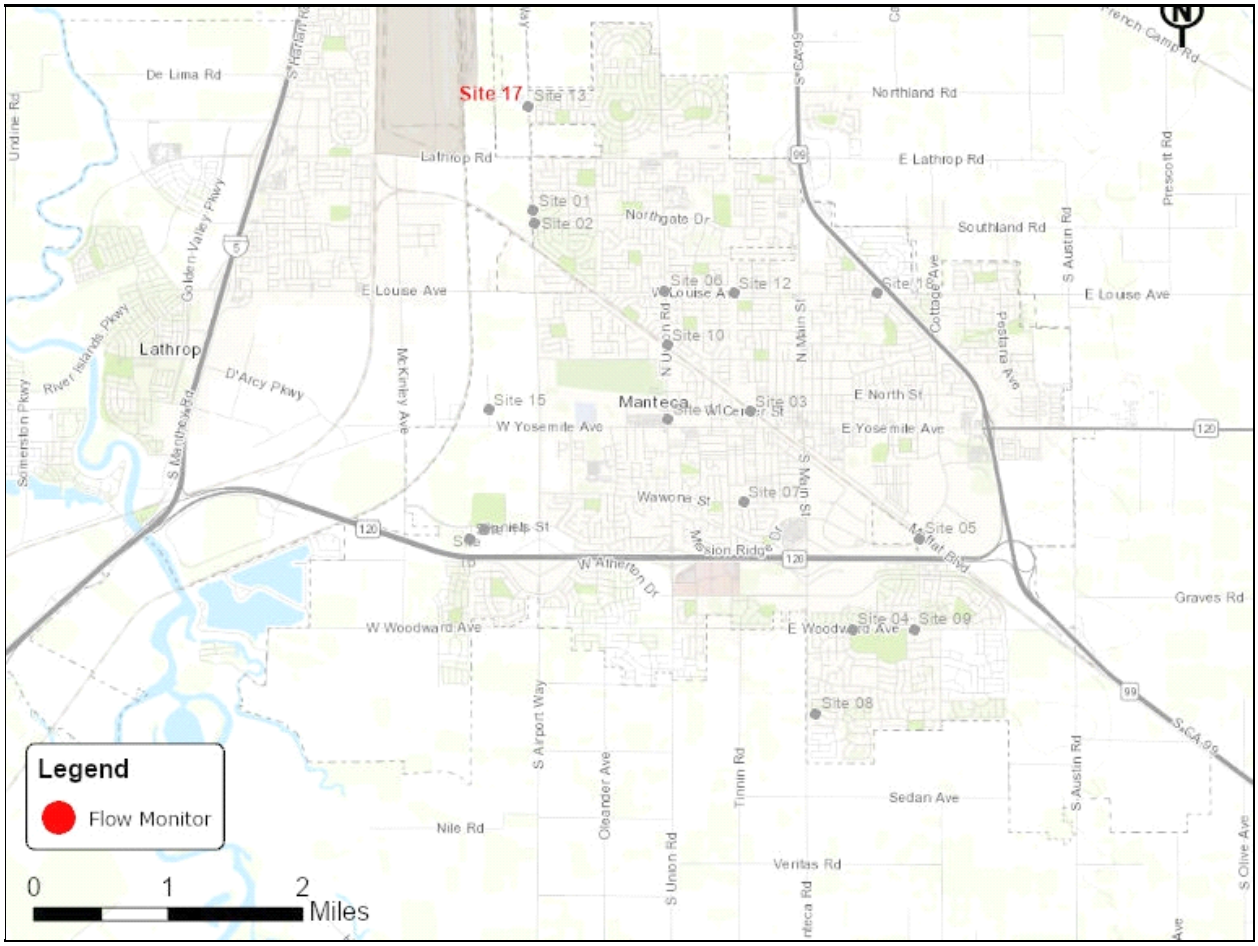
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: Airport Way at Daisywood Drive

Data Summary Report



Vicinity Map: Site 17

SITE 17

Additional Site Photos

Effluent Pipe



Northwest Influent Pipe



SITE 17

Additional Site Photos

Monitored East Influent Pipe

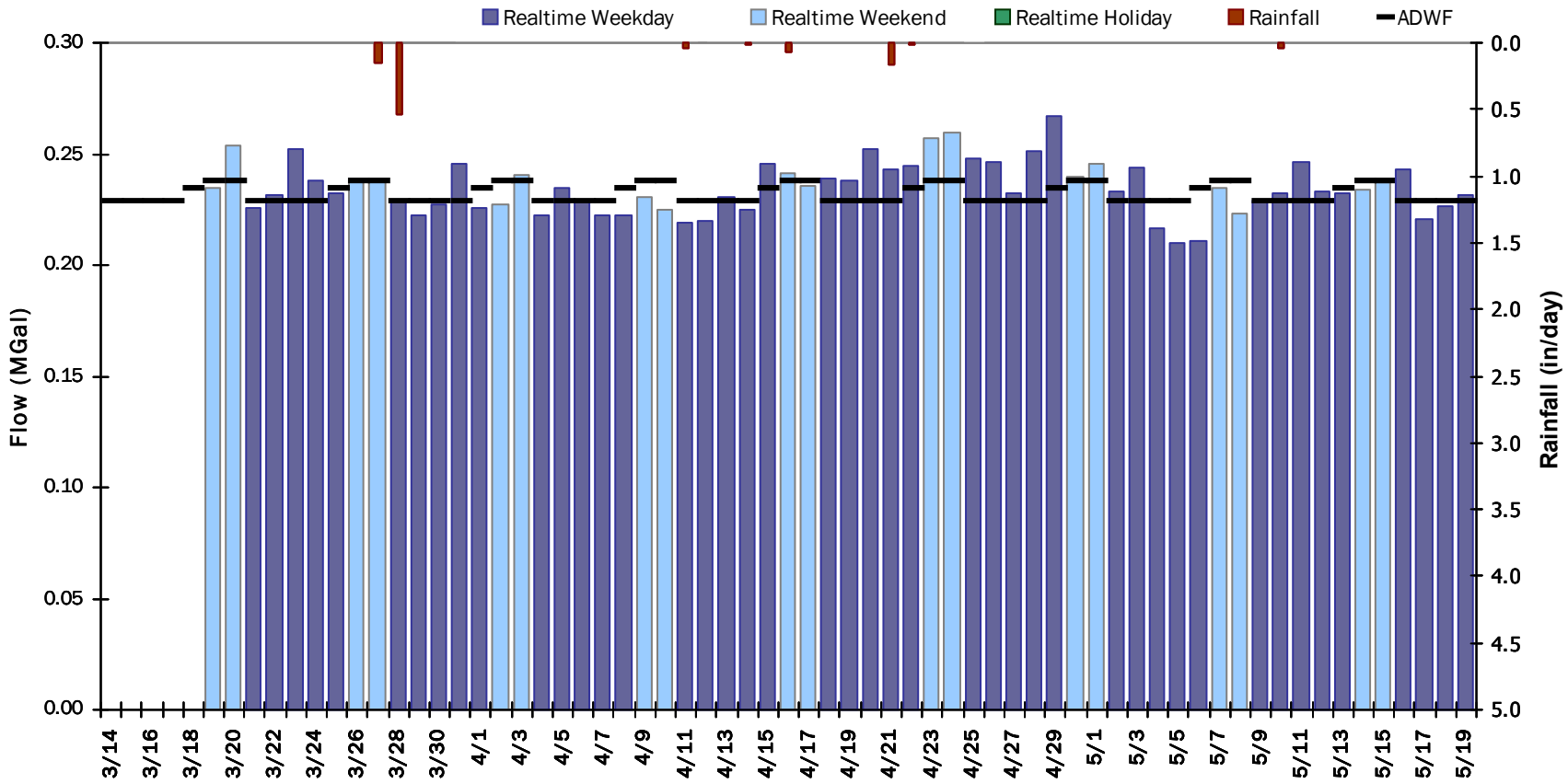


SITE 17

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.235 MGal Peak Daily Flow: 0.267 MGal Min Daily Flow: 0.210 MGal

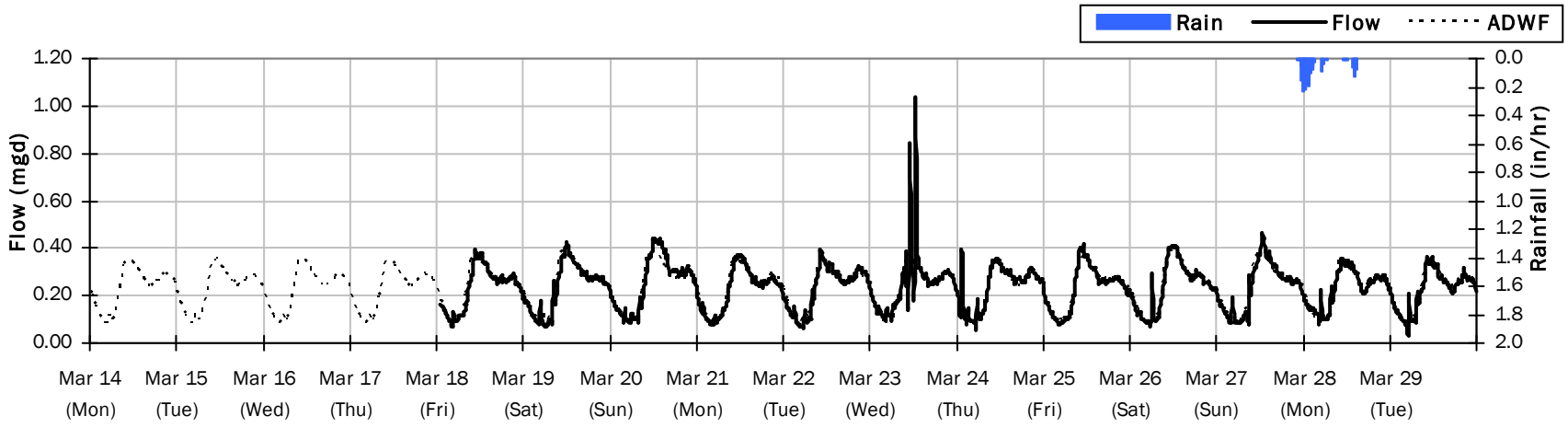
Total Rainfall: 1.04 inches

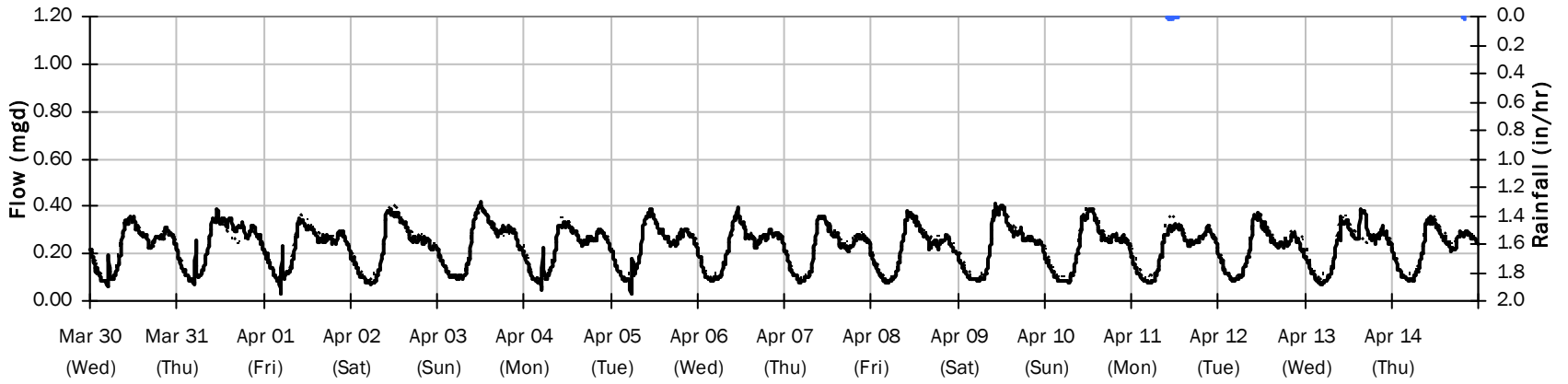


SITE 17

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.75 inches Period Avg Flow: 0.231 mgd Period Peak Flow: 1.034 mgd Period Min Flow: 0.029 mgd

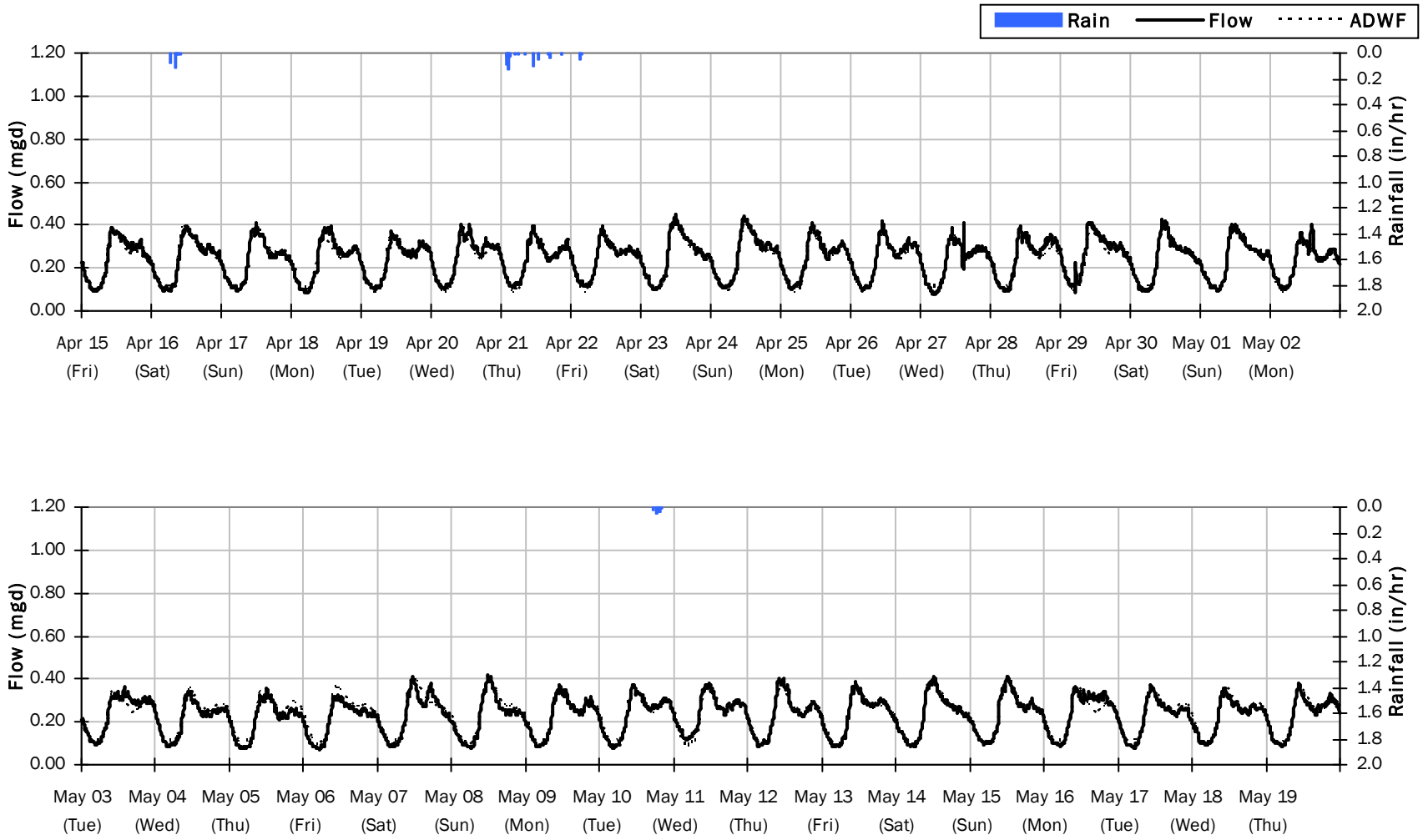




SITE 17

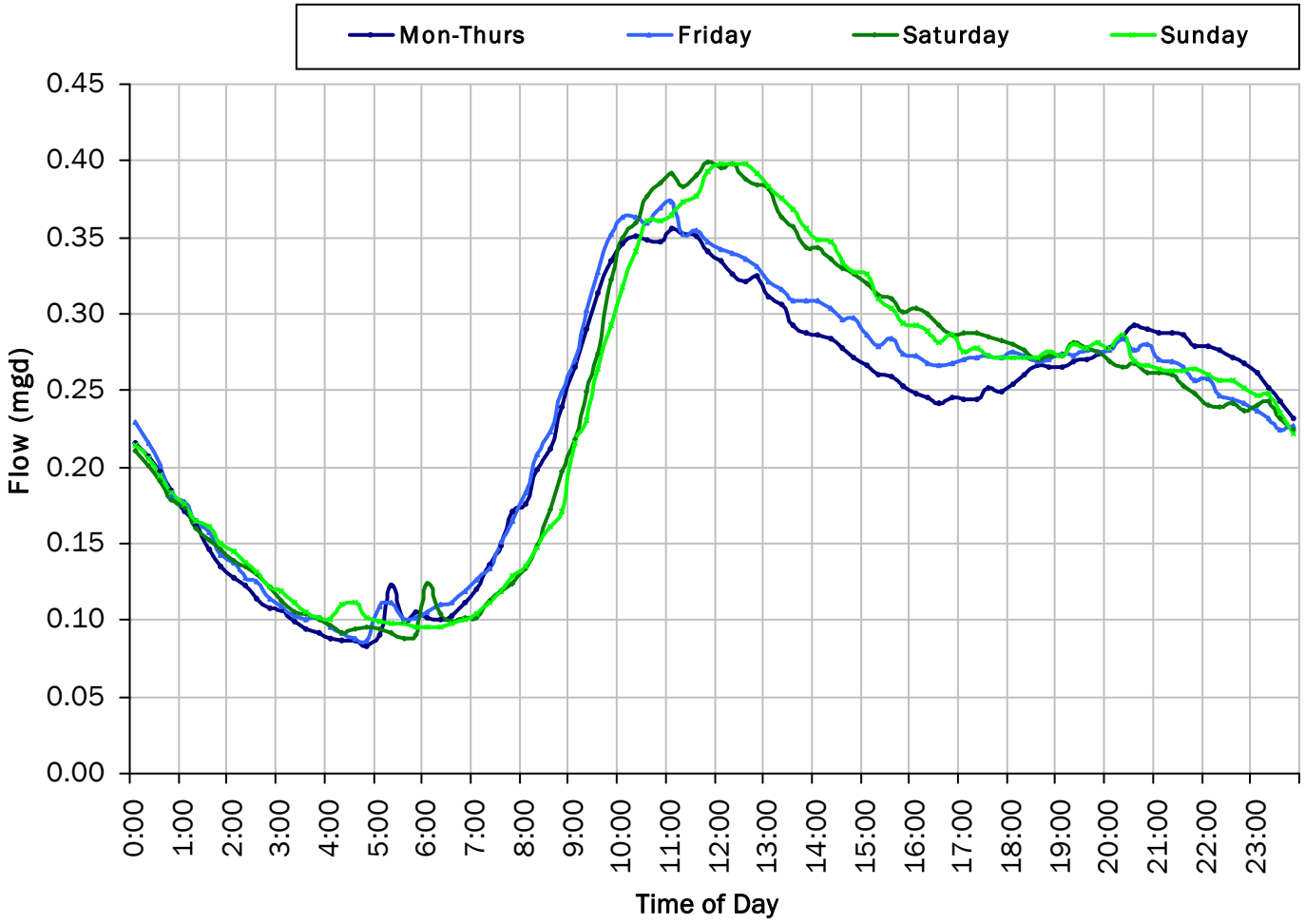
Flow Summary: 4/15/2022 to 5/19/2022

Period Rainfall: 0.29 inches Period Avg Flow: 0.238 mgd Period Peak Flow: 0.449 mgd Period Min Flow: 0.073 mgd



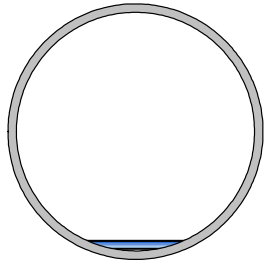
SITE 17

Average Dry Weather Flow Hydrographs



ADWF:

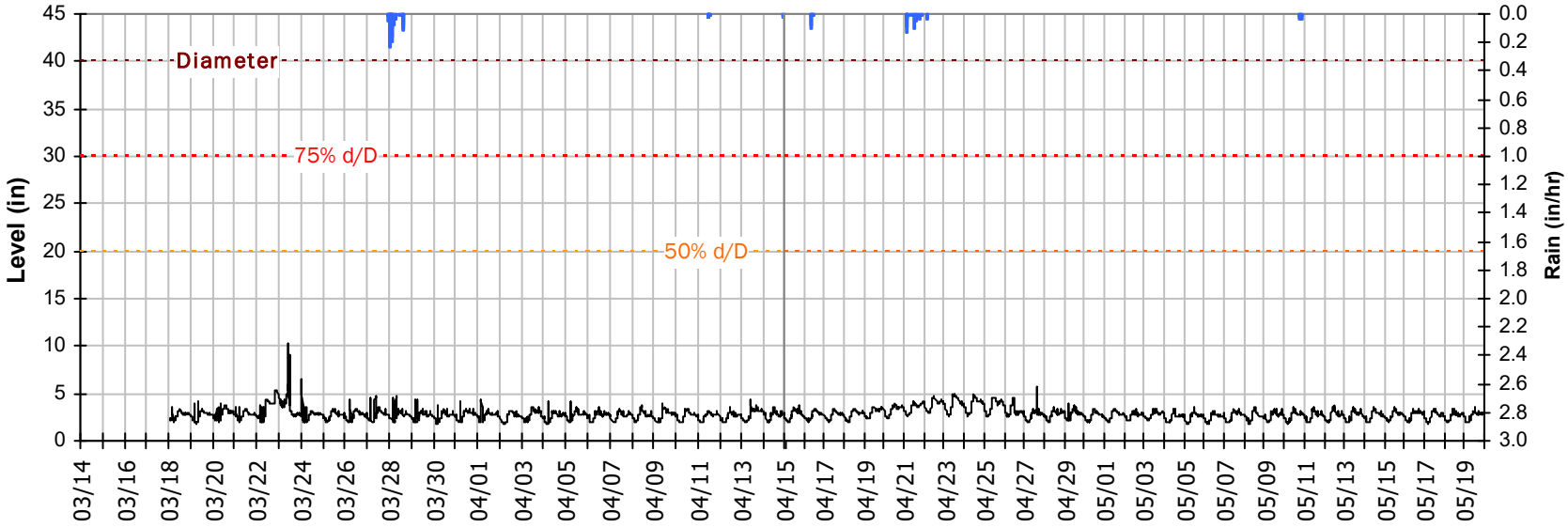
0.232 *mgd*

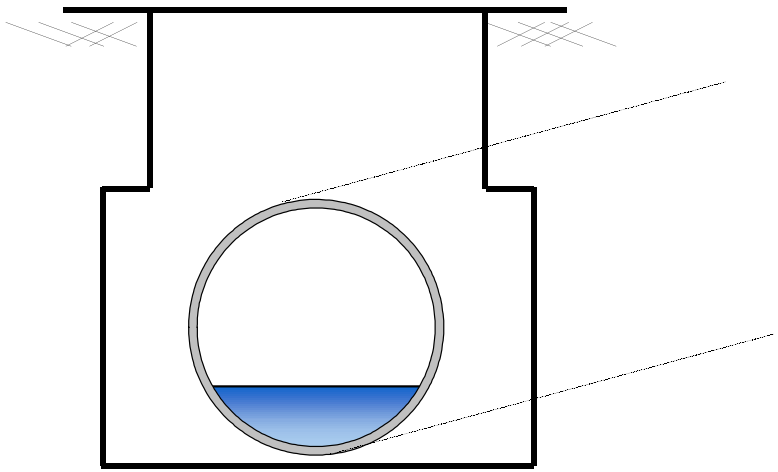


SITE 17

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

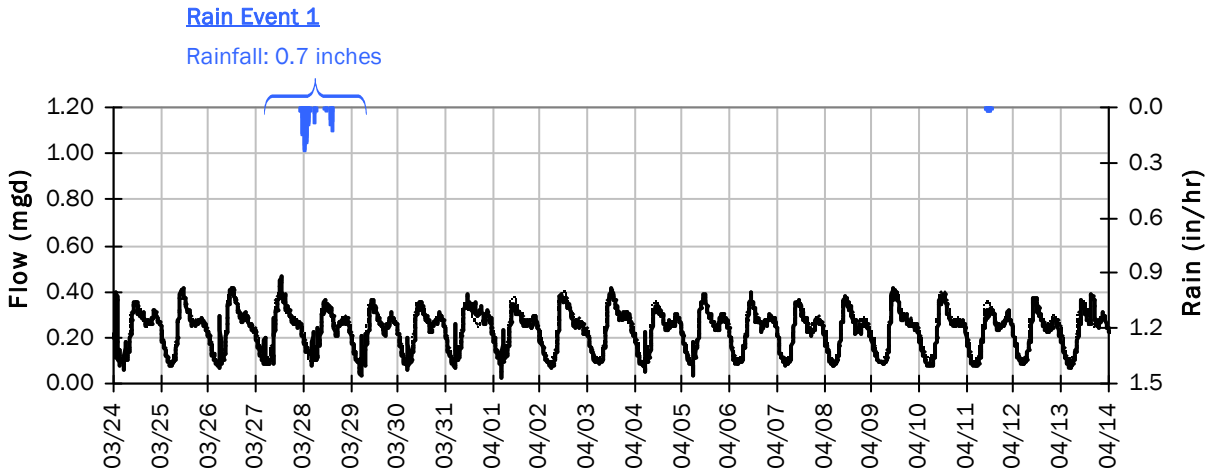




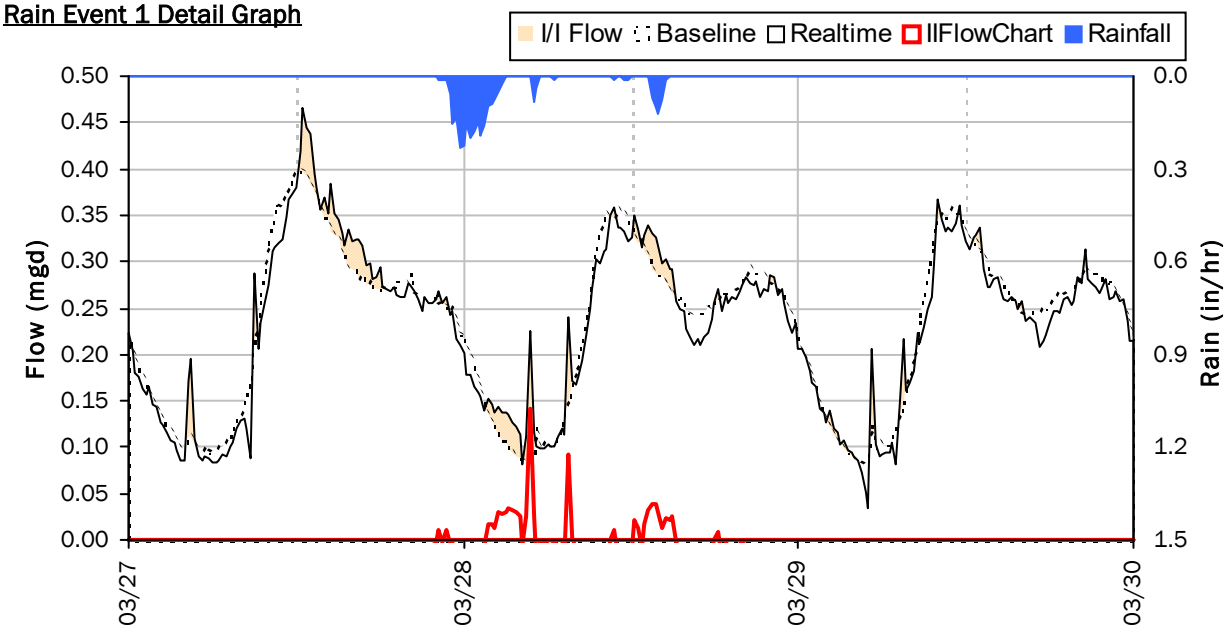
Pipe Diameter:	40	*inches*
Peak Measured Level:	10.1	*inches*
Peak d/D Ratio:	0.25	

SITE 17
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



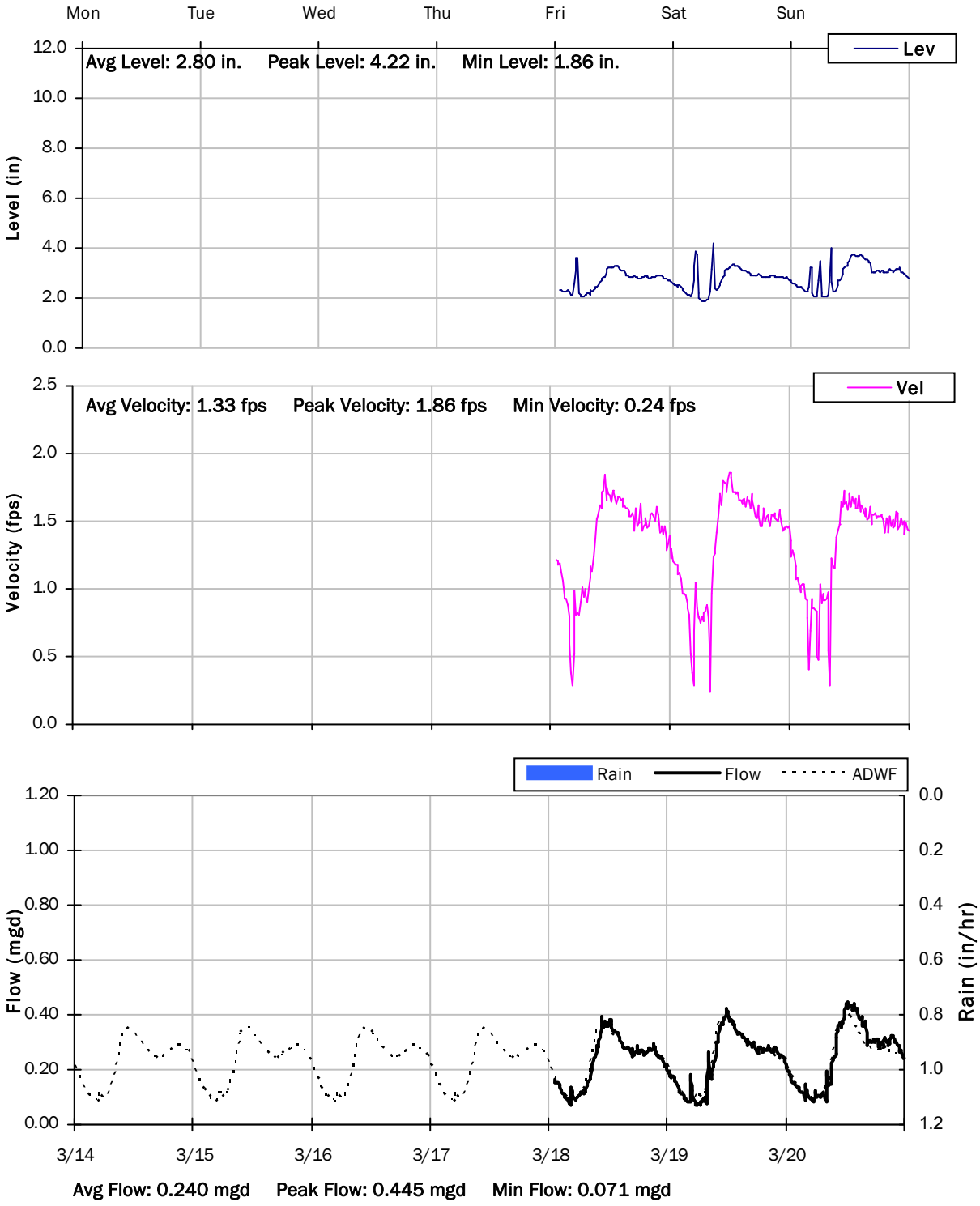
Storm Event I/I Analysis (Rain = 0.70 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.358 *mgd*	**Peak I/I Rate:**	0.143 *mgd*
PF:	1.54	**Total I/I:**	1,000 *gallons*
Peak Level:	4.65 *in*		
d/D Ratio:	0.12		

SITE 17

Weekly Level, Velocity and Flow Hydrographs

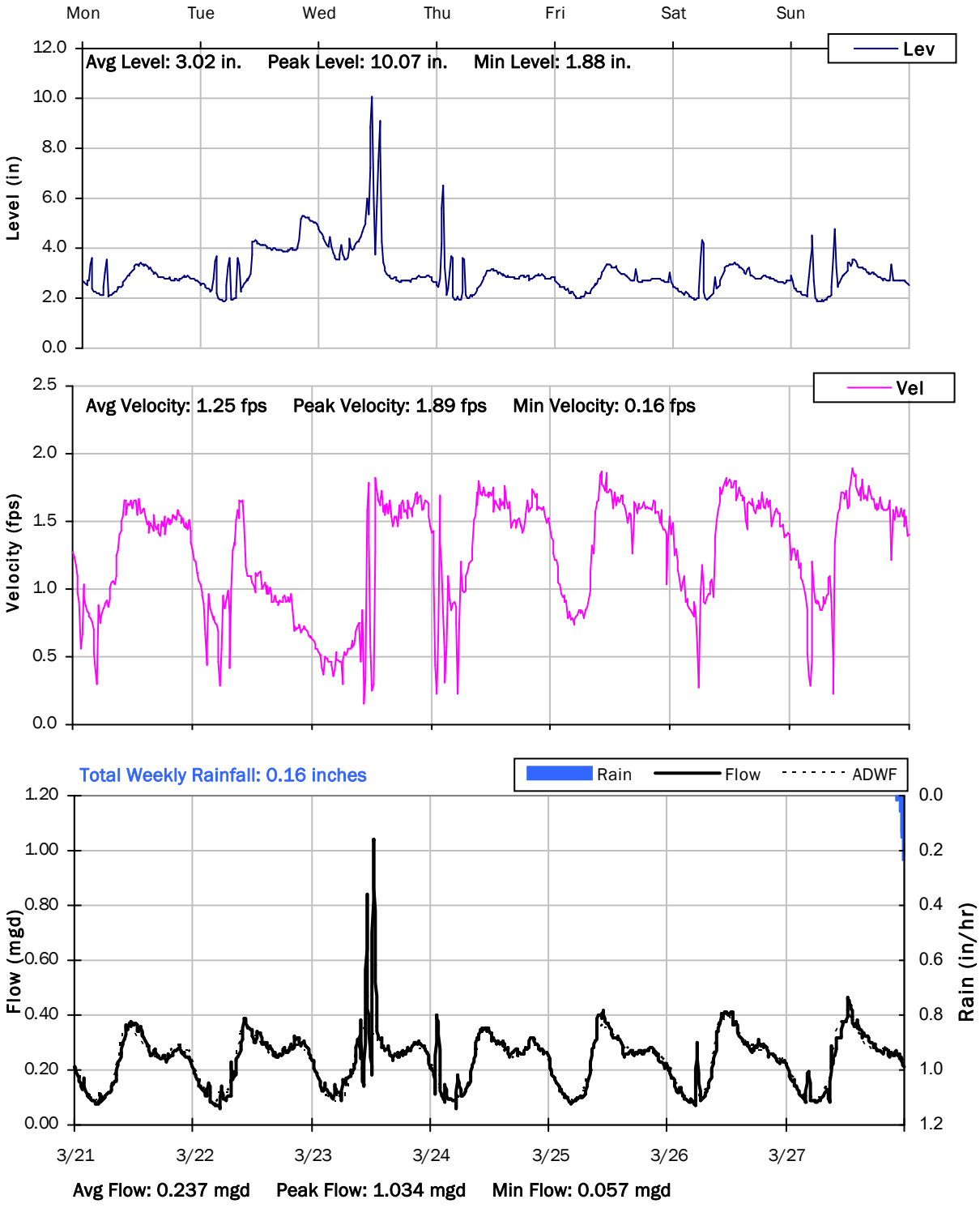
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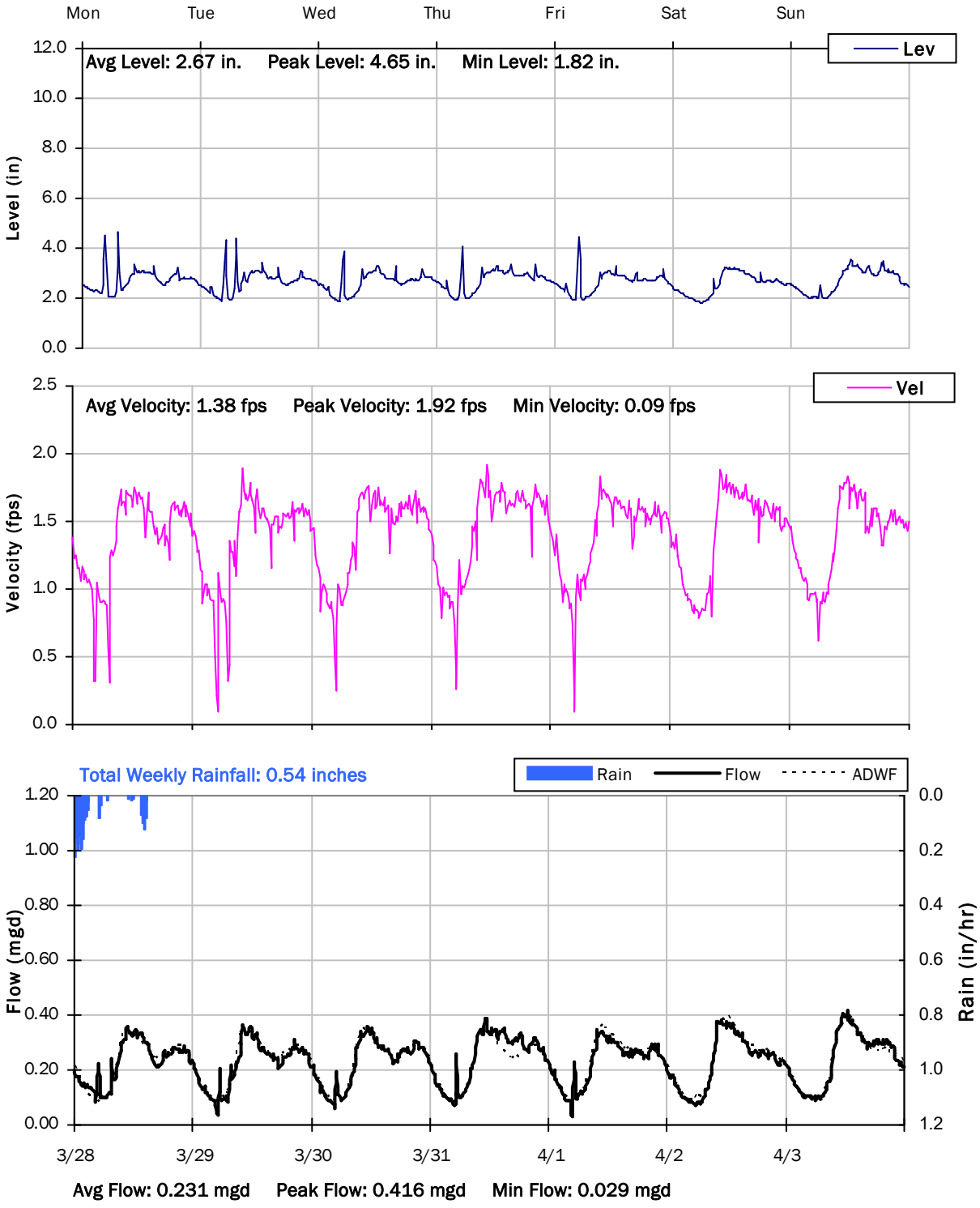
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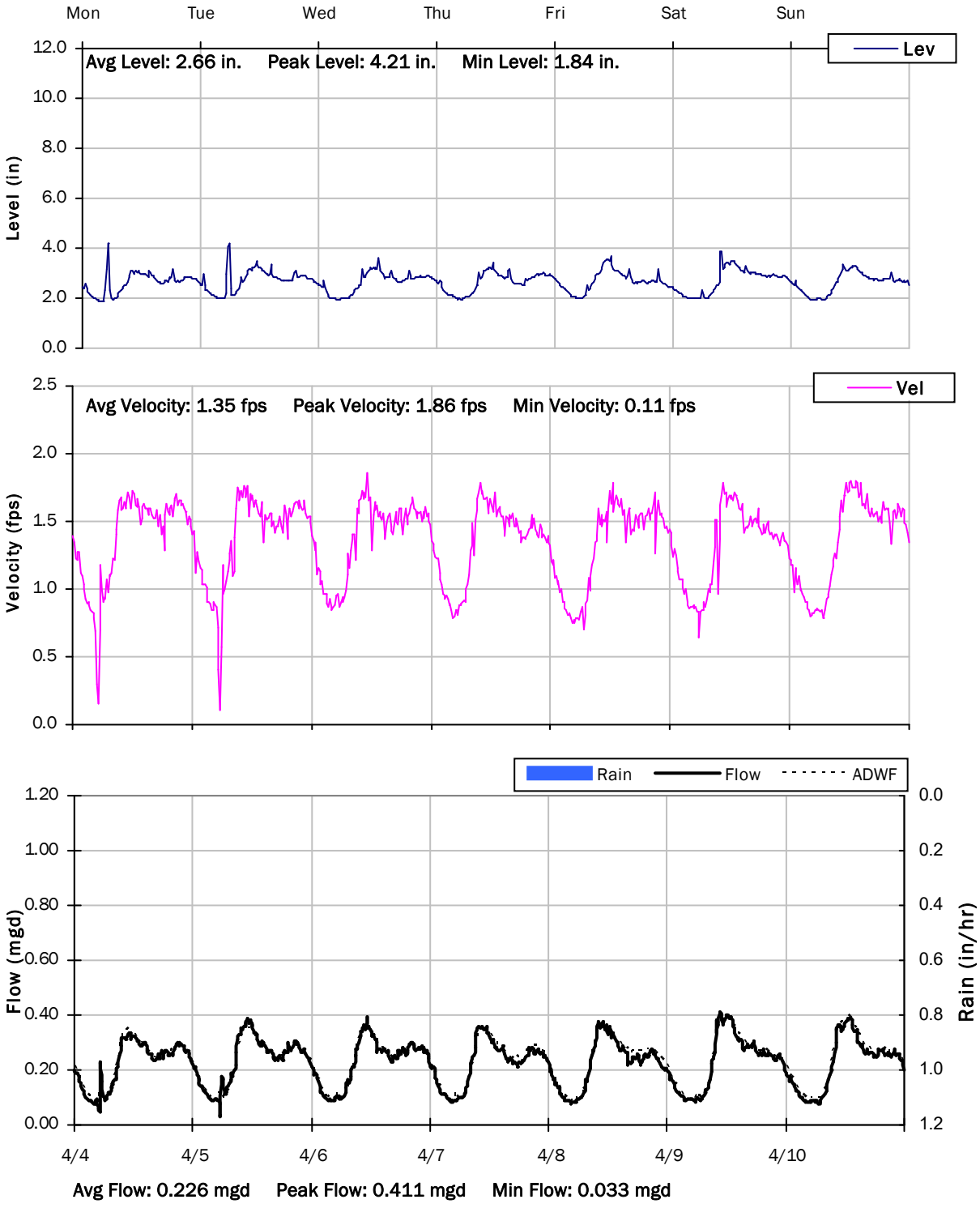
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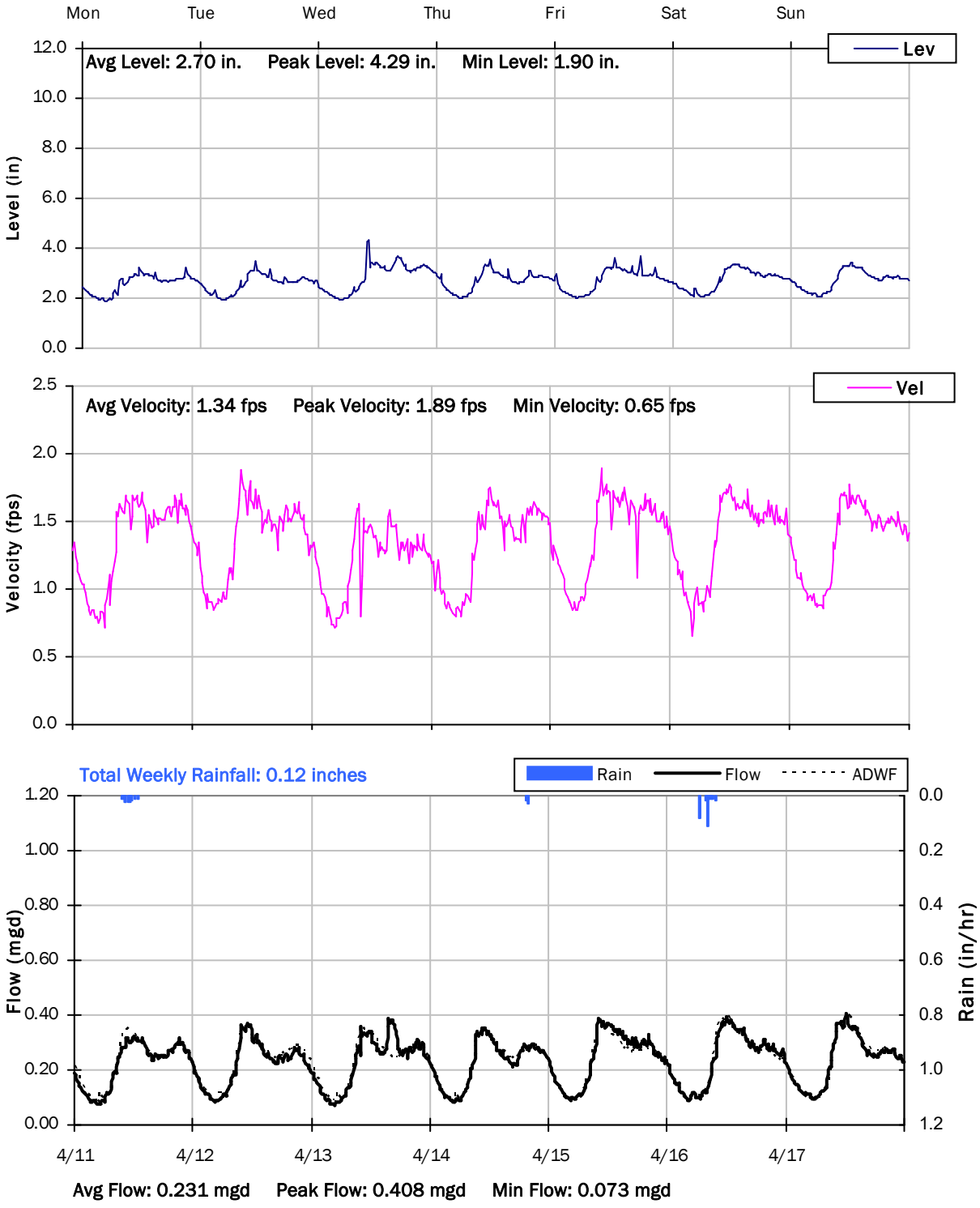
4/4/2022 to 4/11/2022



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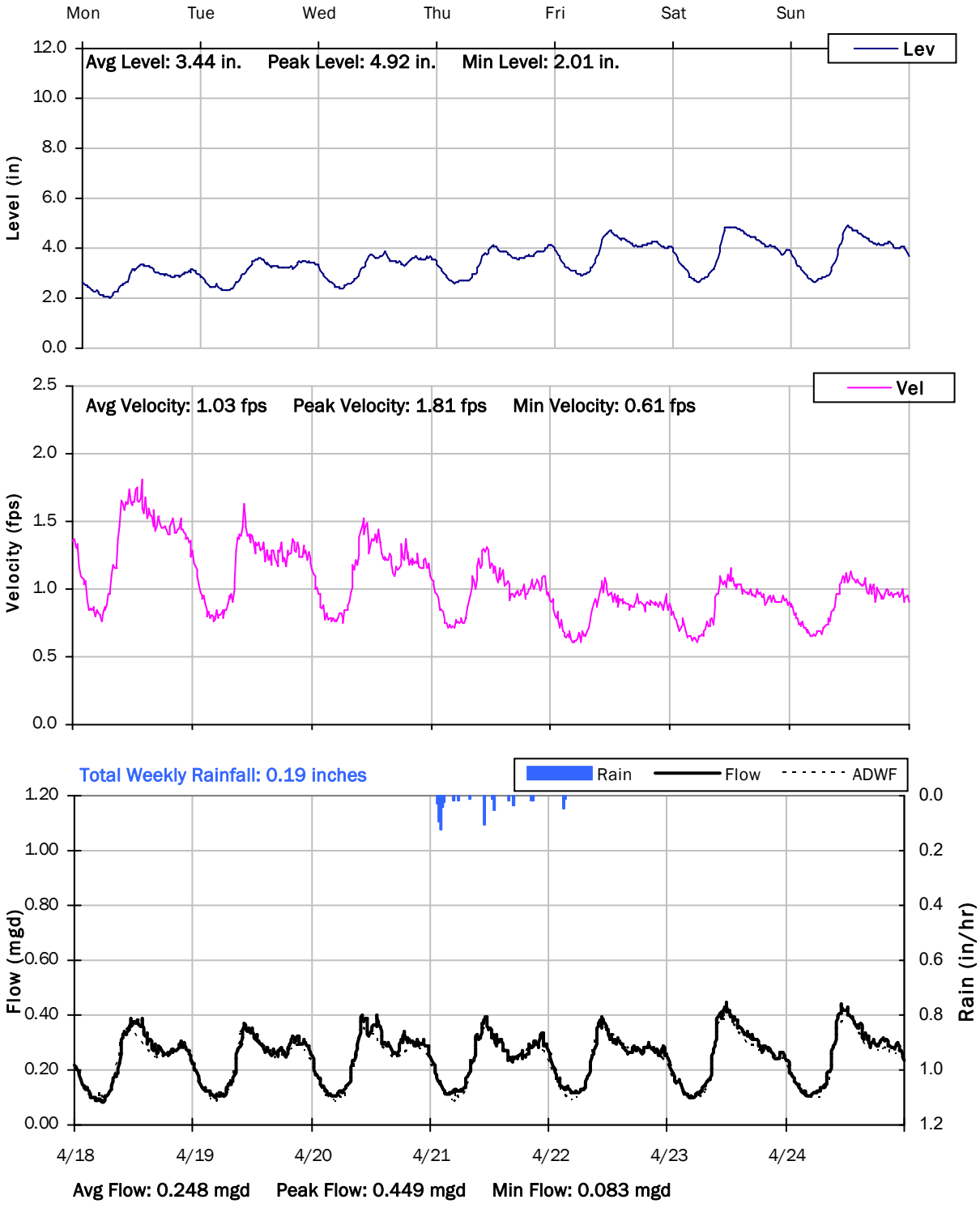
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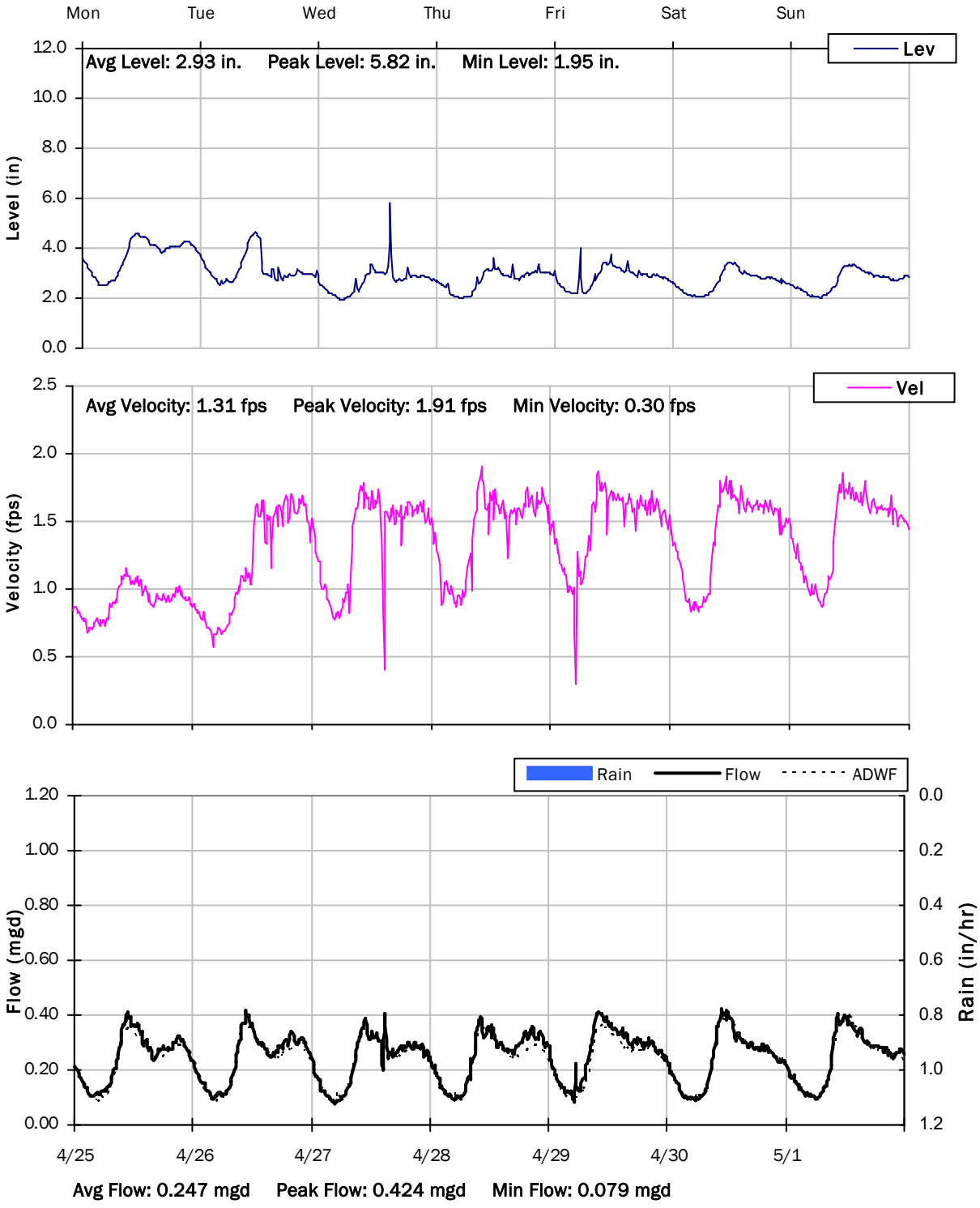
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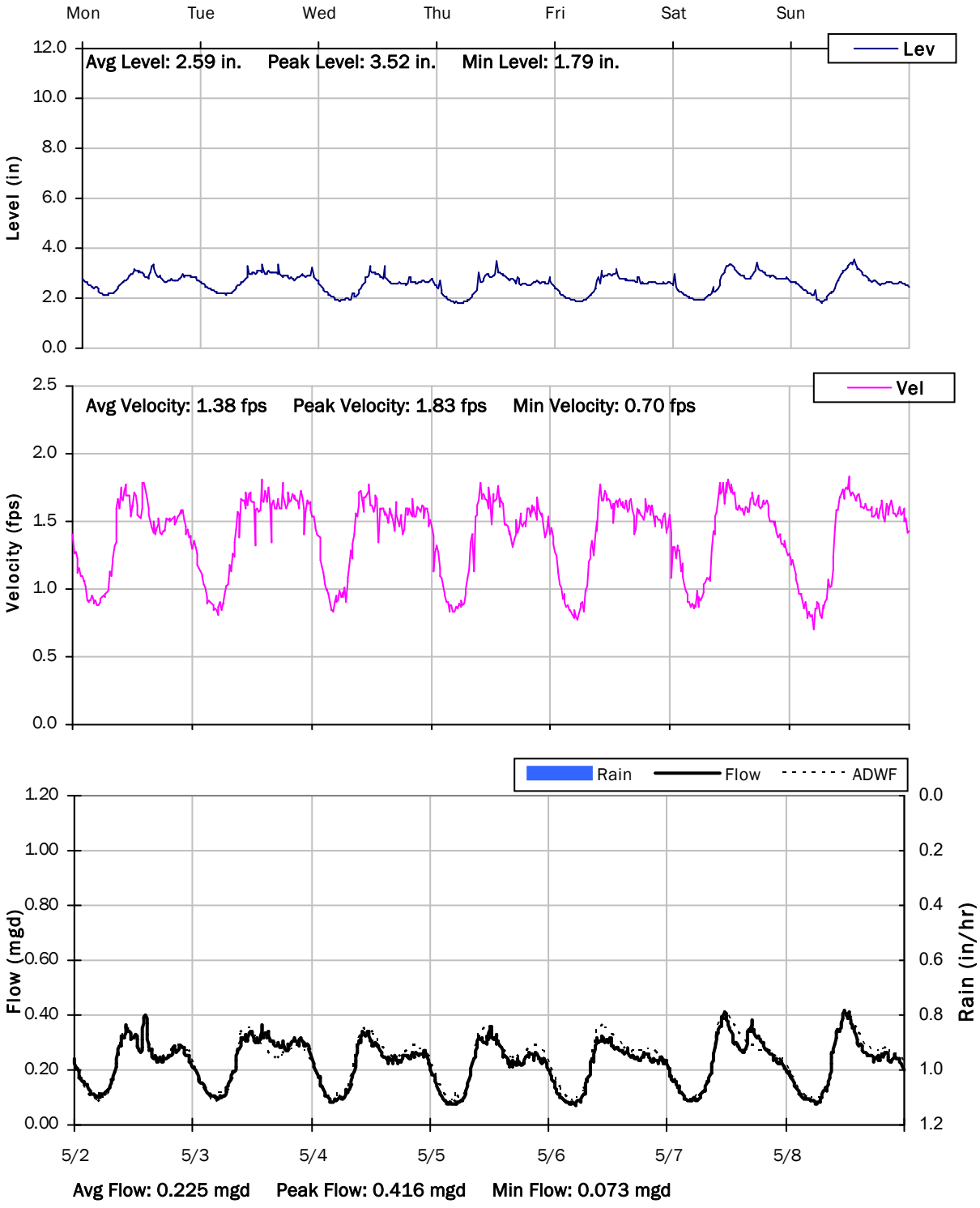
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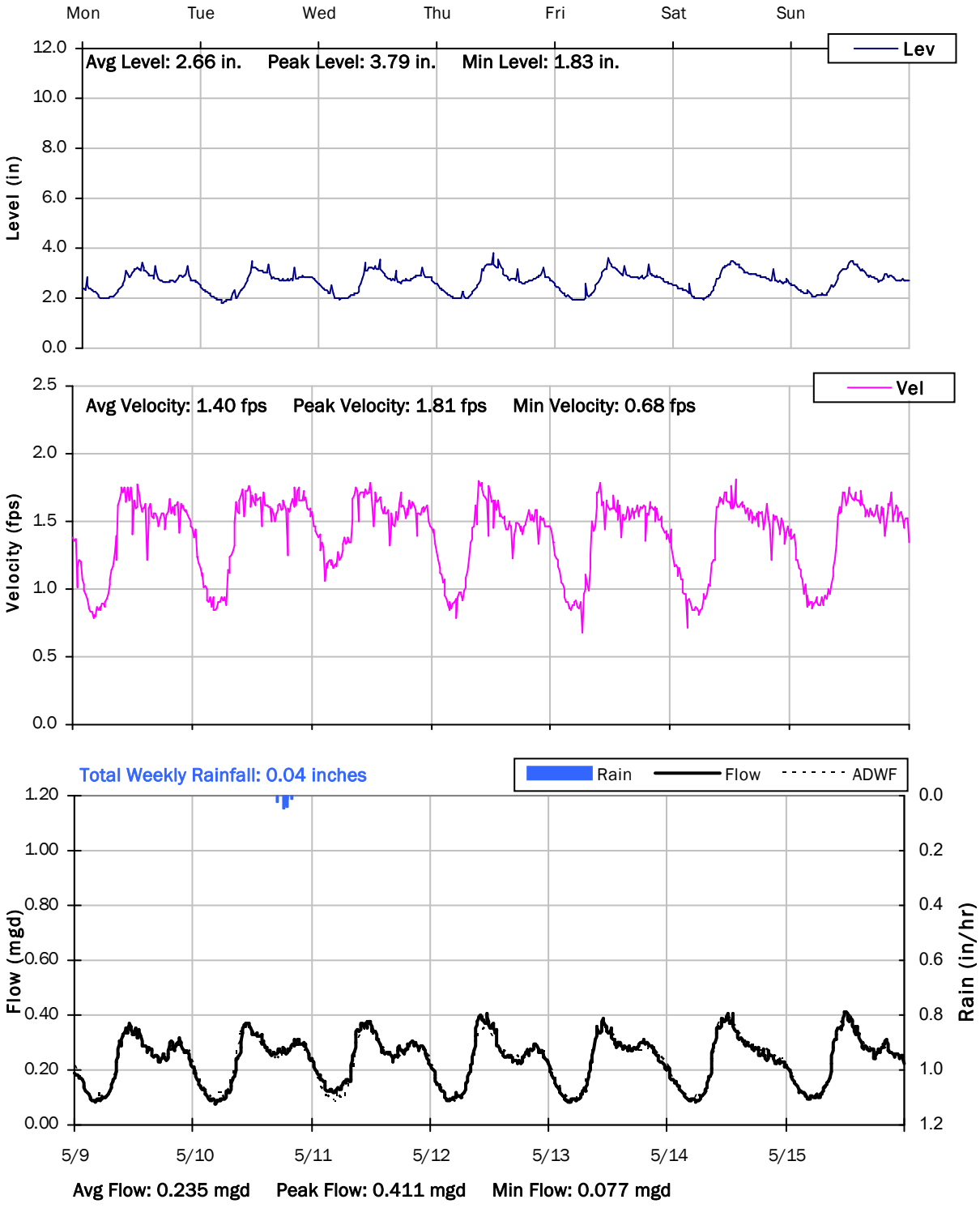
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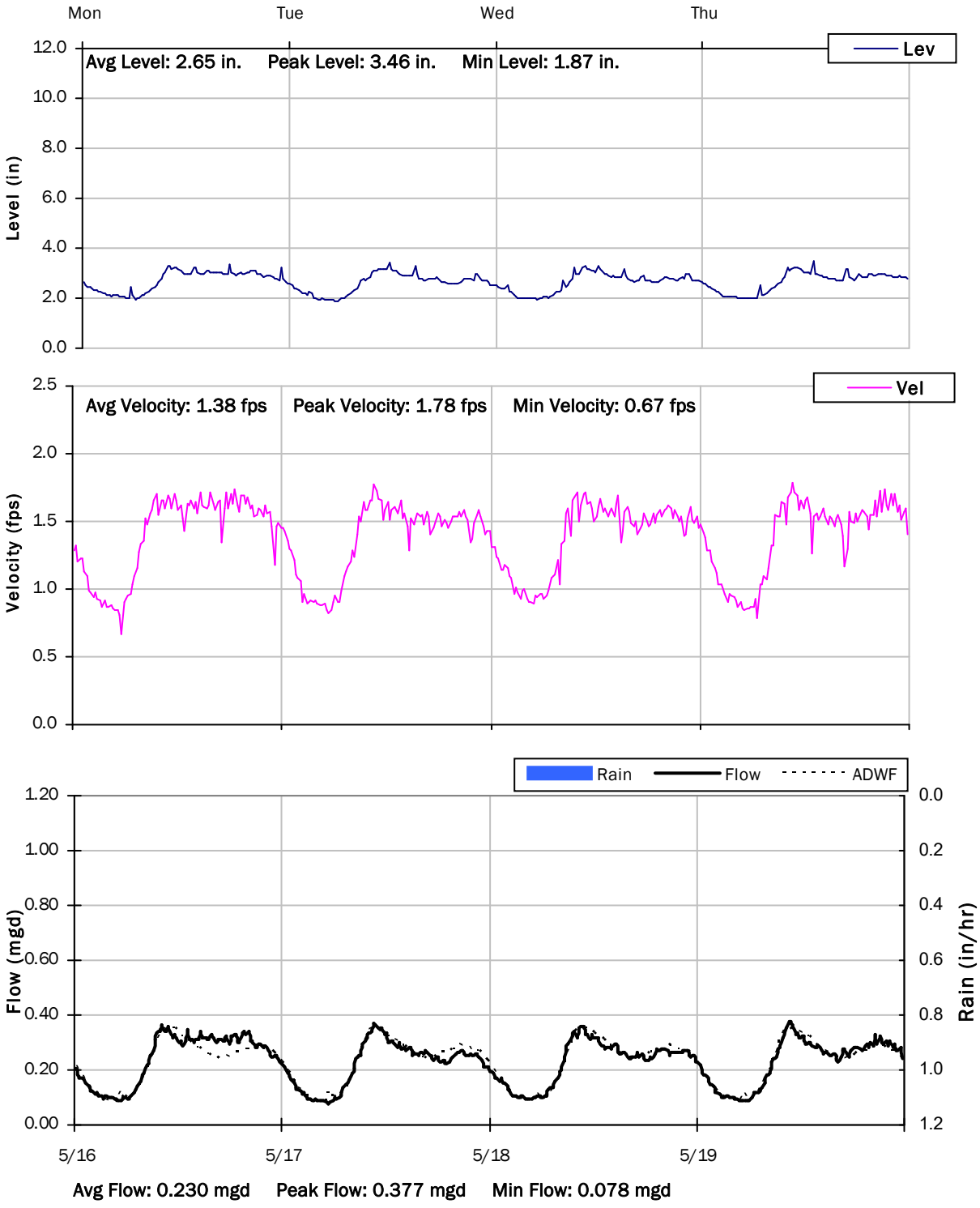
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SITE 17

Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



Monitoring Site: Site 18

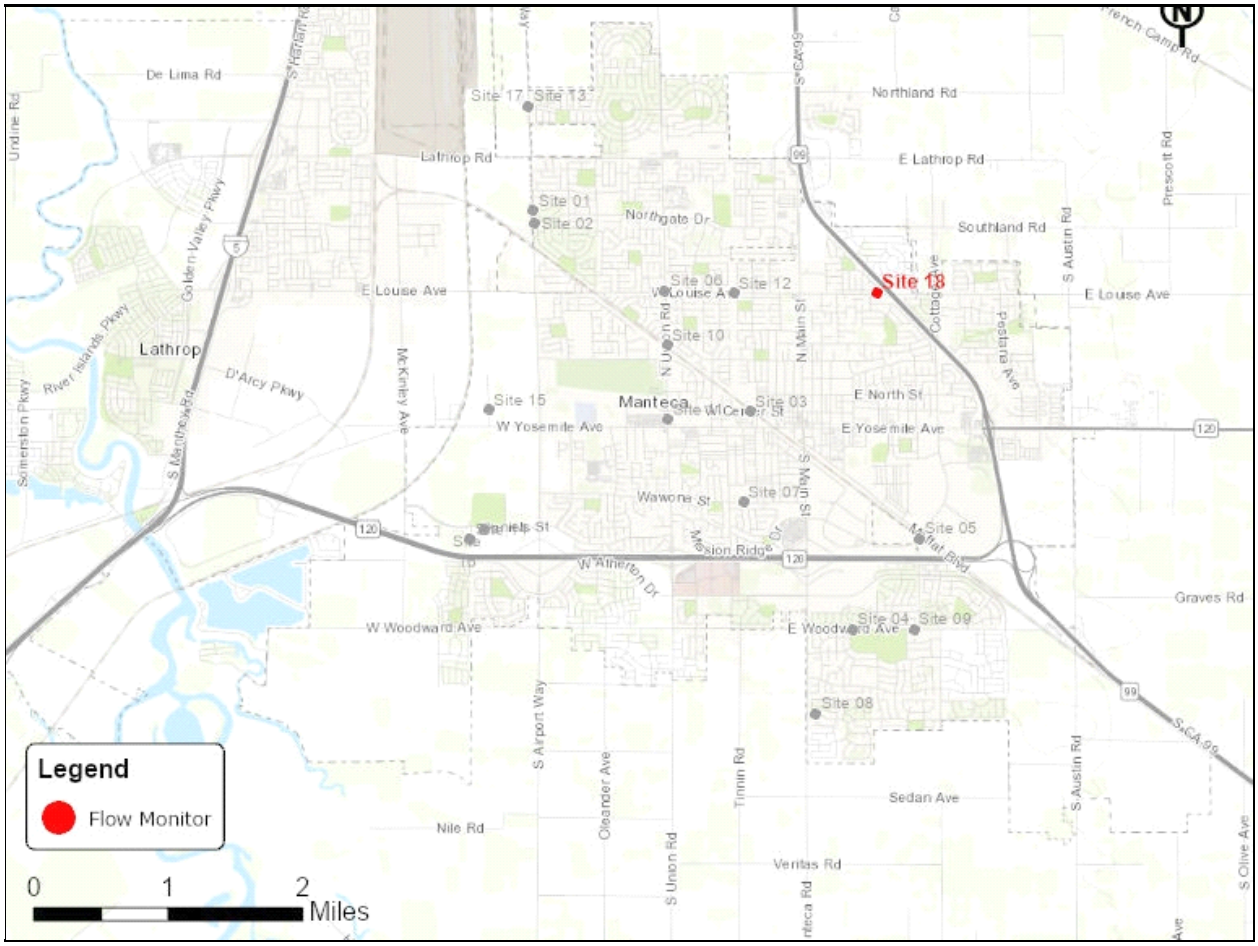
Stantec | City of Manteca, California

Sanitary Sewer Flow Monitoring

March 14, 2022 - May 19, 2022

Location: E. Louise Avenue East of Souza Boulevard

Data Summary Report



Vicinity Map: Site 18

SITE 18

Additional Site Photos

Effluent Pipe



Monitored East Influent Pipe



SITE 18

Additional Site Photos

South Influent Pipe (Lower)



South Influent Pipe (Upper)

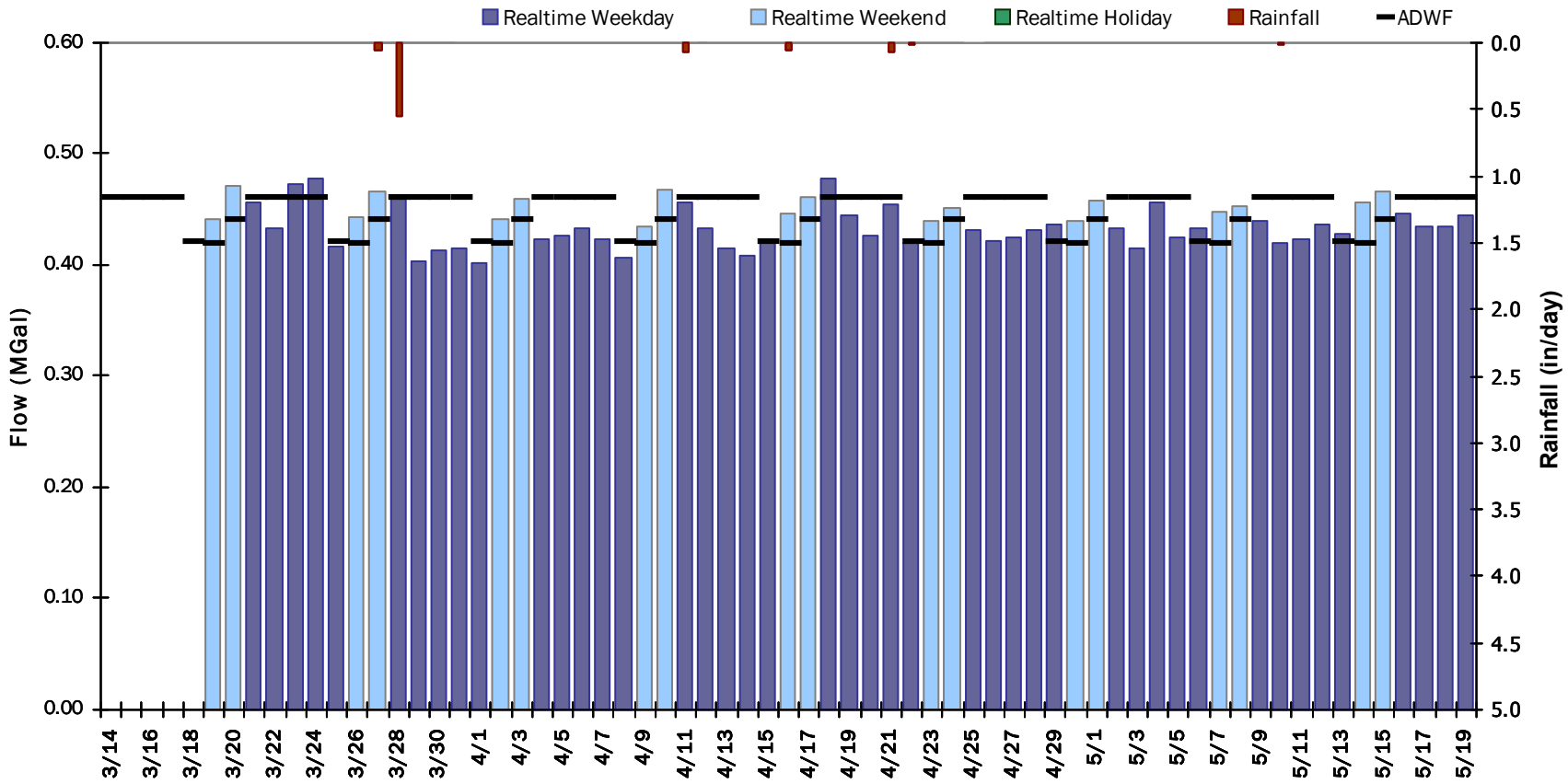


SITE 18

Period Flow Summary: Daily Flow Totals

Avg Daily Flow: 0.438 MGal Peak Daily Flow: 0.478 MGal Min Daily Flow: 0.402 MGal

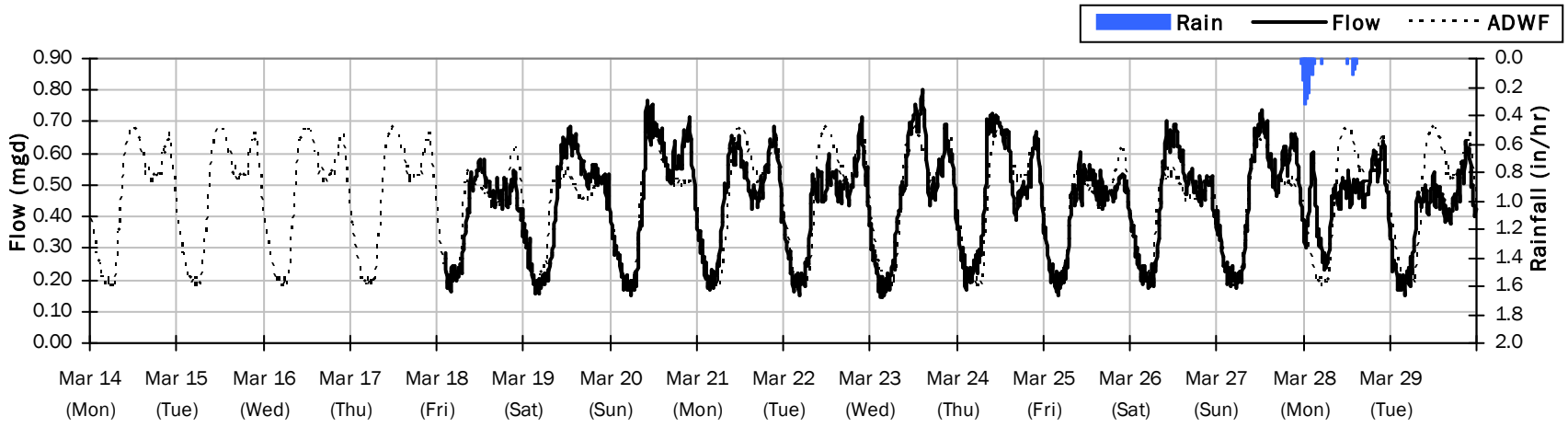
Total Rainfall: 0.84 inches

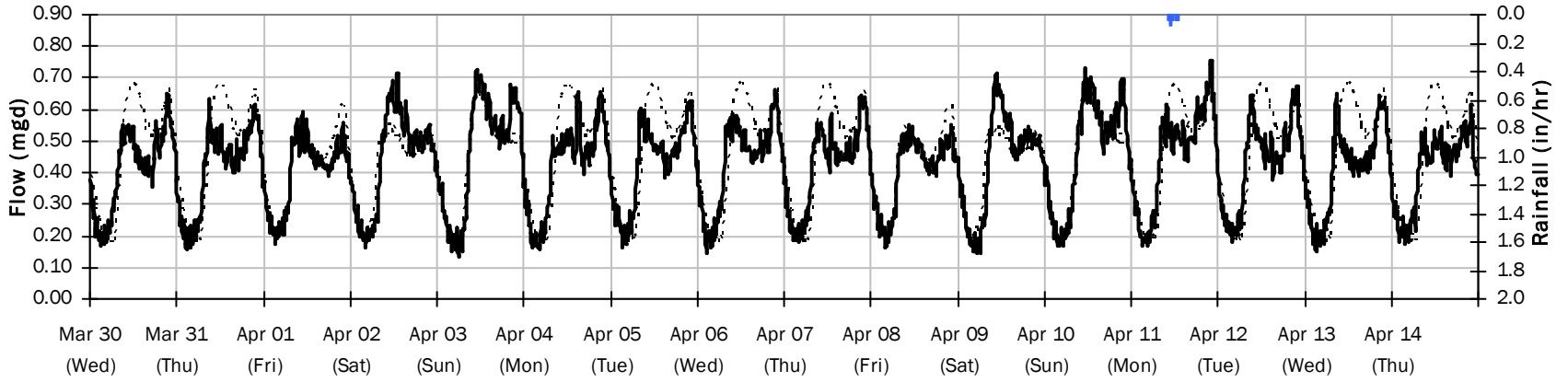


SITE 18

Flow Summary: 3/14/2022 to 4/14/2022

Period Rainfall: 0.68 inches Period Avg Flow: 0.436 mgd Period Peak Flow: 0.804 mgd Period Min Flow: 0.134 mgd

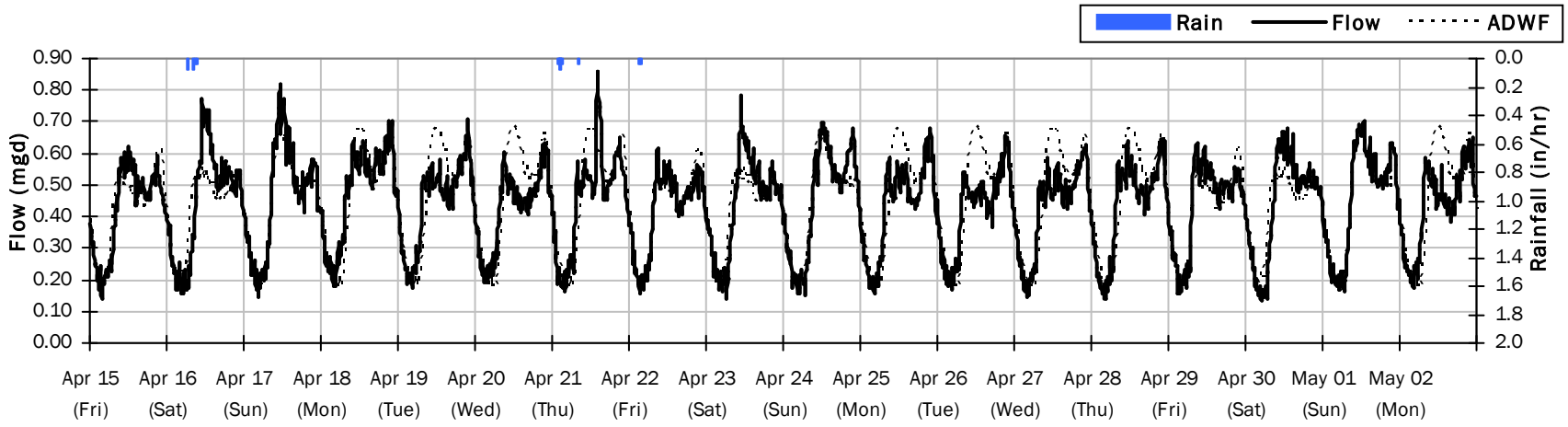


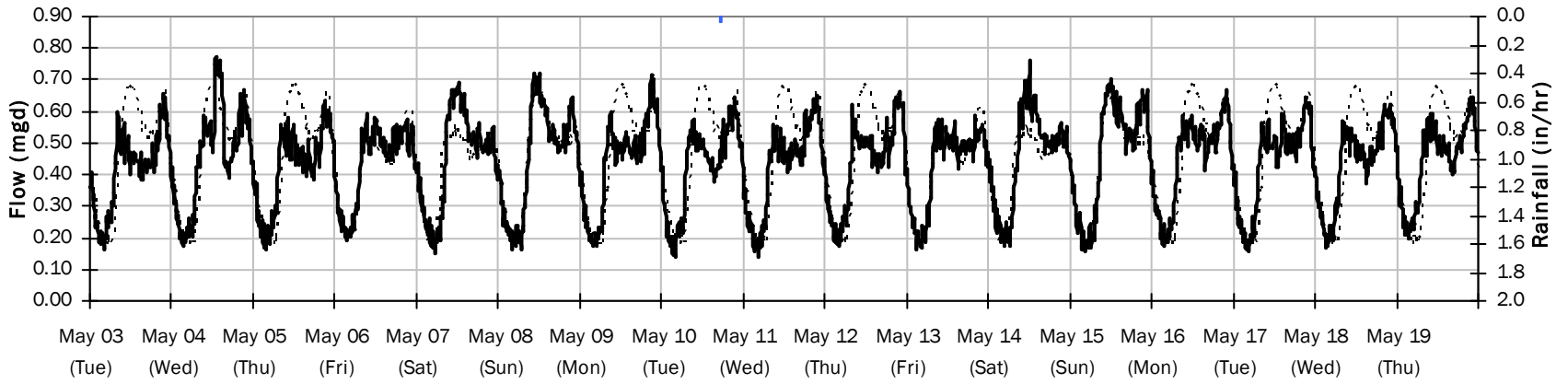


SITE 18

Flow Summary: 4/15/2022 to 5/19/2022

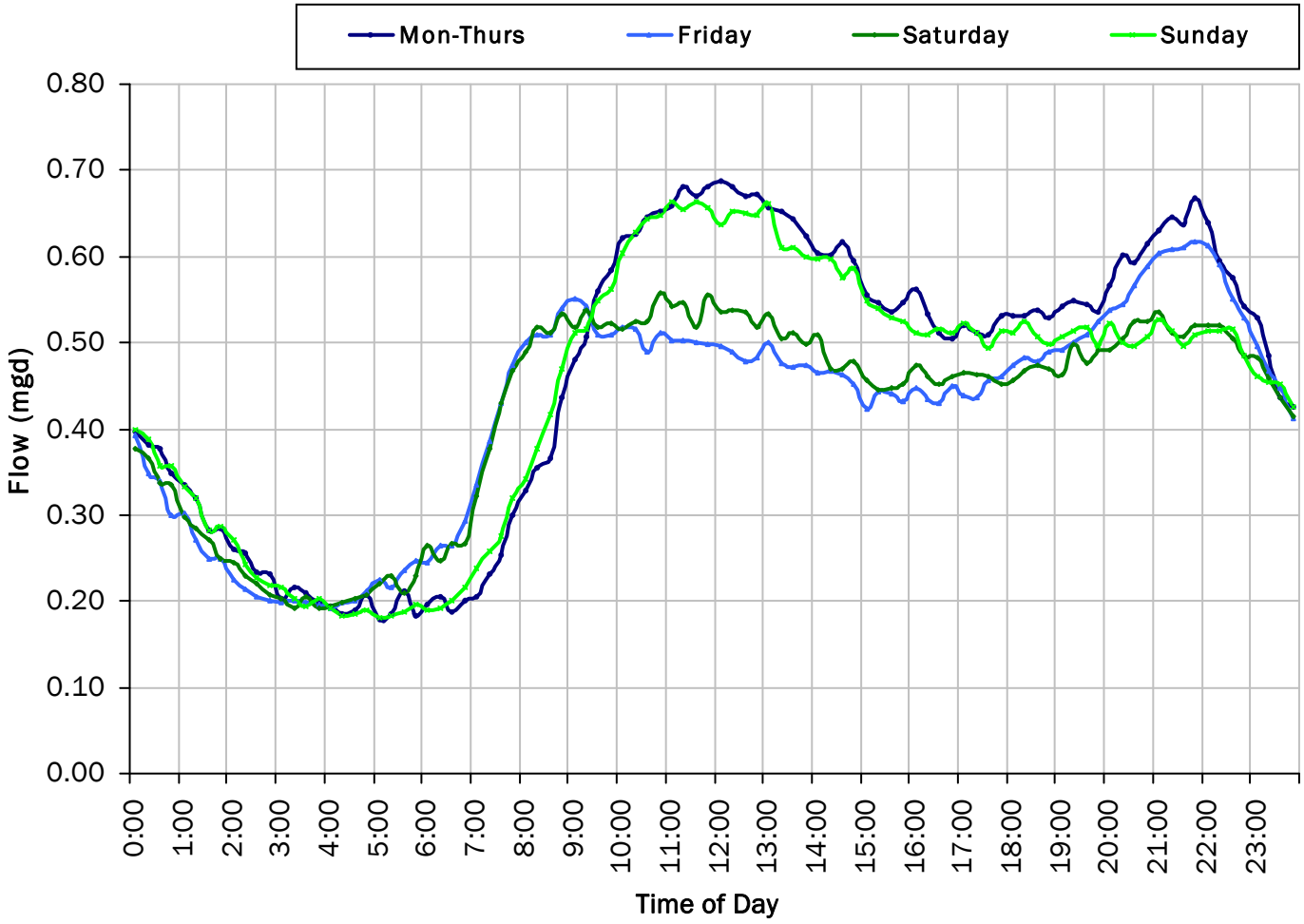
Period Rainfall: 0.16 inches Period Avg Flow: 0.440 mgd Period Peak Flow: 0.856 mgd Period Min Flow: 0.134 mgd





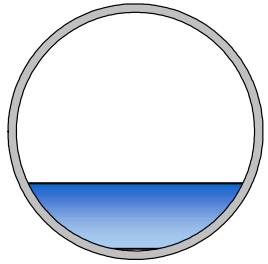
SITE 18

Average Dry Weather Flow Hydrographs



ADWF:

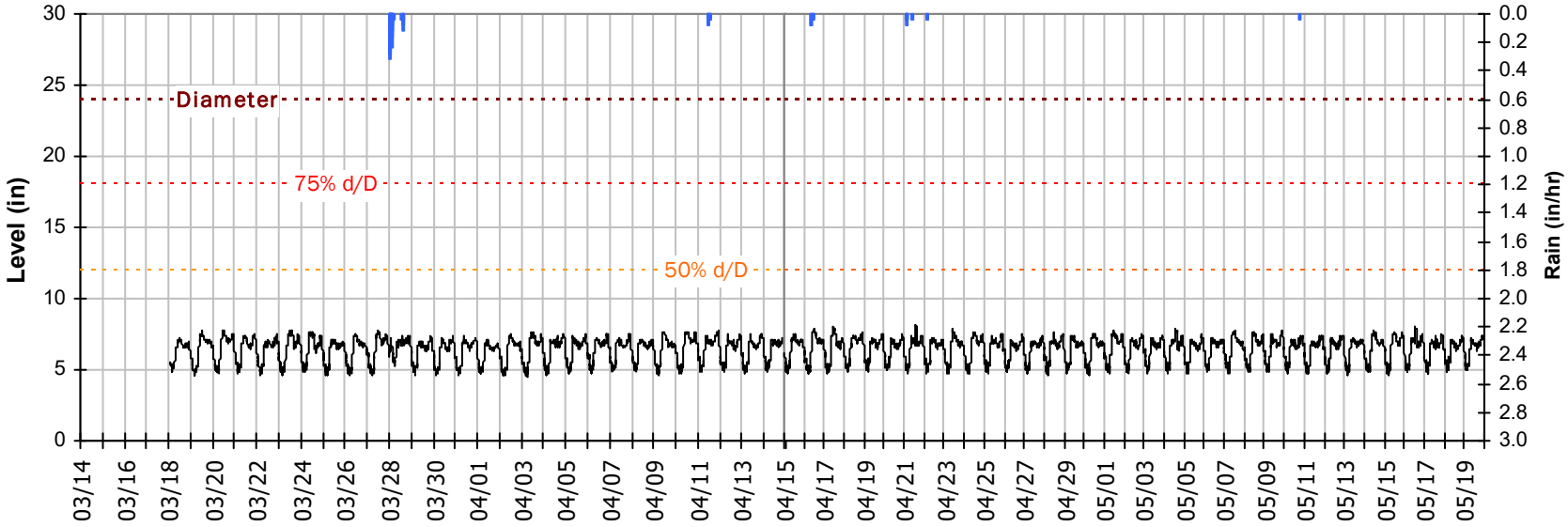
0.448 *mgd*

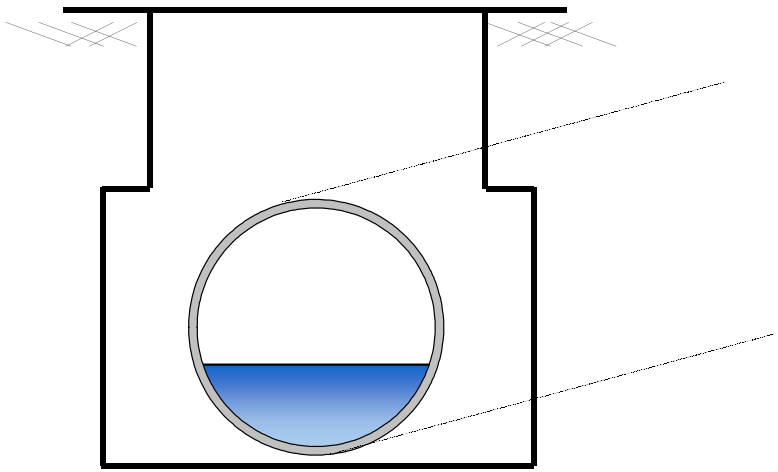


SITE 18

Site Capacity and Surcharge Summary

Realtime Flow Levels with Rainfall Data over Peak Level Period

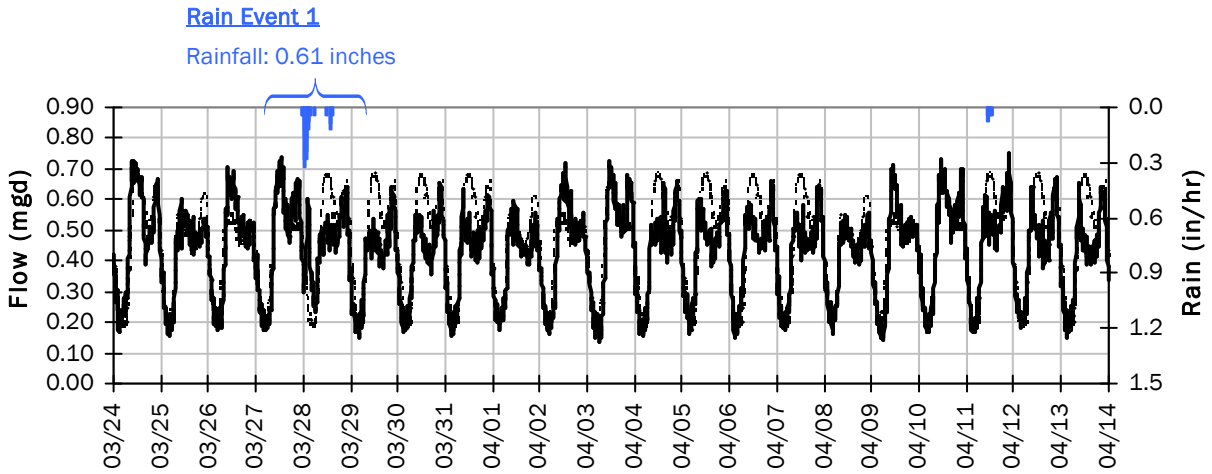




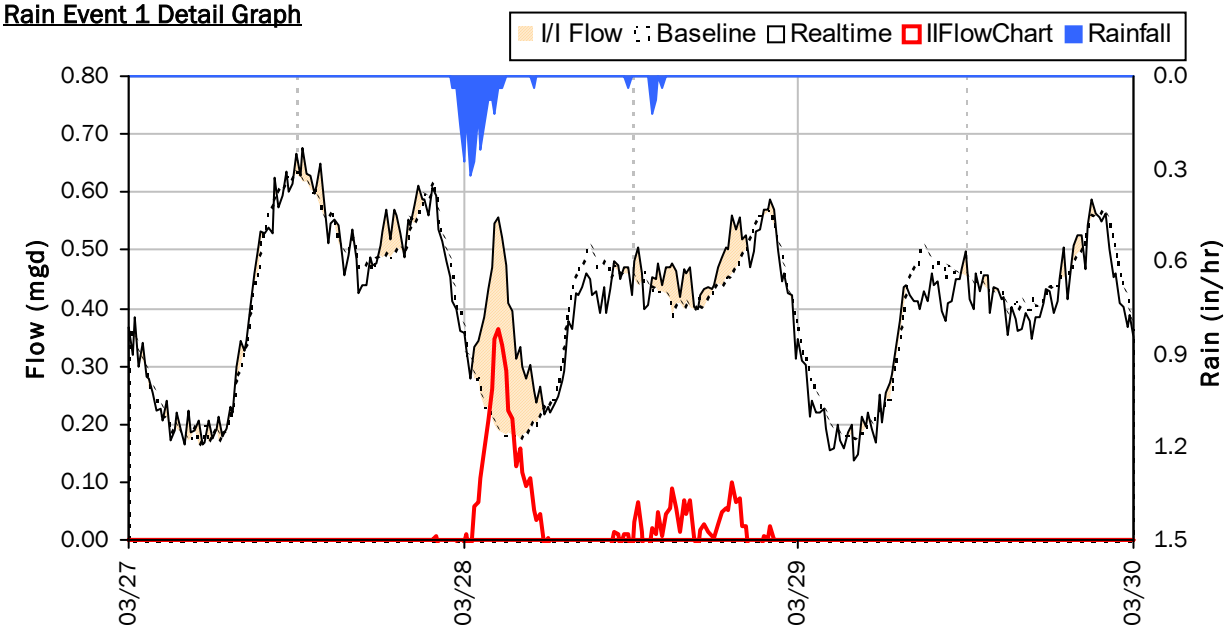
Pipe Diameter:	24	*inches*
Peak Measured Level:	8.18	*inches*
Peak d/D Ratio:	0.34	

SITE 18
I/I Summary: Rain Event 1

Baseline and Realtime Flows with Rainfall Data over Monitoring Period



Rain Event 1 Detail Graph



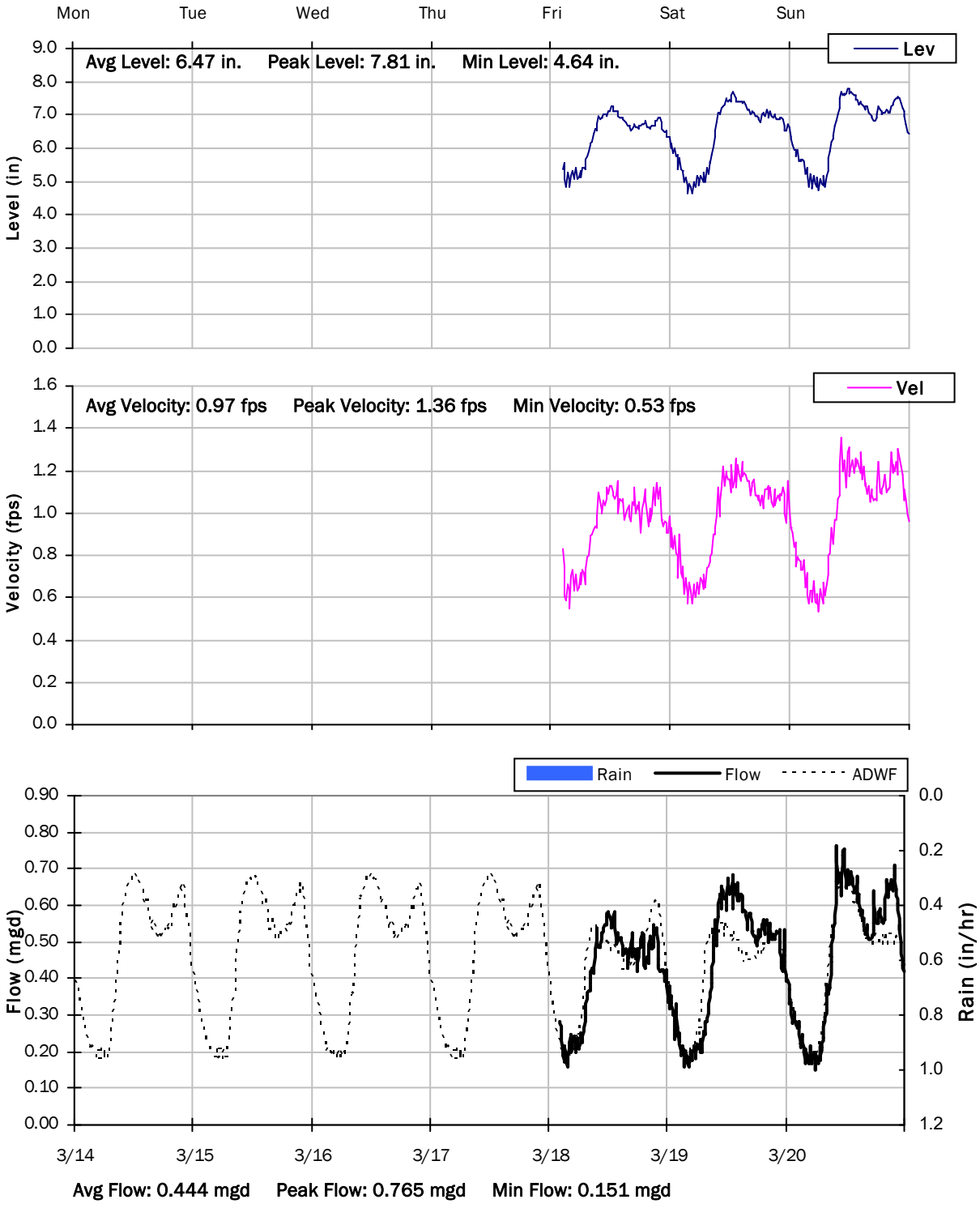
Storm Event I/I Analysis (Rain = 0.61 inches)

Capacity		Inflow / Infiltration	
Peak Flow:	0.593 *mgd*	**Peak I/I Rate:**	0.365 *mgd*
PF:	1.32	**Total I/I:**	35,000 *gallons*
Peak Level:	7.39 *in*		
d/D Ratio:	0.31		

SITE 18

Weekly Level, Velocity and Flow Hydrographs

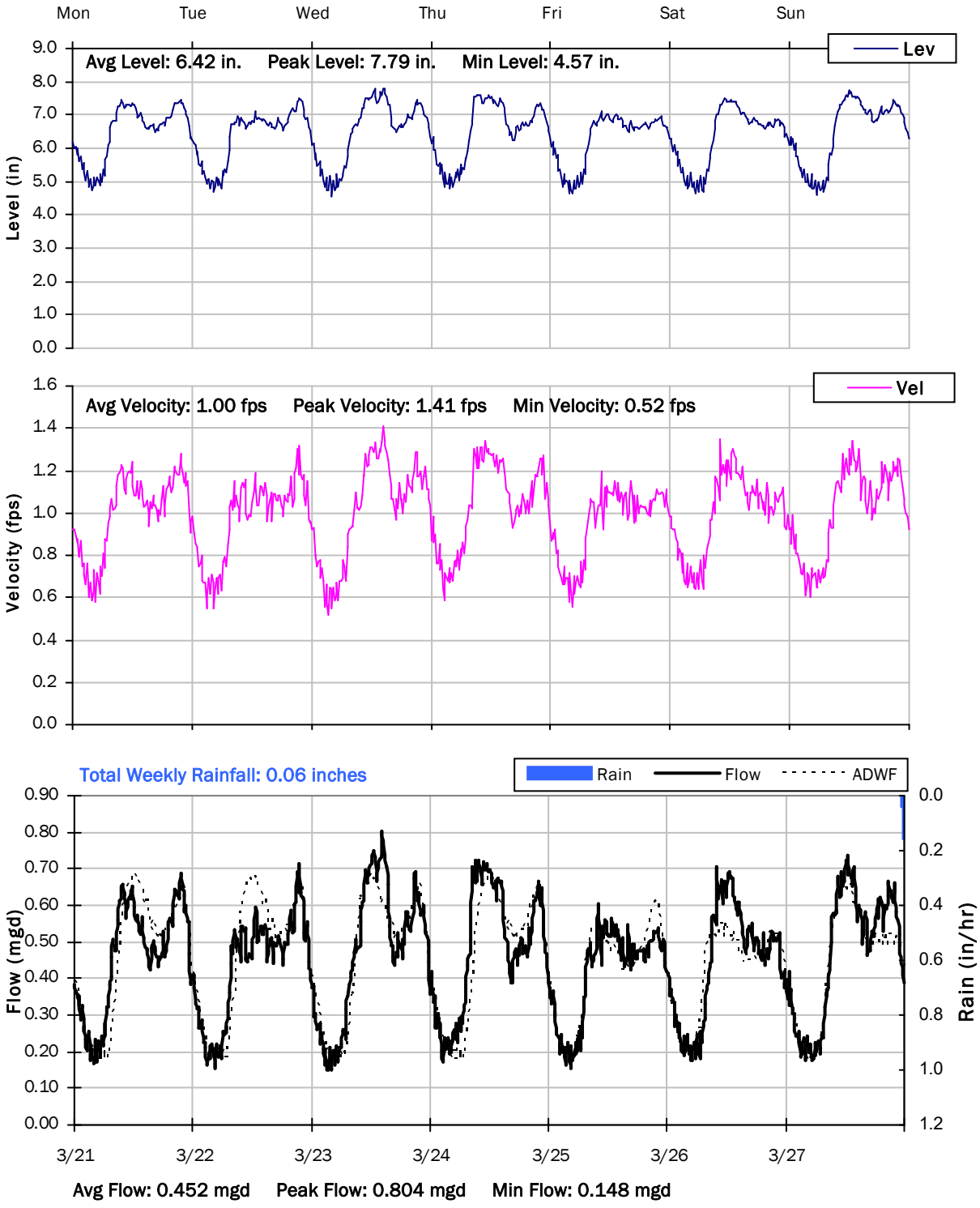
3/14/2022 to 3/21/2022



SITE 18

Weekly Level, Velocity and Flow Hydrographs

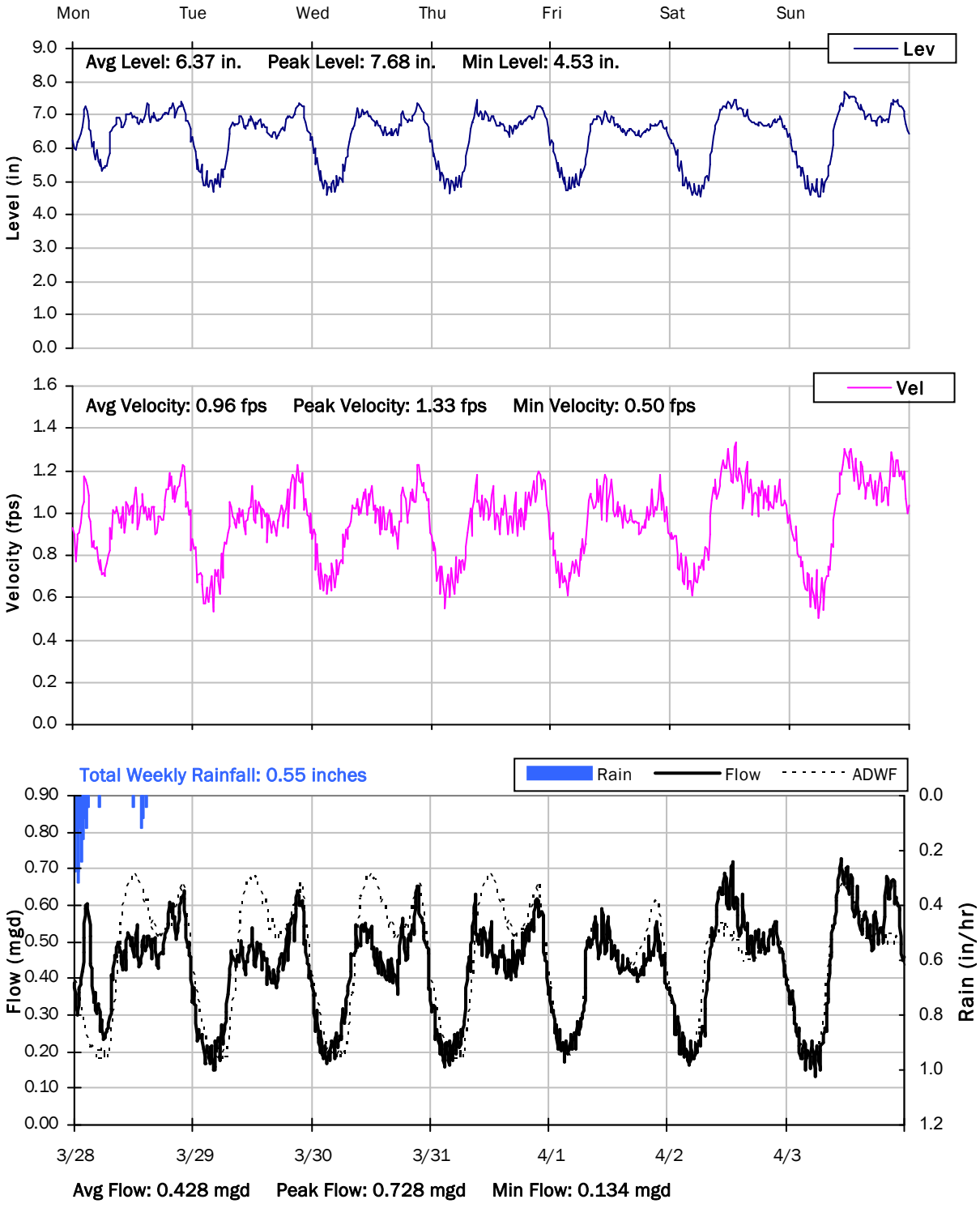
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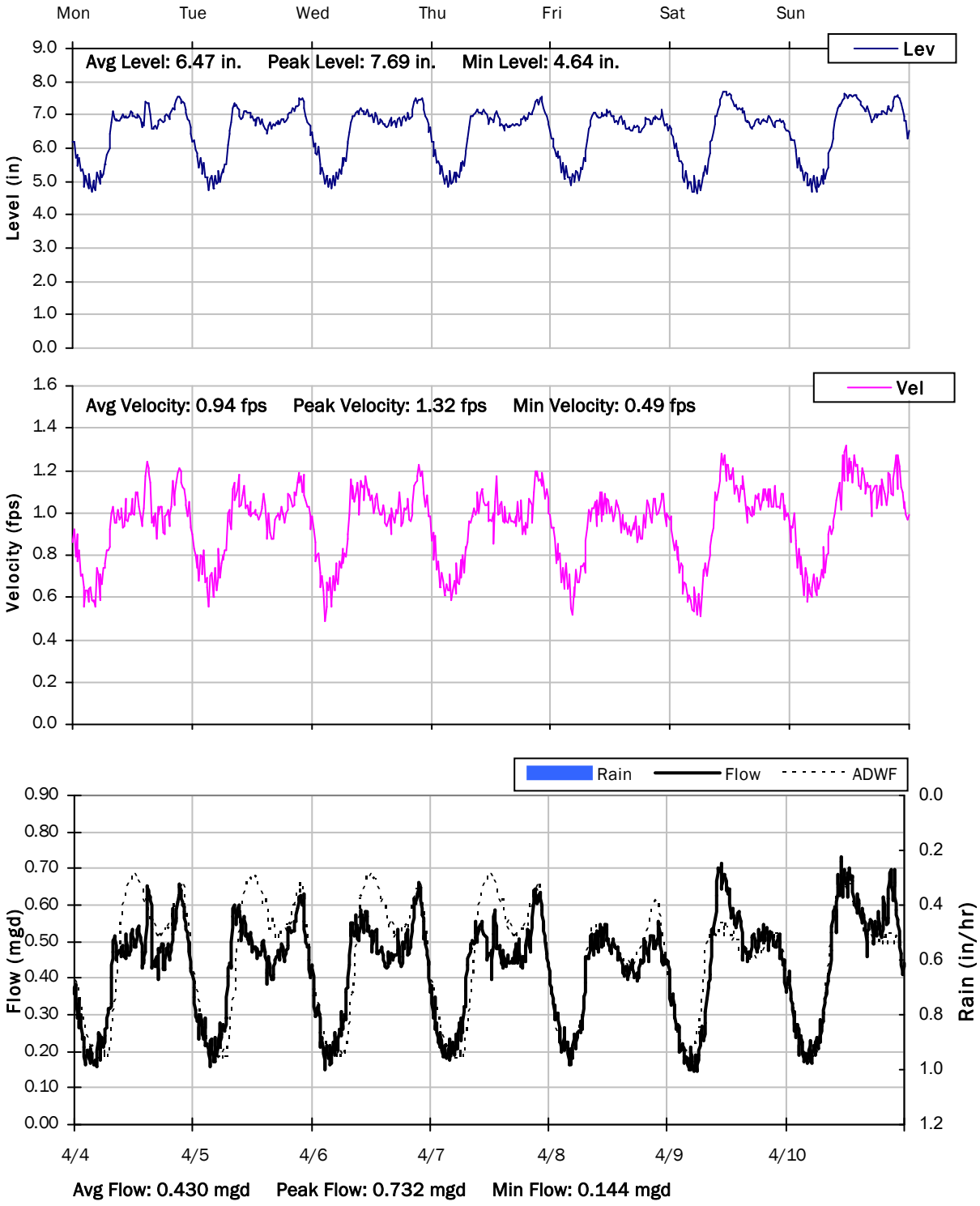
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Weekly Level, Velocity and Flow Hydrographs

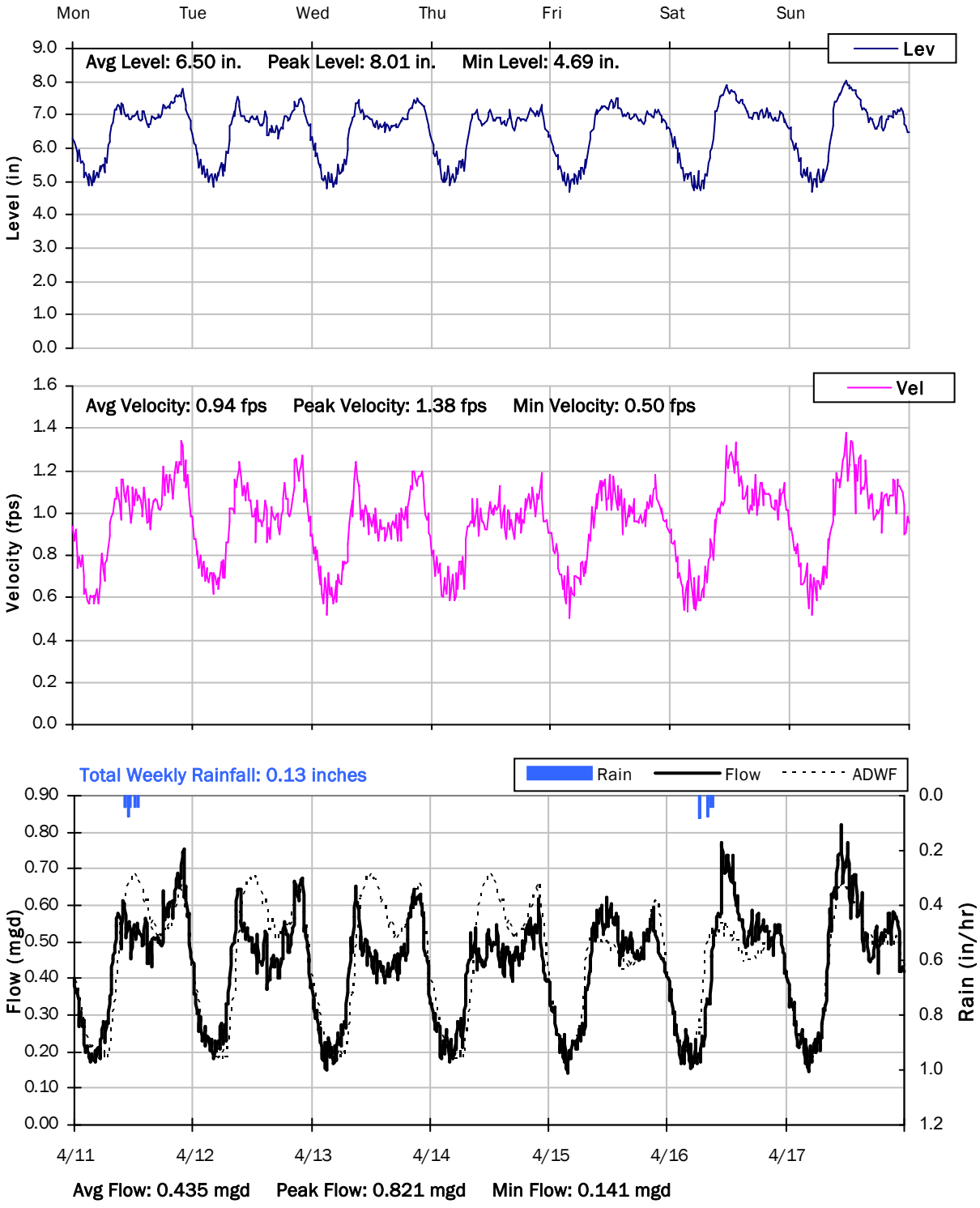
4/4/2022 to 4/11/2022



SITE 18

Weekly Level, Velocity and Flow Hydrographs

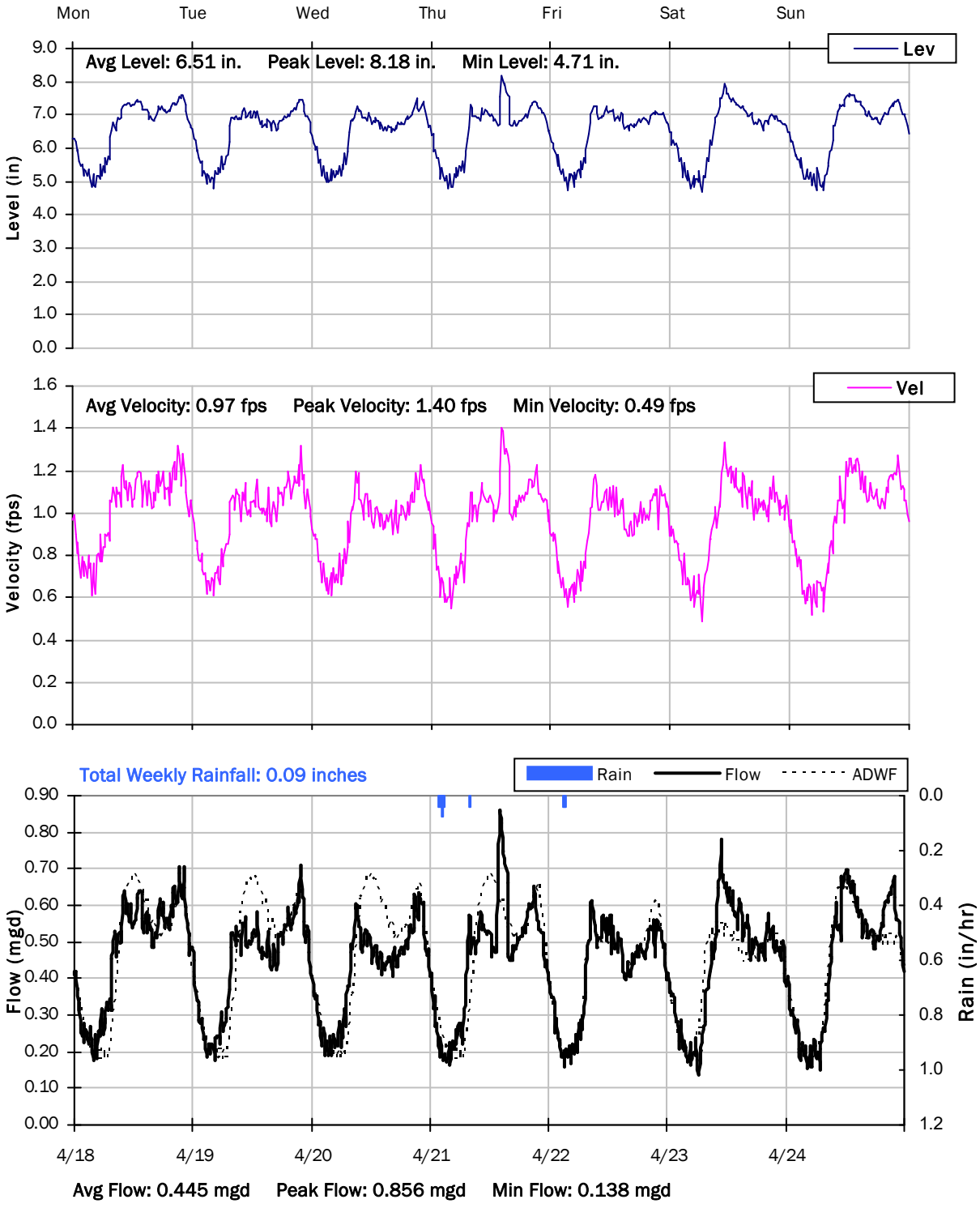
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Weekly Level, Velocity and Flow Hydrographs

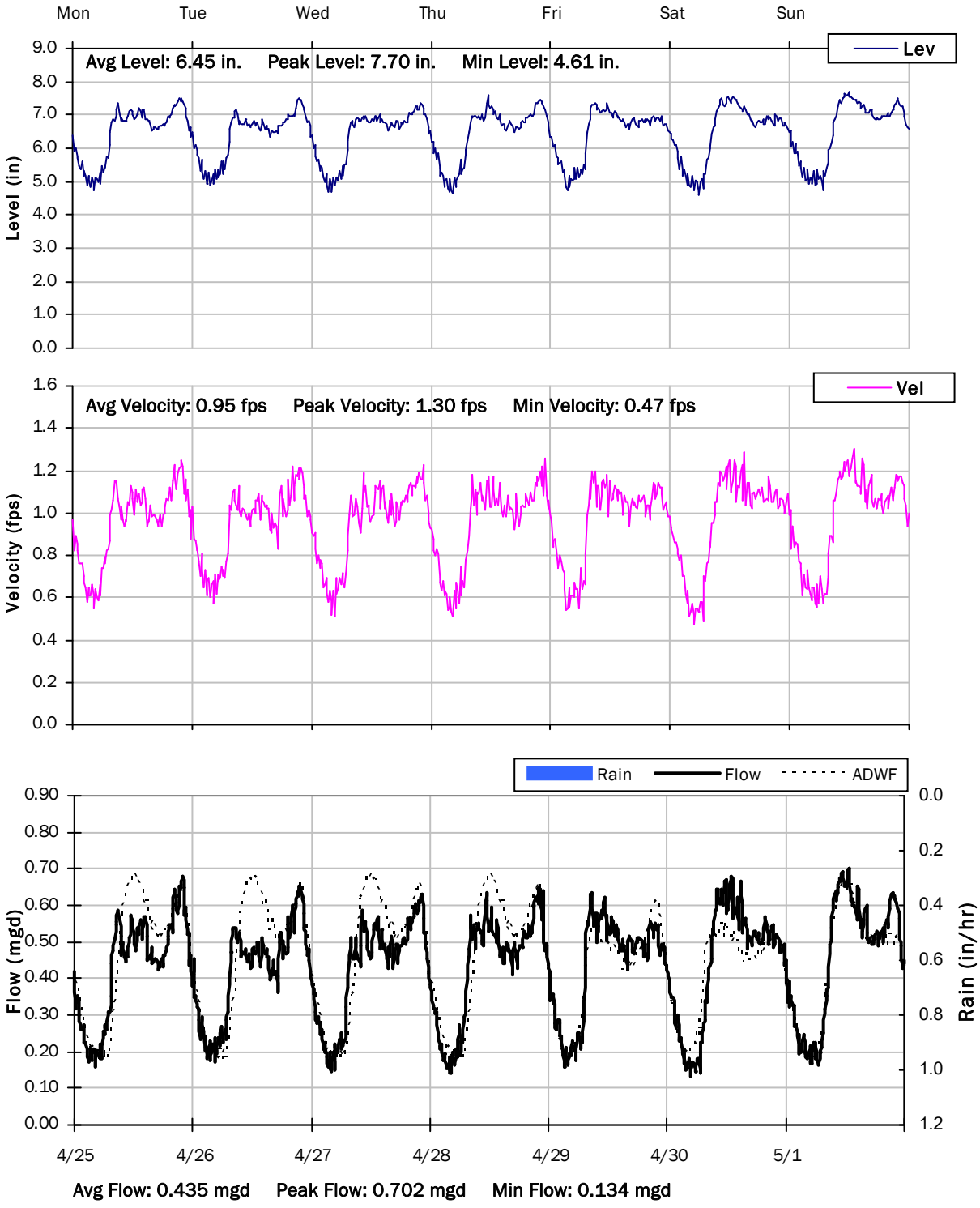
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Weekly Level, Velocity and Flow Hydrographs

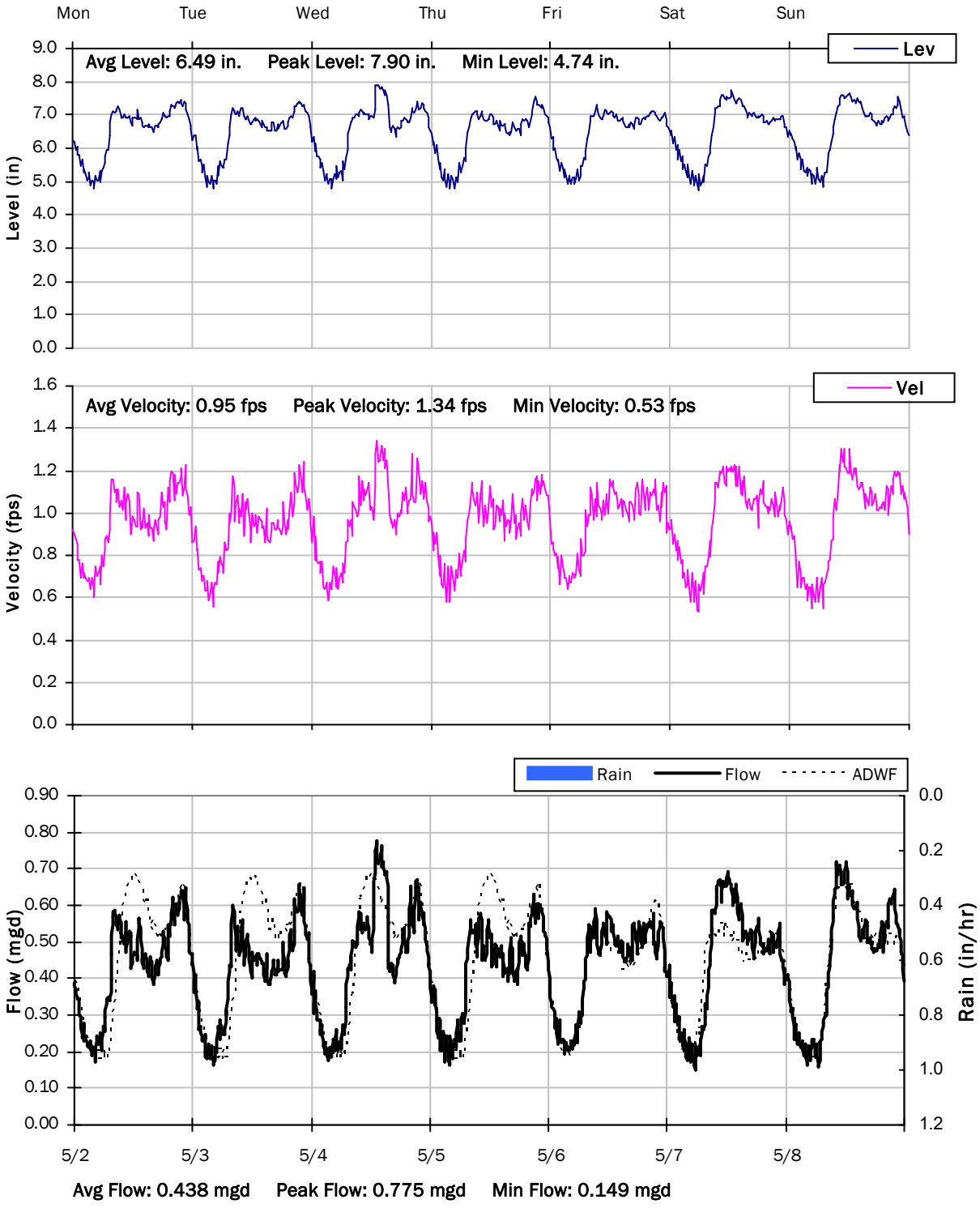
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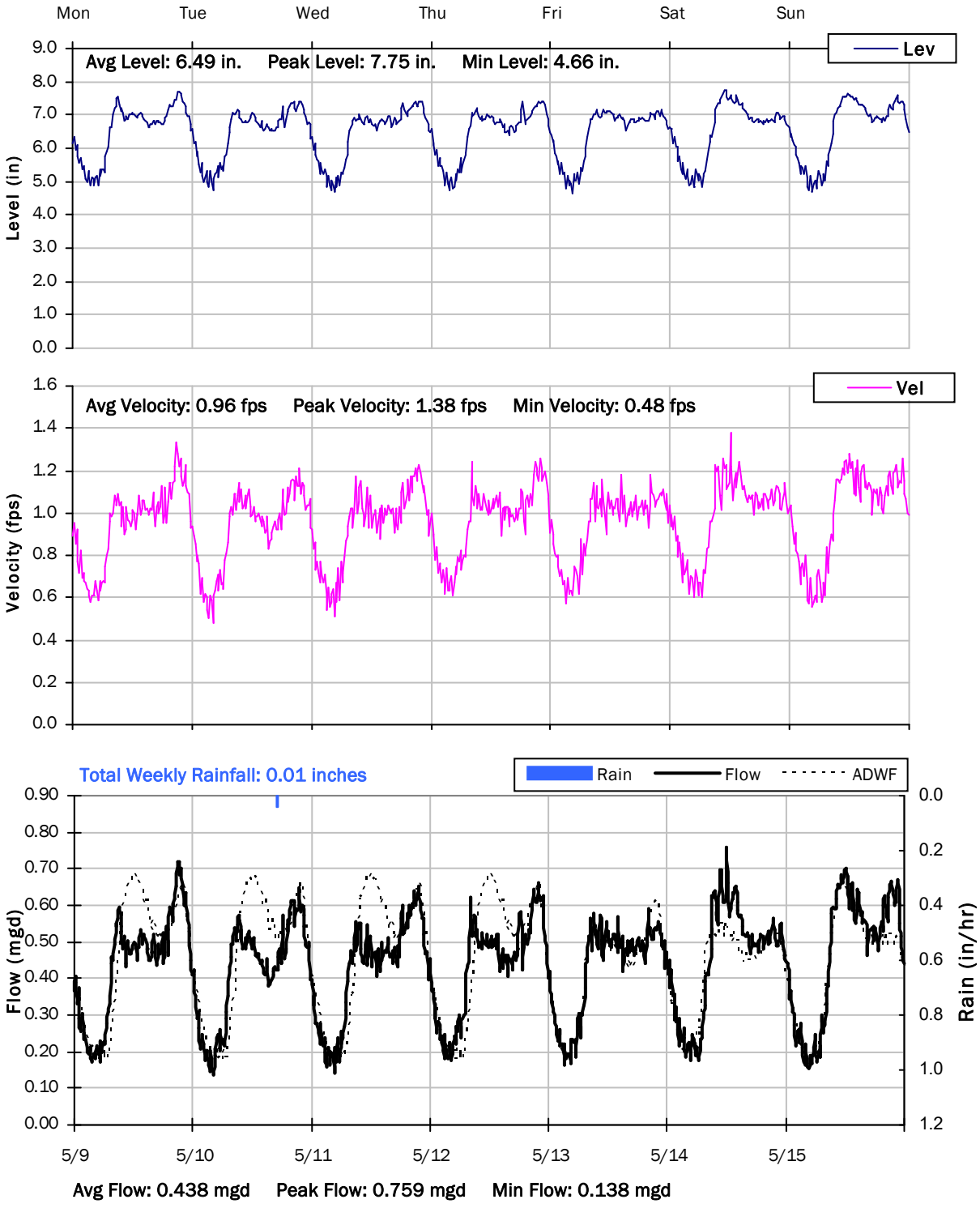
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Weekly Level, Velocity and Flow Hydrographs

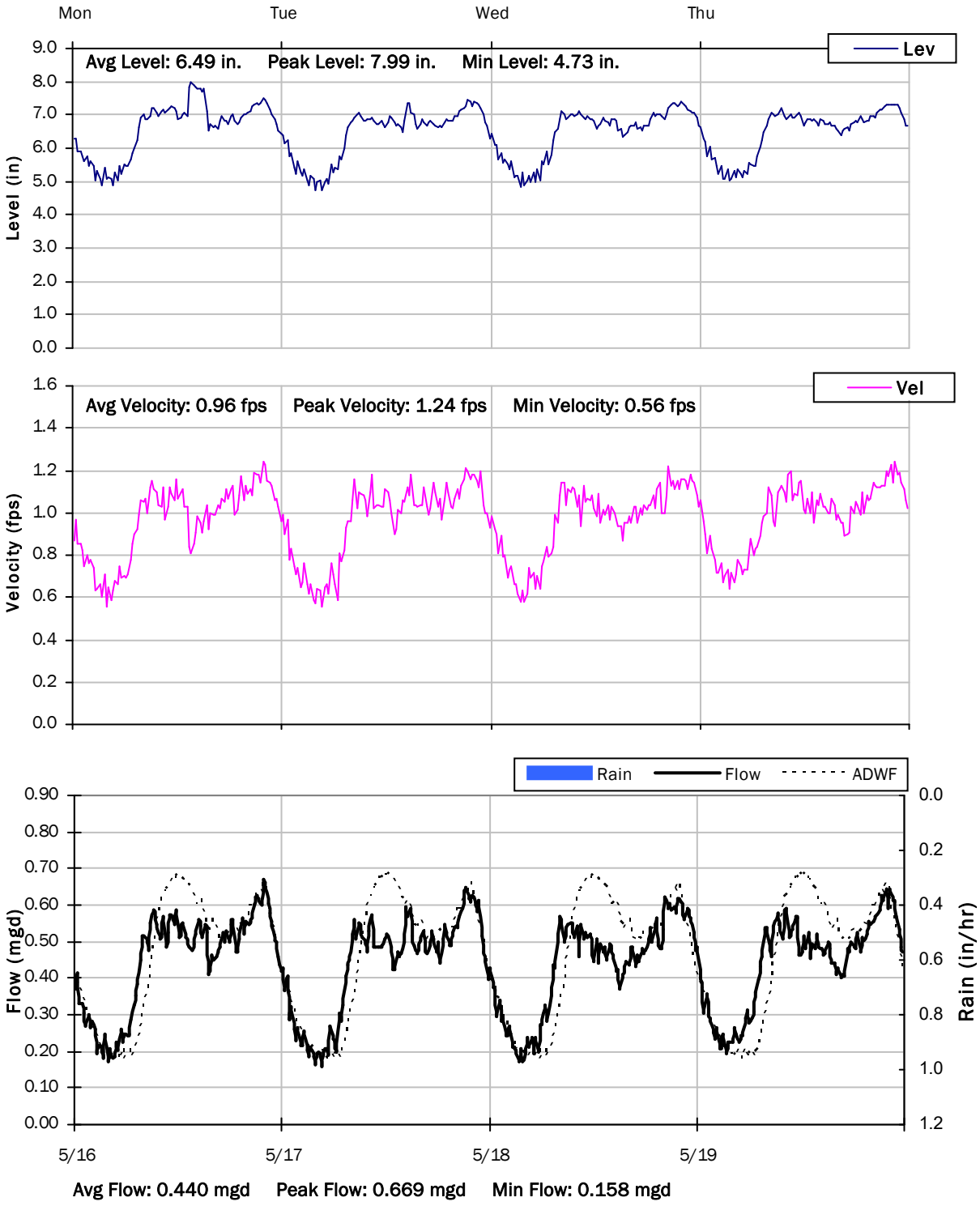
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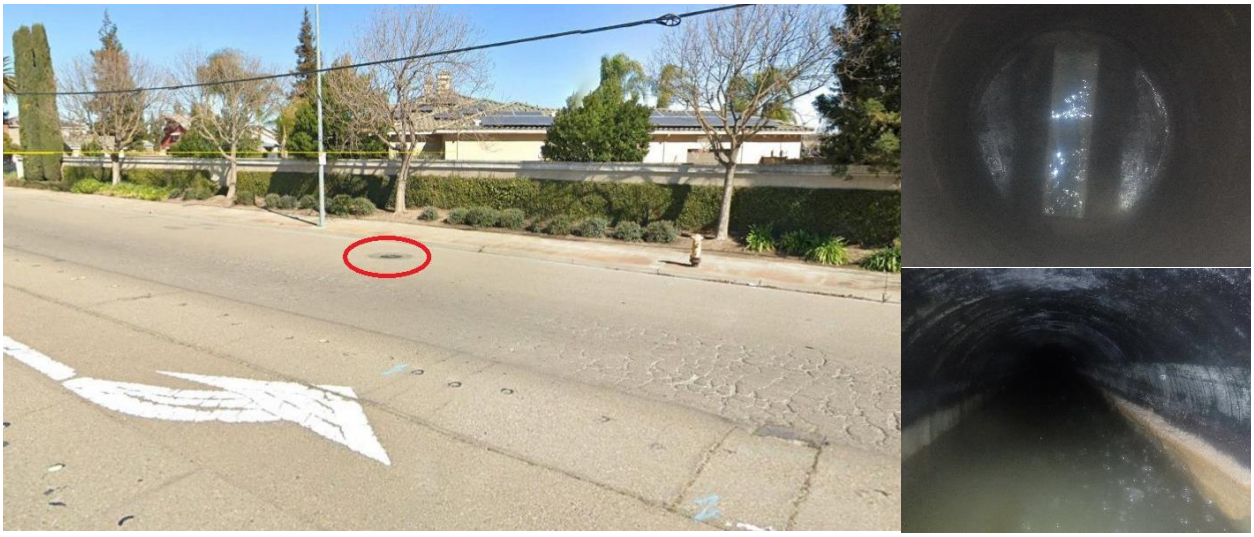
Weekly Level, Velocity and Flow Hydrographs

5/16/2022 to 5/20/2022



ATTACHMENT 2

V&A Project No. 21-0295



V&A consulting engineers
1000 Broadway
Suite 320
Oakland, CA 94607
510.903.6600
510.903.6601, Fax

APPENDIX C

Model Selection TM

ATTACHMENT 2

Stantec

CITY OF MANTECA
WASTEWATER MASTER PLAN

TECHNICAL MEMORANDUM NO. 1:

HYDRAULIC MODEL SOFTWARE SELECTION

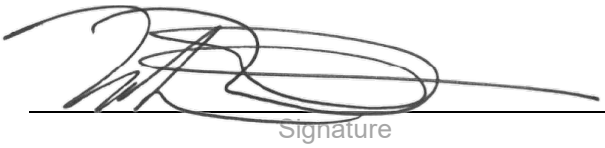
February 2, 2022

Prepared for:
City of Manteca, CA

Prepared by:
Mike Van Doorn

Project Number:
Manteca Wastewater Master Plan / 184031535

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Prepared by: 

Signature

Mike Van Doorn

Printed Name

Reviewed by: _____

Signature

_____

Printed Name

Approved by: _____

Signature

_____

Printed Name

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Appendix A – Software Comparison Matrix

Acronyms / Abbreviations

1D	One Dimensional
2D	Two Dimensional
CAD	Computer Aided Drafting
CHI	Computational Hydraulics International
DHI	Danish Hydraulic Institute
DWF	Dry Weather Flow
EPA	Environmental Protection Agency
ICM	Integrated Catchment Modeling (Innovyze Infoworks ICM)
RDII	Rainfall Dependent Inflow and Infiltration
RTC	Real-Time Control
RTK	RTK is a method of estimating RDII response used primarily by SWMM-variant models
SWMM	Stormwater Management Model
WWF	Wet Weather Flow

1 Introduction

The City of Manteca's Wastewater Master Plan and Sewer Rate Study will focus on the sustainability of the City's capability and capacity to convey and treat incoming wastewater flows.

In order to meet the goals of the Wastewater Master Plan, and in absence of an existing hydraulic model of the City's existing collection system, one of the first steps of this plan is to select an analysis tool that best suits the objectives of this study and to support ongoing monitoring and assessment of the City wastewater infrastructure. The selection of hydraulic modeling software is an important long-term decision / investment to support these needs.

This memo summarizes a review of commercially available open-channel flow hydraulic models for the purposes of efficiently executing the Collection System components of the Wastewater Master Plan. This includes a high-level comparative review of the potential software candidate capabilities, licensing requirements, training needs, and costs, and to select the best fit for Manteca's needs.

The potential software candidates that we have identified in this memo have varying strengths and limitations, and the selection of a particular software is often based on a combination of long-term modeling objectives, software capabilities and features, integration with other system software (CAD / GIS / Asset Management), end-user capabilities, software sustainability, and cost (to name a few). Note that the cost of most software packages is subscription-based and carry an annual fee, but in some cases can also vary in cost by model size (# of pipes) and software extension modules.

Manteca's existing sewer collection system includes more than 5,000 GIS pipe links, with varying data completeness for physical attributes (invert elevations, etc). While it has not been decided if the model will be "full-pipe" or consolidated as a trunk model (i.e. 8" or 10" and larger sewers only), which will be further confirmed during the model development phase, the comparison of software costs will evaluate only software capable of modeling more than 5,000 pipes.

Stantec has a specialized, integrated team of hydraulic modelers with experience in developing, calibrating, testing, and analyzing computer models that simulate the hydraulics of wastewater collection systems. Our team has experience in the development, calibration and use of several different modeling platforms, including (but not limited to): DHI Mike+ (i.e., MikeUrban); Innovyze InfoSWMM & Infoworks ICM; CHI PCSWMM and other potential model platforms. Our team does not have commercial interests in any of the software candidates and have the capabilities to use any of the software reviewed.

There are several software developers for wastewater collection system models, including, but not limited to, Innovyze, Bentley, Danish Hydraulic Institute (DHI), Computational Hydraulics International (CHI), and the Environmental Protection Agency (EPA). Of this list, Innovyze, Bentley, and DHI offer multiple software platforms with varying capabilities, user interfaces, and computation engines. The following commentary provides a brief summary of each software - with the header providing a hyperlink to the developer website and developer sourced excerpts noted in *"quoted italics"*.

A detailed comparison matrix is included in **Appendix A**.



2 Software Candidates

2.1 EPA SWMM 5

EPA Stormwater Management Model (SWMM) 5

"EPA's Storm Water Management Model (SWMM) is used throughout the world for planning, analysis, and design related to stormwater runoff, combined and sanitary sewers, and other drainage systems. It can be used to evaluate gray infrastructure stormwater control strategies, such as pipes and storm drains, and is a useful tool for creating cost-effective green/gray hybrid stormwater control solutions. SWMM was developed to help support local, state, and national stormwater management objectives to reduce runoff through infiltration and retention, and help to reduce discharges that cause impairment of waterbodies.

SWMM is a Windows-based desktop program. It is open source public software and is free for use worldwide. SWMM contains a flexible set of hydraulic modeling capabilities used to route runoff and external inflows through the drainage system network of pipes, channels, storage/treatment units and diversion structures. These include the ability to do the following:

- *Handle drainage networks of unlimited size.*
- *Use a wide variety of standard closed and open conduit shapes as well as natural channels.*
- *Model special elements, such as storage/treatment units, flow dividers, pumps, weirs, and orifices.*
- *Apply external flows and water quality inputs from surface runoff, groundwater interflow, rainfall-dependent infiltration/inflow, dry weather sanitary flow, and user-defined inflows.*
- *Utilize either kinematic wave or full dynamic wave flow routing methods.*
- *Model various flow regimes, such as backwater, surcharging, reverse flow, and surface ponding. apply user-defined dynamic control rules to simulate the operation of pumps, orifice openings, and weir crest levels.*
- *Percolation of infiltrated water into groundwater layers.*
- *Interflow between groundwater and the drainage system.*
- *Nonlinear reservoir routing of overland flow. Runoff reduction via LID controls.*

SWMM accounts for various hydrologic processes that produce runoff from urban areas, which include the following:

- *Runoff reduction via green infrastructure practices.*
- *Time-varying rainfall (precipitation) and evaporation of standing surface water.*
- *Snow accumulation and melting.*
- *Rainfall interception from depression storage.*
- *Infiltration of rainfall into unsaturated soil layers.*
- *Percolation of infiltrated water into groundwater layers Interflow between groundwater and the drainage system.*
- *Nonlinear reservoir routing of overland flow."*

The EPA SWMM5 software includes a very basic interface, without built-in GIS capabilities and does not have sophisticated model development and output tools. The EPA SWMM5 computational engine, however, as an open source code, is used by other software developers (xxxSWMM variants) that have developed integrated GIS-based interfaces with numerous capabilities and user tools to streamline model development, calibration, and output analysis of 1-D stormwater and wastewater collection system models.

The SWMM5 engine uses the RTK method to model rainfall dependent inflow and infiltration (RDII), by applying up to three (3) overlapping triangular unit-hydrographs against time that combine to simulate the short-term, medium-term, and long-term response of RDII entering the sewer system based on a rainfall timeseries. R represents a fraction of rainfall that enters the sewer system, T is the time from the onset of rain until the peak, and K is the ratio of the time to recession from the peak of the hydrograph to zero. The RTK is a widely used method of simulating the RDII response in sewer collection systems and is used by all models evaluated in this memo, with the exception of Mike+ that when additional modules are purchased can also model physical hydrologic and subsurface parameters for the same purpose. Hyperlink to more information on the RTK Method.

While the software is used extensively worldwide, and technical resources are available on-line, there is no developer support or training available for new users unfamiliar with the software.

2.2 Innovyze:

"Innovyze provides the industry's largest global offering of stormwater, sewer network, and flood modeling solutions – designed to meet the needs of your project and organization."

Our evaluation of potential candidates from Innovyze include only InfoSWMM and Infoworks ICM as they are the most prevalent options from this developer. Innovyze is also the vendor for the InfoSewer* and XPSWMM* software however were excluded as they may be phased out by Innovyze within the next 5 years or so.

2.2.1 INFOSWMM

InfoSWMM (Innovyze)

InfoSWMM is a *"static 1D modeling within ArcGIS for capacity analysis and planning of gravity sewer systems*" and largely an integrated front-end interface and GIS-based application with numerous capabilities and user tools to streamline model development, calibration, and output analysis for EPA's SWMM5 computational engine (capabilities noted above under EPA SWMM5). The model can import and export to/from EPA SWMM 5, and does not limit model size to a fixed number of links (pipes). The developer interface and tools significantly improve efficiency and accuracy in model development, error checking, calibration, and output analysis.

The developer offers different "packages" (at varying price points) that *"Tailor[s] InfoSWMM to your requirements with Modules, Suite Extensions, or the standalone version:*

InfoSWMM Suite package:

- *Calibrator: Automate model calibration*
- *DWF Allocator (Dry Weather Flow): Apportion dry weather flow from GIS elements*
- *Designer: Optimize system design and costs*
- *Conduit Storage Synthesizer: Capture system storage for simpler forcemain models*
- *Subcatchment Manager: Automate runoff models directly from terrain*
- *Risk Assessment Manager: Compute flood risk and damage*

InfoSWMM Executive Suite package:

- *Pond Design Manager: Extract and design storage systems*
- *RDII Analyst (Rainfall-Derived Inflow and Infiltration): Decompose measure flow into model RTK inputs (R, T, K parameters for RDII prediction)*
- *NetVIEW (exporting to GIS / Google Earth)"*

The InfoSWMM software is popular among other large municipal agencies throughout the US, and the developer offers extensive support and training opportunities. The pricing of this software is moving to an annual fee subscription service, and is anticipated to cost upwards of $10,000/year (*awaiting developer quote, to be confirmed…*).

2.2.2 INFOWORKS ICM

Infoworks ICM (Innovyze)

Infoworks ICM is Innovyze's flagship hydraulic modeling platform, based on a proprietary computational engine, that integrates 1D collection system modeling with 2D surface modeling - typically found in a combined sewer system that is heavily impacted by direct surface inflows, ponding and CSOs. Infoworks offers a 1-D only Sewer Edition (SE), specifically for wastewater collection systems that do not require the integration and conveyance of surface flows.

This software includes very sophisticated GIS-based model development and analysis tools, including notable advanced hydrologic parameters and response models for rainfall dependent inflow and infiltration (RDII) simulation, real-time control, calibration and visualization and output capabilities. It is used by many large municipal agencies throughout the US, but due to its advanced capabilities is also one of the most complicated commercial models and most expensive on the market. The pricing of this software is moving to an annual fee subscription service, and is anticipated to cost upwards of $15,000/year (*awaiting developer quote, to be confirmed…*).

2.3 Bentley: SewerGEMS

SewerGEMS (Bentley)

SewerGEMS is a versatile software from Bentley that uses a proprietary computational engine that has the ability to use kinematic wave (steady state and extended period simulations with no surcharging or backflow), gradually varied flow solver, or the dynamic wave 1-D St. Venant equations using either an implicit dynamic solution or an explicit dynamic solution (SWMM5 engine). The model interface can be used in several ways, either as a stand-alone interface, or integrated within ArcGIS, AutoCAD, MicroStation, or OpenRoads Designer (Civil license). It includes many useful model development tools including a sewage (load) allocation module, calibration modules, and offers one of the most robust scenario management capabilities of any commercially available software. The output result visualization capabilities of SewerGEMS are not as sophisticated when compared to other software (InfoWorks, InfoSWMM, PCSWMM), and the model cannot be exported to a SWMM5 file for use in other platforms, requiring model users to have a subscription to the software.

Pricing for Bentley's OpenFlows SewerGEMS software is based on an annual subscription, with a starting fee for a 5,000 pipe model is $7,638/year increasing to over $10,000/year for a 10,000 pipe limit.

2.4 DHI: Mike+

Mike+ (DHI)

Mike+ is a very sophisticated hydraulic modeling software that has the ability to integrate both water distribution system modeling and open-channel flow modeling (sanitary and storm) within the same platform. This software is the successor to MikeUrban, its predecessor, used by many large municipal agencies throughout the world. It is a GIS-based program that activates various software modules that hosts and pulls physical model attributes and input parameters from a detailed structure of related geodatabases and solution engines. The software has ability to model complex systems using dynamic wave computations with real-time control (RTC) capabilities and using either the RTK RDII models or a more complex simulation that models physical hydrologic and subsurface parameters to derive RDII responses. Mike+ is meant for use by expert-level users and extensive software documentation and developer support is available.

The cost of the Mike+ base license that includes only the SWMM module for open channel flow is approximately $3,000/year (the base license does not integrate with ArcGIS), and approximately $10,400/year if the Collection System Modules (includes ArcGIS, SWMM+Mike1D Pipeflow, and Rainfall Runoff, Control and Transport extensions).

2.5 CHI: PCSWMM

PCWMM (CHI)

PCSWMM is a complete interface and suite of analysis tools for the SWMM5 engine. It is a stand-alone GIS interface that offers support for over 50 GIS/Shapefile formats, importing / exporting functions for excel, topological tools for model development, digital elevation models, automatic watershed delineation, and access to map services from Microsoft and other web map services. PCSWMM offers unlimited model size and complexity, and can use distributed computing systems to solve large model computations if necessary. It includes very sophisticated model development and error checking routines, time series management and output visualization tools and other analysis tools that streamline the analysis of collection system performance. It is also one of the most user-friendly software available, offers extensive training and support, as well as access to widely used open-source codes, peer-reviewed journals and OpenSWMM community posts.

PCSWMM also has 1D and 2D modeling capabilities (to model surface flows in either combined sanitary or stormwater networks), and also can be used as an interface for water distribution modeling using the EPANET hydraulic model engine. PCSWMM's scenario management tools are extensive and useful in managing multiple scenarios, but considered rudimentary and not as transparent when compared to SewerGEMS.

The PCSWMM is priced at approximately $1,200/year for the Professional 1D version and approximately $1,800/year for the Professional 2D version.

3 Software Pricing Summary:

Table 1 – Cost Summary

Software	Annual Cost
SWMM 5	$0
InfoSWMM	Approximately $10,000+ *(Awaiting developer quote)*
InfoWorks ICM	Approximately $15,000+ *(Awaiting developer quote)*
SewerGEMS	$7,600 (5,000 pipes) - $10,000 (10,000 pipes)
Mike+	$3,000 (base) - $10,400 (with Collection System extensions)
PCSWMM	$1,200 (1D) - $1,800 (2D)

4 Comparison and Ranking Matrix

A simple comparison matrix was developed to rank each of the software against each other using a relative weighting system that attempts to consider our knowledge of Manteca's needs for this project and for the sustainability of managing the ongoing and future performance of the collection system. Many criteria were evaluated, including several criteria under 5 main performance areas including:

- GIS interaction Criteria
- Modeling Capabilities
- Engineering Criteria
- User Interfacing Criteria
- Commercial Criteria

The weighting value (importance to Manteca) of each Technical Criteria was based on the following:

Table 2 – Criteria Weightings

Weight	Descriptions
4	Critical Needs
3	Priority Needs
2	Needs
1	Desired but not a need, yet

The scoring value of each Technical Criteria was based on the following:

Table 3 – Criteria Scoring

Score	Description
4	Fully satisfy the criteria.
3	Almost satisfy the criteria.
2	Partly satisfy the criteria, more to be desired.
1	Satisfy a small portion of the criteria.
0	Do not satisfy the criteria.

The detailed criteria, weighting and evaluation and ranking results of the comparison is provided in **Appendix A**.

5 Conclusion

Based on this analysis, the highest rank (yet lowest cost at $1,200/year) software is PCSWMM.

The 2nd highest ranked software is InfoWorks ICM, however the costs are significantly higher for this and the remaining candidates.

Based on our previous experience in completing similar projects in central California (Concord, Merced, Grass Valley, Lincoln, etc) and throughout North America, we can confidently recommend the use of PCSWMM to the City of Manteca as a cost-effective, user friendly, yet very powerful modeling software that uses based on the EPA SWMM engine. We are very confident in the PCSWMM model software as it will save significant time and effort in the model development and future system analysis for this study.

We trust this memo provides the City with an objective review of available hydraulic models available for use on the Manteca Wastewater Master Plan, and if you have any questions or concerns, we are available at your convenience to discuss.

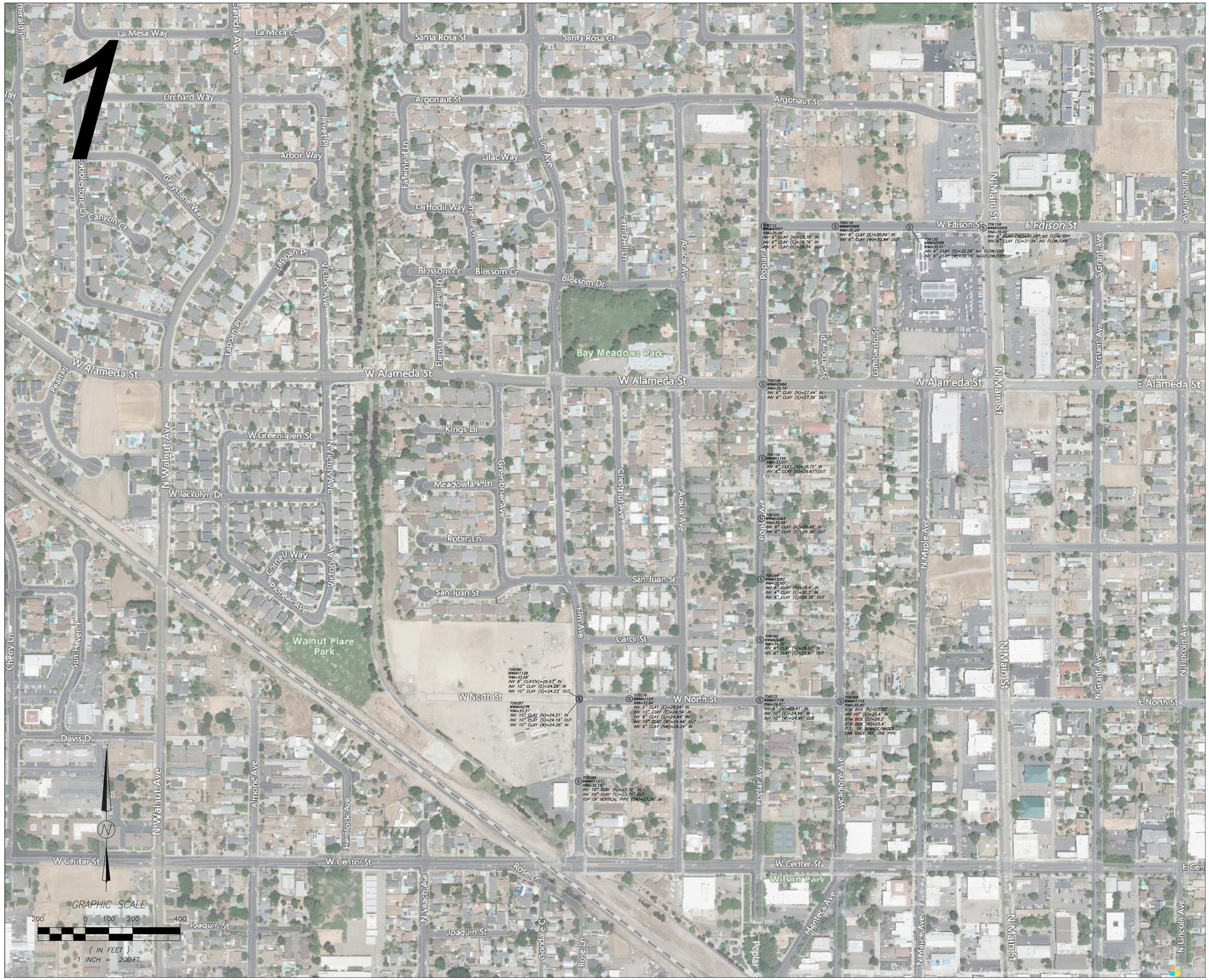
APPENDIX A – SOFTWARE COMPARISON MATRIX

APPENDIX A – SOFTWARE COMPARISON MATRIX

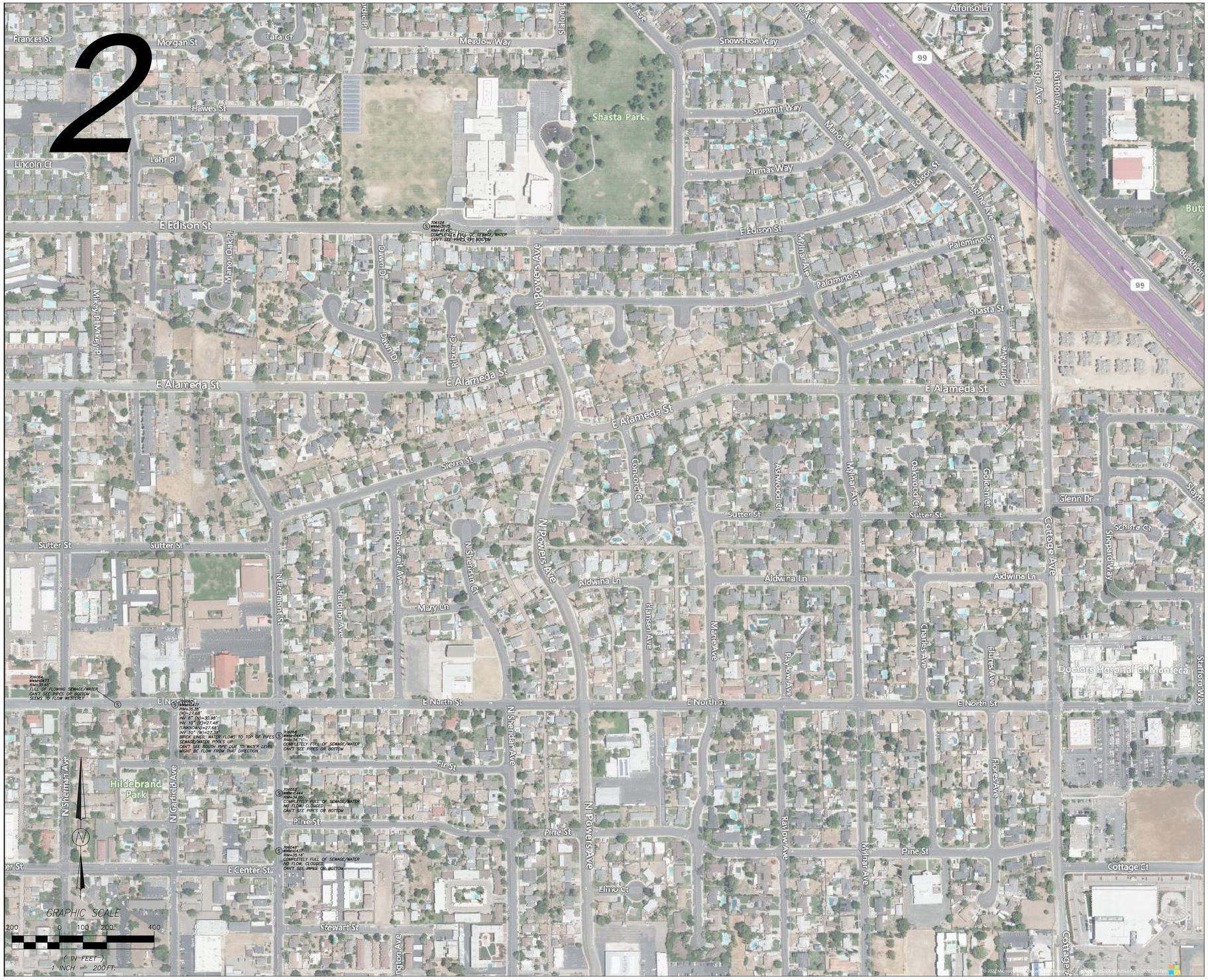
Performance Area	Technical Criteria	Weight (1-4)	Software Score (0, 1, 2, 3, 4)						Software Screening (Weight x Score)					
			Innovyze		DHI	CHI	Bentley	EPA	Innovyze		DHI	CHI	Bentley	EPA
			InfoSWMM	InfoWorks ICM	MikeURBAN	PCSWMM	SewerGEMS	EPA SWMM	InfoSWMM	InfoWorks ICM	Mike URBAN	PCSWMM	SewerGEMS	EPA SWMM
GIS Interaction Criteria	Data exchange between model and GIS	**4**	3	3	3	3	3	0	12	12	12	12	12	0
	Compare updated GIS with model data	**2**	3	2	4	3	3	0	6	4	8	6	6	0
	Model results / GIS mapping capabilities	**4**	4	3	4	4	4	0	16	12	16	16	16	0
	Generate catchment data	**2**	4	2	4	3	3	0	8	4	8	6	6	0
Modeling Capabilities	Merging network models	**1**	2	4	2	4	2	0	2	4	2	4	2	0
	Create sub models	**1**	4	4	4	4	4	0	4	4	4	4	4	0
	Compare two models	**1**	4	4	4	4	0	0	4	4	4	4	0	0
	Input field data flag	**1**	0	4	0	0	0	0	0	4	0	0	0	0
	Version Control	**1**	0	4	1	0	1	0	0	4	1	0	1	0
	SCADA Integration	**1**	2	2	0	0	2	0	2	2	0	0	2	0
	Asset management integration	**1**	4	2	0	0	0	0	4	2	0	0	0	0
	Scenario Management	**3**	1	4	2	1	4	0	3	12	6	3	12	0
	Comparing Scenarios	**3**	1	4	4	4	4	0	3	12	12	12	12	0
	HGL Comparison	**4**	3	3	4	4	2	0	12	12	16	16	8	0
	Data exchange between model and EXCEL	**4**	3	4	3	4	3	0	12	16	12	16	12	0
	Rainfall and Flow Data Analysis	**3**	4	0	0	4	0	0	12	0	0	12	0	0
	Model Validation and Error Check	**4**	4	4	4	4	4	0	16	16	16	16	16	0
	Group Editing	**4**	4	4	4	4	4	1	16	16	16	16	16	4
	Data exchange between model and CAD	**1**	0	4	0	0	4	0	0	4	0	0	4	0
	LID Modeling	**0**	4	4	4	4	4	4	0	0	0	0	0	0
Engineering Criteria	SCS Runoff	**4**	0	3	0	4	4	0	0	12	0	16	16	0
	Modified Rational Method	**3**	0	3	0	4	4	0	0	9	0	12	12	0
	RTC Compatibility	**1**	3	4	3	3	3	2	3	4	3	3	3	2
User Interfacing Criteria	Workspace Display	**3**	4	4	3	4	3	1	12	12	9	12	9	3
	User Friendly	**2**	3	3	2	4	3	1	6	6	4	8	6	2
Commercial Criteria	Software Support	**4**	4	4	4	4	2	0	16	16	16	16	8	0
	Software Sustainability	**1**	4	4	4	4	3	2	4	4	4	4	3	2
	Applicable for smaller systems (<100,000 people)	**4**	4	2	2	4	3	2	16	8	8	16	12	8
	Affordability (1 = High Cost; 4 = Low Cost)	**4**	1	1	1	3	2	4	4	4	4	12	8	16
								SCORE	**193**	**219**	**181**	**242**	**206**	**37**
								RANK	**4**	**2**	**5**	**1**	**3**	**6**

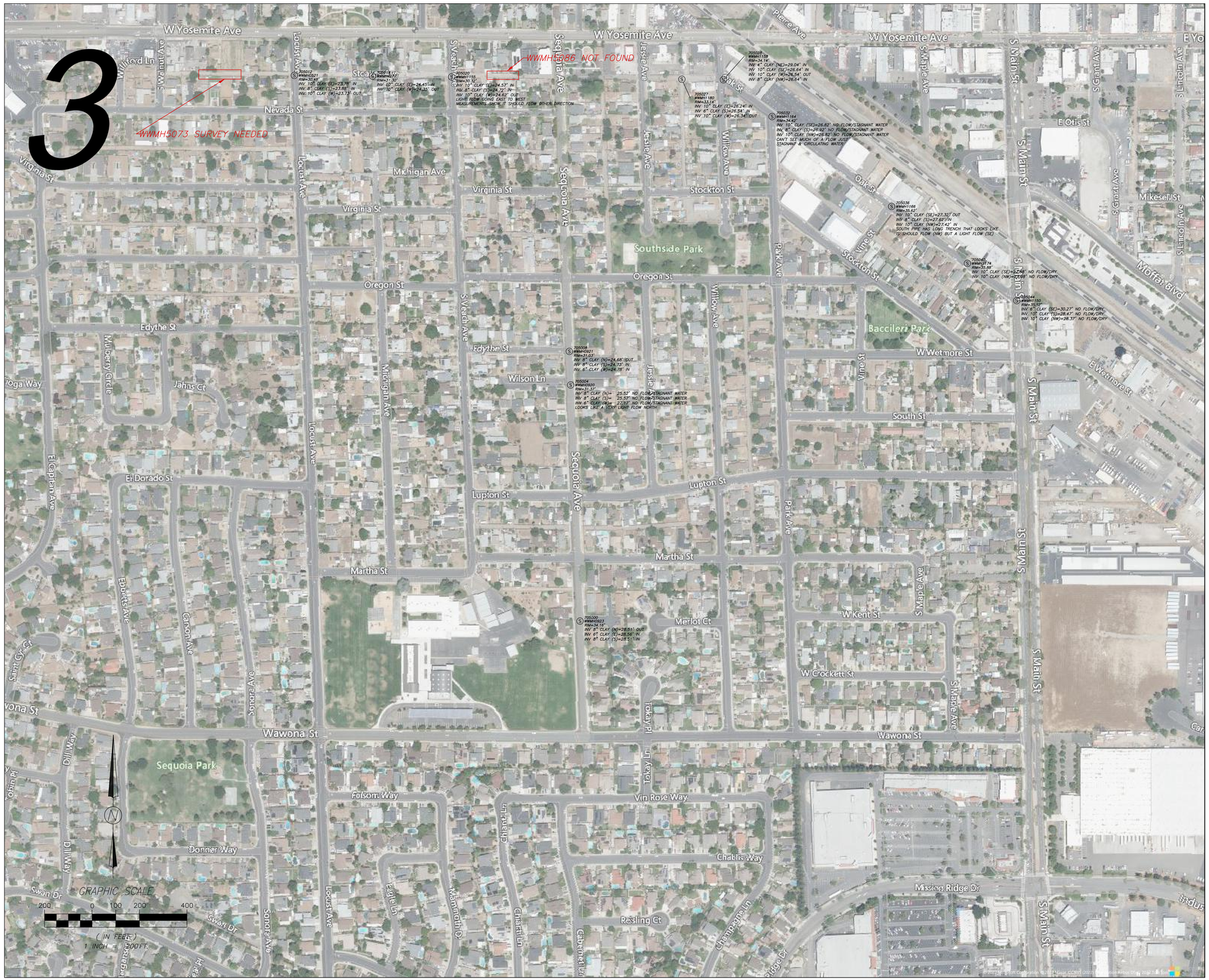
APPENDIX D

F3 Survey Results

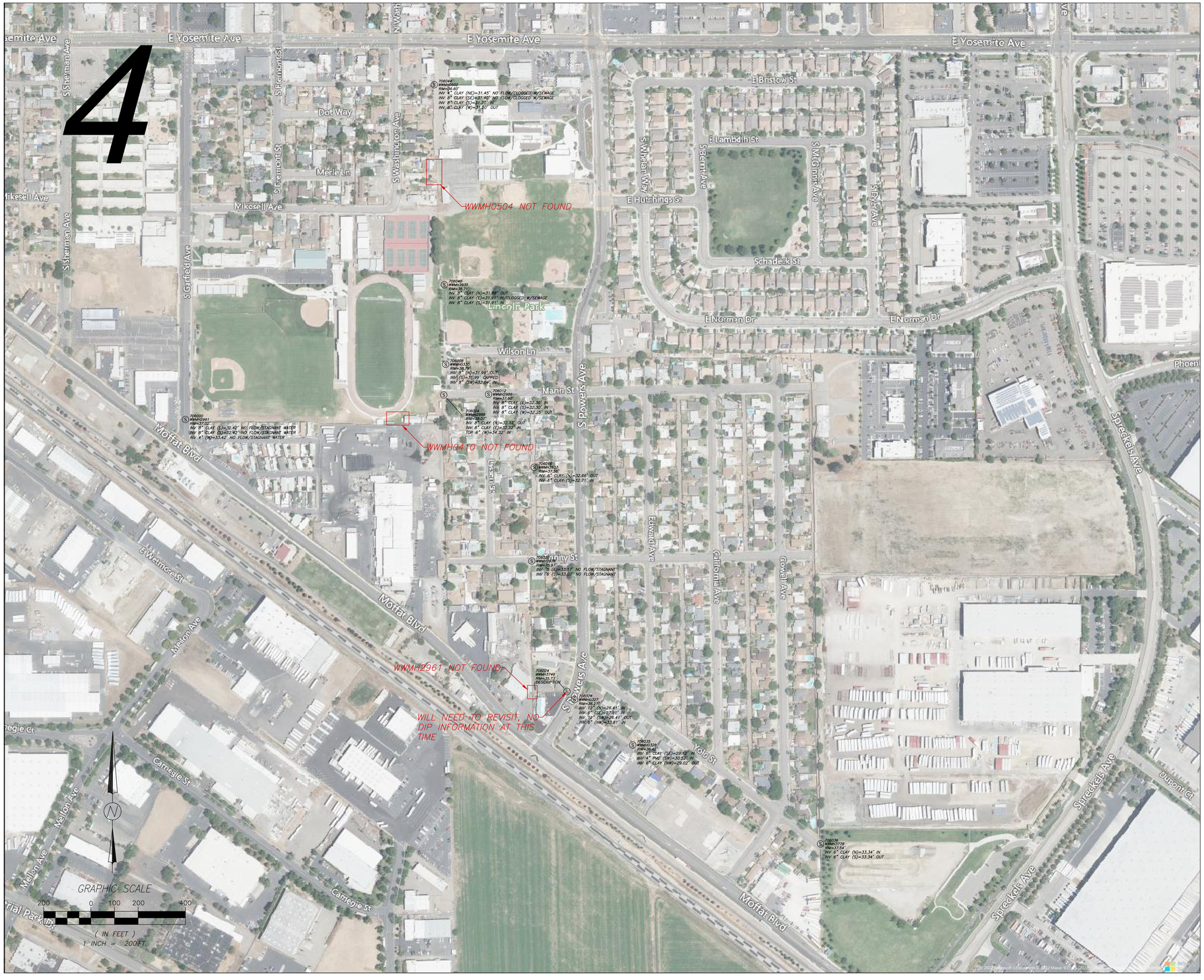

1
La Mesa Way
La Mesa Ct
Santa Rosa St
Santa Rosa Ct
Orchard Way
Argonaut St
Arbor Way
Lilac Way
Daffodil Way
Blossom Ct
Blossom Dr
W Edison St
E Edison St
N Main St
W Alameda St
E Alameda St
Bay Meadows Park
W Greenhaven St
Kings Ln
W Jackolyn Dr
Meadowlark Ln
Robin Ln
San Juan St
Carol St
Walnut Place Park
W North St
E North St
W Center St
Wilson Park
Joaquin St
Rose Ln
Davis Dr
Pioneer Ave
Conrol Way
Victor Ave
Elm Ave
Acacia Ave
Poplar Ave
Sycamore Pl
Lombardi St
Chestnut Ave
Maples Ave
N Maple Ave
N Lincoln Ave
S Grant Ave
N Grant Ave
N Walnut Ave
Almond Ave
Hemlock Ave
Cherry Ln
Sun Haven Pl
Pearl Pl
Cobblestone Ln
Canyon Ct
Graystone Way
Tappan Pl
Victor Ave
Fallenleaf Ln
Camellia Ln
Fern Dell Ln
Elena Ln
Greenbriar Ave
Gaddale Ct
Rose Ln
GRAPHIC SCALE
200 0 100 200 400
(IN FEET)
1 INCH = 200 FT.

2


Frances St
Morgan St
Tara Ct
Meadow Way
Snowshoe Way
Alfonso Ln
Hawes St
Shasta Park
Summit Way
Manor Ln
Plumas Way
Lincoln Ct
Lahr Pl
E Edison St
Alpine Ave
Cottage Ave
Button Ave
99
Palomino St
Mylnar Ave
Manor Oak Pl
Dawn Dr
N Powers Ave
Shasta St
Mikay Pl
Ribor Ct
E Alameda St
Sierra St
Concord Ct
Ashwood Ct
Oakwood Ct
Galen Ct
Glenn Dr
Sutter St
N Madison St
Harding Ave
Roosevelt Ave
N Sheridan Ct
Aldwina Ln
Hansen Ave
Marie Ave
Rayow Ave
Charles Ave
Flores Ave
Doctors Hospital of Manteca
Shepard Way
Schiesa Ct
Stafford Way
E North St
N Sherman Ave
N Garfield Ave
Hildebrand Park
Fir St
Pine St
E Center St
Elmo Ct
Cottage Ct
Stewart St
GRAPHIC SCALE
200 0 100 200 400
(IN FEET)
1 INCH = 200 FT.


3
WWMH5073 SURVEY NEEDED
WWMH5086 NOT FOUND
W Yosemite Ave
Nevada St
Virginia St
Michigan Ave
Oregon St
Edythe St
Wilson Ln
Lupton St
Martha St
Wawona St
Stockton St
Southside Park
Sequoia Park
Baccileri Park
W Wetmore St
E Wetmore St
South St
E Otis St
Mikesell St
Moffat Blvd
Locust Ave
Sequoia Ave
Yosemite Ave
Jessie Ave
Willow Ave
Park Ave
Oak St
Vine St
S Main St
S Maple Ave
S Grant Ave
S Lincoln Ave
Pierce Ave
Mulberry Circle
Jahns Ct
El Dorado St
Martha St
Merlot Ct
W Kent St
W Crockett St
Folsom Way
Vin Rose Way
Donner Way
Chablis Way
Mission Ridge Dr
Riesling Ct
Dill Way
Sonora Ave
Ebbetts Ave
Carson Ave
Eagle Ln
Mammoth Dr
Charell Ln
Cabernet Ln
Champagne Ln
Tokay Pl
Tokay Ln
GRAPHIC SCALE
200 0 100 200 400
(IN FEET)
1 INCH = 200 FT.

4


E Yosemite Ave
S Sherman Ave
S Fremont St
N Wash
Dot Way
Merle Ln
S Washington Ave
Mikosell Ave
S Griffith Ave
WWMH0504 NOT FOUND
Lincoln Park
Wilson Ln
Marin St
S Powers Ave
Moffat Blvd
WWMH04TO NOT FOUND
E Bristow St
E Lambdin St
S Warren Way
S Berry Ave
S Magnolia Ave
S Dye Ave
E Hutchings St
Schadeck St
E Norman Dr
Phoenix
Spreckels Ave
Trinity St
Edgewall Ave
California Ave
Gowell Ave
WWMH2961 NOT FOUND
WILL NEED TO REVISIT, NO DIP INFORMATION AT THIS TIME
S Steves Ave
Yolo St
Melon Ave
Carnegie St
Westmore St
Outpost Ct
GRAPHIC SCALE
200 0 100 200 400
(IN FEET)
1 INCH = 200 FT.



ABBREVIATION

BM	BENCHMARK
BTM	BOTTOM
EL	ELEVATION
FL	FLOW
GR	GRATE
SSMH	SANITARY SEWER MANHOLE
W/	WITH

LEGEND

Ⓢ MANHOLE – SANITARY SEWER

NOTES

1) SURVEY DATA BASED UPON THE CONDITION AT THE TIME OF SURVEY PERFORMED BY F3 & ASSOCIATES ON JULY 14, 2022.
2) ALL MEASUREMENTS ARE IN FEET AND DECIMAL THEREOF, UNLESS OTHERWISE NOTED.

GRAPHIC SCALE

400 0 200 400 800

(IN FEET)
1 INCH = 400 FT.

F3 & Associates, Inc.
LAND SURVEYING - 3D INDUSTRIAL LASER SCANNING
701 E. H ST, BENICIA, CA 94510
PHONE(707)748-4300 FAX(707)361-0295
www.F3-Inc.com

CITY OF MANTECA

SANITARY SEWER MASTER PLAN

SAN JOAQUIN COUNTY, CALIFORNIA

MANTECA

DESIGN BY:	N/A
DRAWN BY:	STAFF
DATE:	7/20/2022
SCALE:	1"=400'
PAGE OF	1 1
JOB NUMBER:	18181

FILE: P:\PROFESSIONAL\2022\22433-MANTECA SEWER STUDY\AUTOCAD\22433-MANTECA SEWER STUDY.DWG DATE: 7/14/2022

ATTACHMENT 2

Stantec

PROJECT: Manteca Wastewater Master Plan
Survey Data Summary

DATE: 7/21/2022

JOB NUMBER: 184031535

PREPARED BY: BEW

CLIENT: City of Manteca

CHECKED BY: SLB

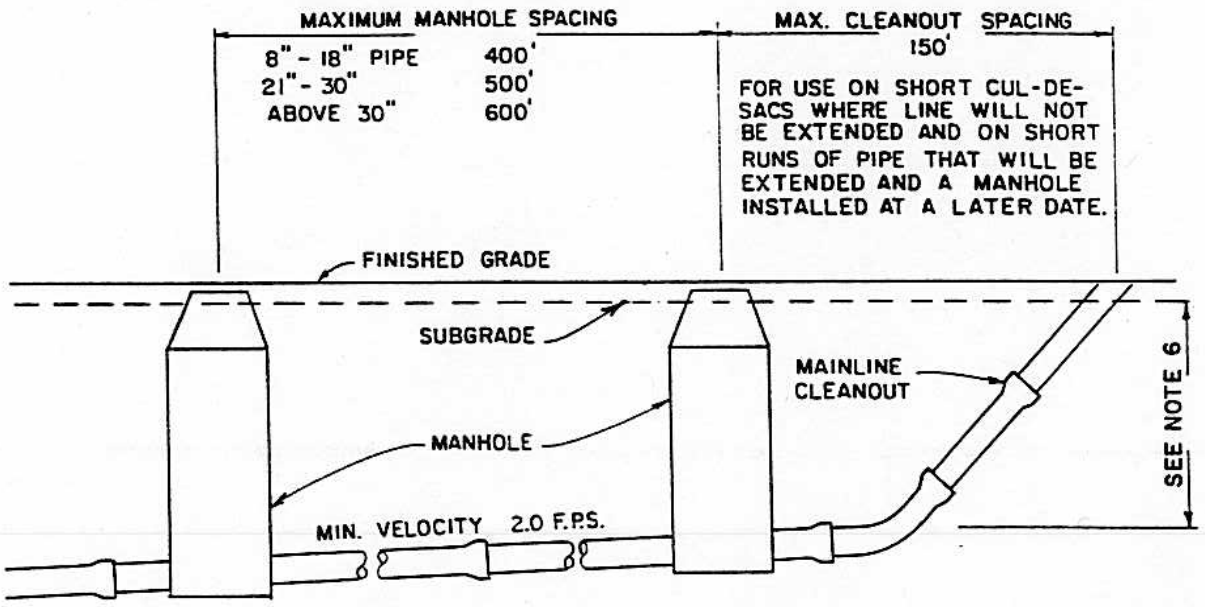
DESCRIPTION: Survey Data Summary

Manhole ID	RIM EL (ft)	OUT EL (ft)	IN EL (ft)	IN EL (ft)	IN EL (ft)	NOTES
WWMH0327	36.21	26.41 SW, 12"	26.41 N, 12"	27.91 SE, 6"	33.81 NW, 6"	
WWMH0328	36.42	29.02 NW, 6"	29.12 SE, 6"	30.52 SW, 4"		
WWMH0330	38.79	31.99 N, 8"	32.04 SW, 8"	31.99 , CAPPED		
WWMH0410	NA	NA	NA	NA	NA	NOT FOUND
WWMH0437	35.16	NA	NA	NA		Completely full of sewage, can't see pipes or bottom.
WWMH0443	34.71	NA	NA	NA		Completely full of sewage, can't see pipes or bottom.
WWMH0444	34.05	NA	NA	NA		Completely full of sewage, can't see pipes or bottom.
WWMH0473	35.65	NA	NA	NA		Full of flowing water/sewage, can't see pipes or bottom, seems to flow westerly.
WWMH0477	35.38	27.38 W, 10"	27.48 E, 10"	27.68 N, ?	30.98 N, 6"	Brick lined, water flows to top of pipes, sewage pools up, cant see south pipe due to water level, flow might be from that direction.
WWMH0502	36.60	31.2 W, 8"	31.2 S, 8"	31.4 SE, 8" X	31.45 NE, 4" X	<Marked X = No flow/clogged
WWMH0504	NA	NA	NA	NA	NA	NOT FOUND
WWMH0521	30.48	23.73 W, 10"	23.78 E, 10"	23.88 S, 8"		
WWMH0557	35.06	29.74 S, 6"	29.76 N, 6"	29.76 E, 6"		
WWMH0558	35.51	32.16 W, 6"	32.16 S, 4"			NO FLOW/DRY
WWMH0920	31.37	25.52 N, 8"	25.57 S, 8"	27.17 W, 6"		No Flow/ Stagnant water, looks like very light flow north.
WWMH0921	31.03	24.68 N, 8"	24.73 S, 8"	24.78 W, 6"		
WWMH0923	34.16	28.51 N, 8"	28.51 S, 8"	28.56 E, 6"		
WWMH0959	35.69	31.29 NE, 6"	31.34 S, 6"			NO FLOW/DRY
WWMH0966	32.74	27.39 S, 6"	27.44 N, 6"			
WWMH0968	35.29	30.84 W, 6"	30.89 E, 6"			
WWMH1115	35.40	25.4 W, ?	25.4 E, 10"	26.2 S, ?	25.55 N, ?	BOX? FULL OF SEWAGE CAN ONLY SEE ONE PIPE
WWMH1118	34.61	24.91 W, 10"	24.96 E, 10"	25.41 N, 6"		
WWMH1125	33.84	24.44 W,10"	24.54 E, 10"	28.24 E, 6"	24.84 S, 8"	29.24, NW, 6"
WWMH1127	32.16	23.71 S, 10"	23.76 N, 10"	27.36 SW, 6"		(top of vertical pipe, SW)
WWMH1128	33.28	24.23 S, 10"	24.28 E, 10"	25.93 N, 8"		
WWMH1146	33.57	26.67 S, 6"	26.72 N, 6"			
WWMH1150	35.52	28.37 NW, 10"	28.47 S, 10"	30.27 SE, 6"		No flow/Dry
WWMH1155	30.32	24.62 W, 10"	24.57 E, 10"	24.72 S, 8"		Light flow going east to west, measurements show it should flow other direction
WWMH1158	34.14	26.54 W, 10"	26.64 SE, 10"	26.64 NW, 8"	29.04 NE, 4"	
WWMH1164	34.42	26.82 NW, 10"	26.82 SE, 10"	26.92 S, 8"		No flow/stagnant water. Can't see much of a flow just stagnant & circulating water
WWMH1166	35.62	27.32 SE, 10"	27.42 NW, 10"	27.62 S, 8"		South pipe has long trench that looks like it should flow NW, but light flow SE.
WWMH1174	35.88	27.88 SE, 10"	27.98 NW, 10"			No flow/Dry
WWMH1180	33.14	26.34 W, 10"	26.24 E, 10"	26.54 S, 6"		
WWMH2961	NA	NA	NA	NA	NA	NOT FOUND
WWMH2978	35.97	33.07 S, 6"	33.17 E, 8"			No Flow/Stagnant
WWMH2986	37.60	32.25 W, 8"	32.3 E, 8"	32.3 S, 8"		
WWMH2988	38.07	32.17 N, 8"	32.22 E, 8"	34.32 W, 6" *		* = Top of 6"
WWMH2991	37.02	32.42 ?, 8"	32.42 ?, 8"	33.42 W, 4"		No Flow/Stagnant Water
WWMH3075	37.49	NA	NA	NA		Completely full of sewage, can't see pipes or bottom.
WWMH3081	34.72	25.97 S, 6"	26.02 N, 6"			
WWMH3082	35.90	26.38 S, 6"	26.4 N, 6"	30.3 E, 4"		
WWMH3083	35.48	26.38 S, 6"	26.48 N, 6"			
WWMH3746	35.73					Survey Needed
WWMH3779	37.54	33.34 S, 6"	33.34 N, 6"			
WWMH3935	38.71	31.86 N, 8"	31.91 S, 8"	31.91 E, 8" X		< X = Clogged w/ sewage
WWMH3937	37.56	32.66 N, 6"	32.71 S, 6"			
WWMH4277	31.30	24.35 W, 10"	24.45 E, 10"			
WWMH4278	33.31	24.16 S, 10"	24.21 N, 10"	24.26 N, 10"		
WWMH5073						Survey Needed
WWMH5086	NA	NA	NA	NA	NA	NOT FOUND

DATA SUMMARY	# of MHs
Invert could not be determined	
Surcharged	5
Behind Fence	1
Not found/ likely paved over	3
Survey crew to follow up	2
Total missing invert data	***11***
Total with data provided	***39***
Total manholes requested for survey	***50***

APPENDIX E

Manteca Design Standards



PIPE SIZE	"n"	MIN. SLOPE
6" DIAM.	0.013	.0040 FT./FT.
8" DIAM.	0.013	.0034 FT./FT.
10" DIAM.	0.013	.0025 FT./FT.
12" DIAM.	0.013	.0020 FT./FT.
15" DIAM.	0.013	.0015 FT./FT.
18" DIAM.	0.013	.0012 FT./FT.

NOTES:

1. THE MINIMUM PIPE SIZE SHALL BE 6 INCHES IN DIAMETER.
2. A MANHOLE SHALL BE INSTALLED AT ALL INTERSECTING LINES AND CHANGES OF GRADE, ALIGNMENT, PIPE SIZES OR MATERIALS.
3. ALL SERVICE CONNECTIONS TO SANITARY SEWERS SHALL BE MADE AT WYES OR BY CUTTING A HOLE AND INSTALLING A COLLAR WYE SADDLE. NO CONNECTIONS WILL BE PERMITTED IN LINES OVER 15 INCHES IN DIAMETER EXCEPT AT MANHOLES.
4. THE MANNING "n" SHALL BE NOT LESS THAN 0.013 FOR ALL PIPES.
5. A SLOPE OF 0.006 FT./FT. MINIMUM ON ENDS OF RUNS UP TO 15 CONNECTIONS. MORE THAN 15 CONNECTIONS, SLOPE SHALL BE AS PER THE ABOVE SCHEDULE.
6. PROVIDE A MINIMUM COVER OF 2.5 FEET TO TOP OF PIPE. WHERE MINIMUM COVER CANNOT BE OBTAINED, DUCTILE IRON CEMENT LINED PIPE SHALL BE USED WHEN APPROVED BY THE CITY ENGINEER.
7. THE CITY ENGINEER WILL REQUIRE DEWATERING FOR ALL CONSTRUCTION BELOW EXISTING WATER TABLE.
8. MINIMUM SEWER LINE SLOPE SHALL BE SUFFICIENT TO MAINTAIN AN EFFLUENT VELOCITY OF 2 FEET PER SECOND OR GREATER.
9. REFER TO SECTION NO. 71 OF THE STANDARD SPECIFICATION FOR ADDITIONAL DESIGN GUIDE CRITERIA.
10. TEMPORARY MANHOLE PUMPING STATION DETAILS SHALL BE SUBMITTED WITH THE IMPROVEMENT PLANS FOR APPROVAL.

NO.	REVISED	BY

DRAWN BY: J. HULSEY
CHECKED BY: J. PODESTA
SCALE: NONE

SANITARY SEWER PROFILE DATA

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

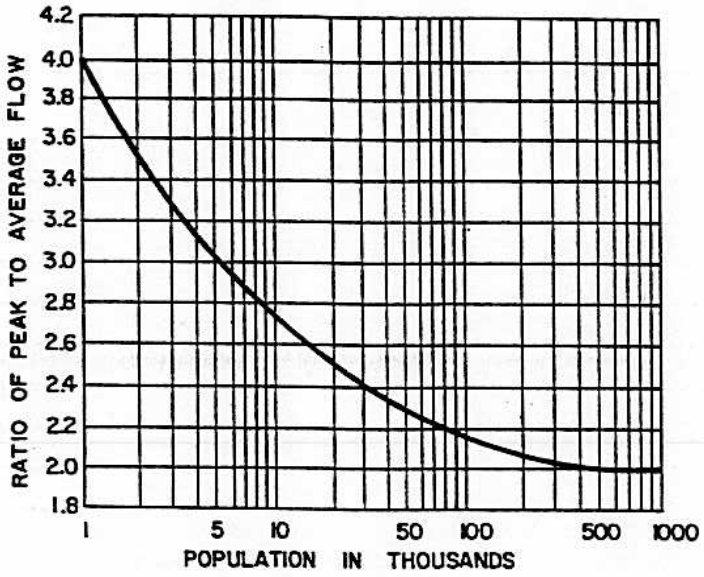
APPROVED BY: M. Bruton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-1
DATE: JAN. 1988

PRINTED ON DIEPO NO 1000H CLEARPRINT

ATTACHMENT 2

RESIDENTIAL PEAKS



WASTEWATER SEWER SYSTEM DESIGN SHALL BE IN CONFORMANCE WITH THE CITY OF MANTECA'S CURRENT WASTEWATER SEWER SYSTEM MASTER PLAN.

ASSUME SINGLE FAMILY RESIDENCE AVERAGE OF 4.5 LOTS PER ACRE AND 3.3 PERSONS PER LOT OR 14.8 PERSONS PER ACRE.

VOLUME

RESIDENTIAL:

AVERAGE FLOW	100 GAL./PERSON/DAY

COMMERCIAL:

AVERAGE FLOW	3,400 GAL./ACRE/DAY
PEAK FLOW	10,000 GAL./ACRE/DAY

INDUSTRIAL AND INSTITUTIONAL (NON-SEASONAL):

AVERAGE FLOW	4,700 GAL./ACRE/DAY
PEAK FLOW	13,500 GAL./ACRE/DAY

NO.	REVISED	BY

DRAWN BY: C. SABERTON
CHECKED BY: J. PODESTA
SCALE: NONE

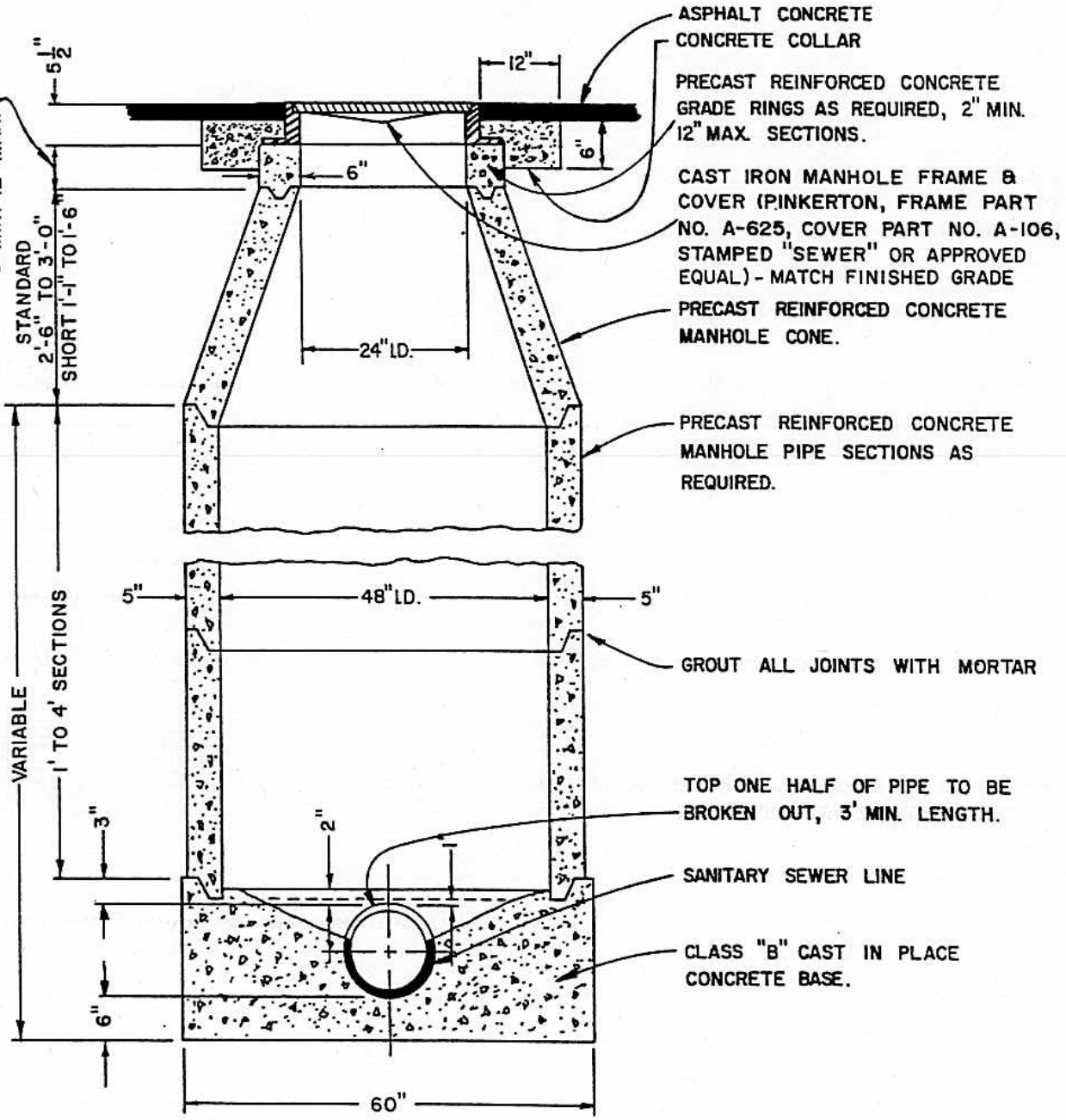
SANITARY SEWER DESIGN DATA

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-2
DATE: JAN. 1988

ATTACHMENT 2



NOTES:

1. PRECAST REINFORCED CONCRETE MANHOLE UNIT SHALL CONFORM TO A.S.T.M. C-478.
2. PIPE JOINT SHALL BE WITHIN 6 INCHES OF OUTER WALLS OF MANHOLE.
3. MANHOLE BASE TO BE TROWELED SMOOTH INSIDE.
4. MANHOLE SHALL BE CLEANED IN ACCORDANCE WITH CITY OF MANTECA SPECIFICATIONS.
5. SHORT CONE TO BE USED ONLY WHEN MANHOLE DEPTH JUSTIFIES.
6. COLLAR SHALL BE CLASS "B" CONCRETE AND CONSTRUCTED 2 1/2 INCHES BELOW FINISHED GRADE.

NO.	REVISED	BY

DRAWN BY: C. SABERTON
CHECKED BY: J. PODESTA
SCALE: NONE

SANITARY SEWER MANHOLE 6" THRU 33" DIA. PIPES

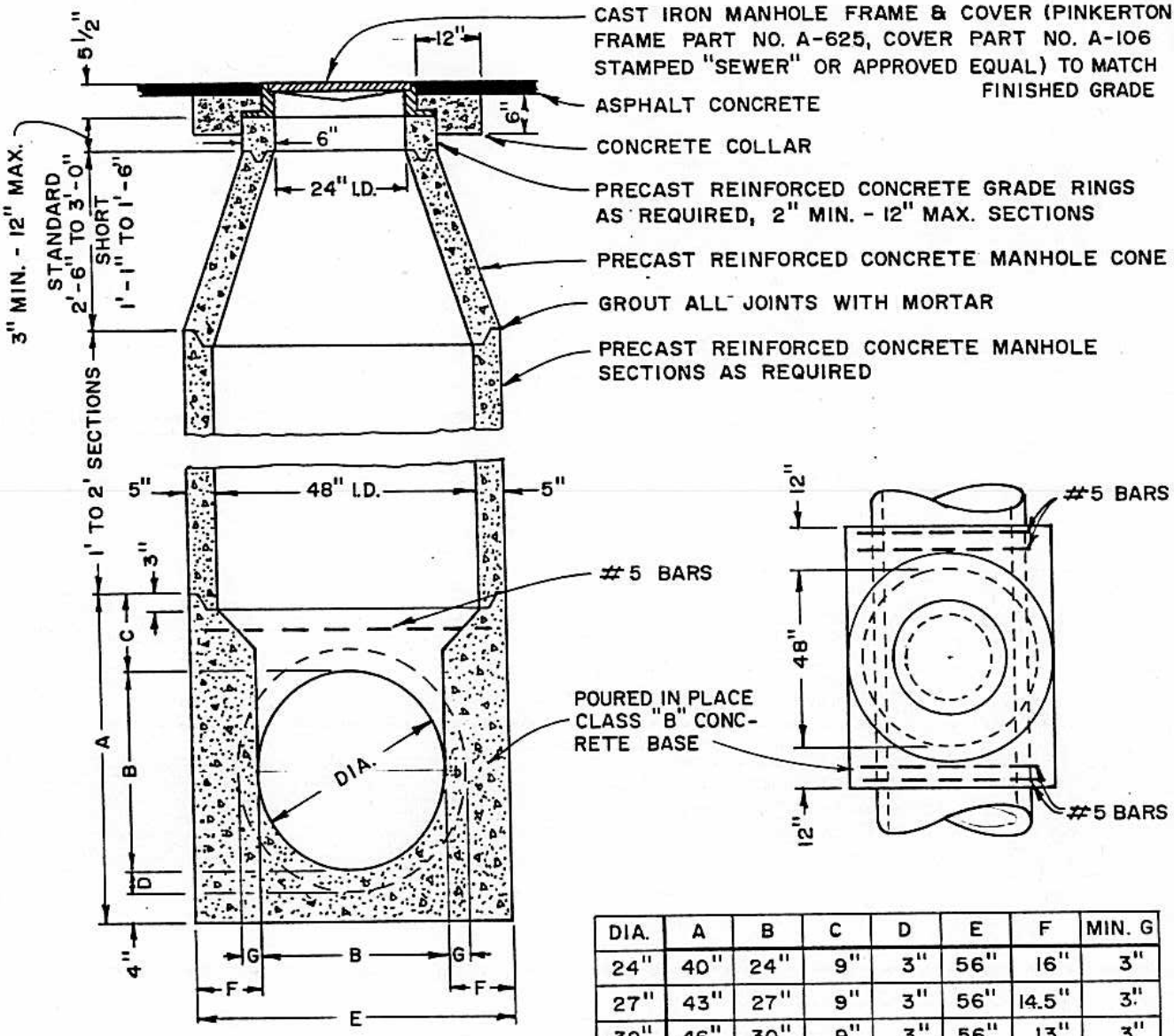
CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: M. Brinton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-3
DATE: JAN 1988

PRINTED ON DIEPO NO. 1000H CLEARPRINT

ATTACHMENT 2



DIA.	A	B	C	D	E	F	MIN. G
24"	40"	24"	9"	3"	56"	16"	3"
27"	43"	27"	9"	3"	56"	14.5"	3"
30"	46"	30"	9"	3"	56"	13"	3"
36"	53"	36"	9.5"	3.5"	56"	10"	3.5"
42"	60"	42"	10"	4"	60"	9"	4"

NOTES:

1. PRECAST REINFORCED CONCRETE MANHOLE UNIT SHALL CONFORM TO A.S.T.M. C-478.
2. PIPE JOINT SHALL BE WITHIN 6 INCHES OF OUTER WALLS OF MANHOLE.
3. MANHOLE BASE TO BE TROWELED SMOOTH INSIDE.
4. MANHOLE SHALL BE CLEANED IN ACCORDANCE WITH CITY OF MANTECA SPECIFICATIONS.
5. SHORT CONE TO BE USED ONLY WHEN MANHOLE DEPTH JUSTIFIES.
6. COLLAR SHALL BE CLASS "B" CONCRETE AND CONSTRUCTED 2 1/2 INCHES BELOW FINISHED GRADE.

NO.	REVISED	BY

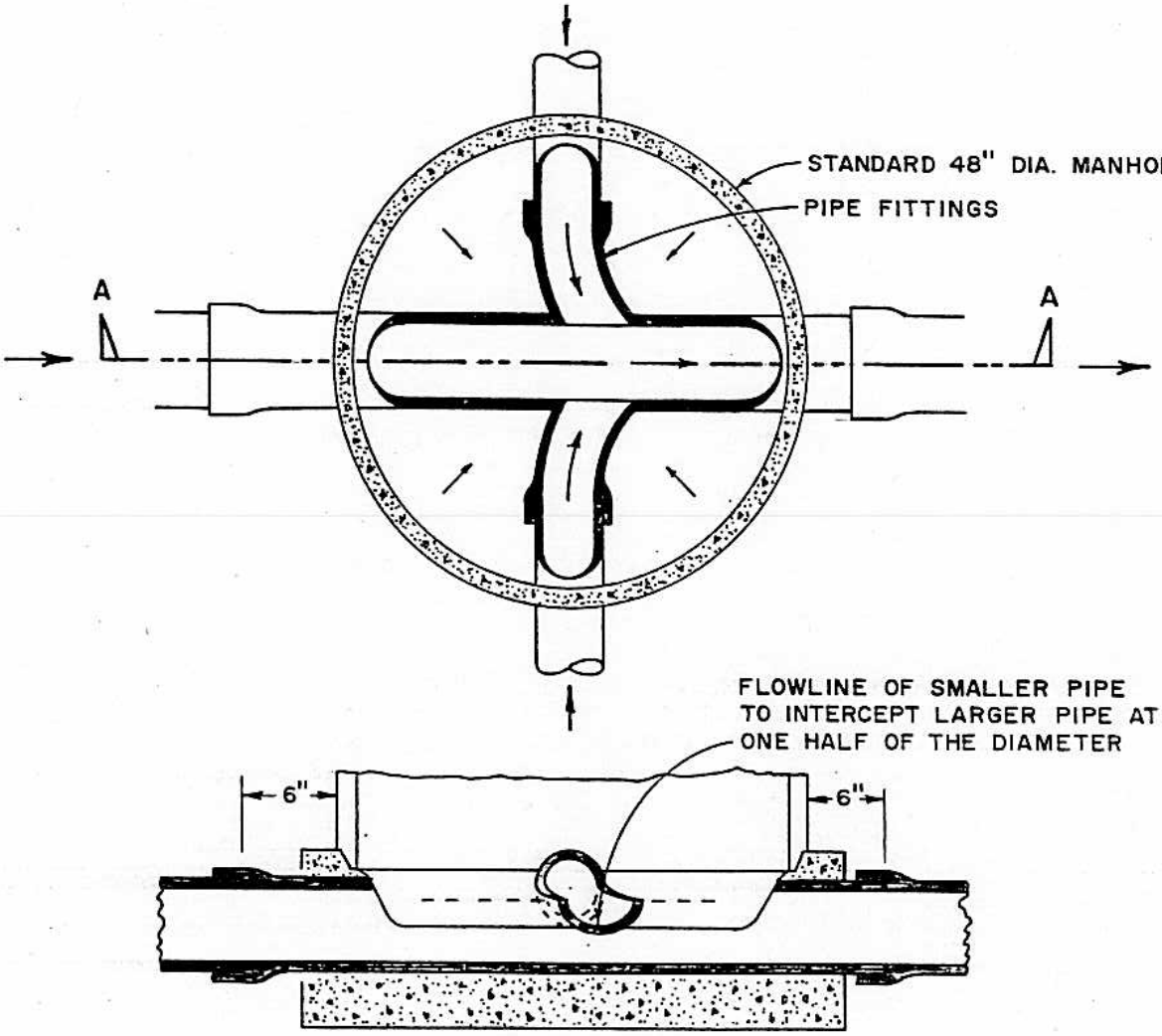
DRAWN BY: J. HULSEY
CHECKED BY: J. PODESTA
SCALE: NONE

SANITARY SEWER MANHOLE 36" THRU 42" DIA. PIPES

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: M. A. Brinton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-4
DATE: JAN. 1988



SECTION A-A

NOTES:

1. CLAY PIPE FITTINGS WITH TOP HALF BROKEN OUT IS REQUIRED FOR TROUGH.
2. TROUGHS WITHIN MANHOLE SHALL BE FULLY ACCESSIBLE.
3. MANHOLE SHALL BE CLEANED OF ALL EXCESS MATERIALS.
4. CONCRETE TROUGH CONSTRUCTED INTO BASE OF MANHOLE MAY BE USED WITH THE APPROVAL OF THE CITY ENGINEER.
5. ALL OTHER MANHOLE REQUIREMENTS AS PER STANDARD SANITARY SEWER MANHOLE DETAIL.

NO.	REVISED	BY

DRAWN BY: J. HULSEY
CHECKED BY: J. PODESTA
SCALE: NONE

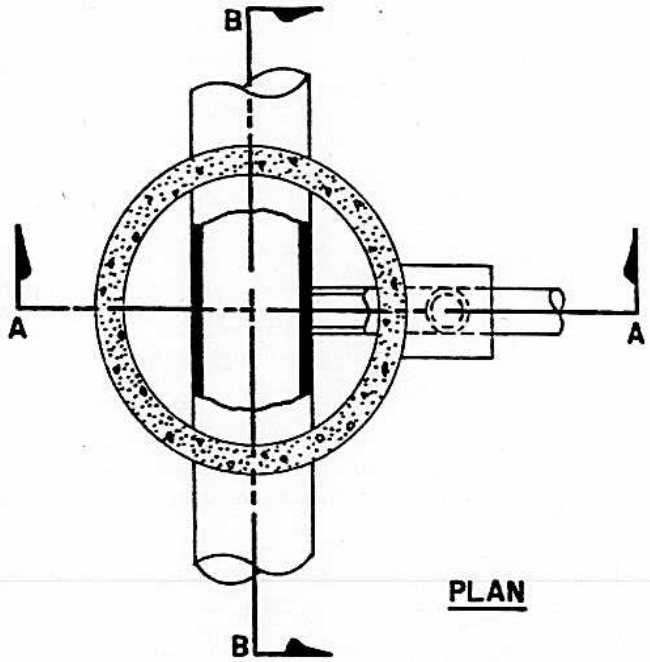
INTERSECTION FOR 24" DIA. PIPE & SMALLER

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

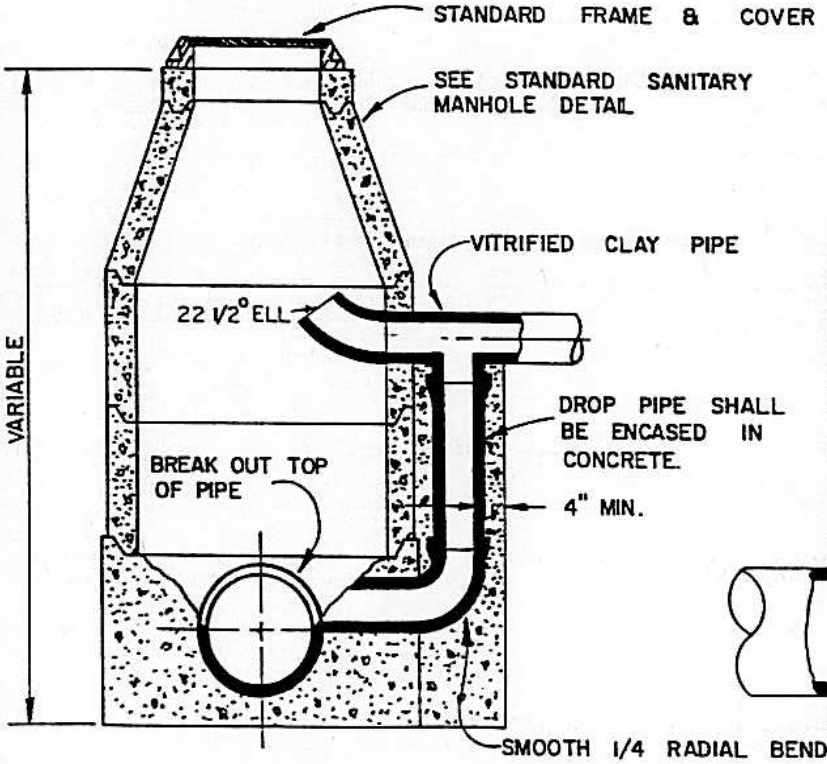
APPROVED BY: M. J. Brunton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-5
DATE: JAN. 1988

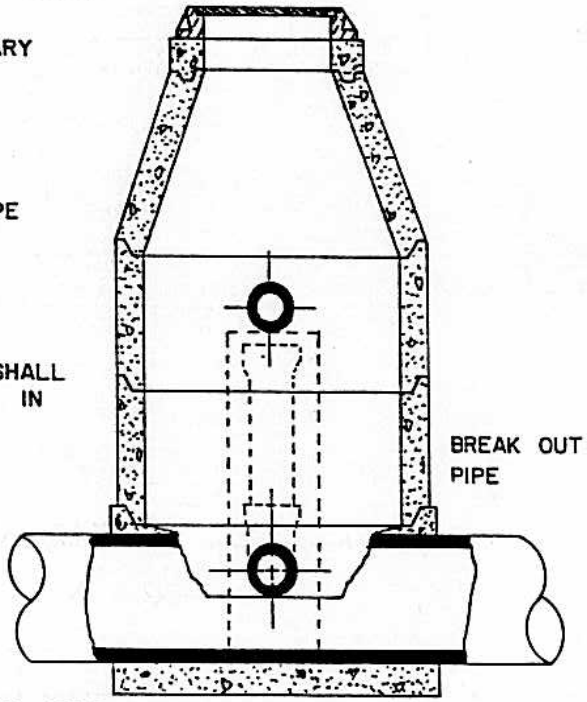
ATTACHMENT 2



PLAN



SECTION A-A



SECTION B-B

NOTES:

1. THIS TYPE OF MANHOLE SHALL BE USED WHEN THE DIFFERENCE IN ELEVATIONS OF THE FLOW LINE OF UPPER LINE AND CROWN OF LOWER LINE EXCEEDS 24 INCHES.
2. ALL OTHER CONDITIONS AS NOTED ON STANDARD SANITARY SEWER MANHOLE DETAIL SHALL APPLY.

NO.	REVISED	BY

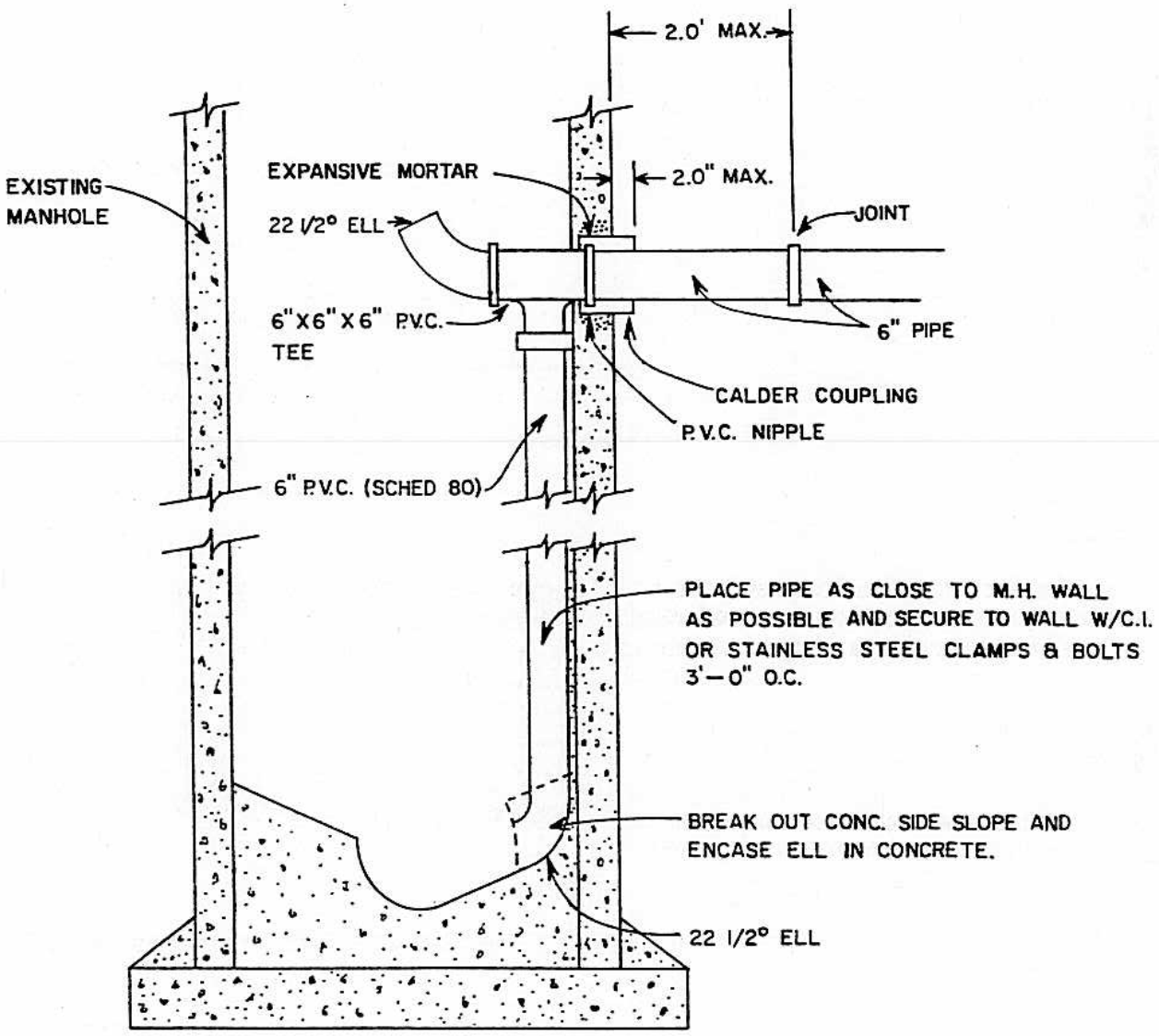
DRAWN BY: C. SABERTON
CHECKED BY: J. PODESTA
SCALE: NONE

OUTSIDE SEWER DROP MANHOLE

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-6
DATE: JAN. 1988



NOTES:

1. THIS TYPE OF MANHOLE SHALL BE USED ONLY WHEN TIEING INTO AN EXISTING MANHOLE.
2. THIS TYPE OF MANHOLE SHALL BE USED WHEN THE DIFFERENCE IN ELEVATION OF THE FLOW LINE OF THE UPPER LINE AND THE CROWN OF THE LOWER LINE EXCEEDS 24 INCHES.
3. ALL OTHER CONDITIONS AS NOTED ON STANDARD SANITARY SEWER MANHOLE DETAIL SHALL APPLY.

NO.	REVISED	BY

DRAWN BY: A. MENOR
CHECKED BY: J. PODESTA
SCALE: NONE

INSIDE SEWER DROP MANHOLE

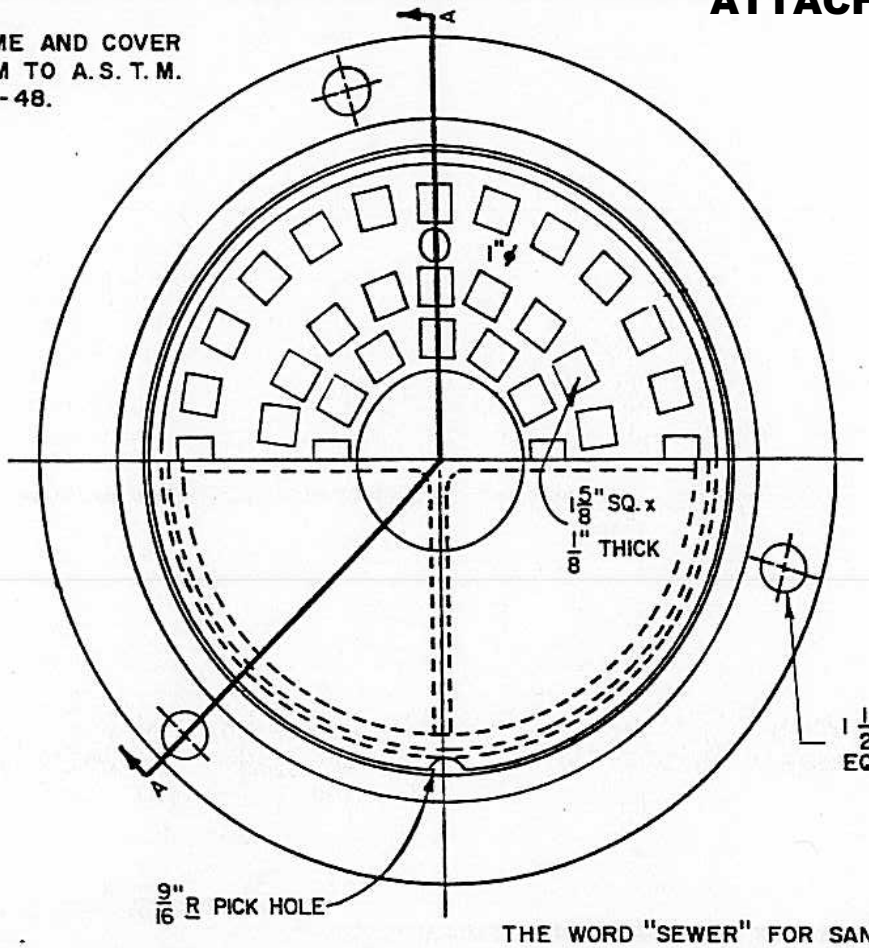
CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-7
DATE: JAN. 1988

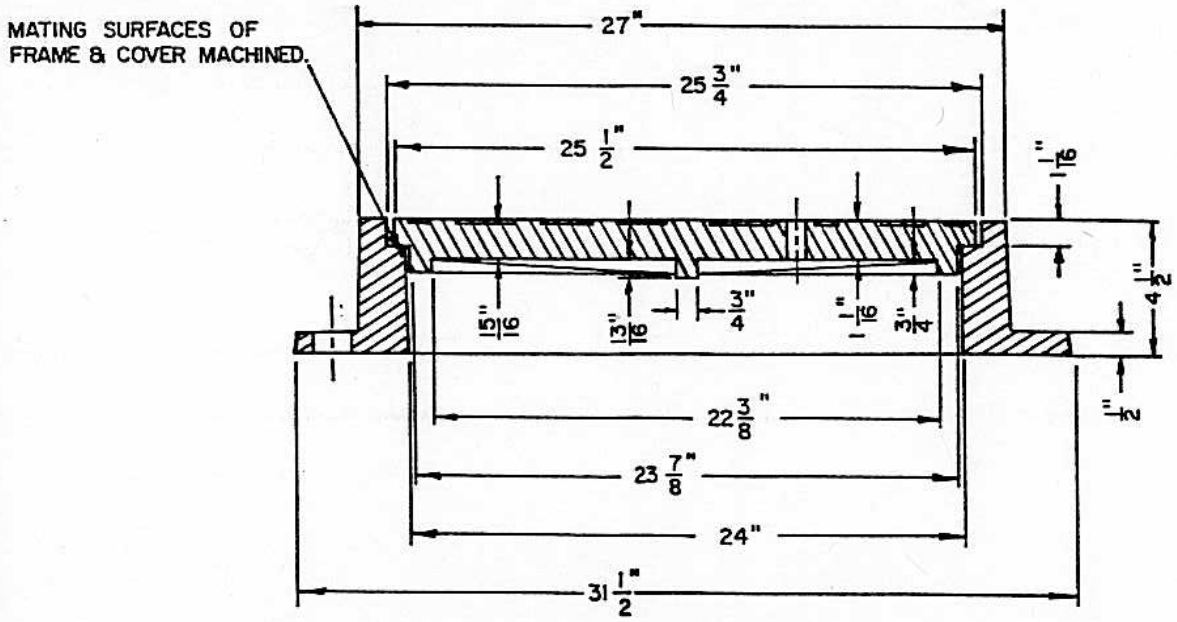
ATTACHMENT 2

CAST IRON FRAME AND COVER SHALL CONFORM TO A.S.T.M. DESIGNATION A-48.



PINKERTON
FRAME PART NO. A-625 APPROX. WT. 140 LBS.
COVER PART NO. A-106 APPROX. WT. 163 LBS.
OR APPROVED EQUAL FRAME AND COVER

THE WORD "SEWER" FOR SANITARY SEWER OR THE WORD "STORM" FOR STORM DRAIN AS APPROPRIATE SHALL BE EMBOSSED ON CENTER DISC.



SECTION A-A

NO.	REVISED	BY
1	MANHOLE FRAME	DRK
DRAWN BY: C. SABERTON		
CHECKED BY: J. PODESTA		
SCALE: NONE		

MANHOLE FRAME AND COVER ASSEMBLY

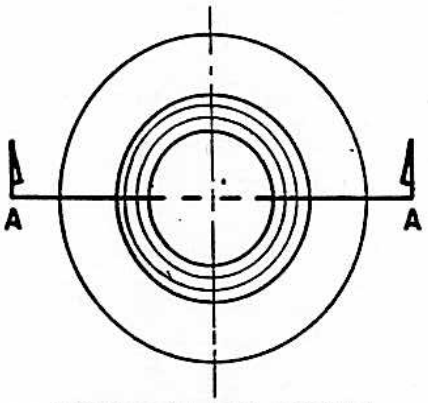
CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: M. Brinton
DIRECTOR OF PUBLIC WORKS

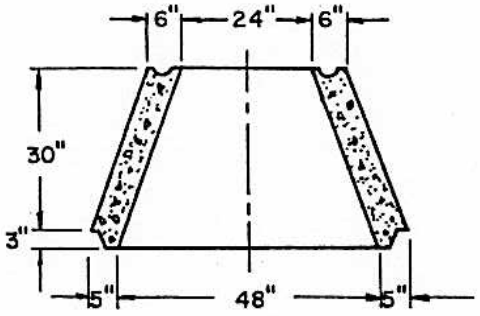
DRAWING NO. S-8
DATE: JAN 1988

PRINTED ON DIEPO NO. 1000H CLEARPRINT

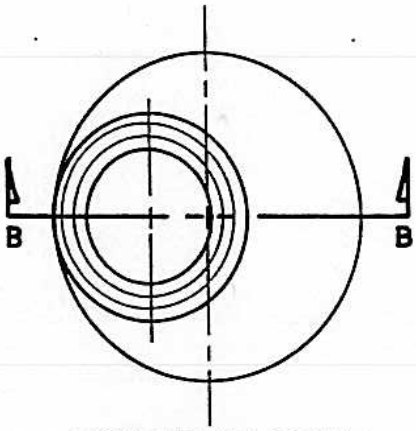
ATTACHMENT 2



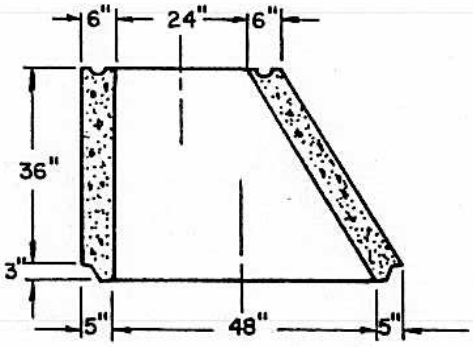
CONCENTRIC CONE



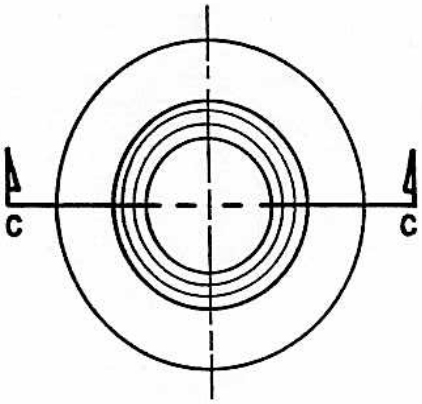
SECTION A-A



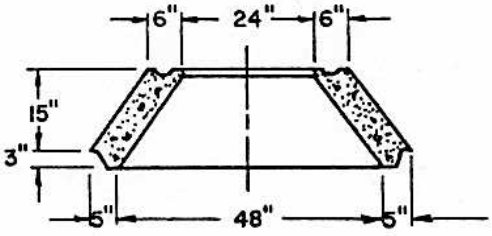
ECCENTRIC CONE



SECTION B-B



CONCENTRIC SHORT CONE



SECTION C-C

NOTES:

1. PRECAST REINFORCED CONCRETE MANHOLE CONE SHALL CONFORM TO A.S.T.M. C-478.
2. ECCENTRIC CONE TO BE USED ONLY WITH THE APPROVAL OF THE CITY ENGINEER.

NO.	REVISED	BY

DRAWN BY: C. SABERTON

CHECKED BY: J. PODESTA

SCALE: NONE

PRECAST REINFORCED CONCRETE MANHOLE CONE

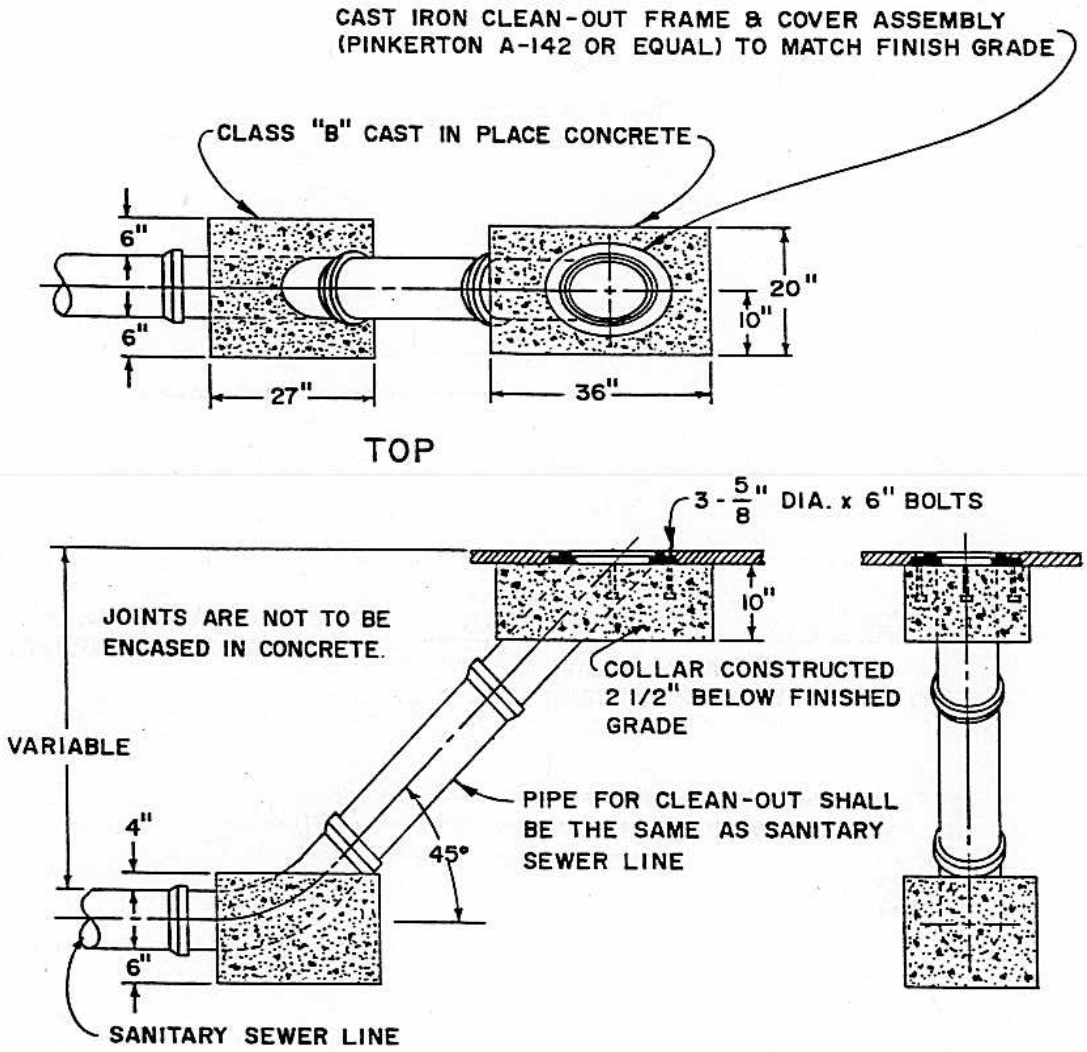
CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: M.G. Brinton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-9

DATE: JAN. 1988

ATTACHMENT 2



NO.	REVISED	BY

DRAWN BY: B. CANTU
CHECKED BY: J. PODESTA
SCALE: NONE

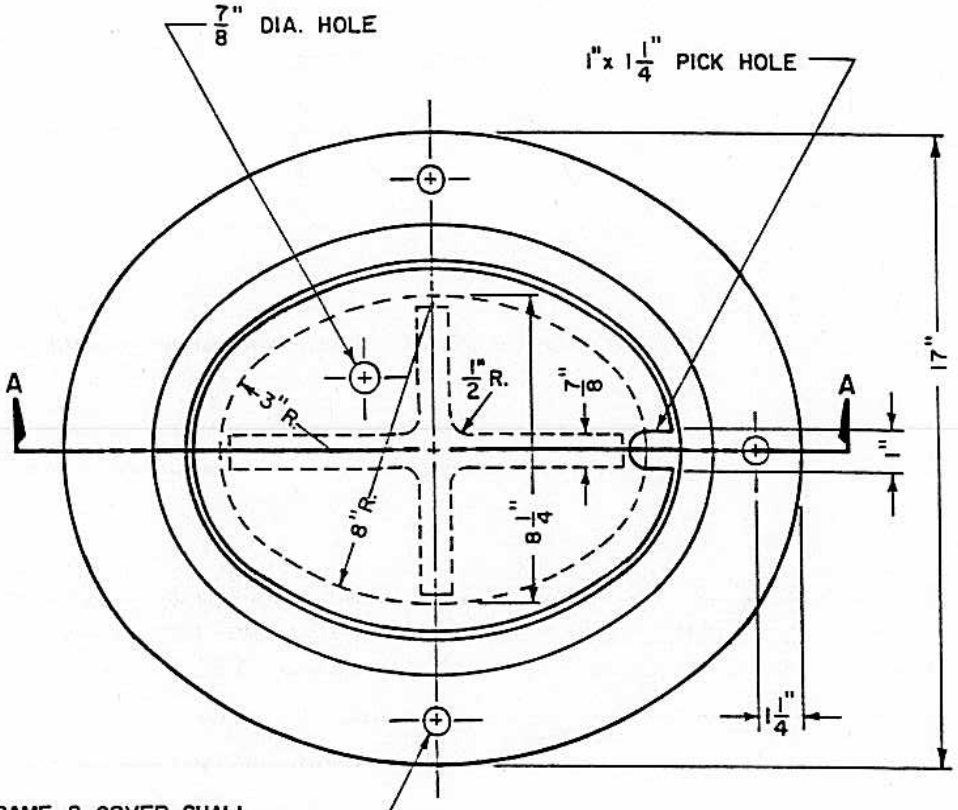
MAIN LINE CLEAN-OUT

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

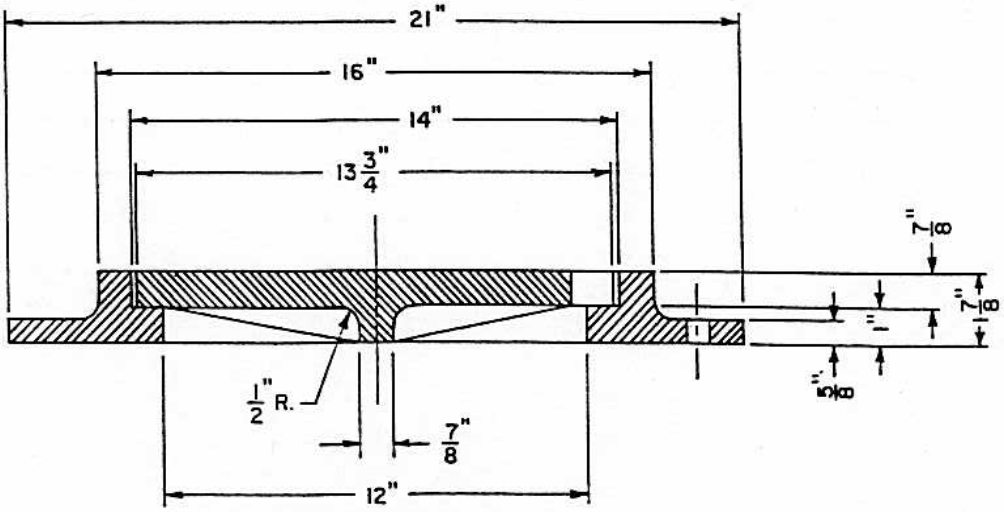
DRAWING NO. S-10
DATE: JAN. 1988

PINKERTON:
FRAME PART NO. A-144 APPROX. WT. 45 LBS.
COVER PART NO. A-144 APPROX. WT. 25 LBS.
OR APPROVED EQUAL



CAST IRON FRAME & COVER SHALL CONFORM TO A.S.T.M. DESIGNATION A-48.

5/8" DIA. – 3 HOLES



SECTION A-A

NO.	REVISED	BY

DRAWN BY: B. CANTU
CHECKED BY: J. PODESTA
SCALE: NONE

MAIN CLEAN-OUT FRAME AND COVER ASSEMBLY

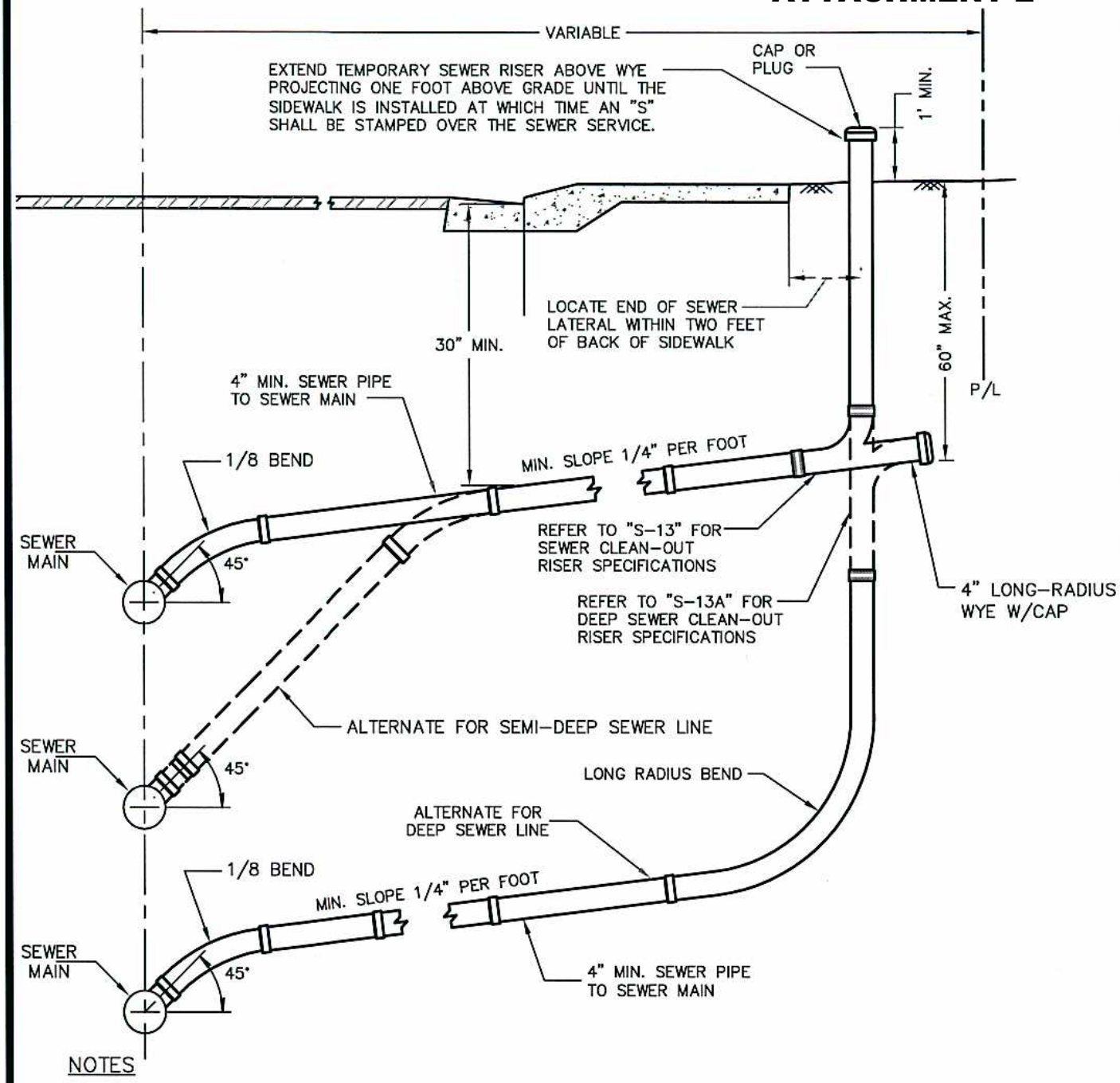
CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: W. Bruton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-11
DATE: JAN 1988

PRINTED ON DIEPO NO. 1000H CLEARPRINT

ATTACHMENT 2



NOTES

1. ANY SANITARY SEWER LATERAL THAT CROSSES A WATER MAIN SHALL BE DUCTILE IRON CEMENT-LINED OR P.V.C. (C-900) FOR TEN FEET IN EACH DIRECTION FROM THE CROSSING, UNLESS THE WATER MAIN IS ONE FOOT OR GREATER ABOVE THE SANITARY SEWER LATERAL.
2. FITTINGS, WYE BRANCH, RISER AND LATERALS SHALL BE OF THE SAME DIAMETER.
3. CLEAN-OUT MAY BE CAST IRON, PLASTIC, OR VITRIFIED CLAY PIPE.
4. SEWER LATERALS WITH COVER LESS THAN 30 INCHES SHALL BE DUCTILE IRON CEMENT-LINED PIPE.
5. 4" LONG RADIUS WYE WITH CAP AND TEMPORARY 4" CLEAN-OUT RISER WITH CAP TO BE CONSTRUCTED & TESTED WITH SEWER LATERAL.
6. PERMANENT CLEANOUT RISER SHALL BE ADJUSTED TO FINAL GRADE WITH INSTALLATION OF THREADED CLEAN-OUT PLUG & BOX BY BUILDING CONTRACTOR. REFER TO CITY STANDARD S-13 AND S-13A FOR CLEAN-OUT RISER SPECIFICATIONS.

NO.	REVISED	BY
2	NOV. 2006	J.R.
DRAWN BY:	J. ROSS	
CHECKED BY:	J. PODESTA	
SCALE:	NONE	

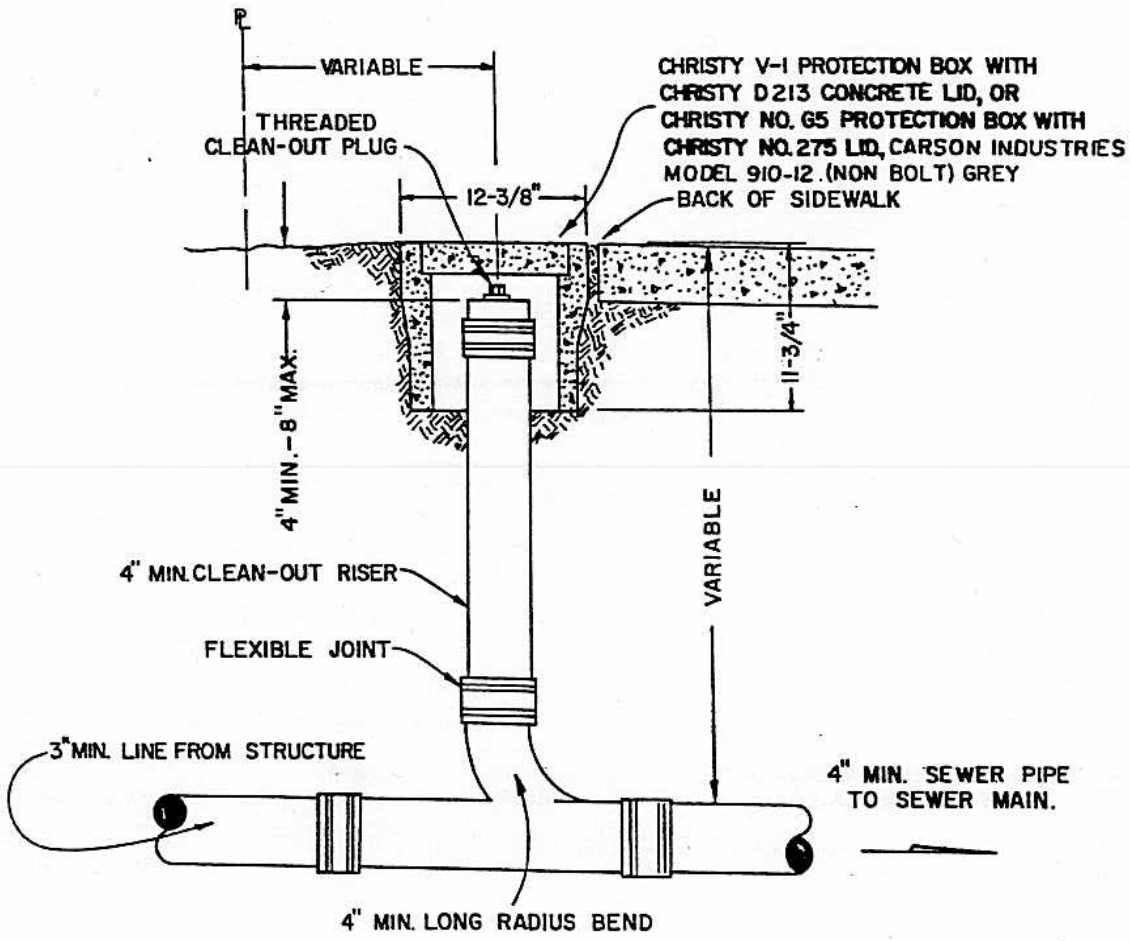
SEWER LATERAL

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: Michael A. Brintnall
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-12

DATE: JAN. 1988



NOTES:

1. CLEAN-OUT RISER SHALL BE THE SAME SIZE AS THE SEWER LATERAL.
2. CLEAN-OUT SHALL BE LOCATED AT BACK OF SIDEWALK.
3. ANY DEVIATION FROM THIS STANDARD MUST HAVE THE APPROVAL OF THE CITY ENGINEER.
4. CLEAN-OUT RISER COMBINATION MAY BE CAST IRON, PLASTIC, OR VITRIFIED CLAY PIPE.

NO.	REVISED	BY

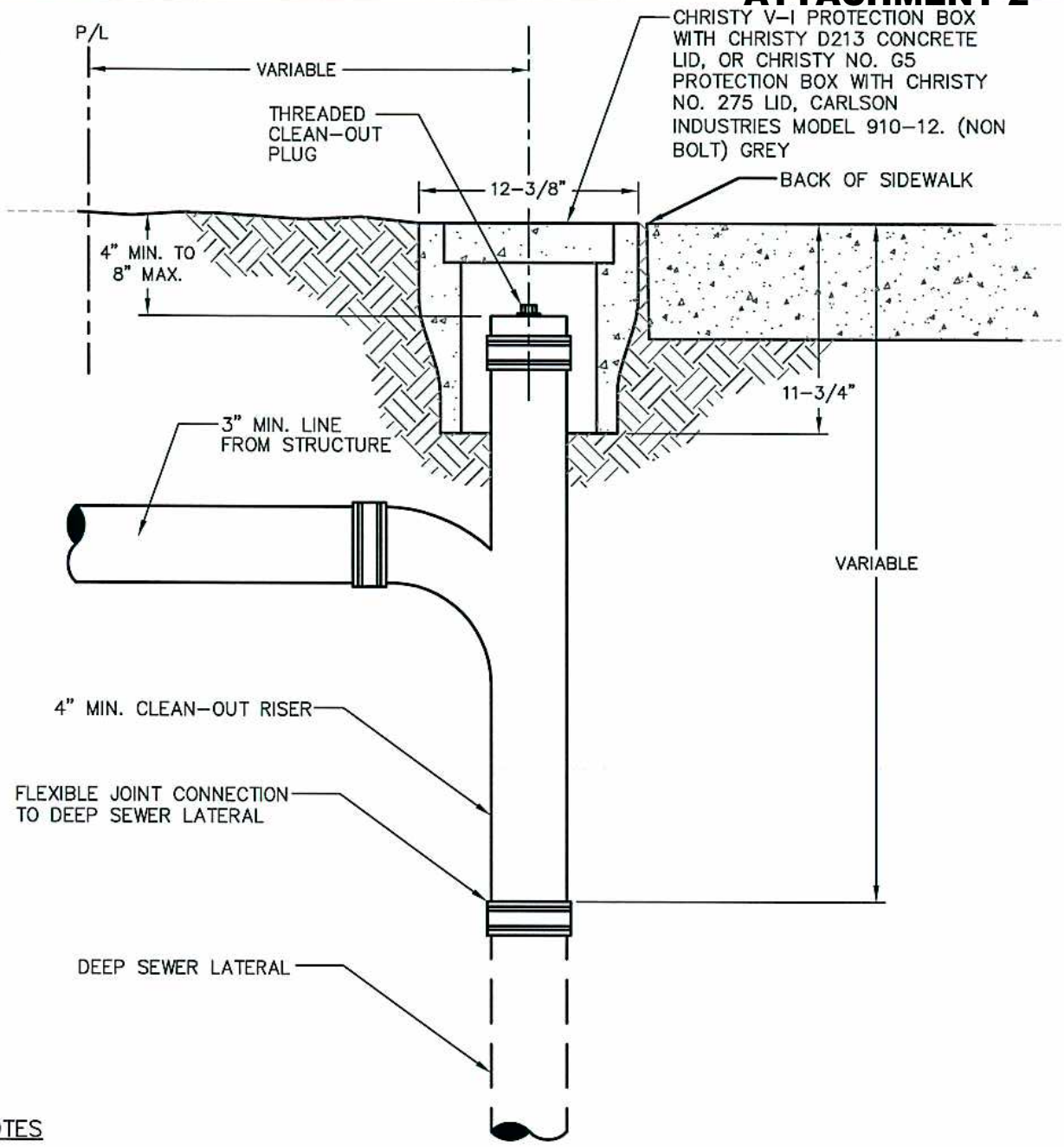
DRAWN BY: C. SABERTON
CHECKED BY: J. PODESTA
SCALE: NONE

CLEAN-OUT RISER

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY:
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-13
DATE: JAN. 1988



NOTES

1. CLEAN–OUT RISER SHALL BE THE SAME SIZE AS THE SEWER LATERAL.
2. CLEAN–OUT SHALL NOT BE LOCATED MORE THAN 24" FROM THE BACK OF SIDEWALK.
3. CLEAN–OUT RISER MAY BE DUCTILE IRON, A.B.S. (S.D.R. 35) SOLID WALL PIPE, P.V.C. (S.D.R. 23.5), OR VITRIFIED CLAY PIPE.
4. PRIOR TO INSTALLATION, INSTALLER MUST OBTAIN AN ENCROACHMENT PERMIT FROM THE CITY OF MANTECA PUBLIC WORKS DEPARTMENT.
5. CLEAN–OUTS WITHIN THE STREET RIGHT OF WAY MUST BE INSTALLED BY A LICENSED CONTRACTOR.
6. THE CITY MAINTAINS SEWER LATERALS DOWNSTREAM FROM CLEAN–OUTS LOCATED WITHIN 24" FROM THE BACK OF SIDEWALK. PROPERTY OWNERS MUST MAINTAIN SEWER LATERALS UPSTREAM FROM THE CLEAN–OUT. SEWER LATERALS WITHOUT CLEAN–OUTS, OR WITH CLEAN–OUTS LOCATED GREATER THAN 24" FROM THE BACK OF SIDEWALK MUST BE MAINTAINED THEIR FULL LENGTH BY THE PROPERTY OWNER.

NO.	REVISED	BY

DRAWN BY: J. ROSS
CHECKED BY: J. PODESTA
SCALE: NONE

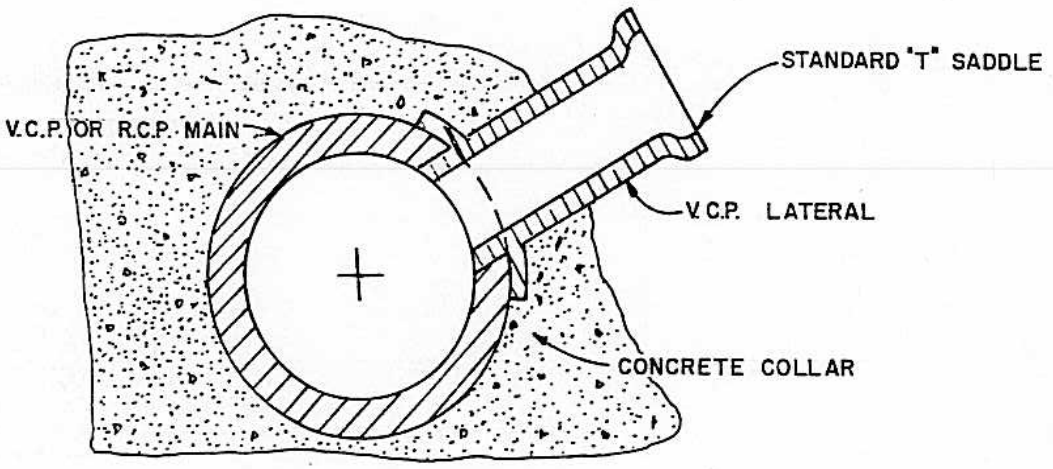
CLEAN–OUT RISER FOR DEEP SEWER LATERAL

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: Michael L. Britton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-13A
DATE: AUG. 1999

ATTACHMENT 2



SANITARY SEWER

NOTES:

1. BREAK OUT PORTION OF MAIN TO FIT LATERAL.

NO.	REVISED	BY

DRAWN BY: C. SABERTON
CHECKED BY: J. PODESTA
SCALE: NONE

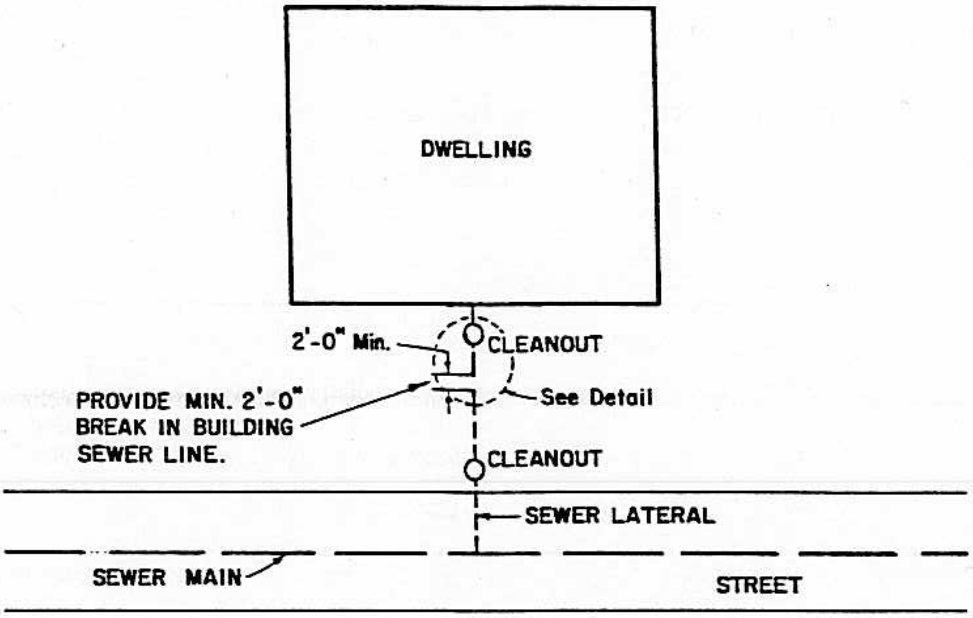
TAPPING FOR SEWER MAINS

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: M.K. Brinton
DIRECTOR OF PUBLIC WORKS

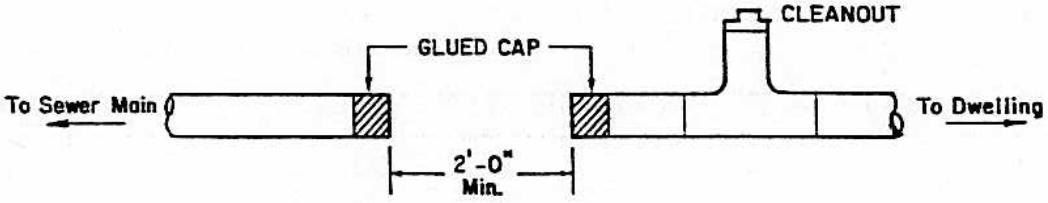
DRAWING NO. S-14
DATE: JAN. 1988

ATTACHMENT 2



PLAN

N.T.S.



SEWER LINE DETAIL

N.T.S.

NOTES:

1. TWO FOOT BREAK IN BUILDING SEWER LINE SHALL BE LEFT UNCOVERED UNTIL SEWER ALLOCATION IS GRANTED.
2. FINAL CONNECTION SHALL NOT BE MADE UNTIL SEWER ALLOCATION IS GRANTED. A FINAL INSPECTION WILL BE PERFORMED AT THAT TIME.

NO.	REVISED	BY

DRAWN BY: J. KOESTER
CHECKED BY: J. PODESTA
SCALE: NONE

SEWER CONNECTION

CITY OF MANTECA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY: M. Brinton
DIRECTOR OF PUBLIC WORKS

DRAWING NO. S-15
DATE: JAN. 1988

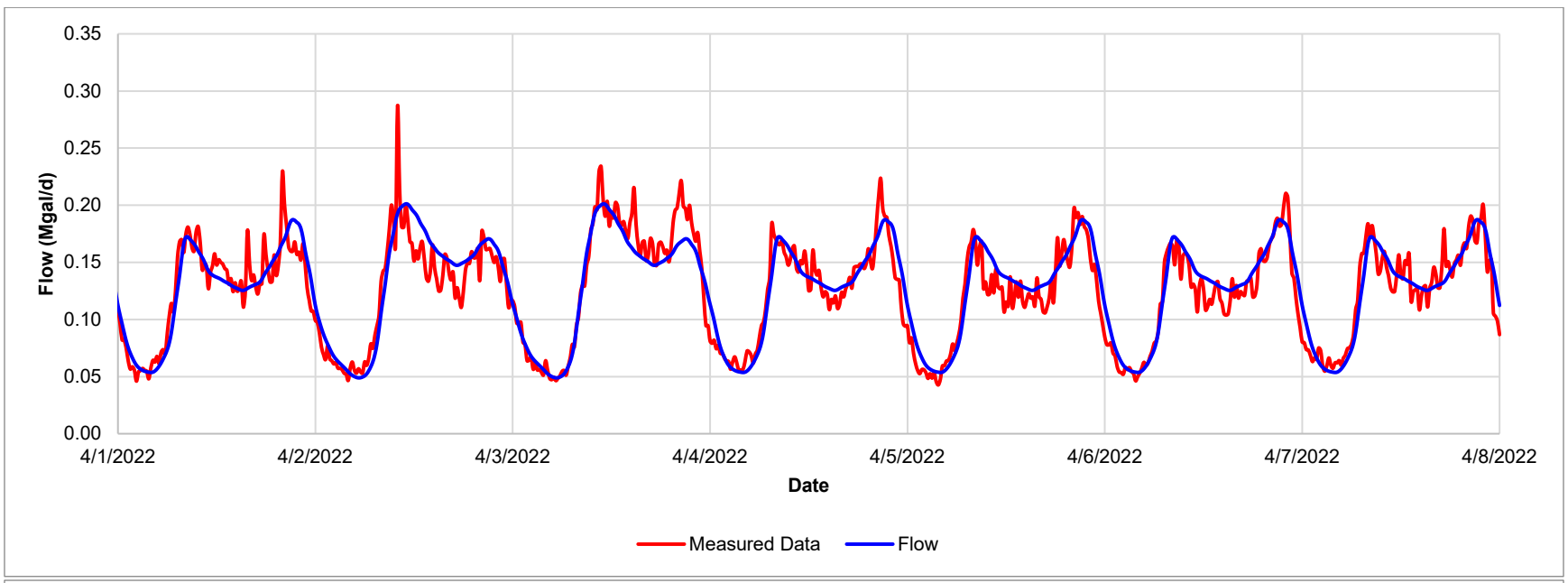
Appendix
February 2024

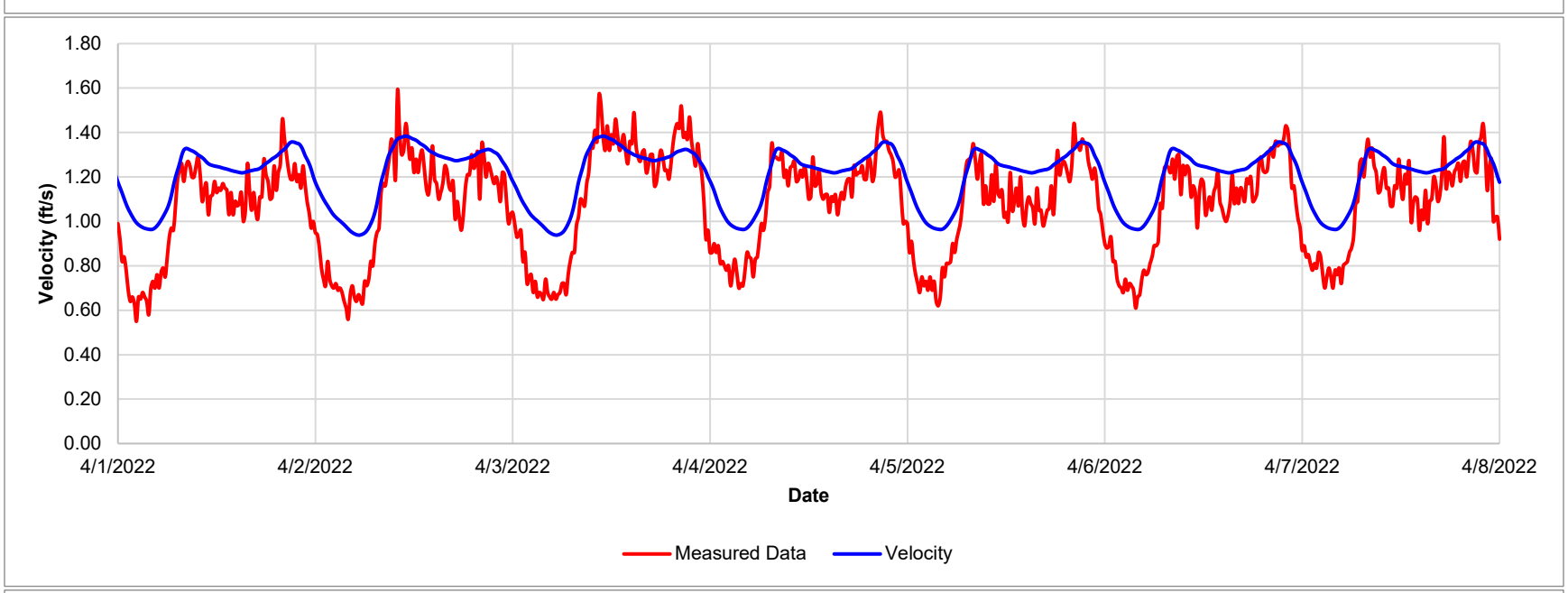
APPENDIX F

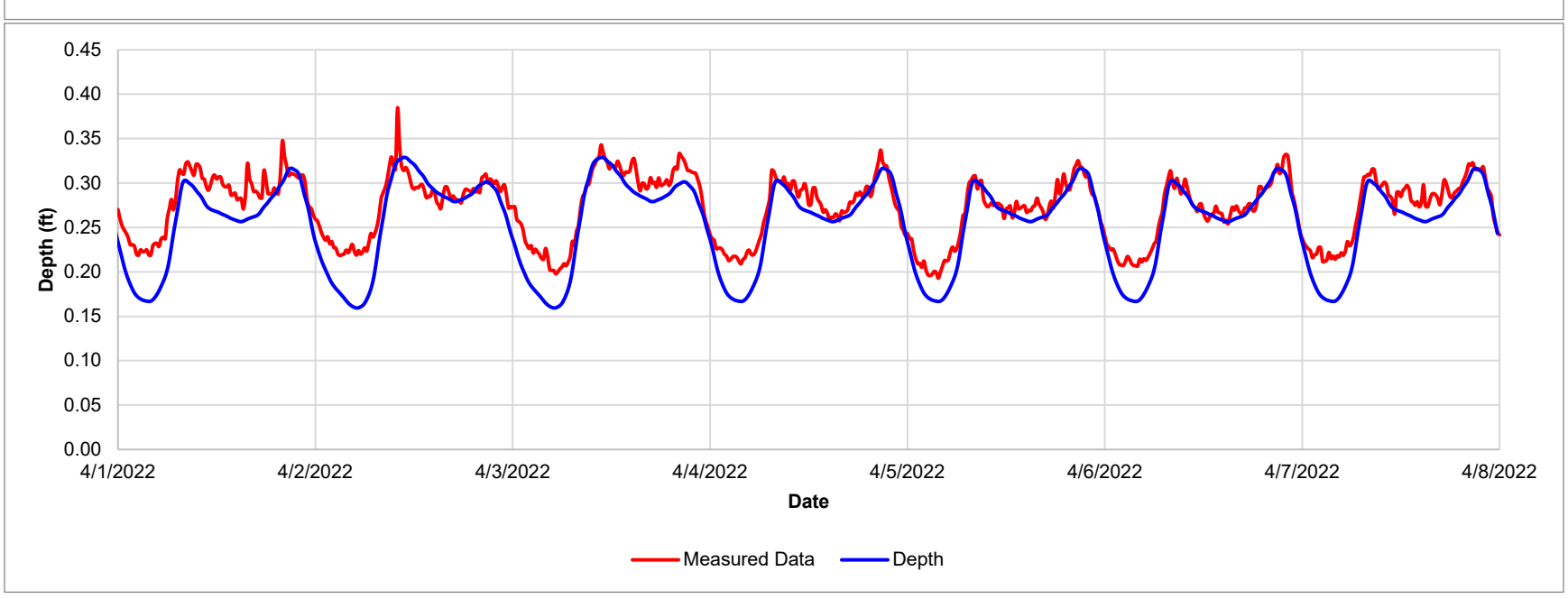
Hydraulic Model Calibration & Scenario Results

Appendix F – Calibration

1.1 SITE 1 - DWF

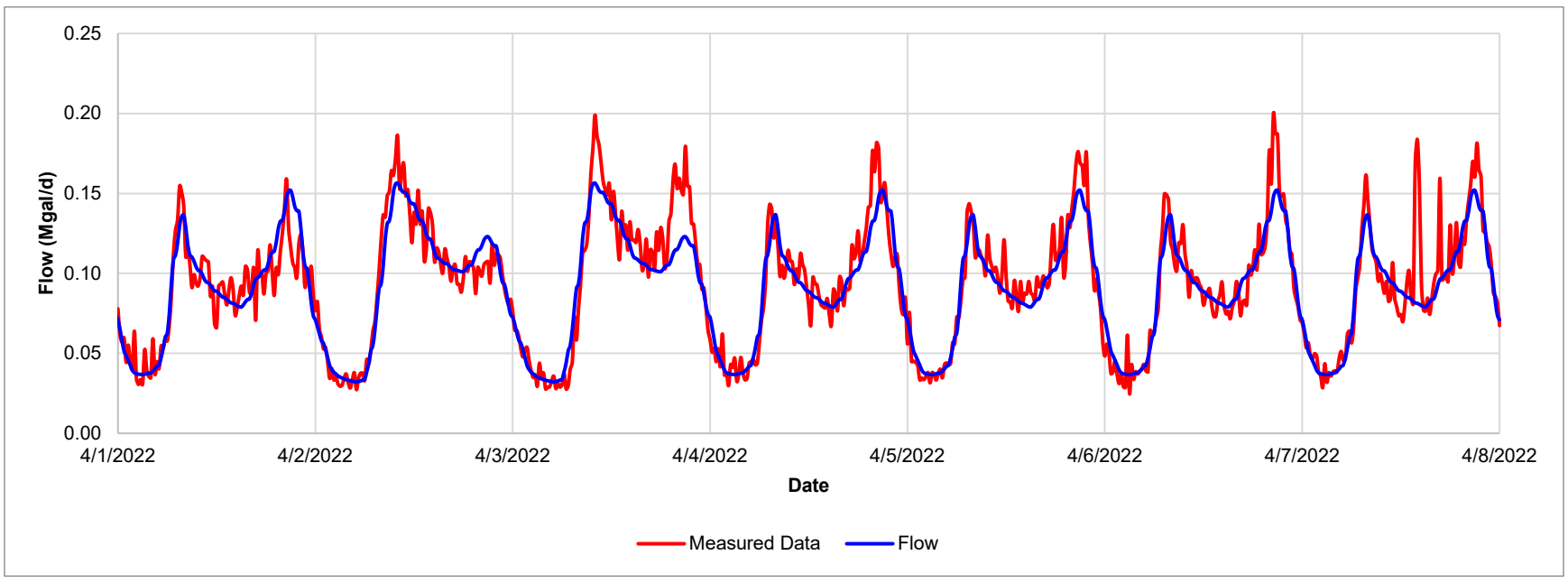


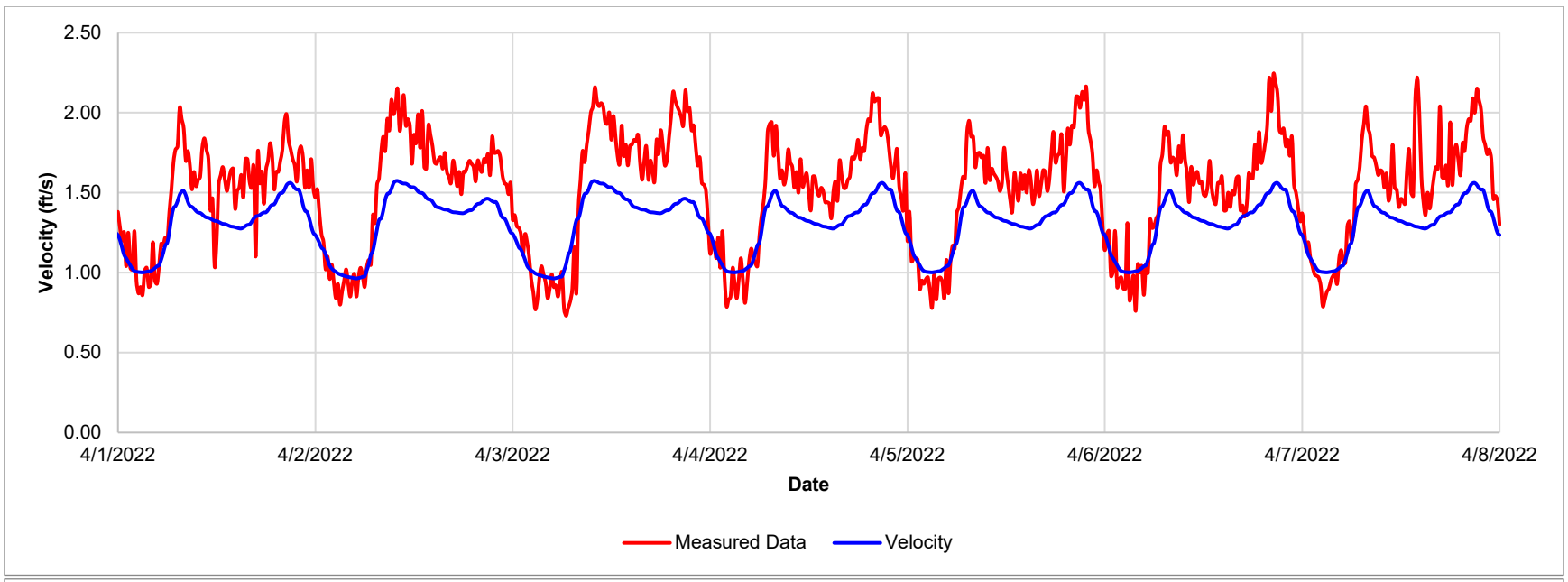


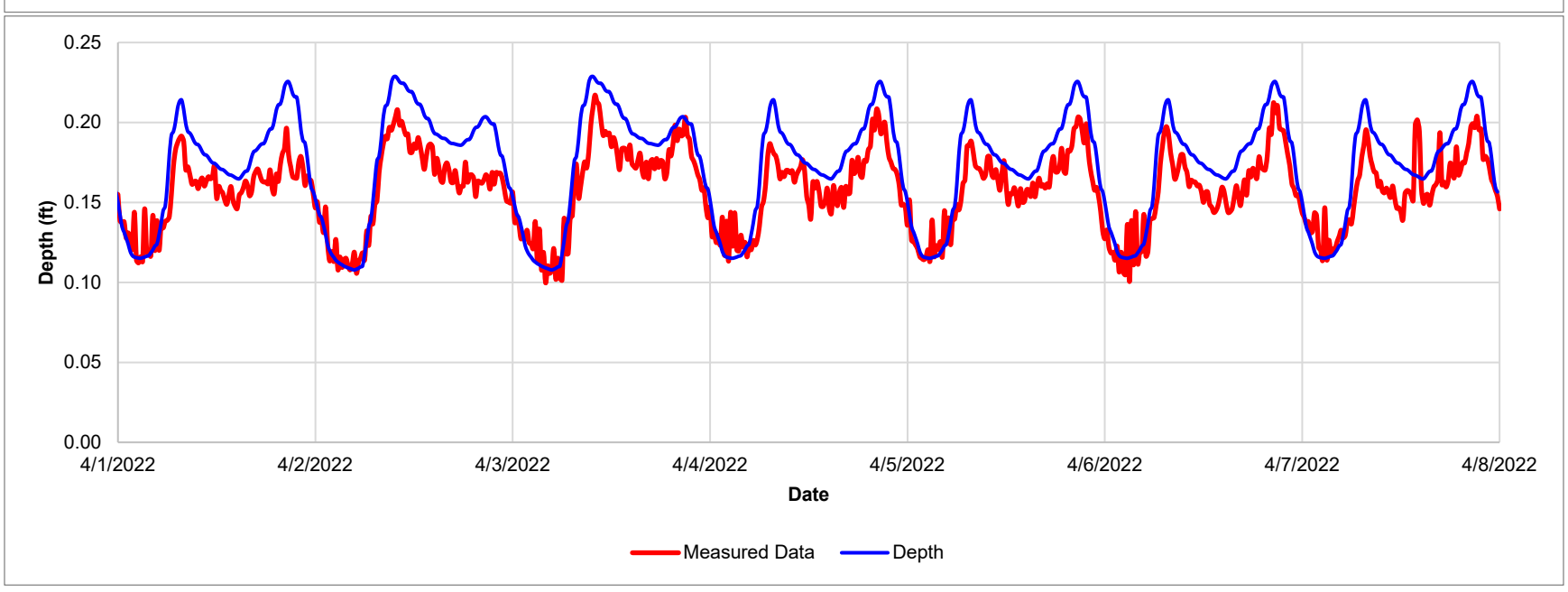


Site 1	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.38	1.59	0.29	0.22	0.33	1.38	0.20	-14.5%	-13.0%	-29.8%	-6.9%
Min	0.19	0.55	0.04	0.05	0.16	0.94	0.05				
Avg	0.27	1.08	0.13	0.13	0.25	1.21	0.13	-6.7%	12.1%	1.5%	1.5%
Volume			250,615	250,662			254,360			1.5%	1.5%

1.2 SITE 2 – DWF

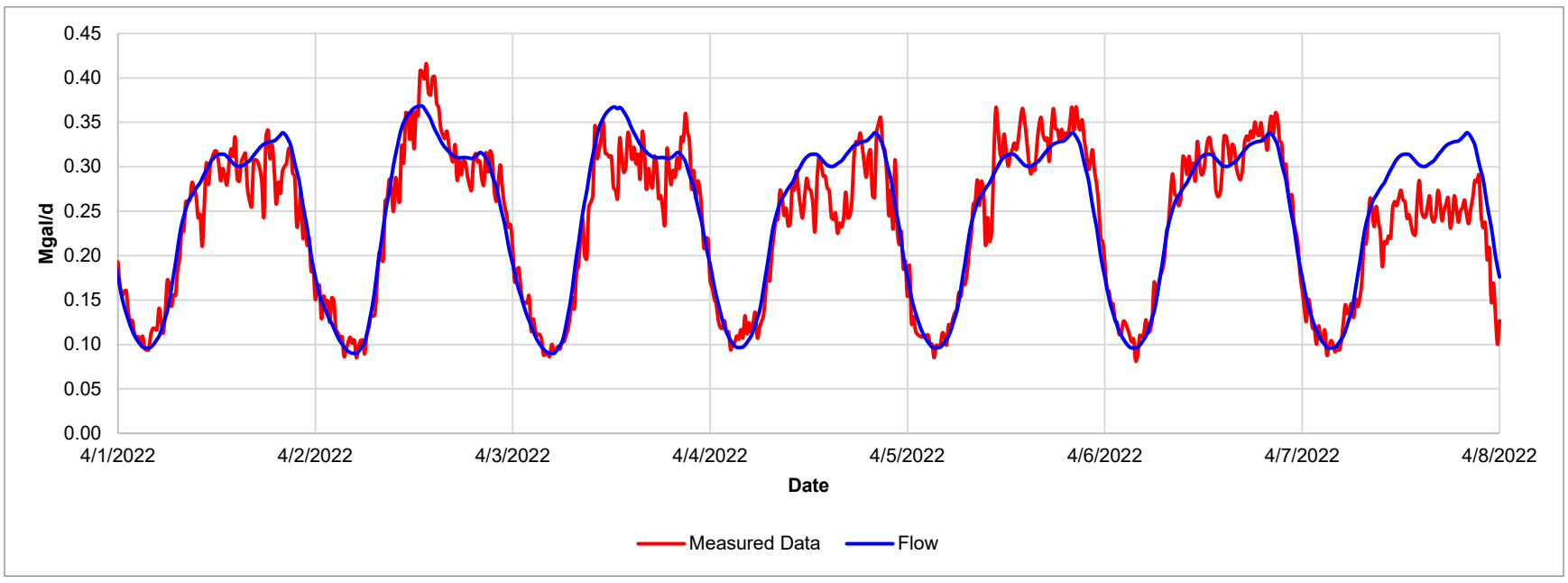


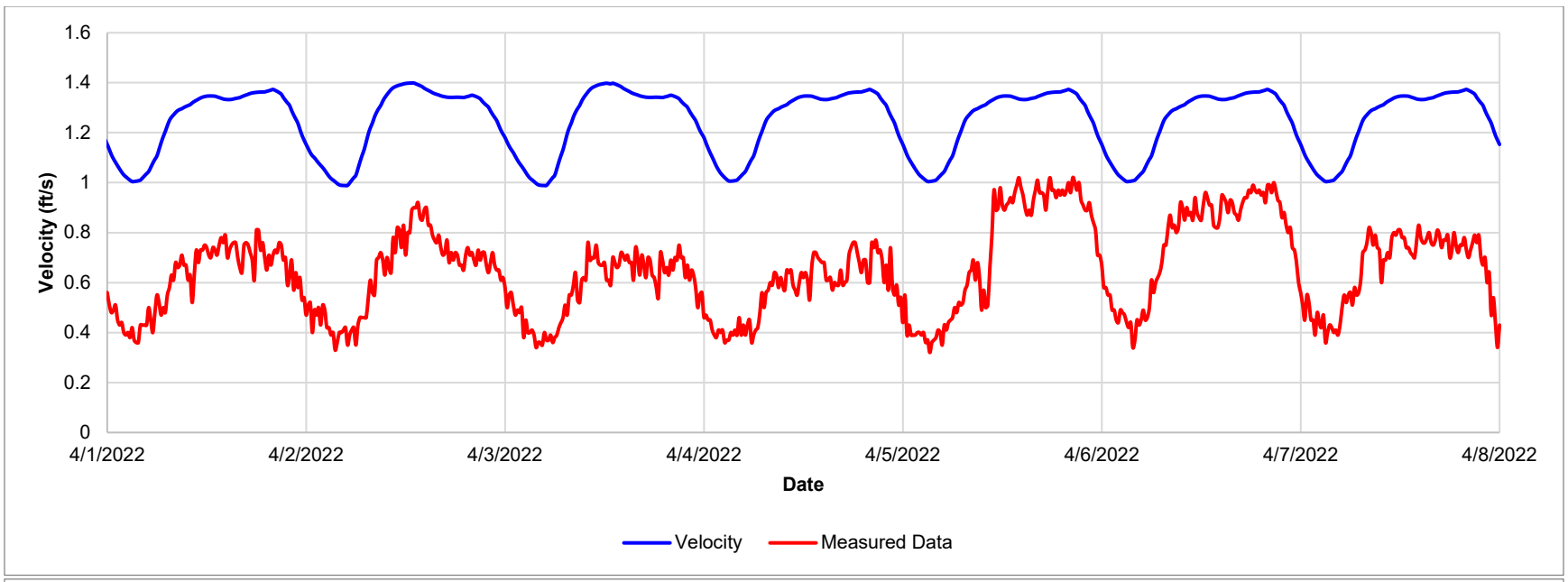


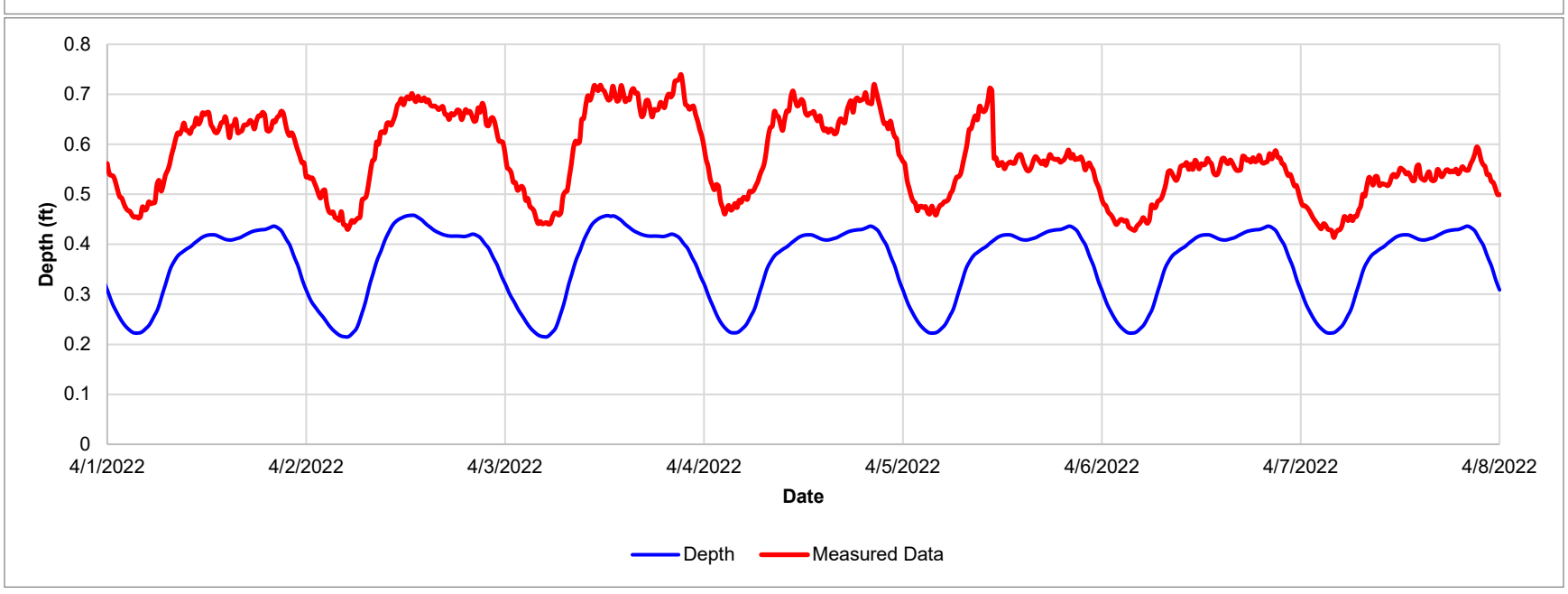


Site 2	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.22	2.24	0.20	0.19	0.23	1.57	0.16	5.4%	-29.8%	-21.6%	-15.7%
Min	0.10	0.73	0.02	0.03	0.11	0.96	0.03				
Avg	0.16	1.52	0.09	0.09	0.17	1.31	0.09	9.4%	-13.9%	-2.4%	-2.4%
Volume			186,015	186,038			181,625			-2.4%	-2.4%

1.3 SITE 3 – DWF

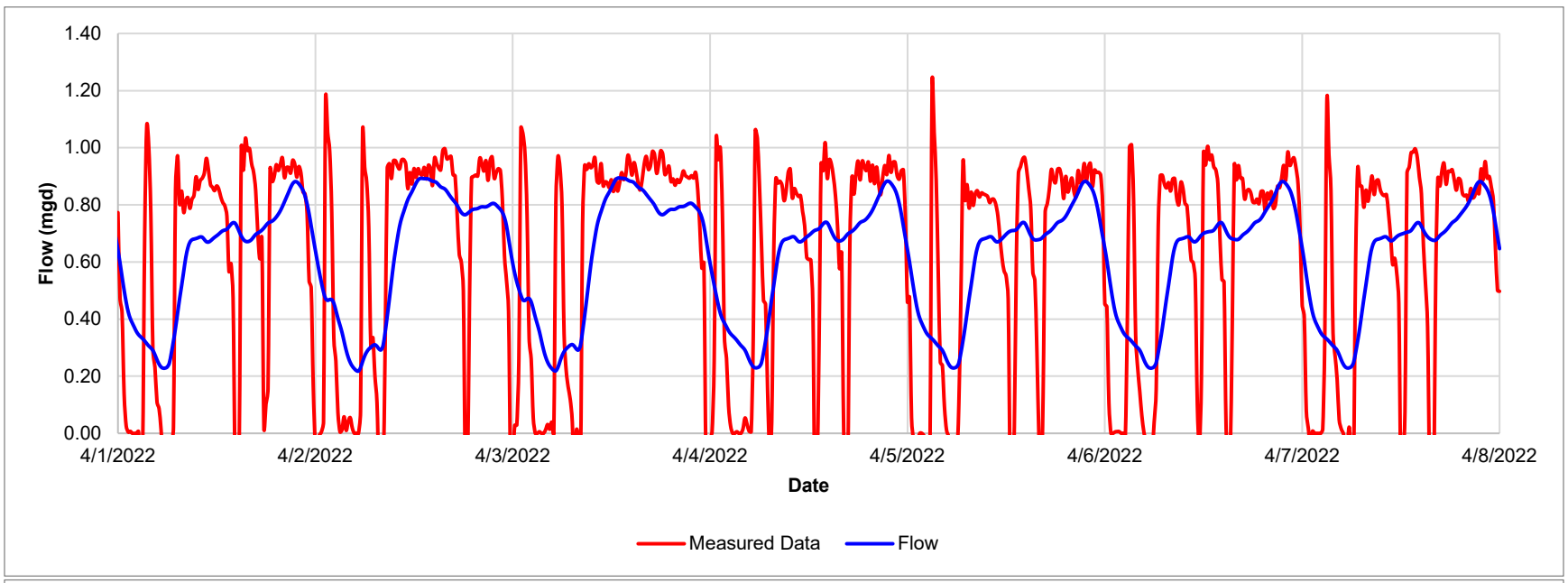


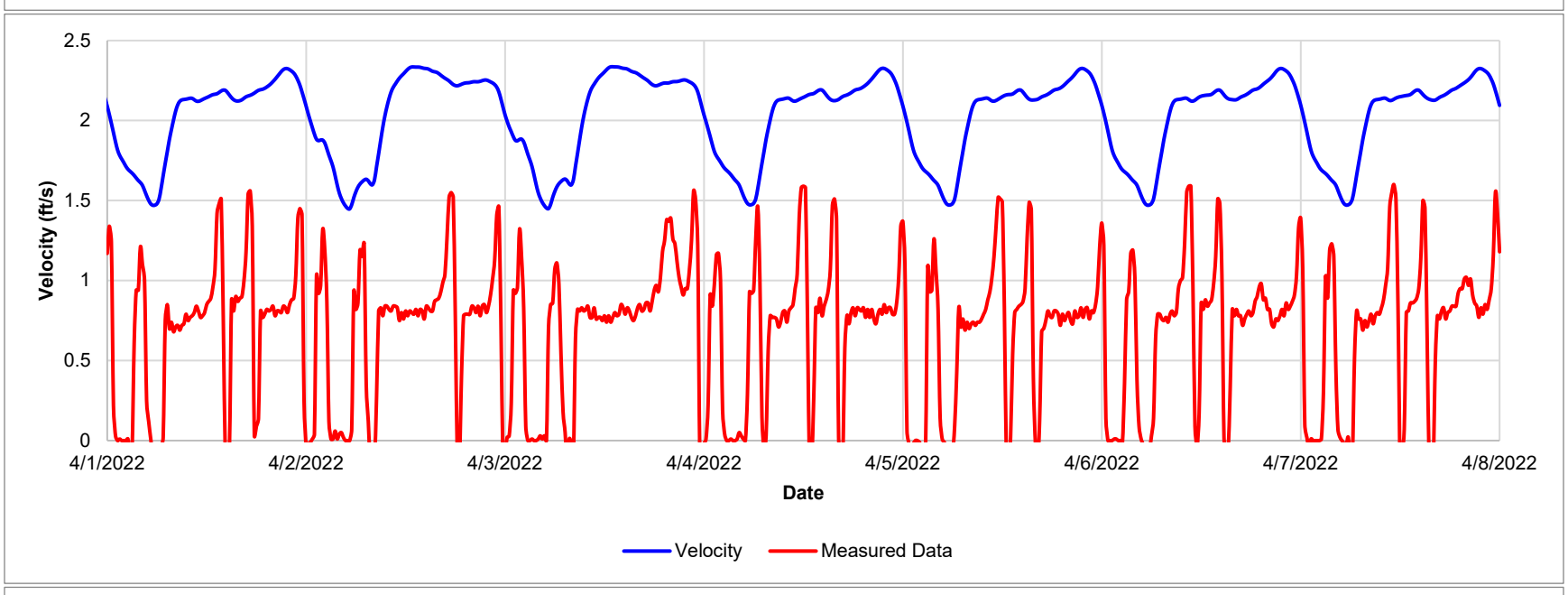


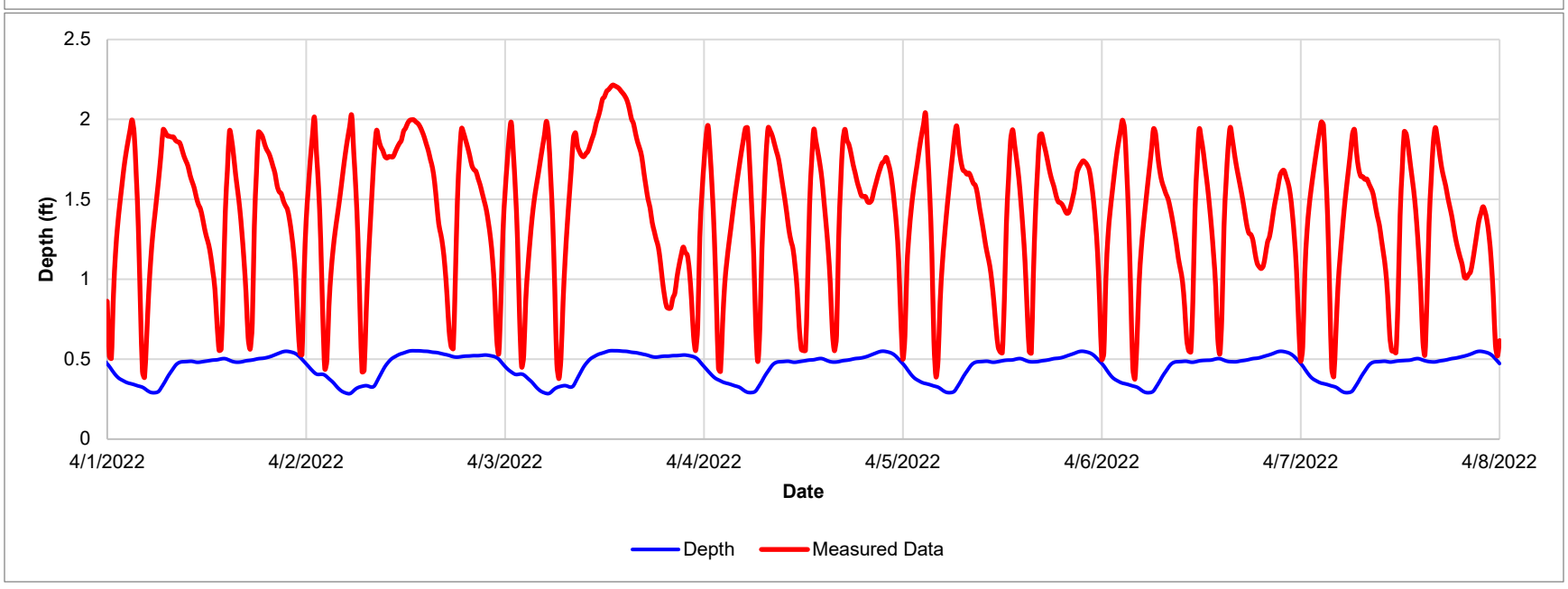


Site 3	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.74	1.02	0.42	0.41	0.46	1.40	0.37	-38.0%	37.1%	-11.4%	-9.6%
Min	0.41	0.32	0.08	0.09	0.21	0.99	0.09				
Avg	0.57	0.65	0.24	0.24	0.36	1.25	0.24	-37.2%	92.2%	4.1%	4.1%
Volume			470,307	470,476			489,773			4.1%	4.1%

1.4 SITE 4 – DWF

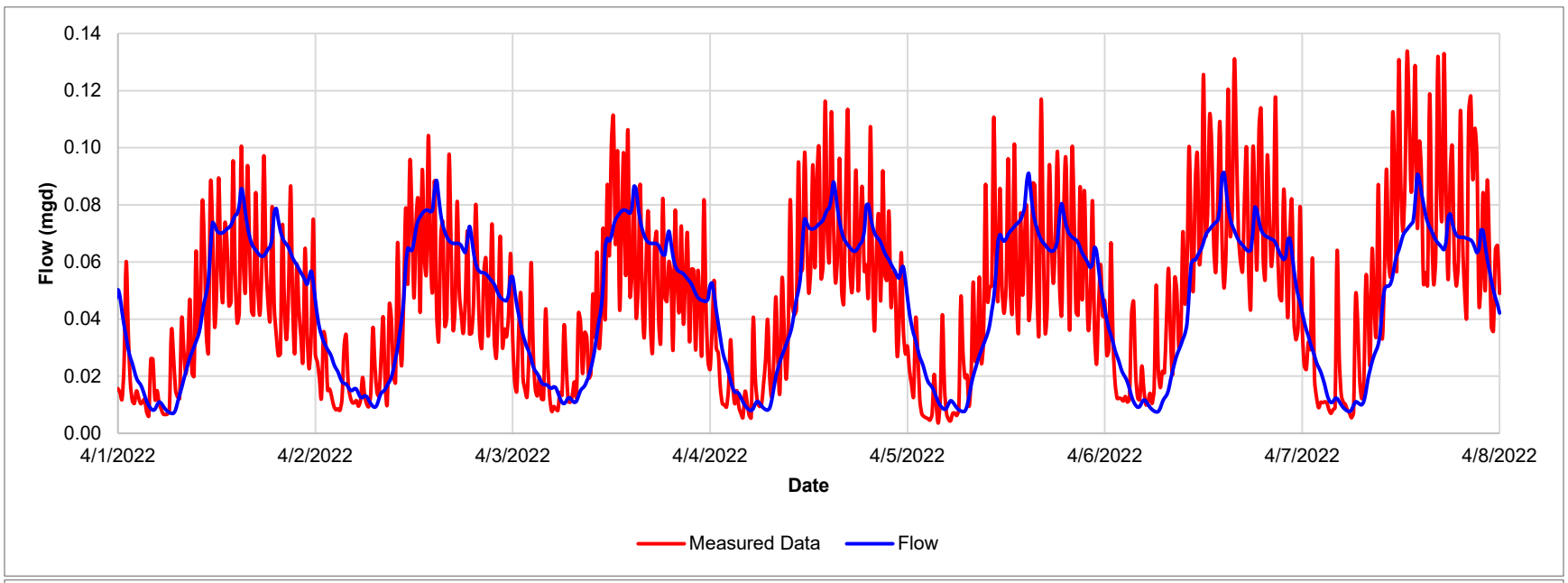


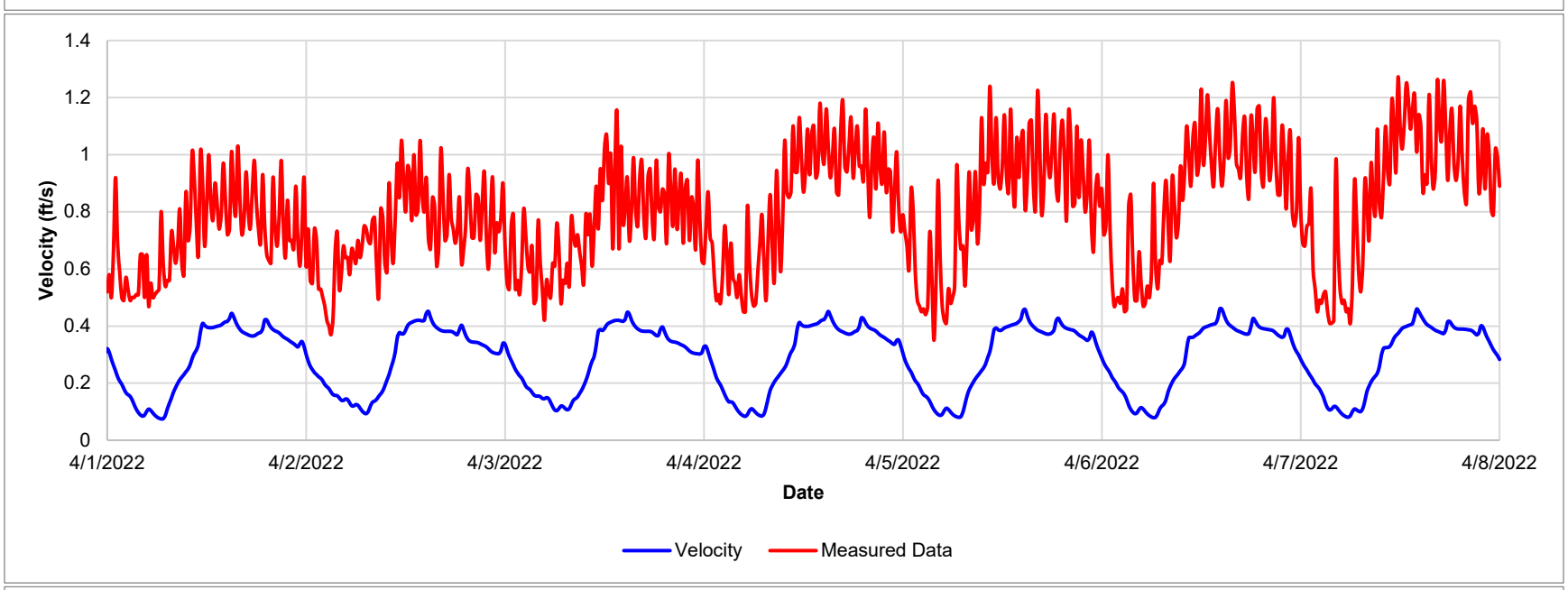


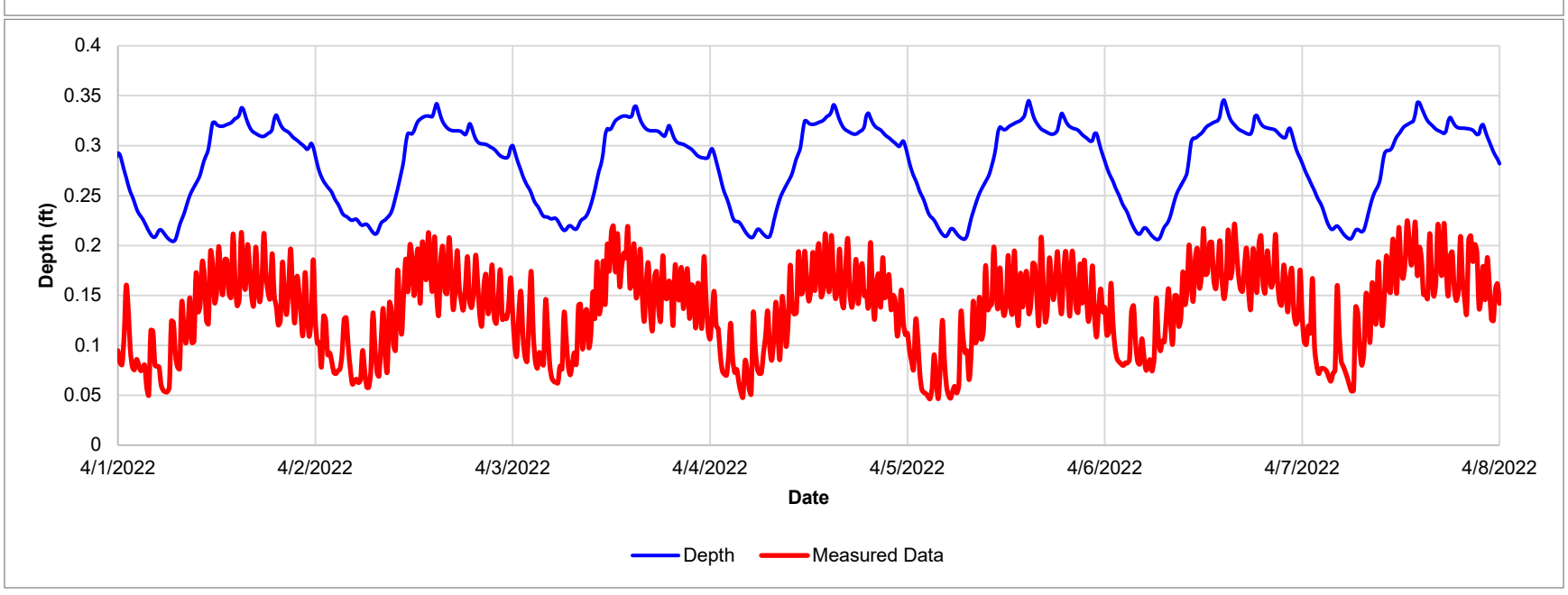


Site 4	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	2.22	1.60	1.23	1.00	0.55	2.34	0.89	-75.0%	46.0%	-27.2%	-10.3%
Min	0.38	-0.20	-0.23	-0.09	0.28	1.45	0.22				
Avg	1.41	0.69	0.61	0.61	0.45	2.03	0.61	-67.8%	194.3%	0.4%	0.4%
Volume			1,223,326	1,223,577			1,228,243			0.4%	0.4%

1.5 SITE 5 – DWF

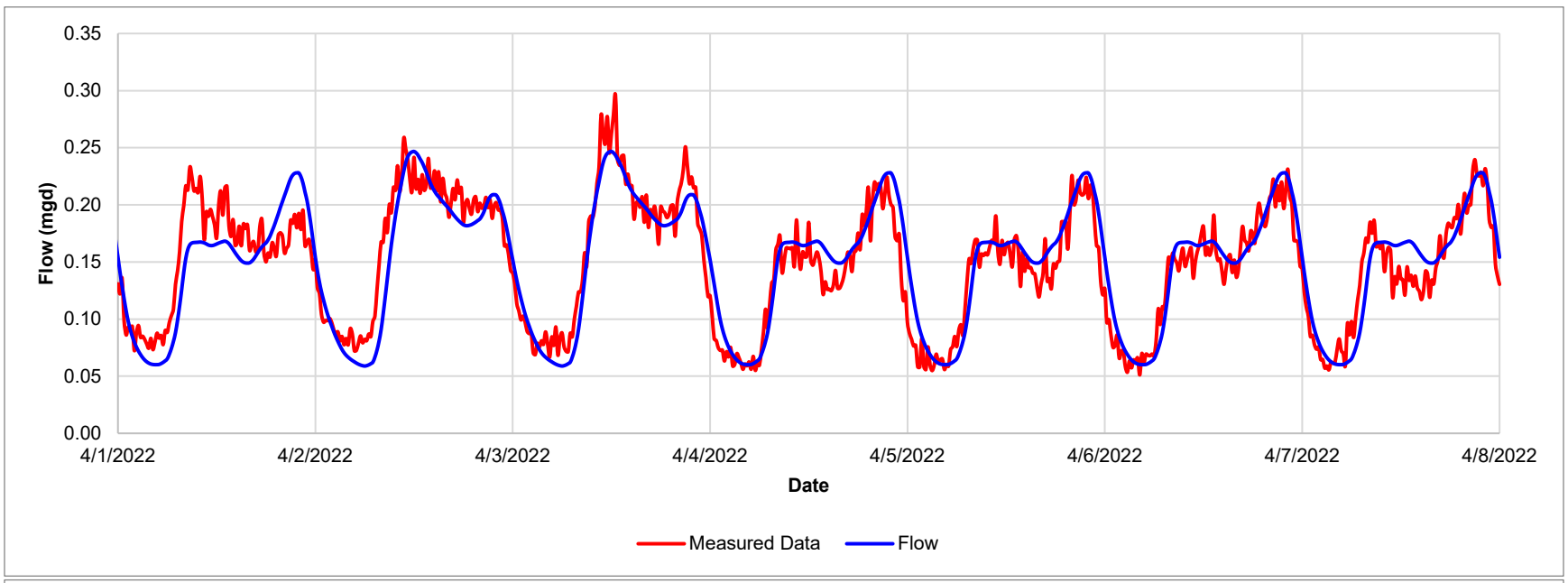


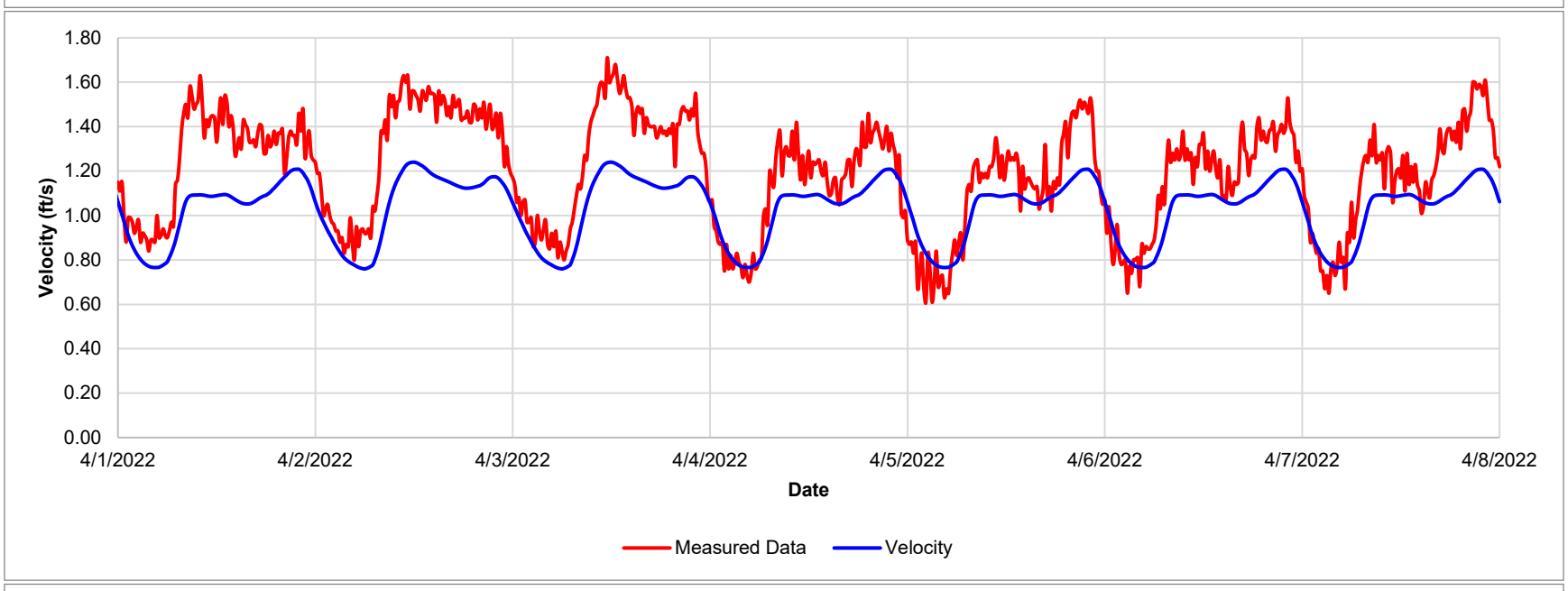


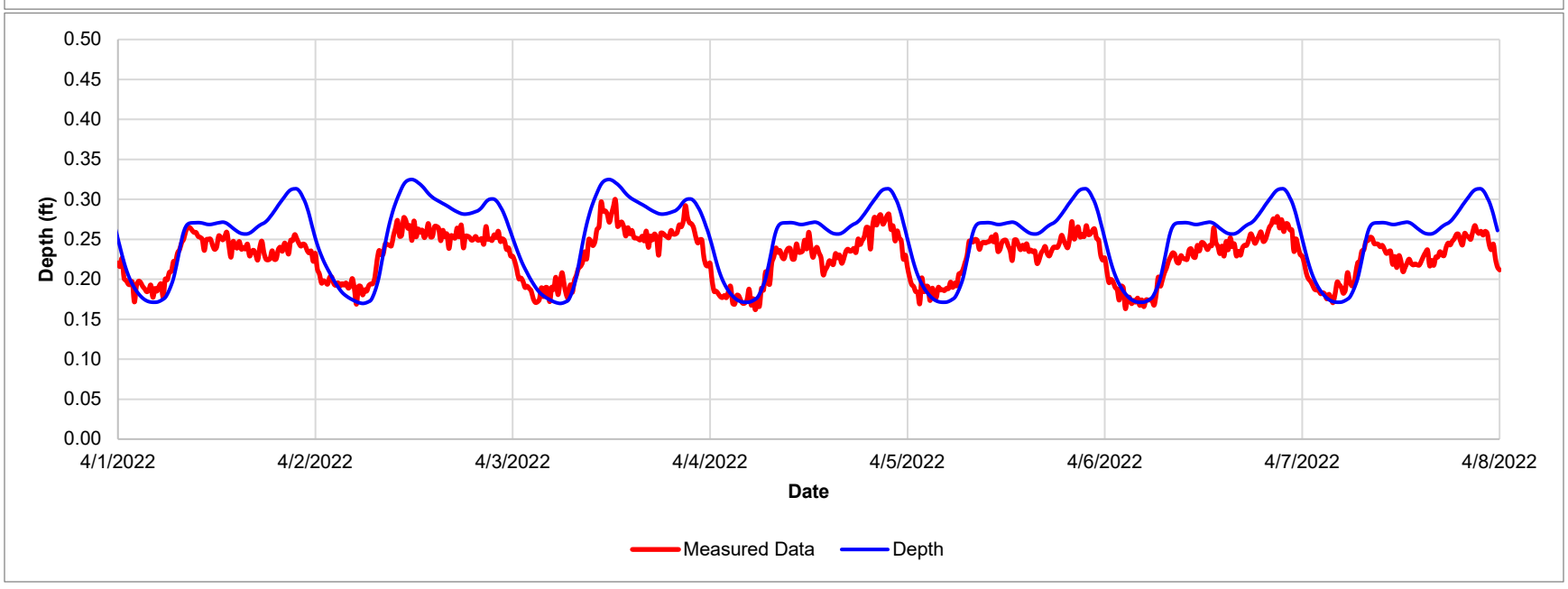


Site 5	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.22	1.27	0.13	0.11	0.35	0.46	0.09	54.2%	-63.8%	-31.5%	-15.3%
Min	0.05	0.35	0.00	0.00	0.20	0.07	0.01				
Avg	0.14	0.80	0.05	0.05	0.28	0.29	0.05	106.4%	-64.0%	-0.9%	-0.9%
Volume			94,259	94,236			93,387			-0.9%	-0.9%

1.6 SITE 6 – DWF

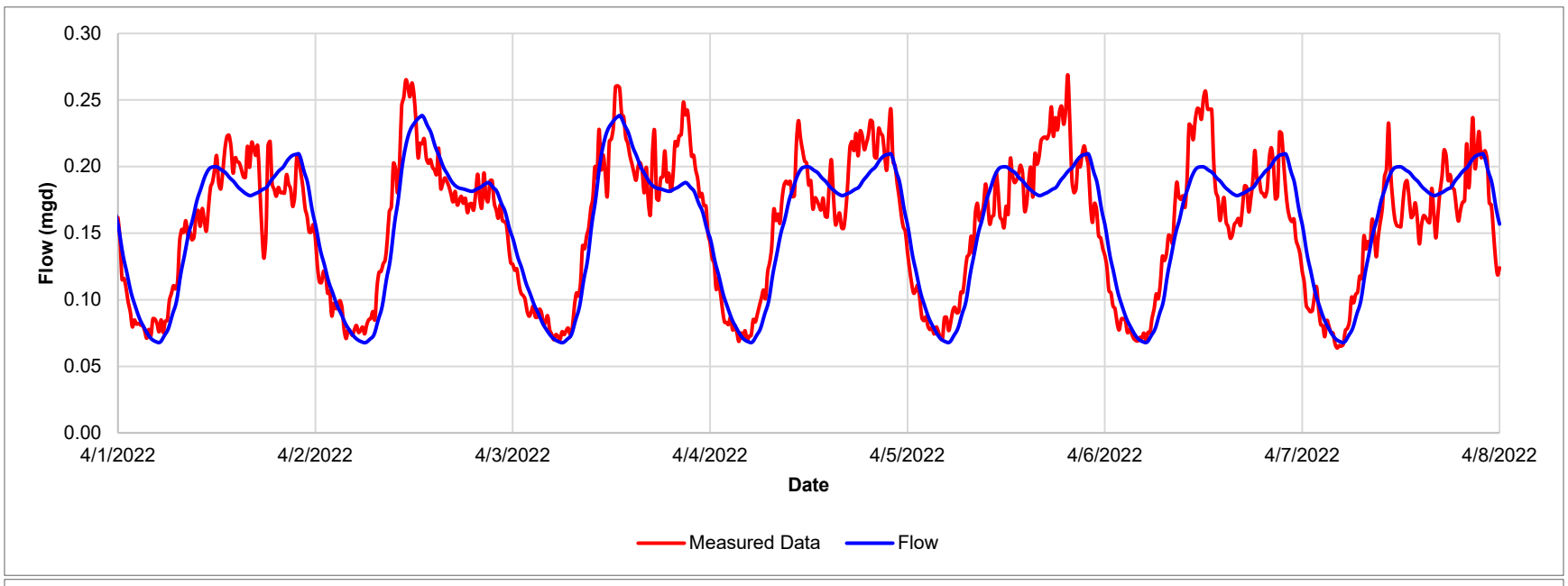


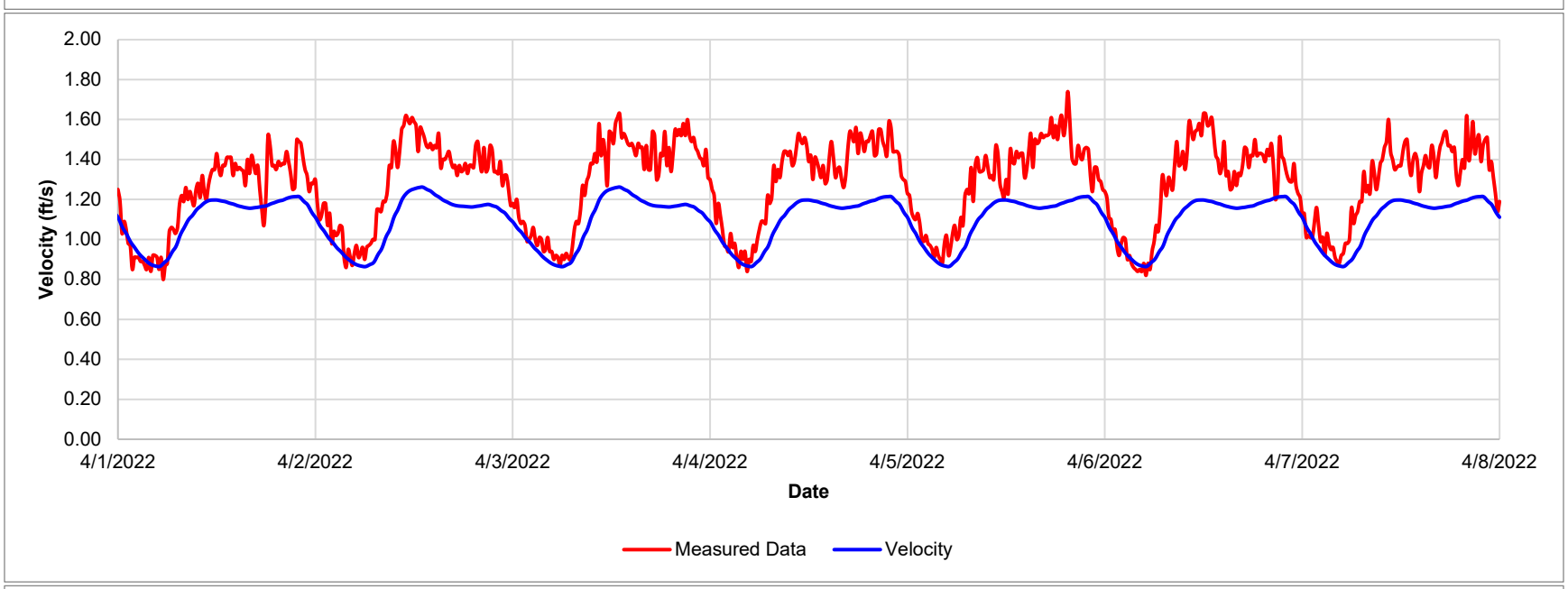


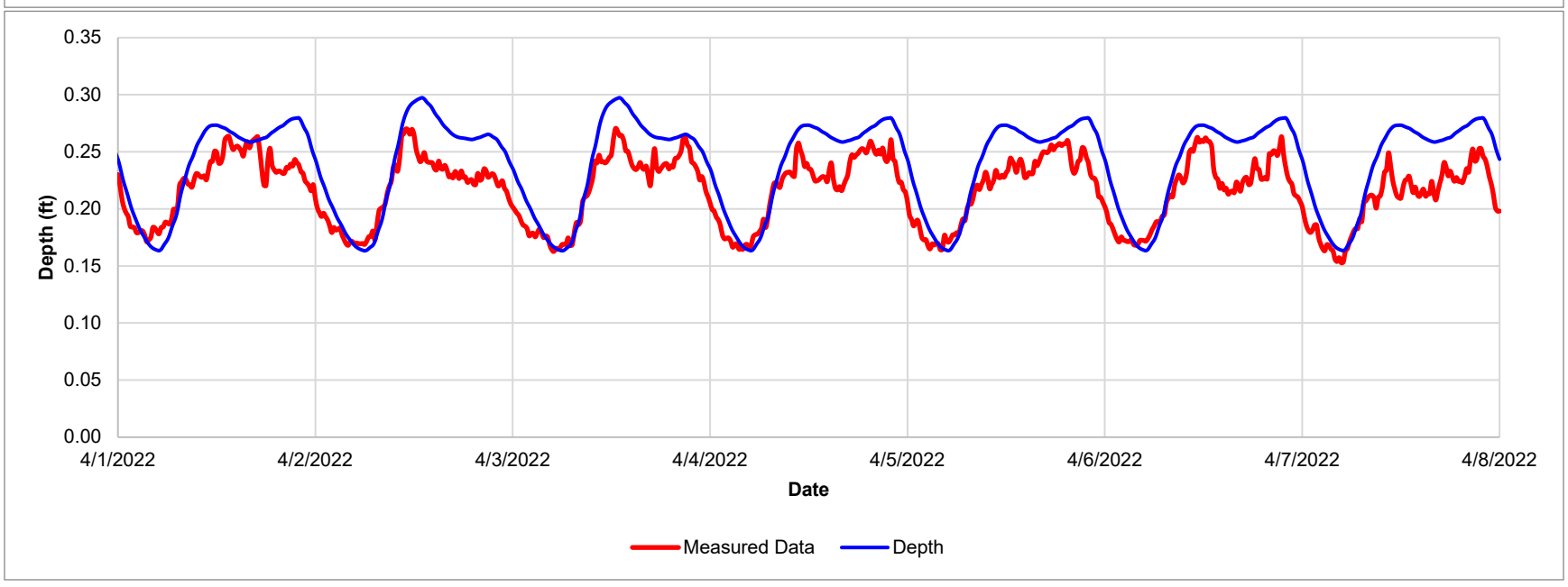


Site 6	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.30	1.71	0.30	0.27	0.32	1.24	0.25	8.6%	-27.5%	-16.6%	-8.8%
Min	0.16	0.61	0.05	0.06	0.17	0.76	0.06				
Avg	0.23	1.20	0.15	0.15	0.25	1.03	0.15	10.4%	-14.0%	0.1%	0.1%
Volume			297,889	297,899			298,133			0.1%	0.1%

1.7 SITE 7 – DWF

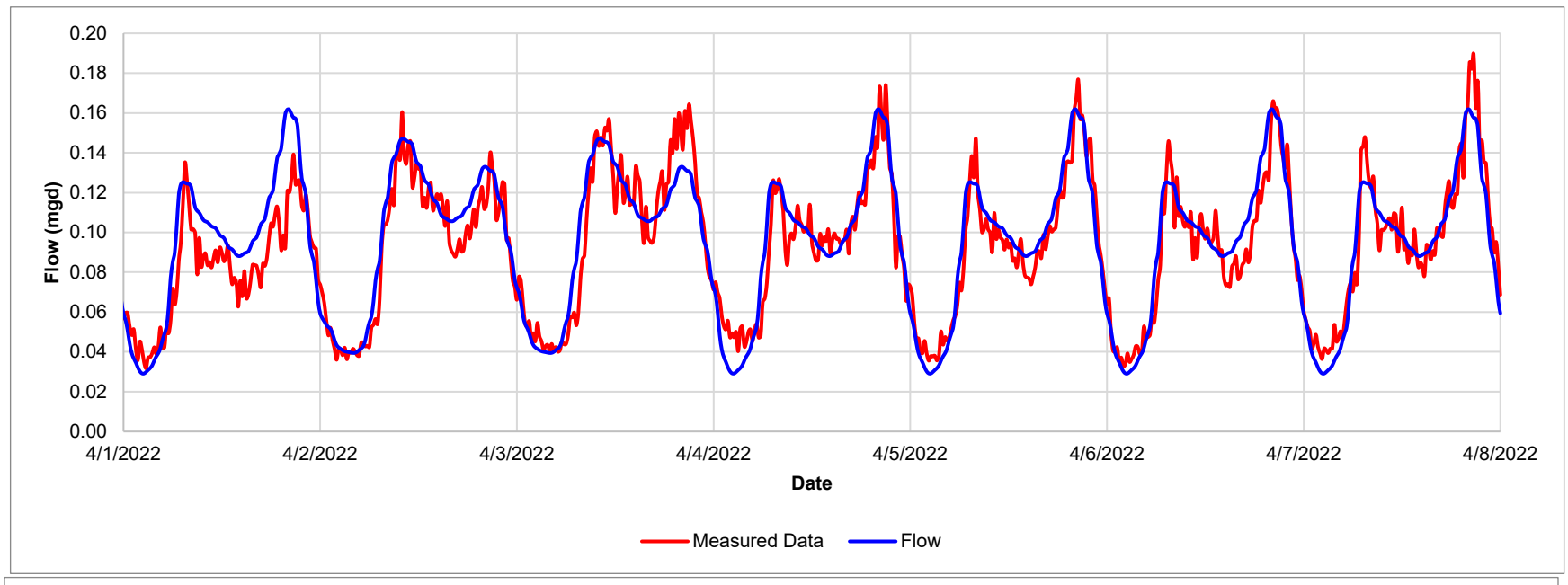


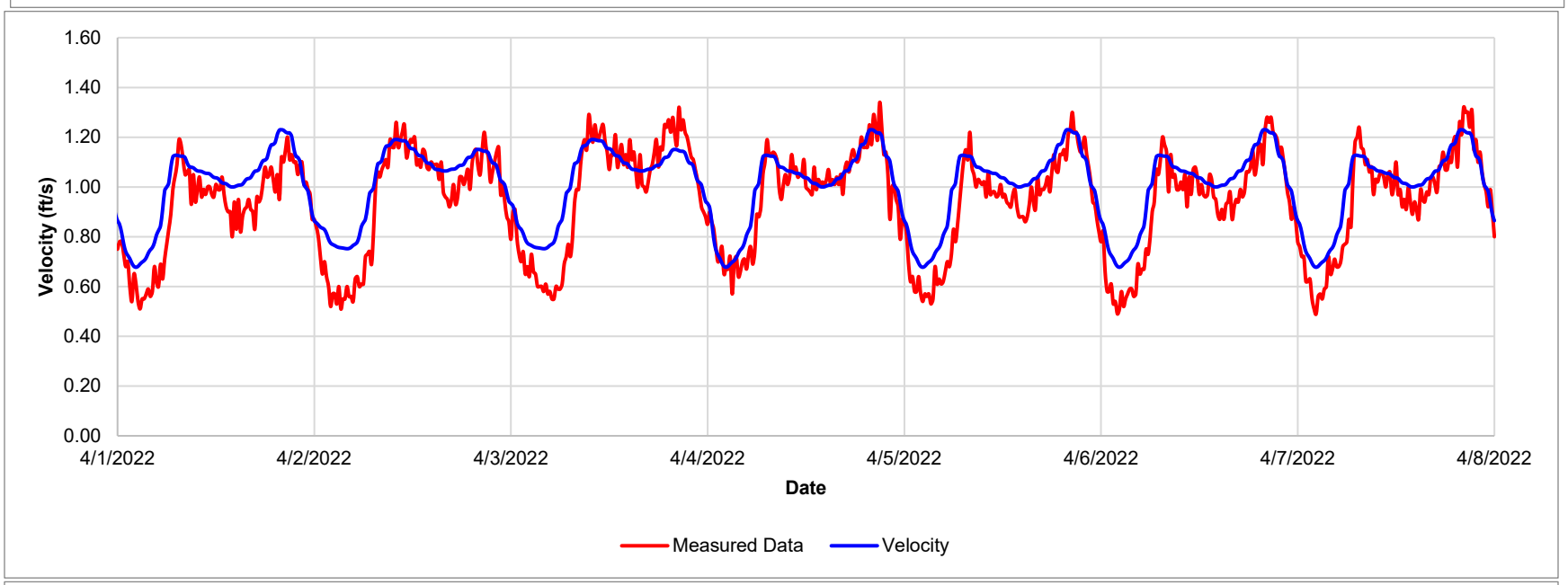


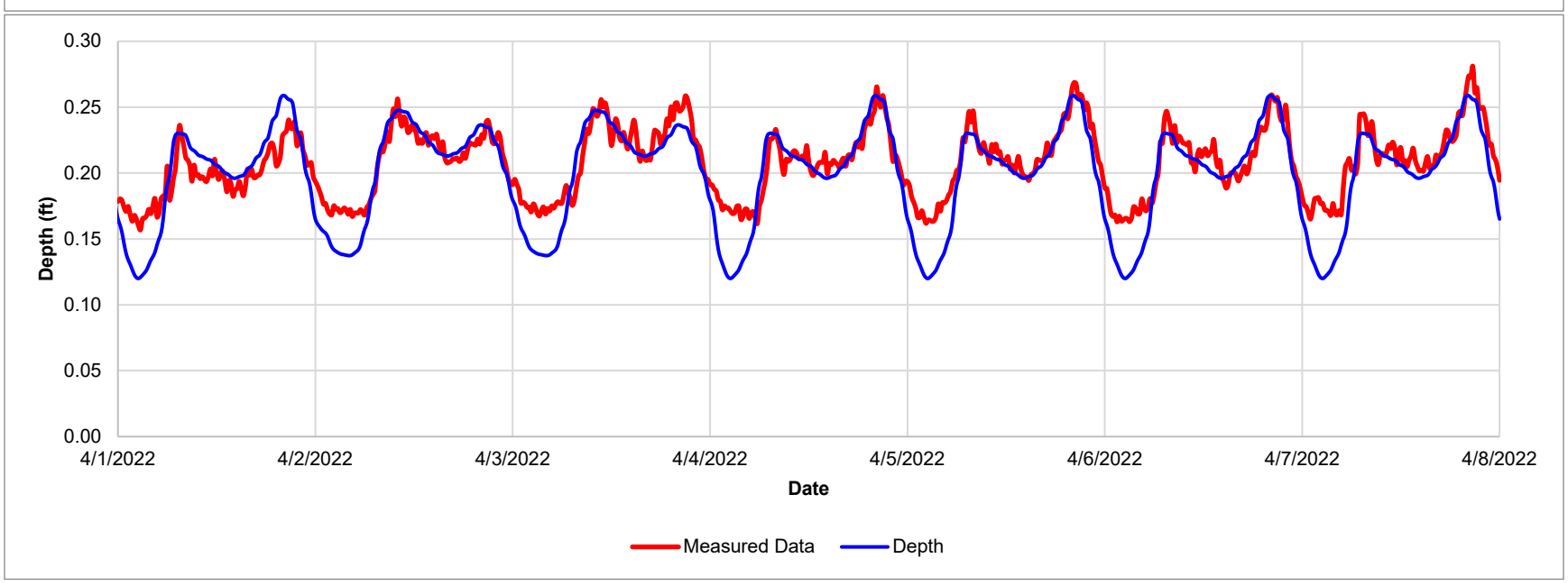


Site 7	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.27	1.74	0.27	0.26	0.30	1.26	0.24	10.0%	-27.5%	-11.4%	-8.4%
Min	0.15	0.80	0.06	0.07	0.16	0.86	0.07				
Avg	0.22	1.28	0.16	0.16	0.24	1.10	0.16	10.4%	-14.1%	-0.6%	-0.7%
Volume			313,823	313,895			311,830			-0.6%	-0.7%

1.8 SITE 8 – DWF

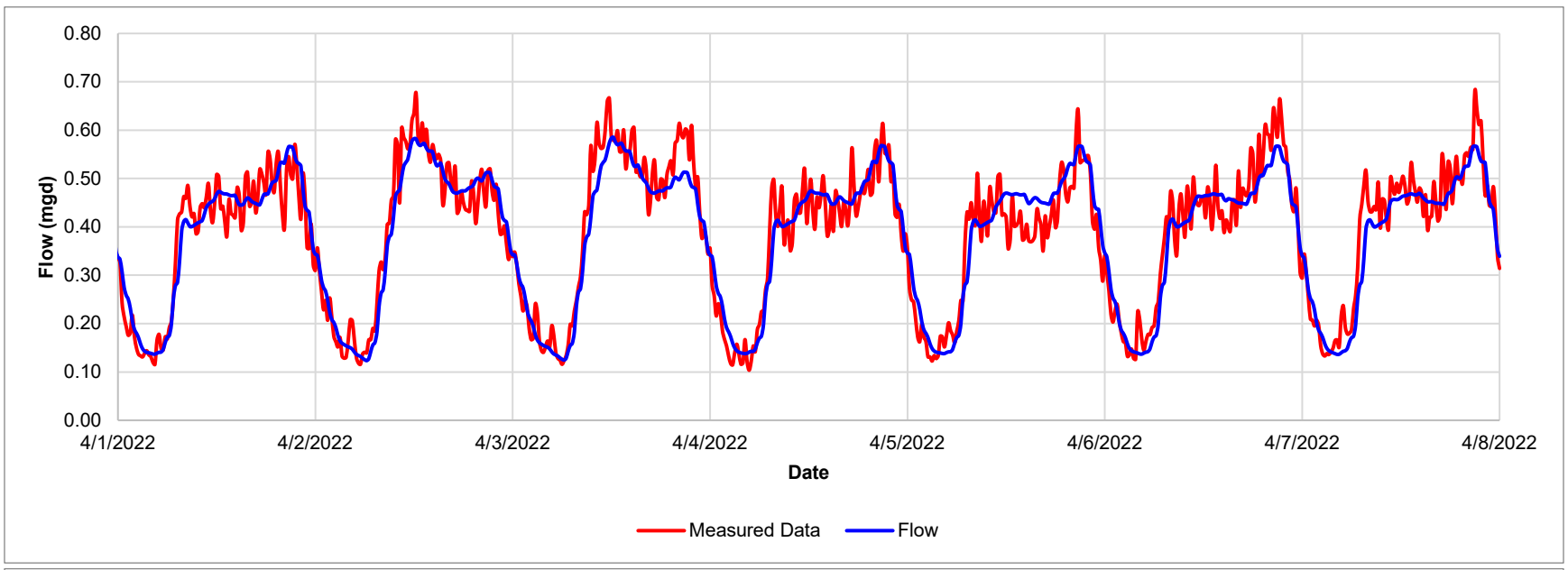


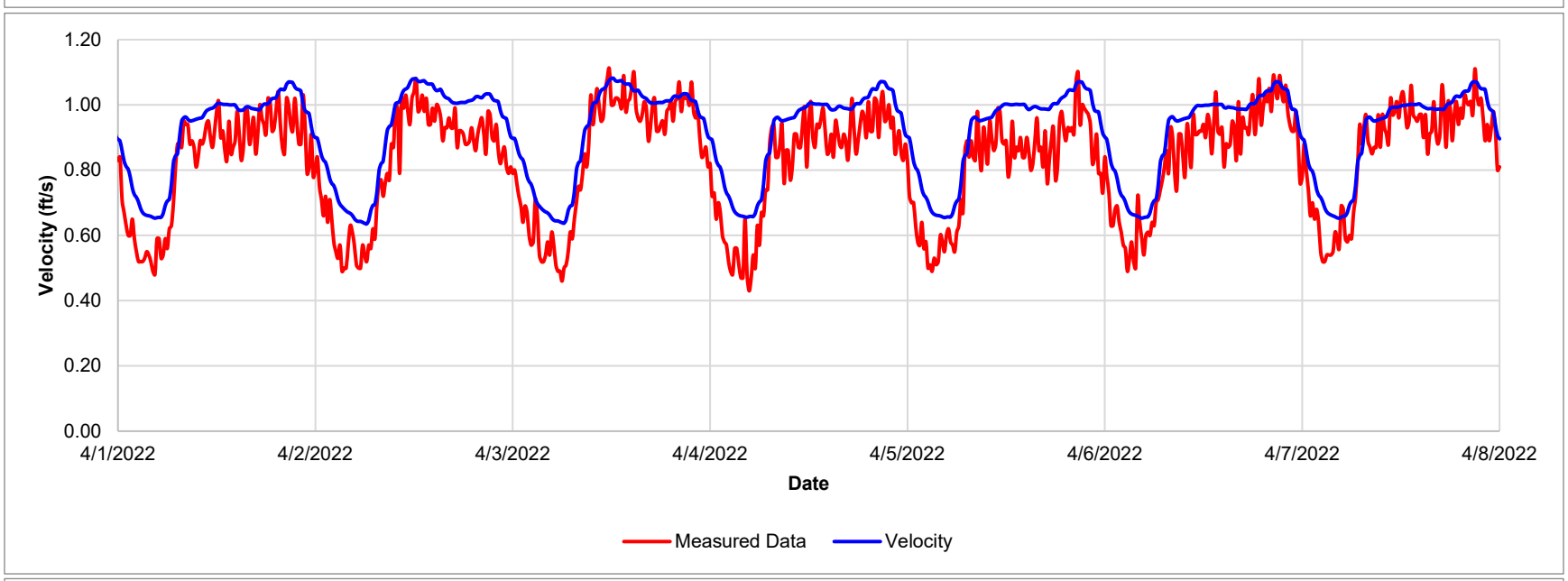


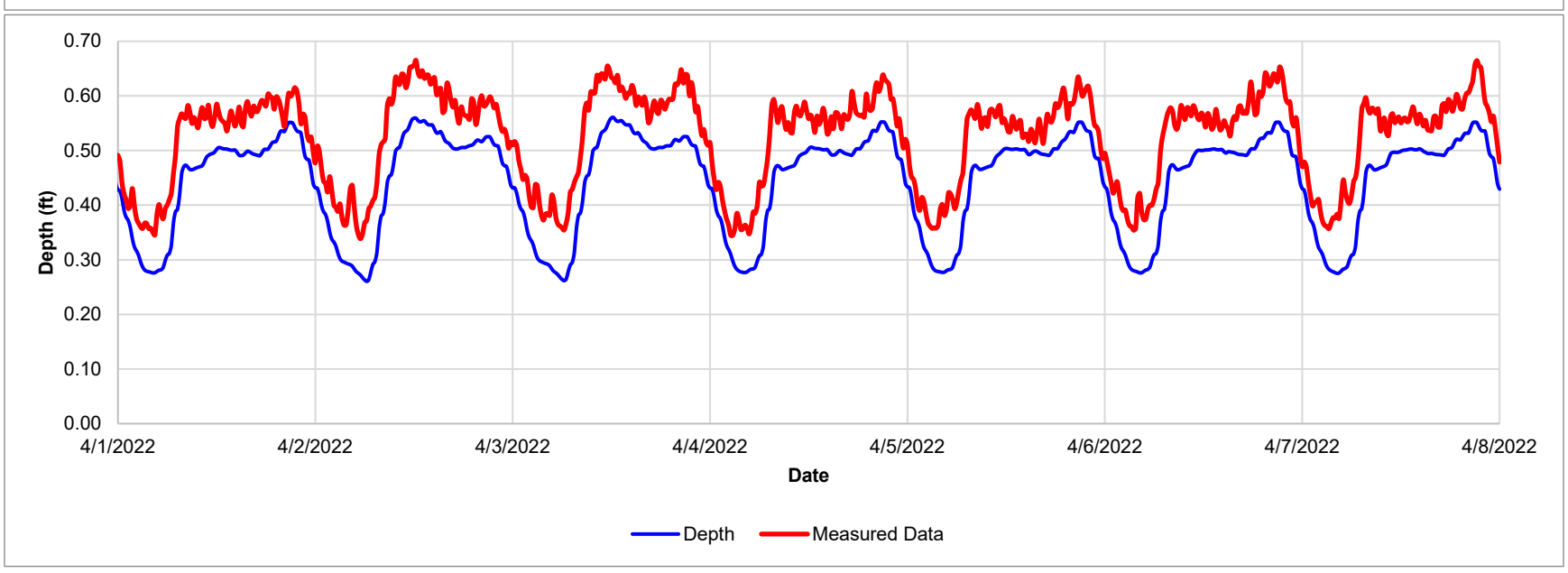


Site 8	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.28	1.34	0.19	0.19	0.26	1.23	0.16	-6.8%	-8.2%	-14.6%	-14.0%
Min	0.16	0.49	0.03	0.04	0.12	0.68	0.03				
Avg	0.21	0.94	0.09	0.10	0.20	1.01	0.10	-5.9%	6.5%	2.9%	-5.9%
Volume			185,394	202,746			190,737			2.9%	-5.9%

1.9 SITE 9 – DWF

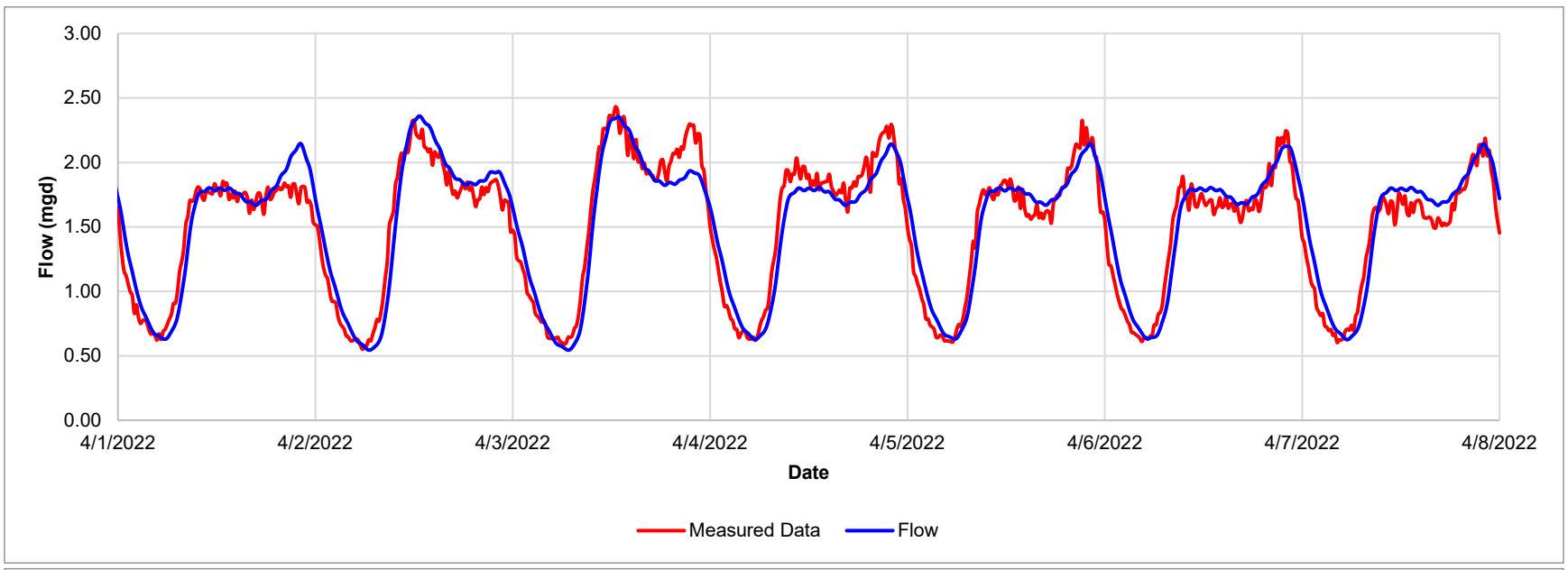


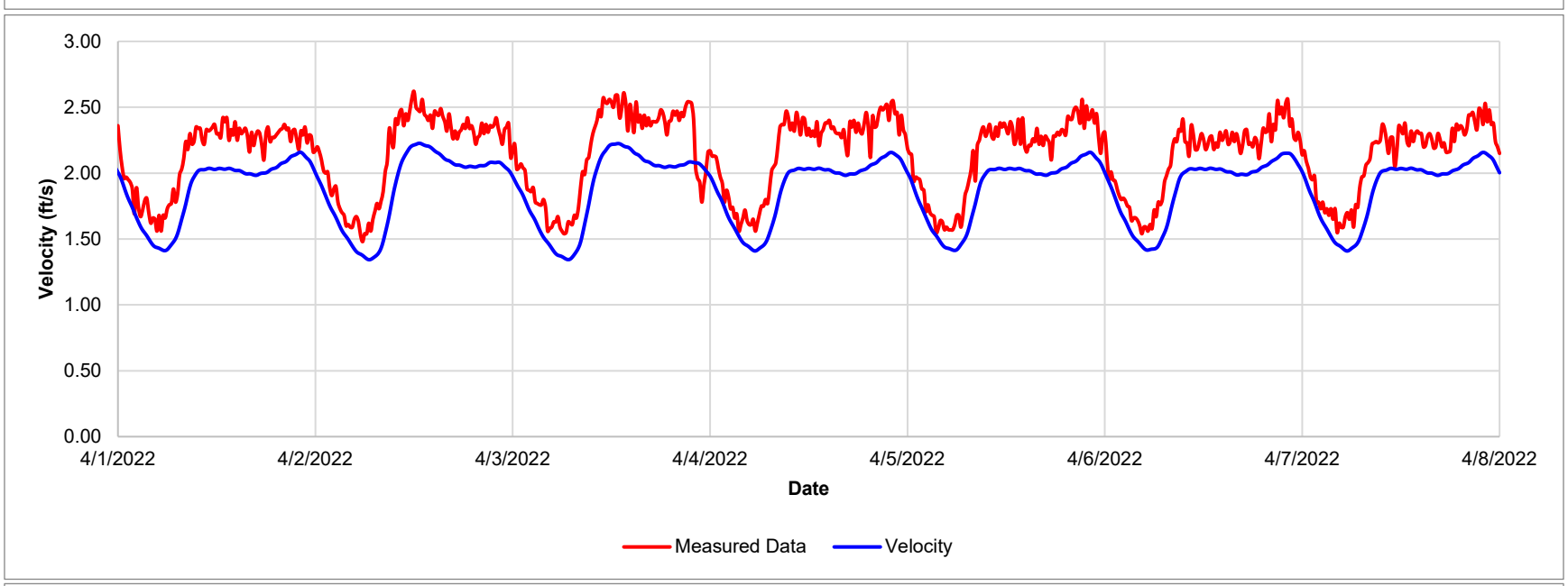


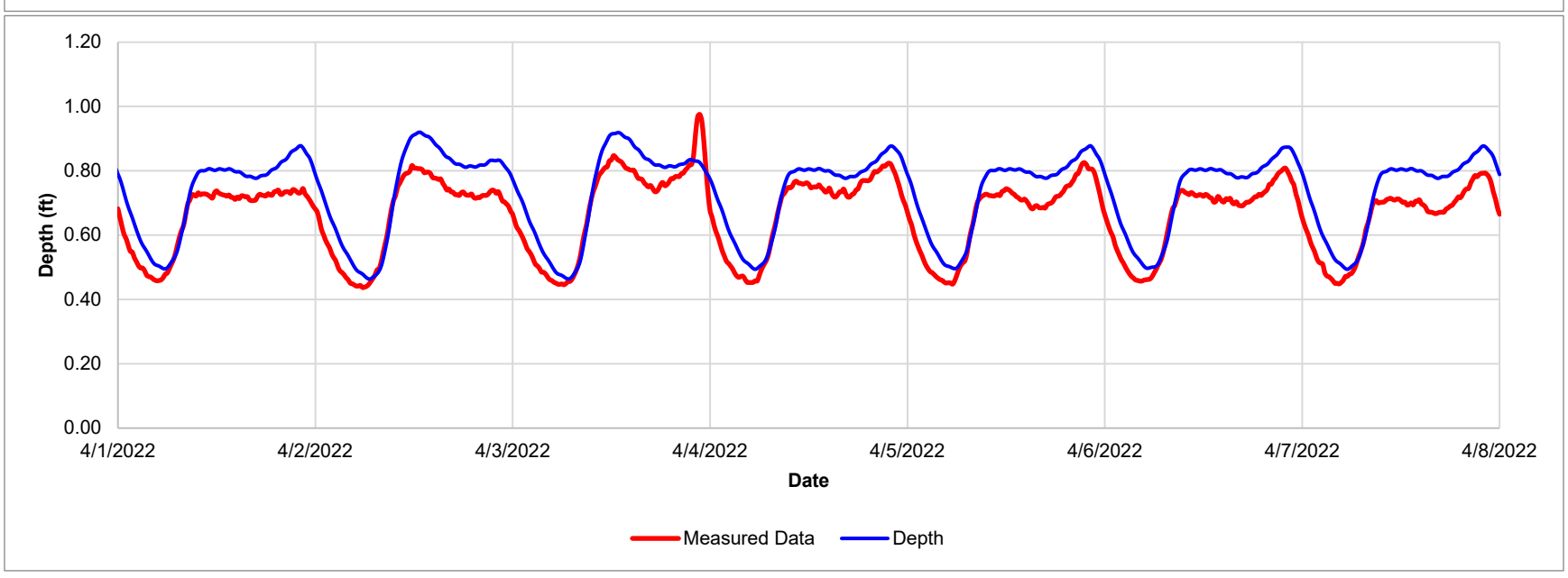


Site 9	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.67	1.11	0.68	0.64	0.56	1.08	0.59	-15.7%	-2.6%	-14.2%	-8.4%
Min	0.34	0.43	0.10	0.12	0.26	0.64	0.12				
Avg	0.52	0.83	0.39	0.39	0.45	0.92	0.38	-15.1%	10.4%	-1.4%	-1.4%
Volume			774,240	774,280			763,615			-1.4%	-1.4%

1.10 SITE 10 – DWF

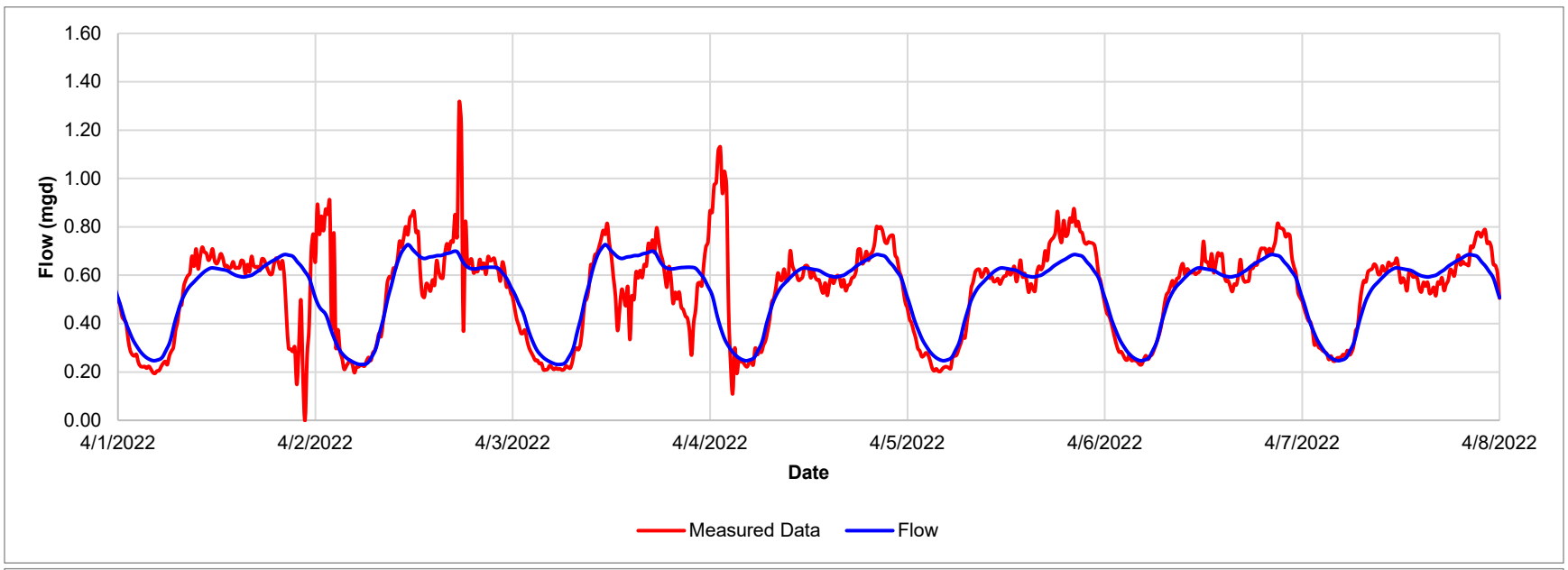


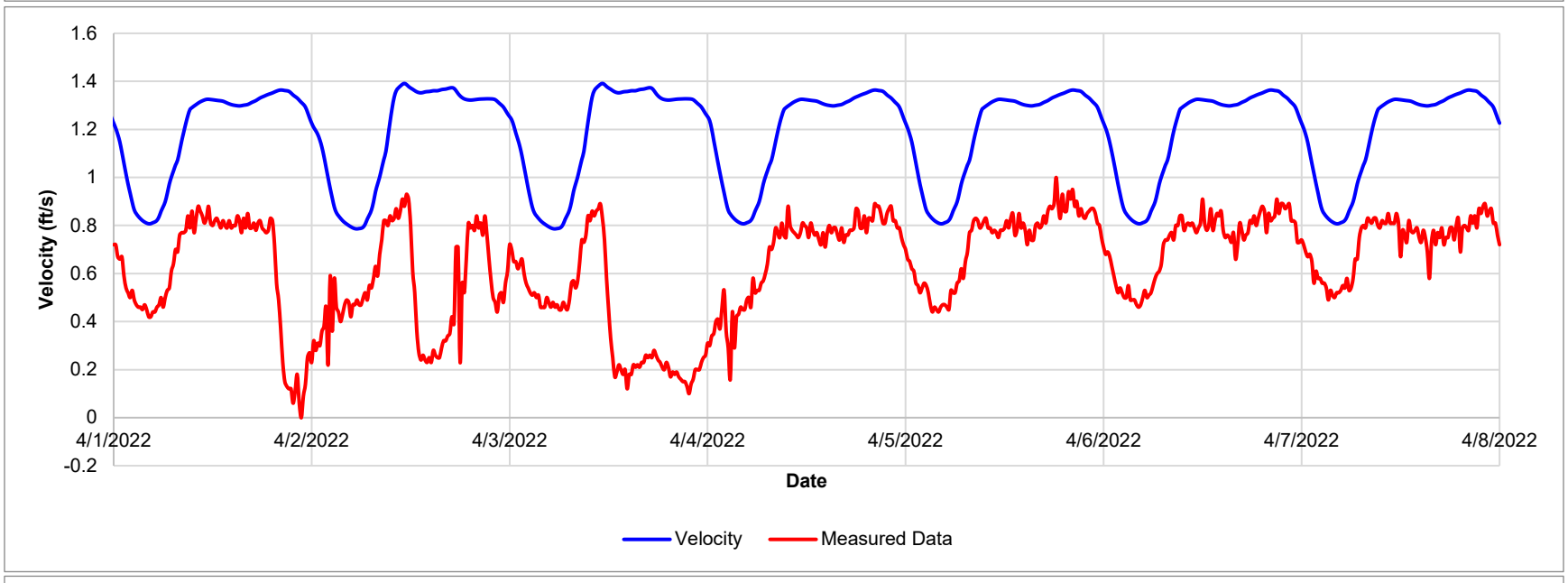


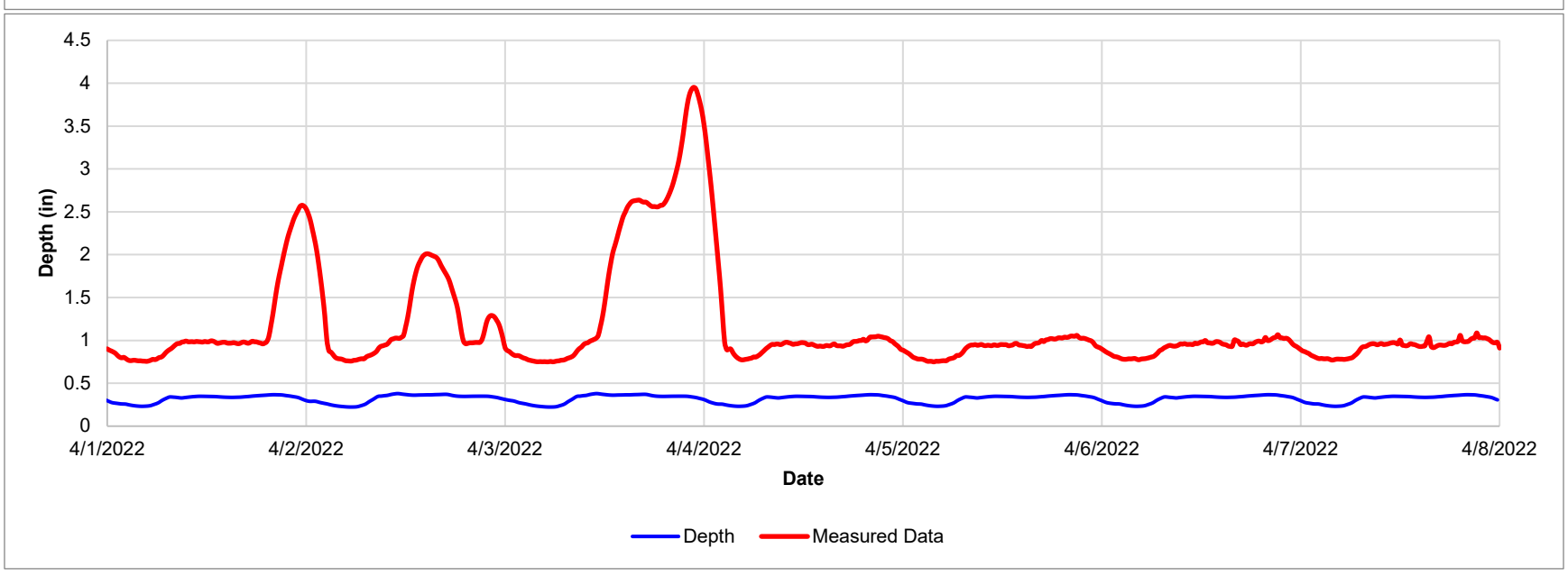


Site 10	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.98	2.62	2.43	2.39	0.92	2.23	2.36	-5.7%	-15.0%	-3.0%	-1.3%
Min	0.44	1.48	0.55	0.57	0.46	1.34	0.54				
Avg	0.66	2.14	1.50	1.50	0.73	1.89	1.52	10.2%	-11.9%	0.9%	0.9%
Volume			3,003,787	3,003,928			3,032,272			0.9%	0.9%

1.11 SITE 11 – DWF

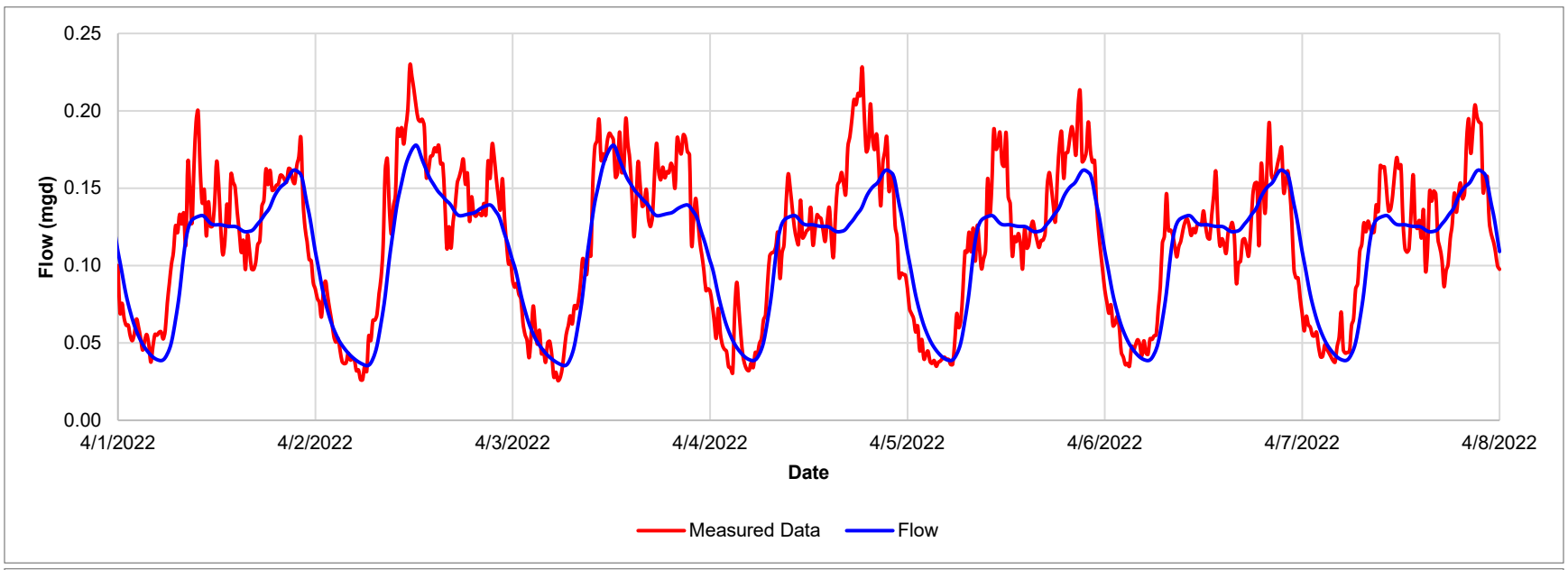


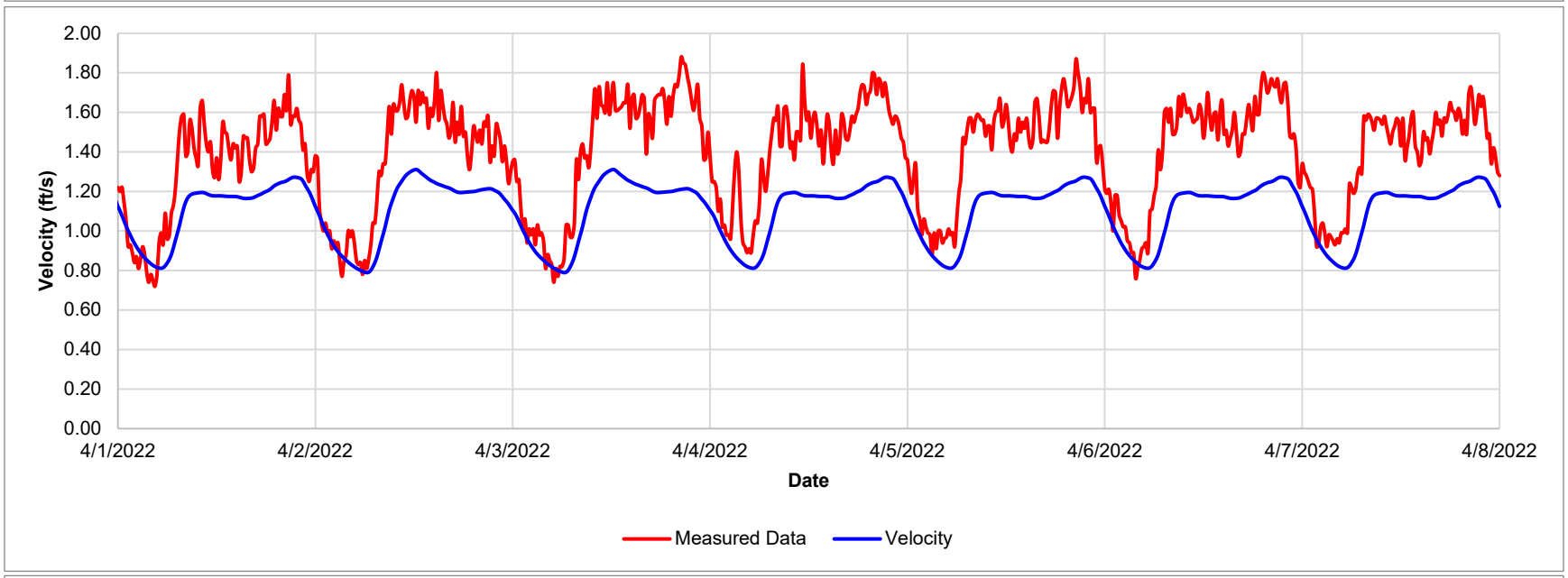


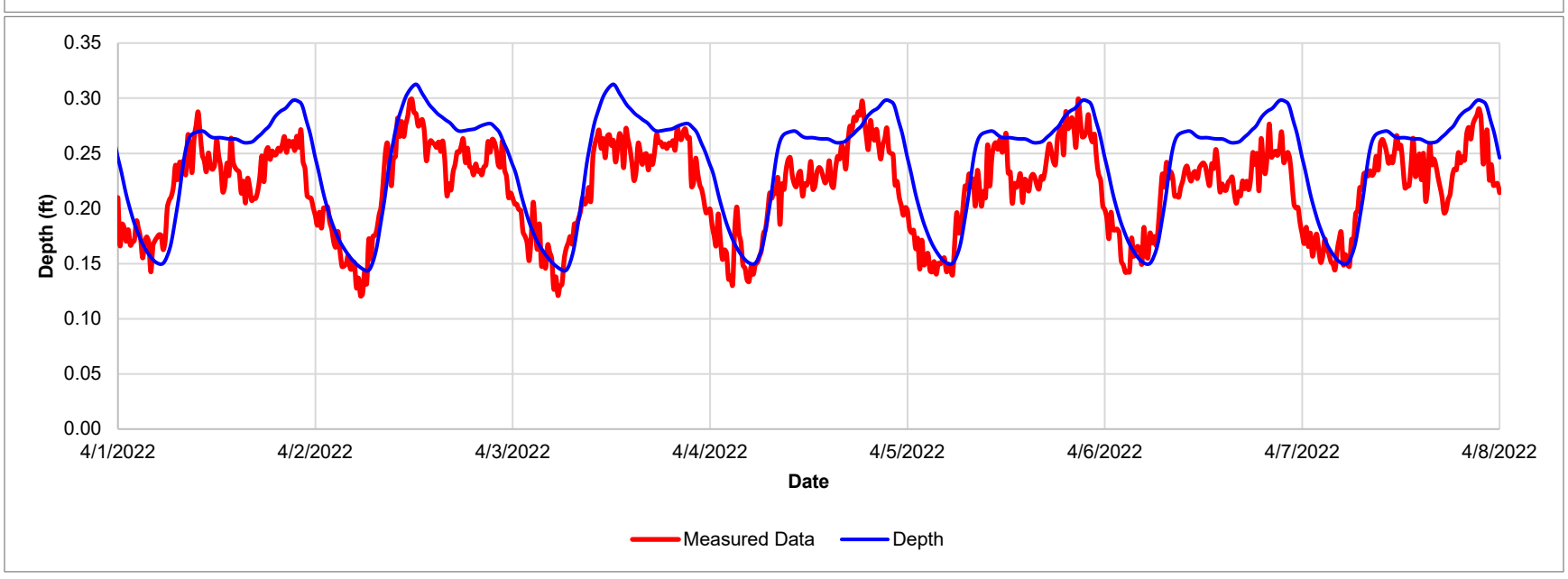


Site 11	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	3.95	1.00	1.31	1.05	0.38	1.39	0.73	-90.4%	39.1%	-44.7%	-31.0%
Min	0.75	0.00	0.00	0.20	0.22	0.79	0.23				
Avg	1.15	0.63	0.53	0.53	0.32	1.19	0.53	-72.2%	87.7%	-1.2%	-1.2%
Volume			1,068,346	1,068,364			1,055,486			-1.2%	-1.2%

1.12 SITE 12 – DWF

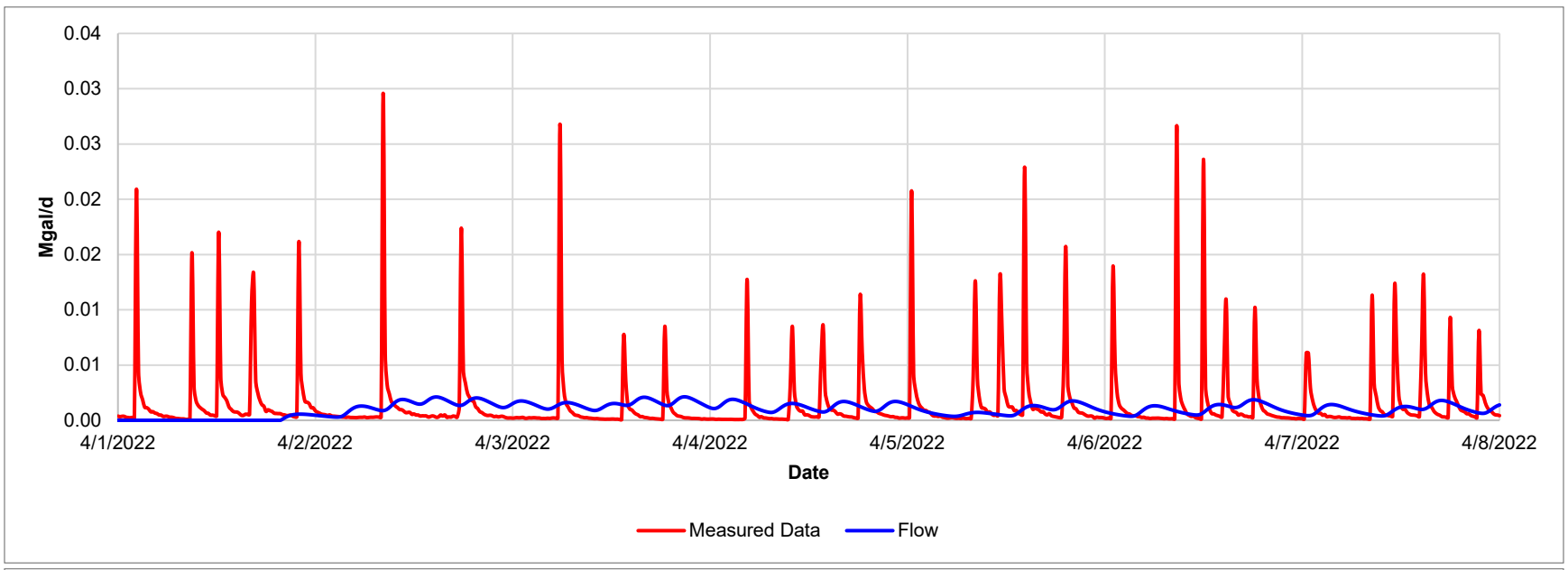


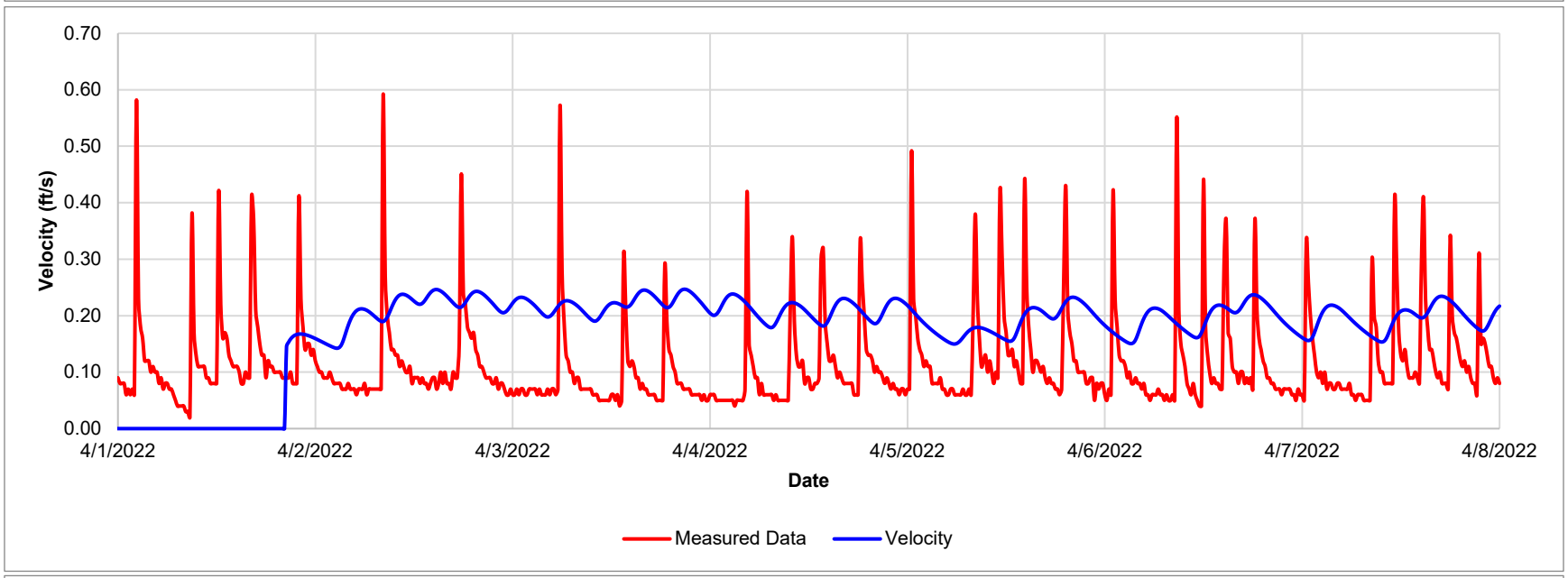


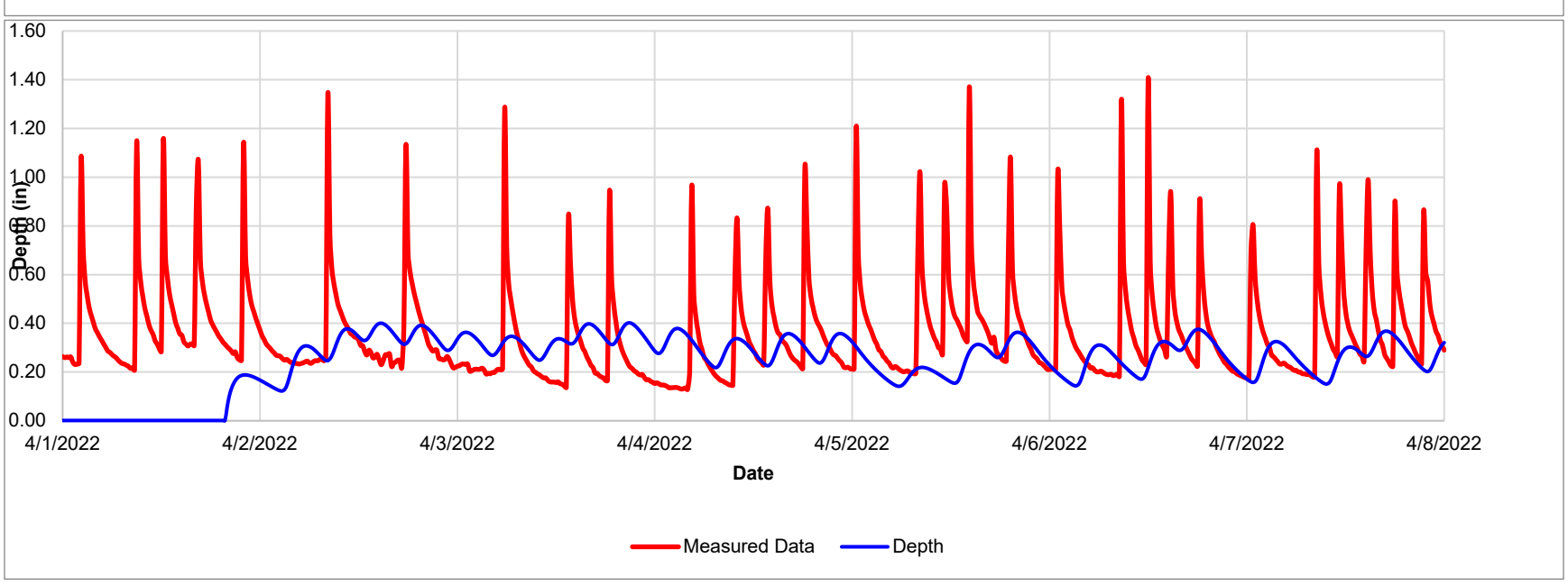


Site 12	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.30	1.82	0.23	0.22	0.31	1.31	0.18	4.5%	-28.0%	-22.5%	-18.0%
Min	0.12	0.70	0.03	0.03	0.14	0.79	0.04				
Avg	0.22	1.33	0.12	0.12	0.24	1.11	0.11	10.5%	-16.9%	-5.4%	-5.4%
Volume			231,775	231,815			219,349			-5.4%	-5.4%

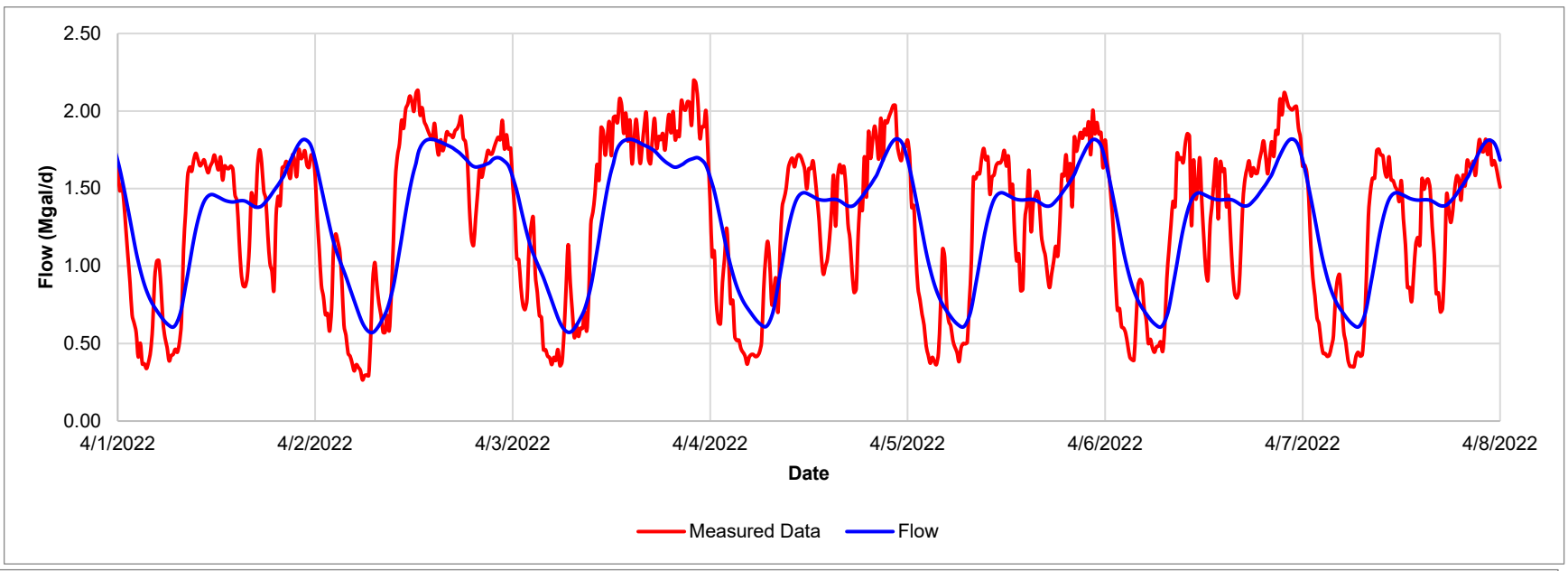
1.13 SITE 13 – DWF (FLOW DATA COULD NOT BE USED)

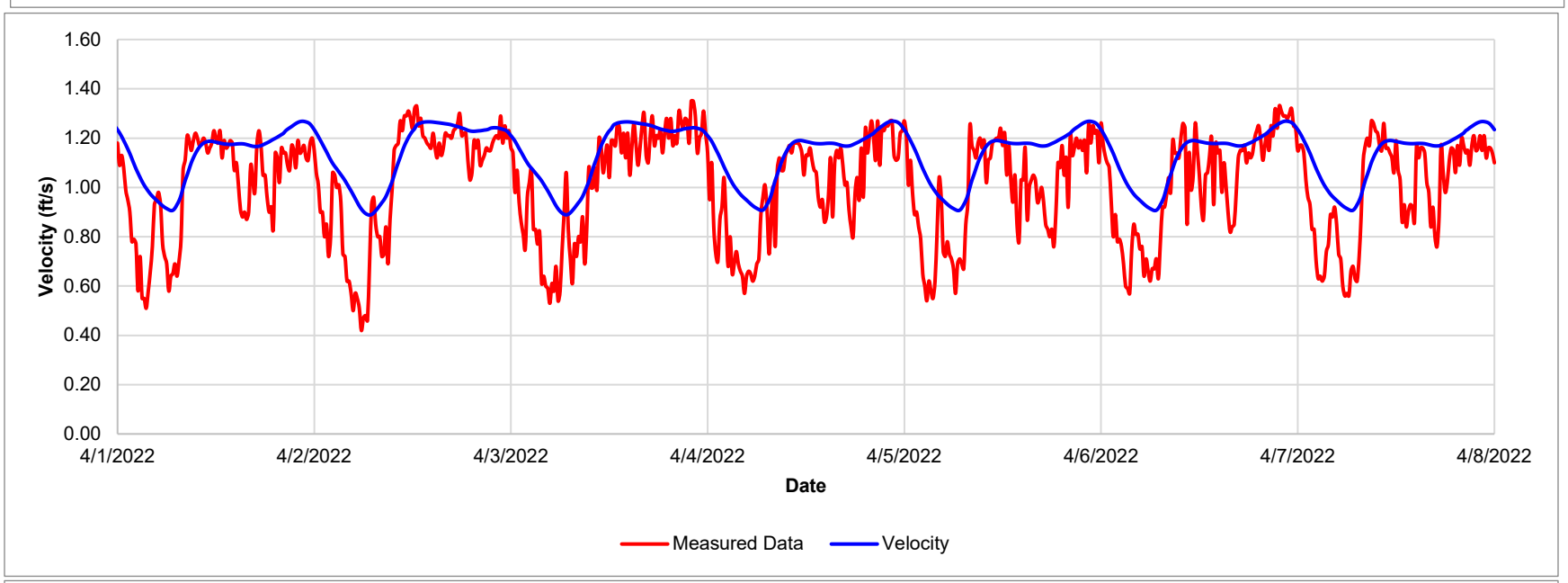


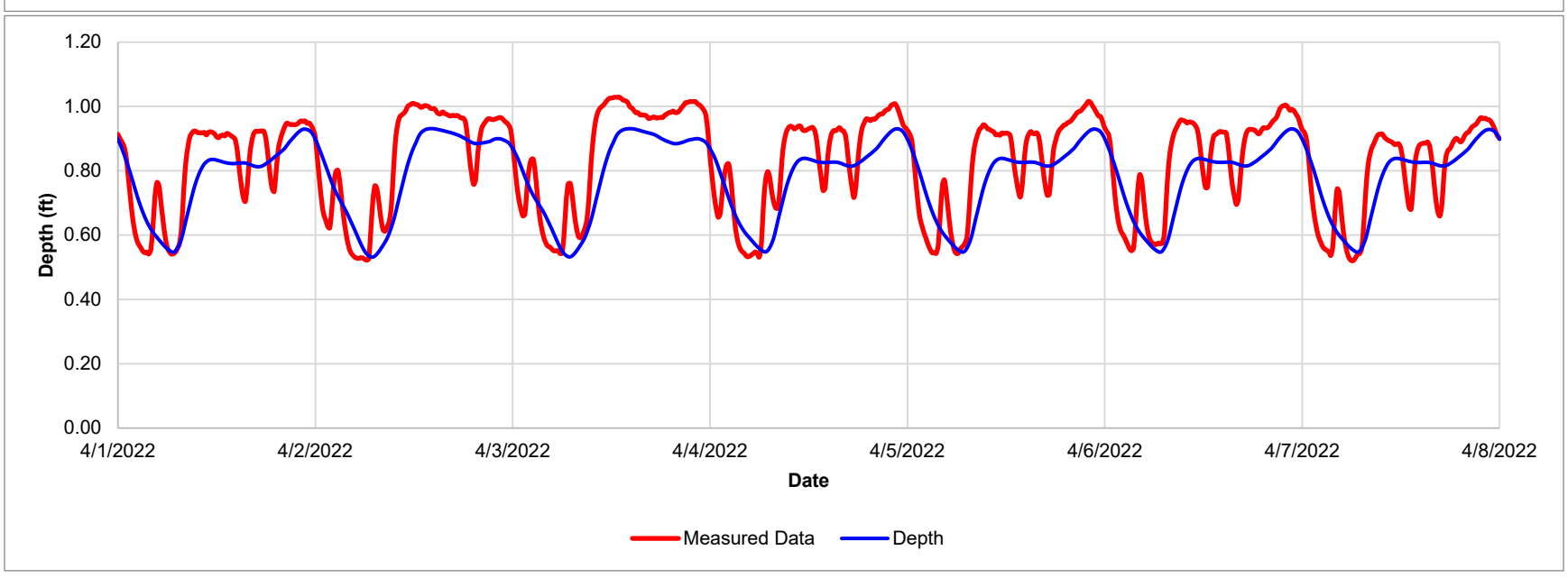




1.14 SITE 14 – DWF

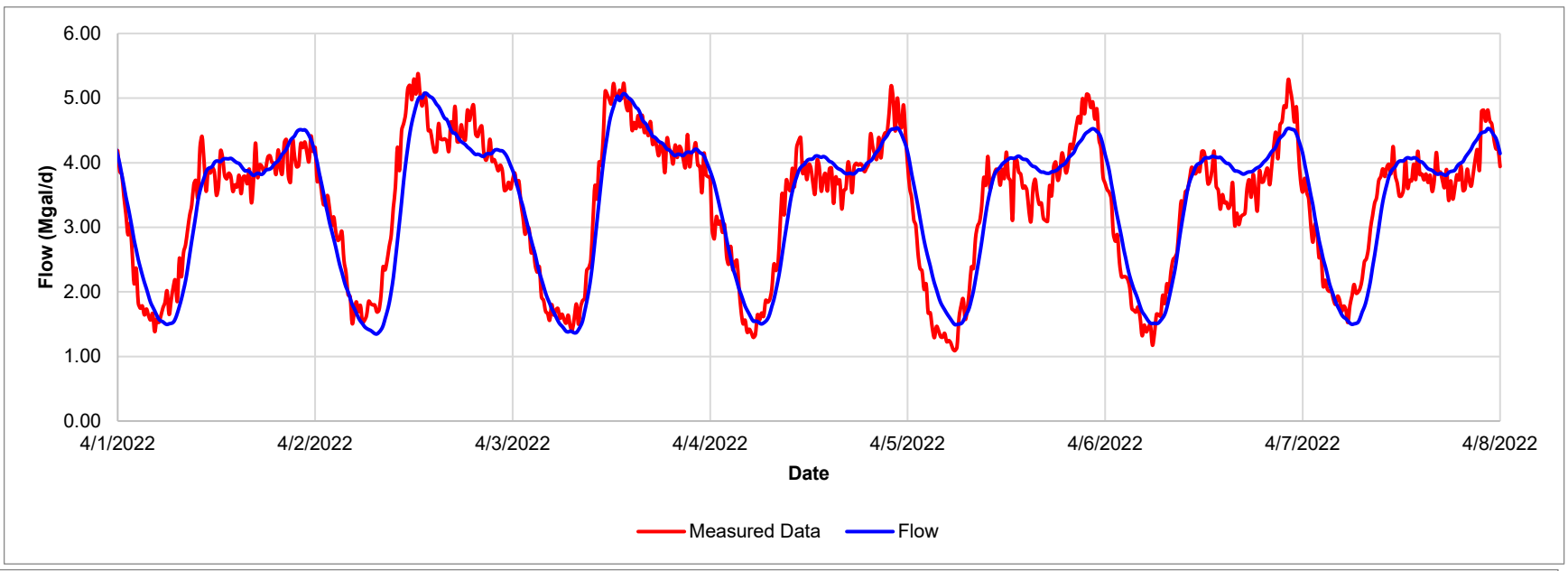


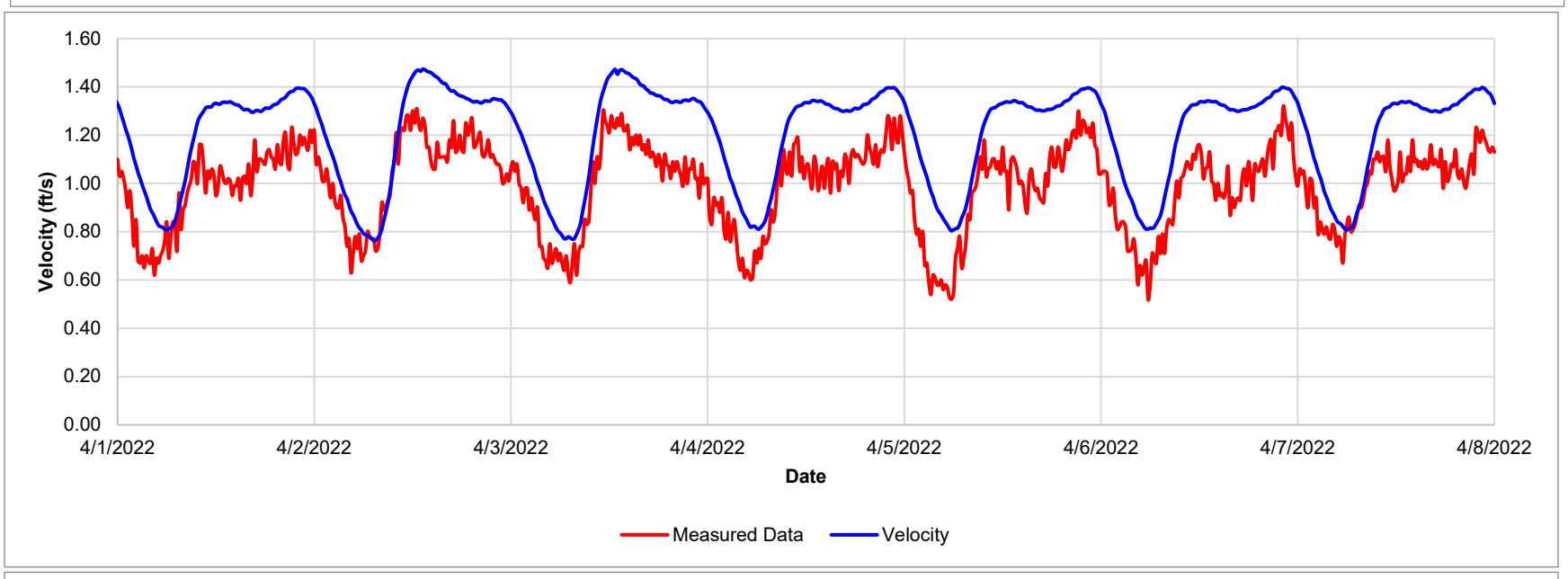


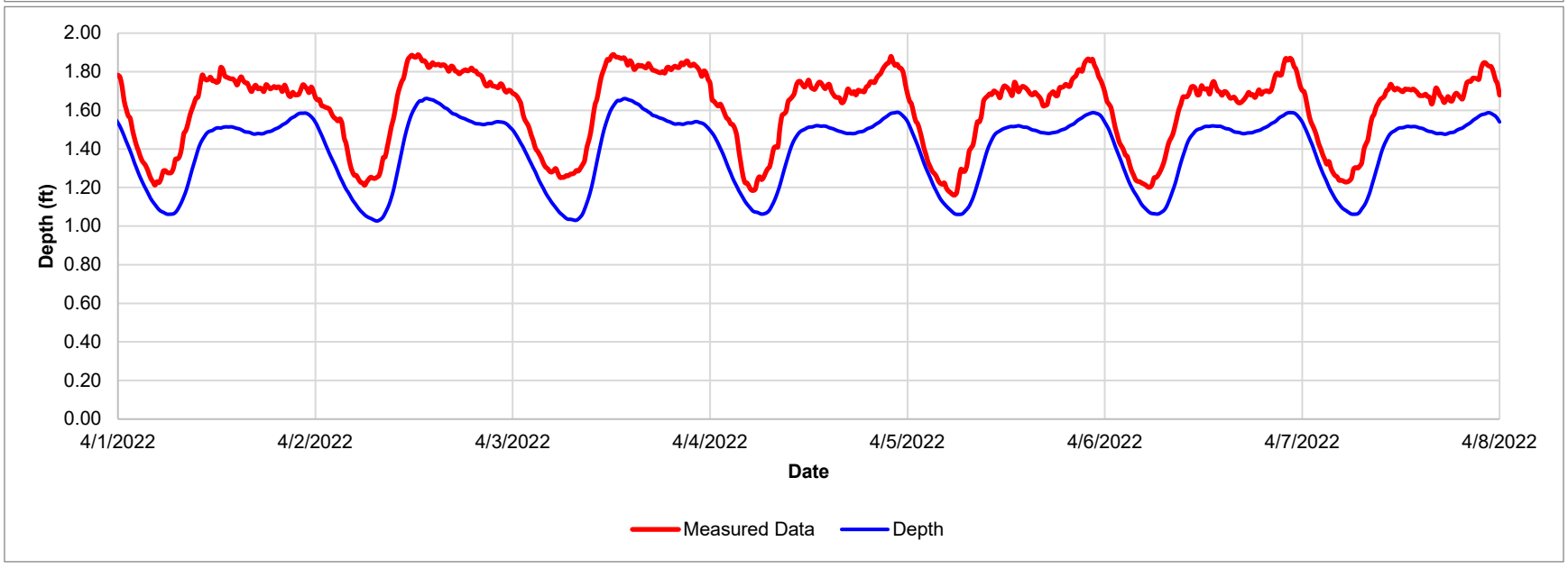


Site 14	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	1.03	1.35	2.20	2.09	0.93	1.27	1.82	-9.5%	-6.0%	-17.2%	-12.9%
Min	0.52	0.42	0.27	0.29	0.53	0.89	0.57				
Avg	0.83	1.01	1.29	1.29	0.78	1.13	1.31	-5.3%	12.5%	1.0%	1.0%
Volume			2,583,853	2,584,016			2,610,837			1.0%	1.0%

1.15 SITE 15 – DWF

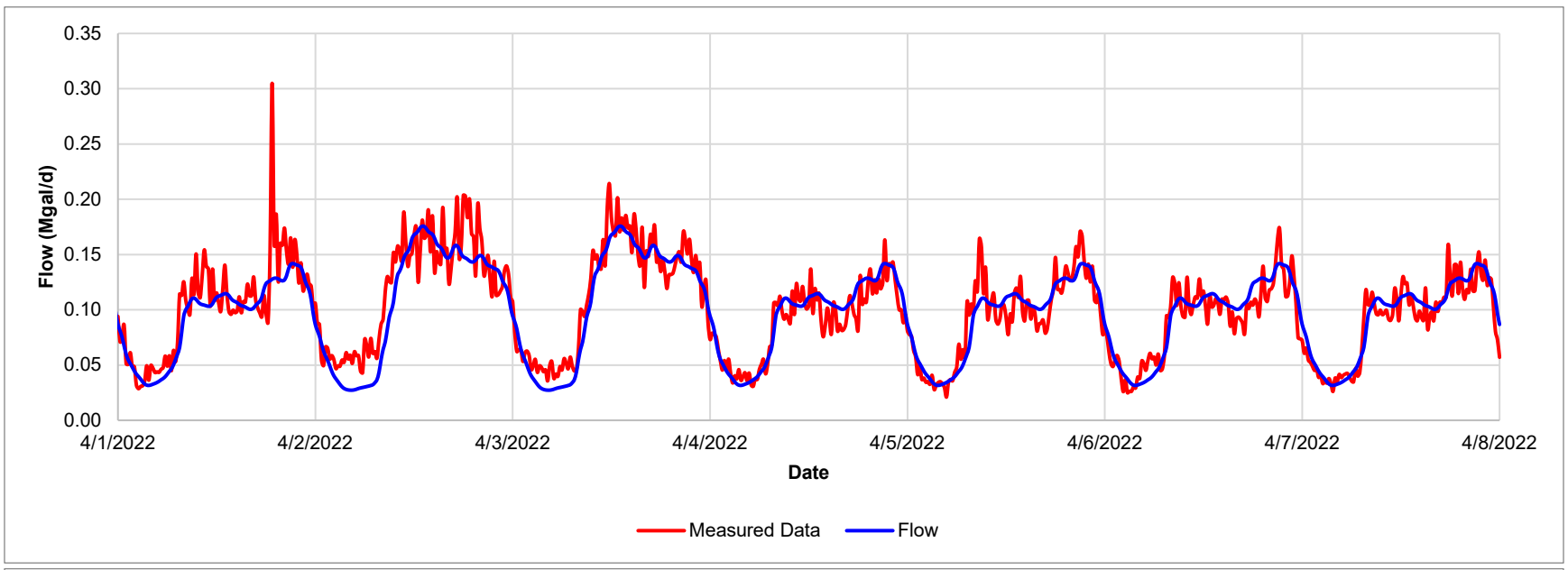


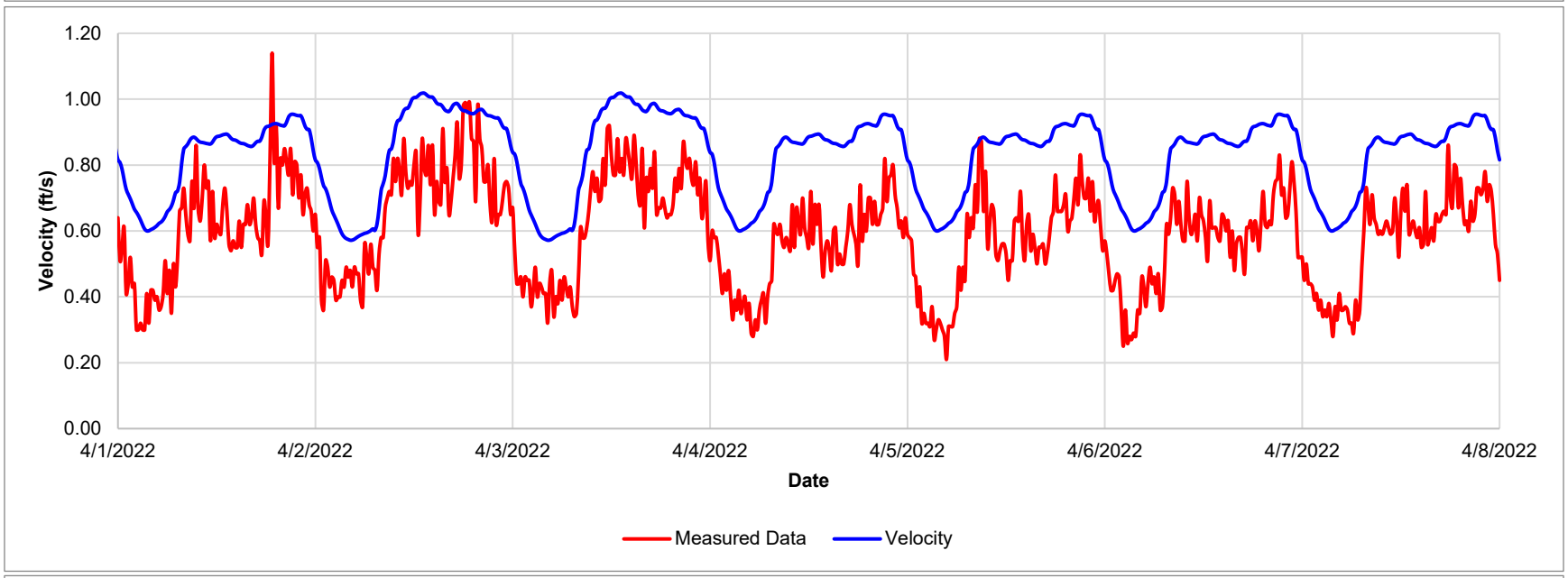


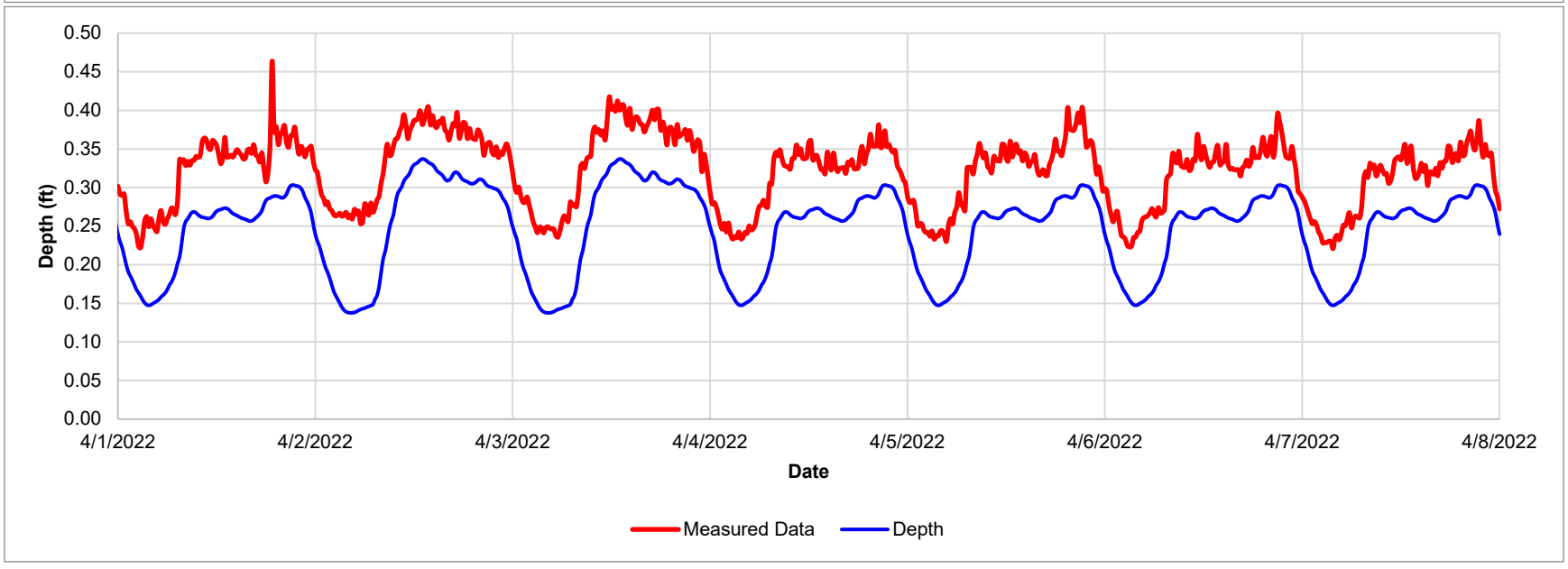


Site 15	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	1.89	1.32	5.38	5.20	1.66	1.47	5.07	-12.1%	11.6%	-5.7%	-2.4%
Min	1.16	0.52	1.09	1.14	1.03	0.76	1.35				
Avg	1.61	0.99	3.37	3.37	1.40	1.20	3.39	-13.1%	21.5%	0.6%	0.6%
Volume			6,737,862	6,737,926			6,778,918			0.6%	0.6%

1.16 SITE 16 – DWF

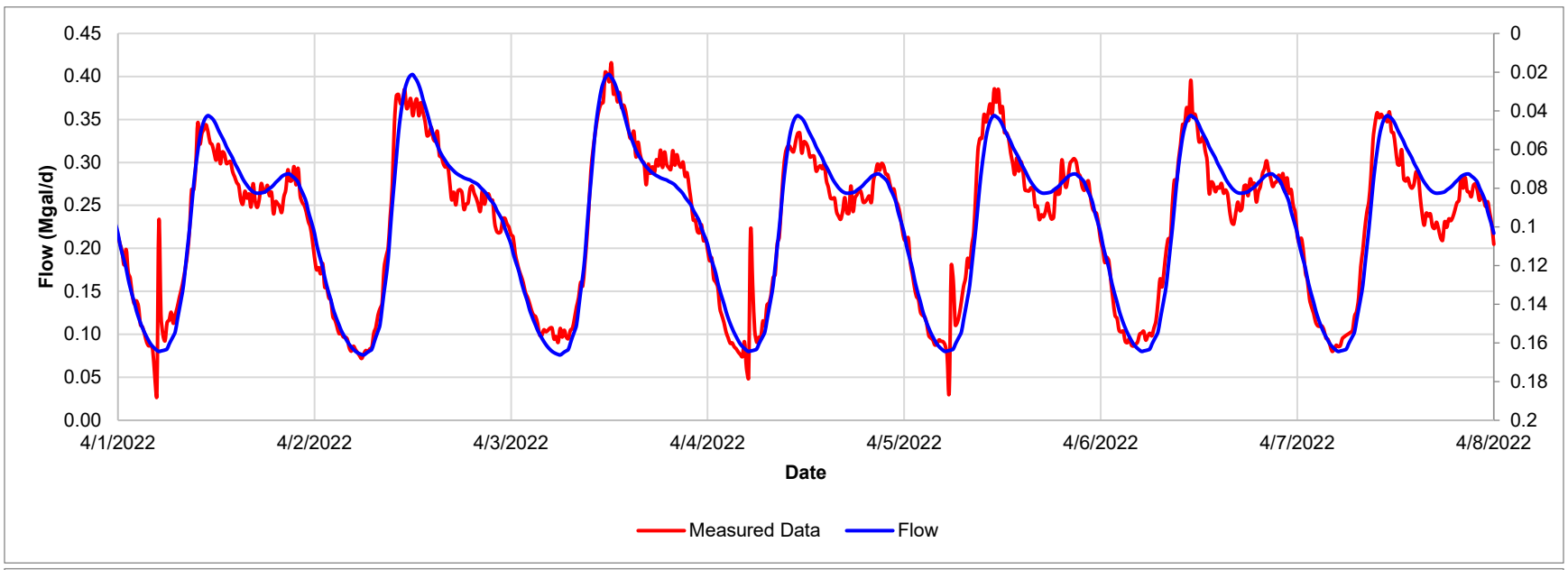


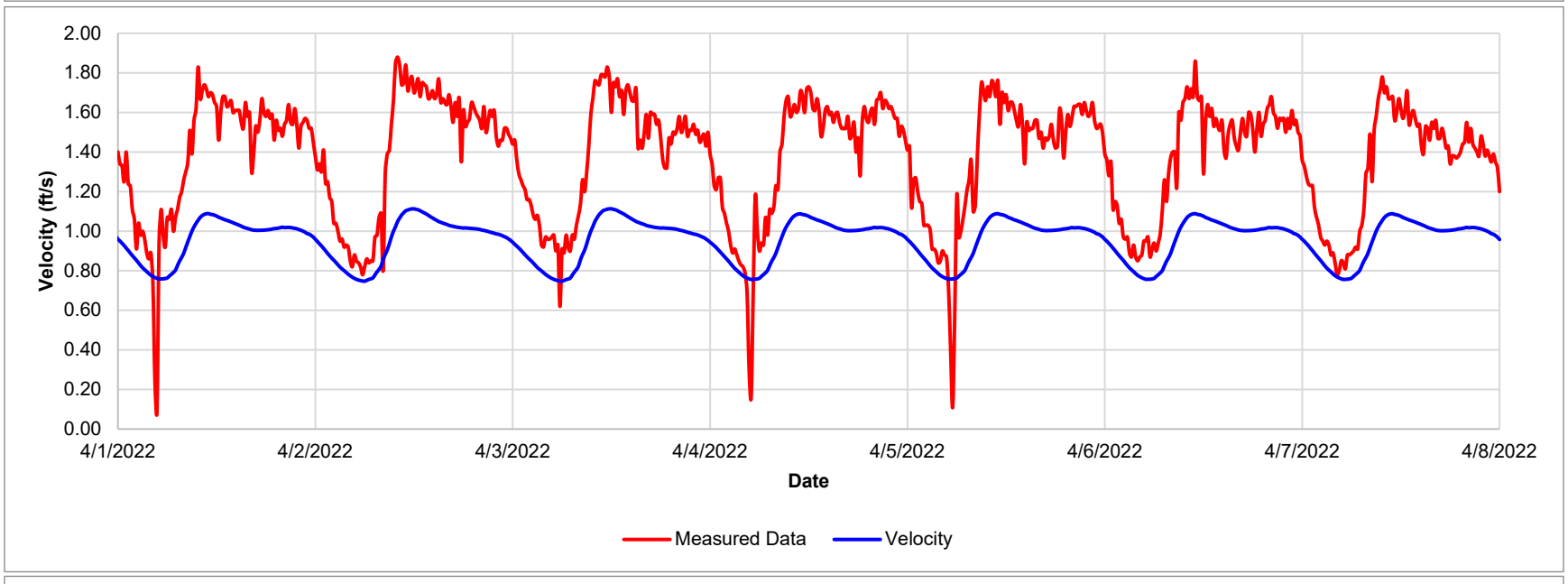


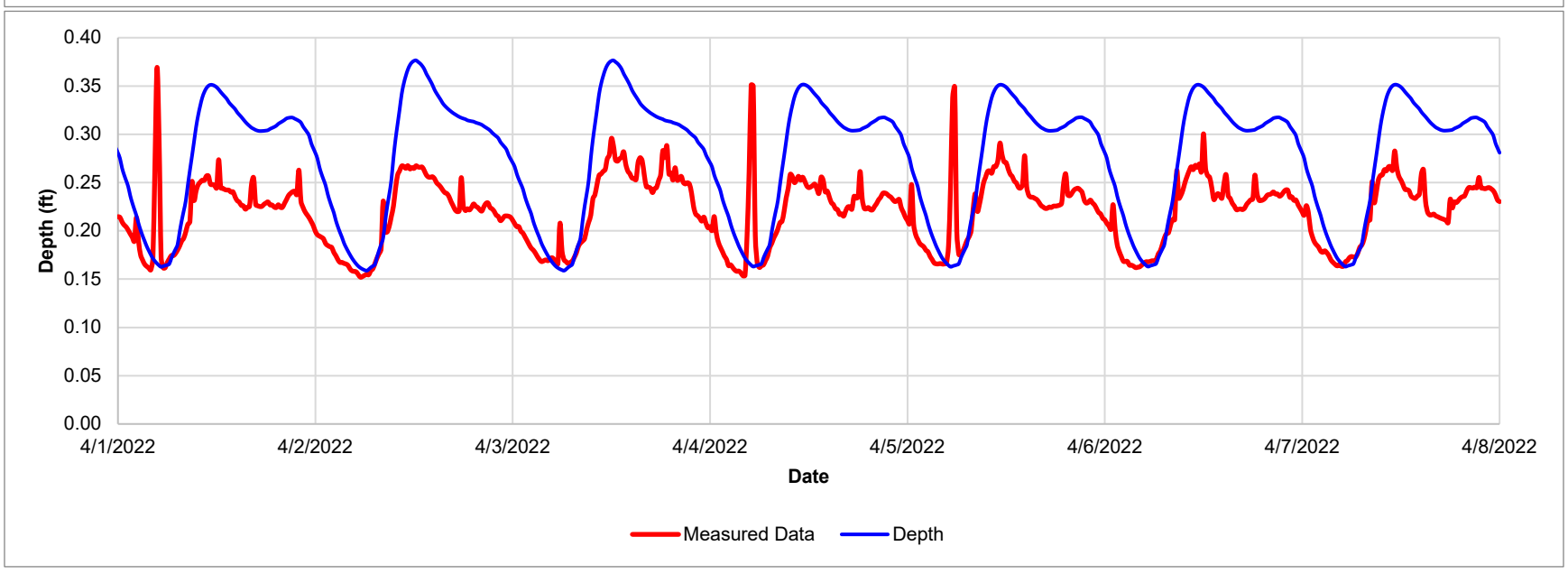


Site 16	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.46	1.14	0.30	0.20	0.34	1.02	0.18	-27.4%	-10.7%	-42.4%	-12.8%
Min	0.22	0.21	0.02	0.03	0.14	0.57	0.03				
Avg	0.32	0.59	0.10	0.10	0.25	0.83	0.10	-23.4%	40.1%	-3.0%	-3.0%
Volume			200,080	200,121			194,162			-3.0%	-3.0%

1.17 SITE 17 – DWF

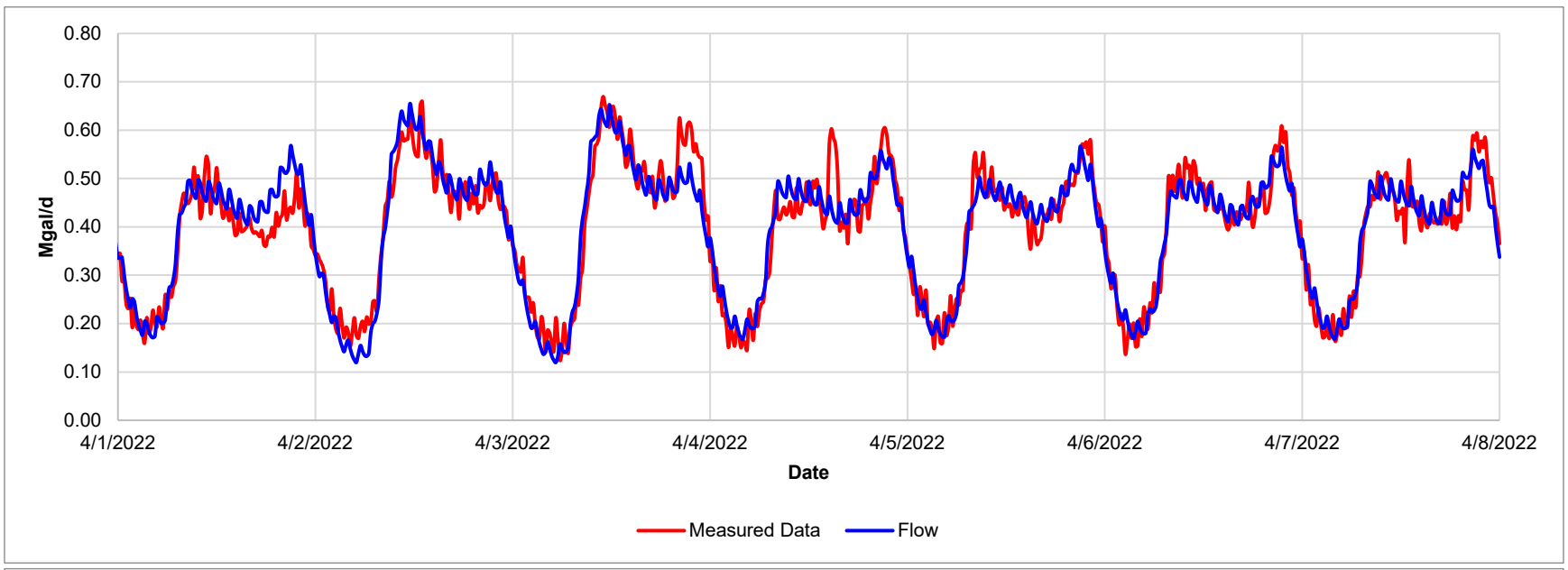


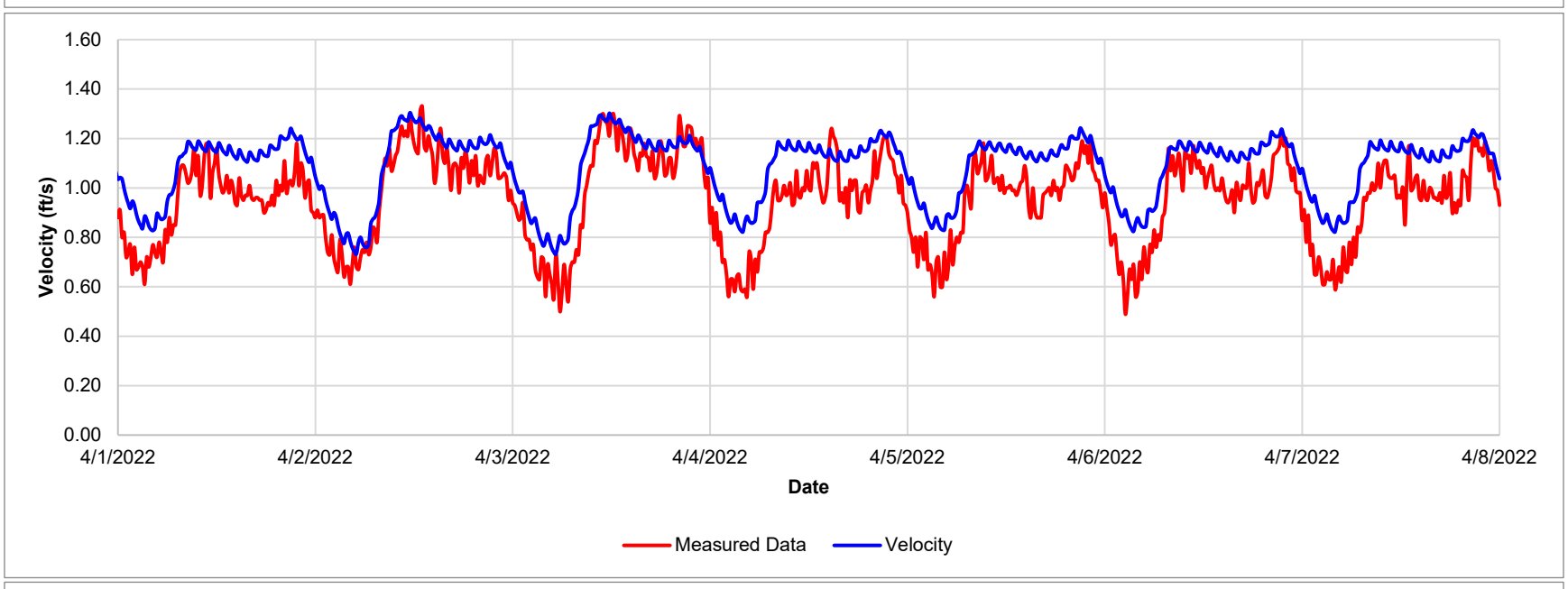


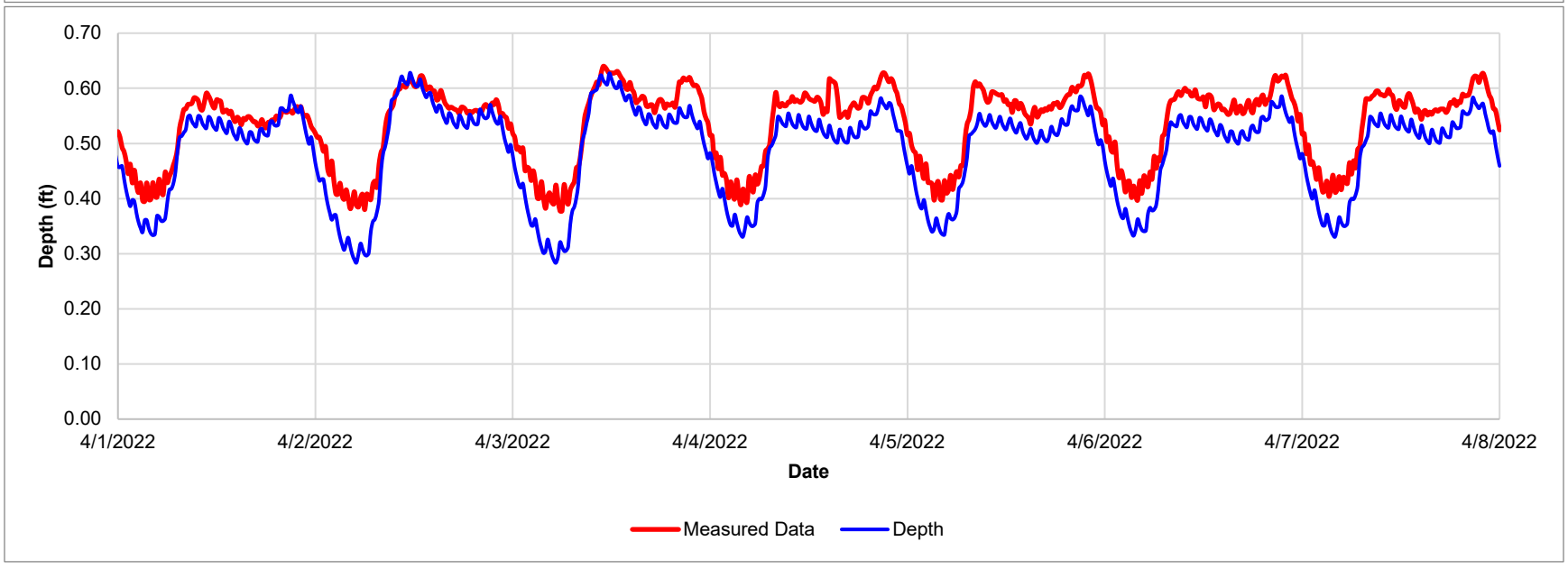


Site 17	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.37	1.88	0.42	0.40	0.38	1.11	0.40	2.0%	-40.8%	-3.3%	-0.5%
Min	0.15	0.09	0.03	0.06	0.16	0.75	0.08				
Avg	0.22	1.38	0.23	0.23	0.28	0.96	0.23	25.0%	-30.5%	0.8%	0.7%
Volume			457,533	457,559			460,966			0.8%	0.7%

1.18 SITE 18 – DWF

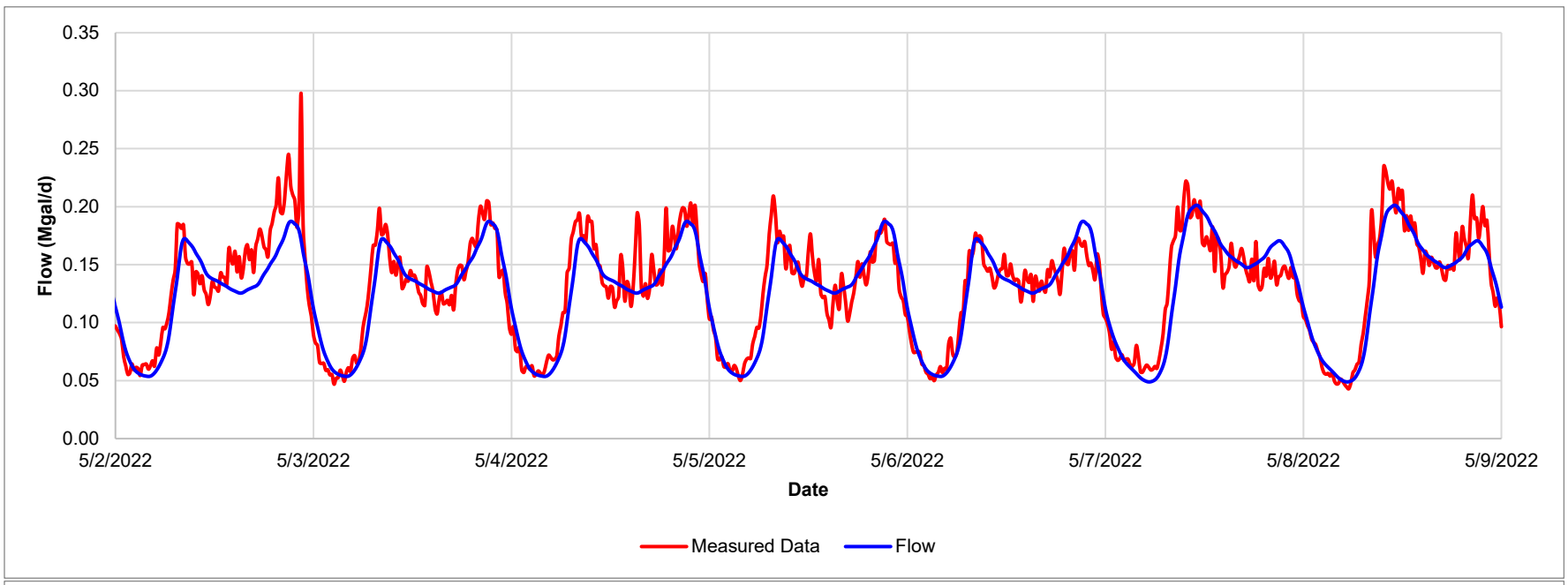


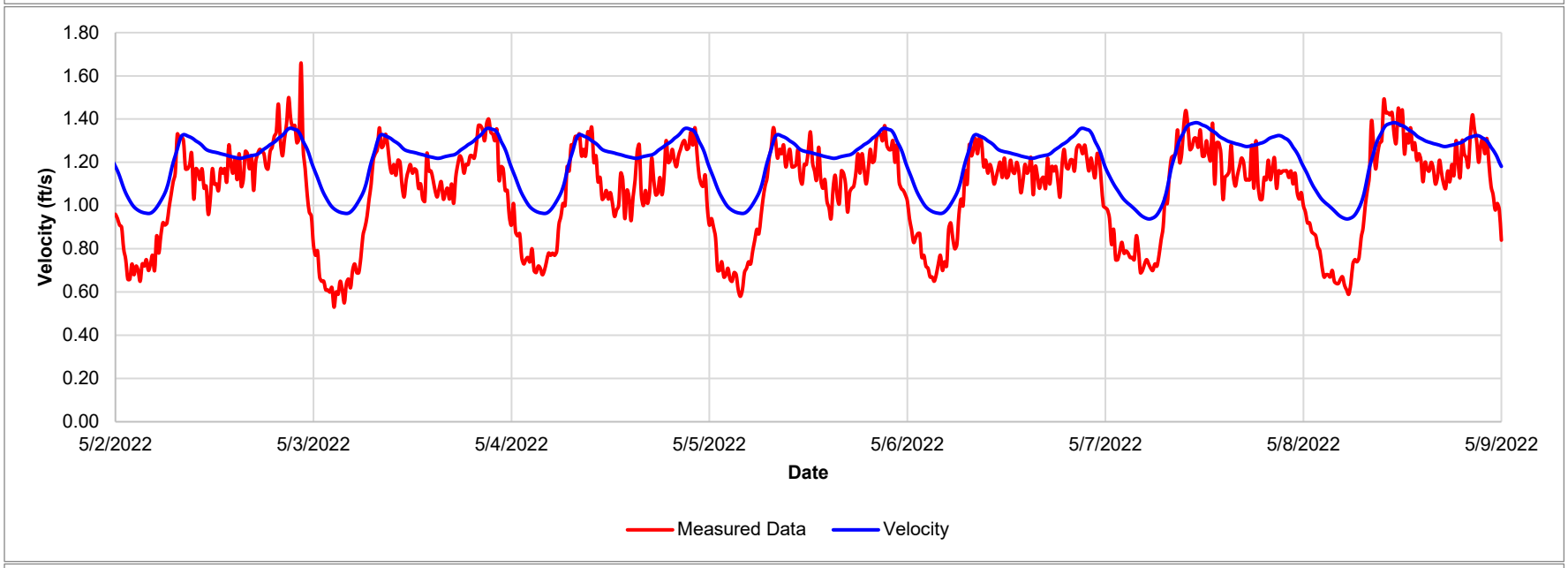


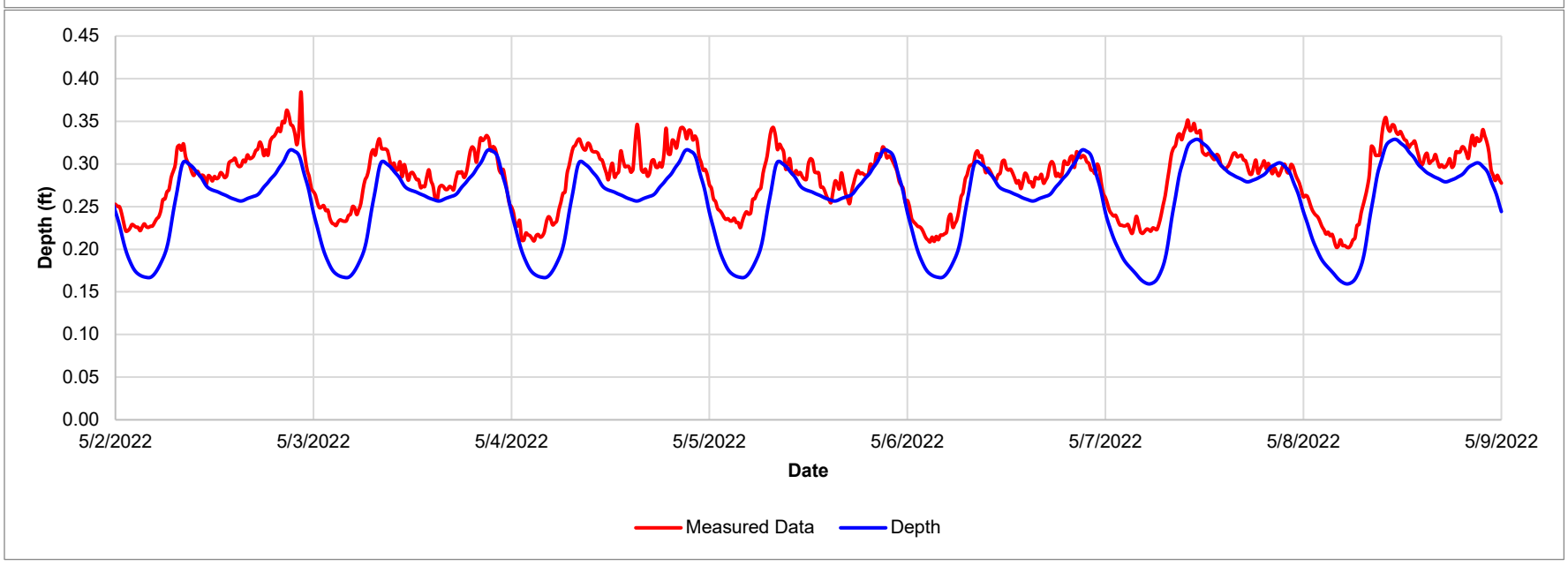


Site 18	Measured				Modeled			Error			
DFW 1	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.64	1.33	0.67	0.65	0.63	1.30	0.65	-1.8%	-1.9%	-2.2%	0.6%
Min	0.38	0.49	0.12	0.16	0.28	0.73	0.12				
Avg	0.53	0.95	0.40	0.40	0.49	1.08	0.40	-8.6%	13.5%	0.4%	0.4%
Volume			792,163	792,126			795,301			0.4%	0.4%

2.1 SITE 1 – DWF

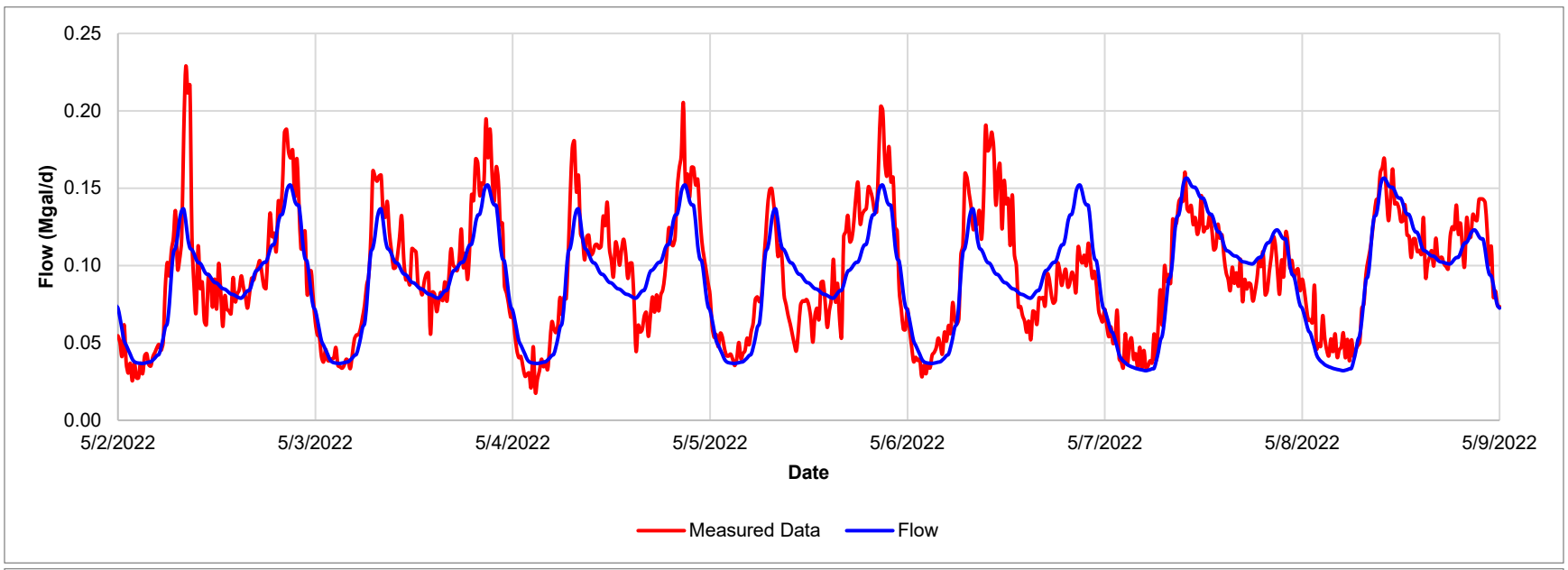


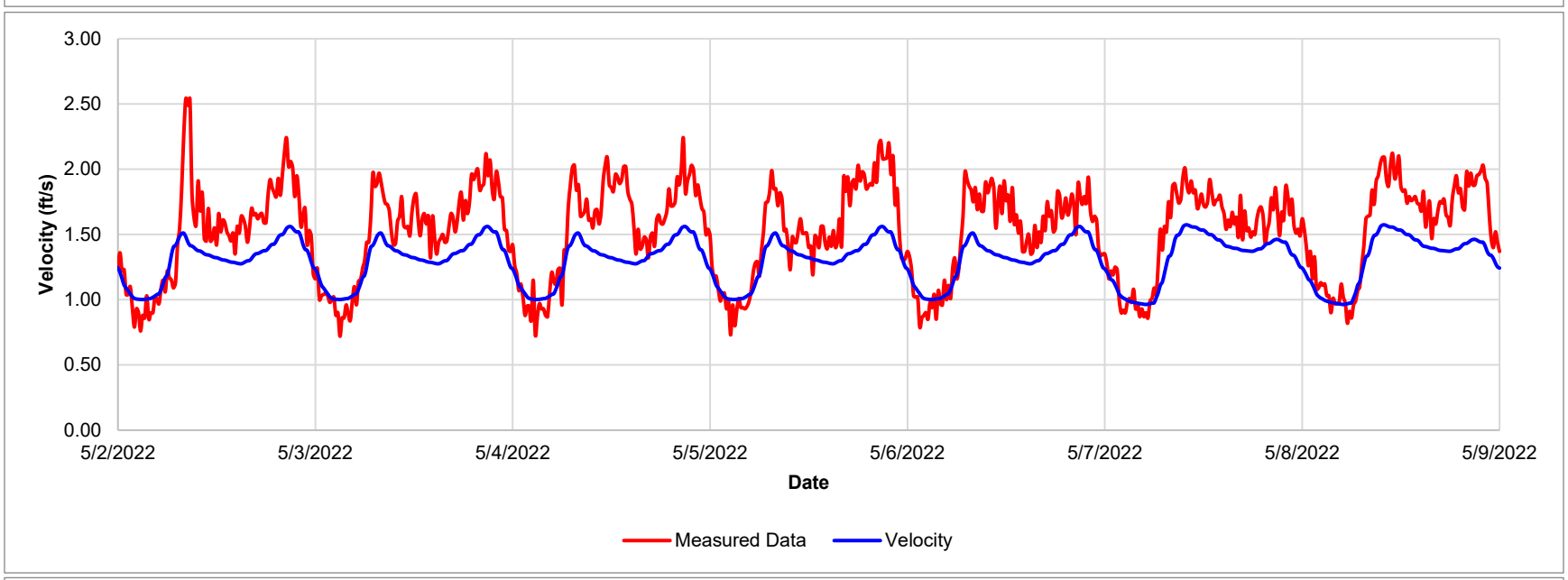


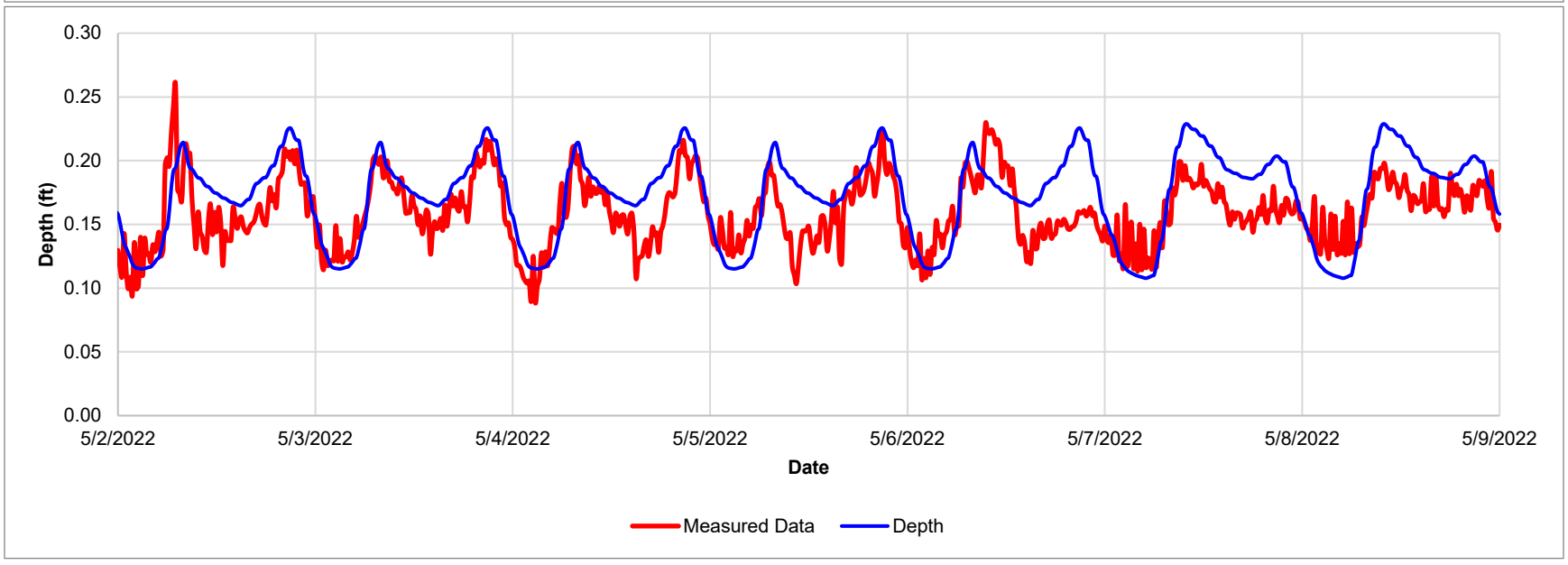


Site 1	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.38	1.66	0.30	0.23	0.33	1.38	0.20	-14.5%	-16.6%	-32.5%	-10.8%
Min	0.20	0.53	0.04	0.05	0.16	0.94	0.05				
Avg	0.28	1.07	0.13	0.13	0.25	1.21	0.13	-10.1%	12.9%	-2.8%	-2.8%
Volume			261,781	261,802			254,364			-2.8%	-2.8%

2.2 SITE 2 – DWF

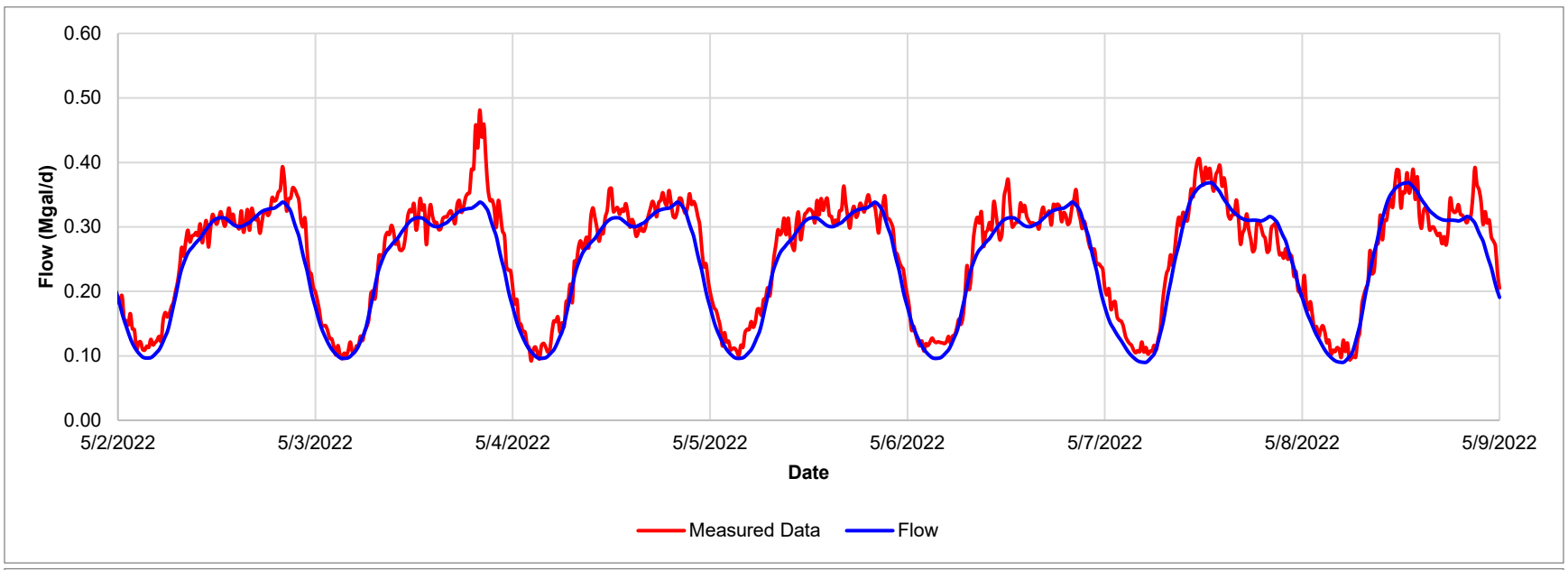


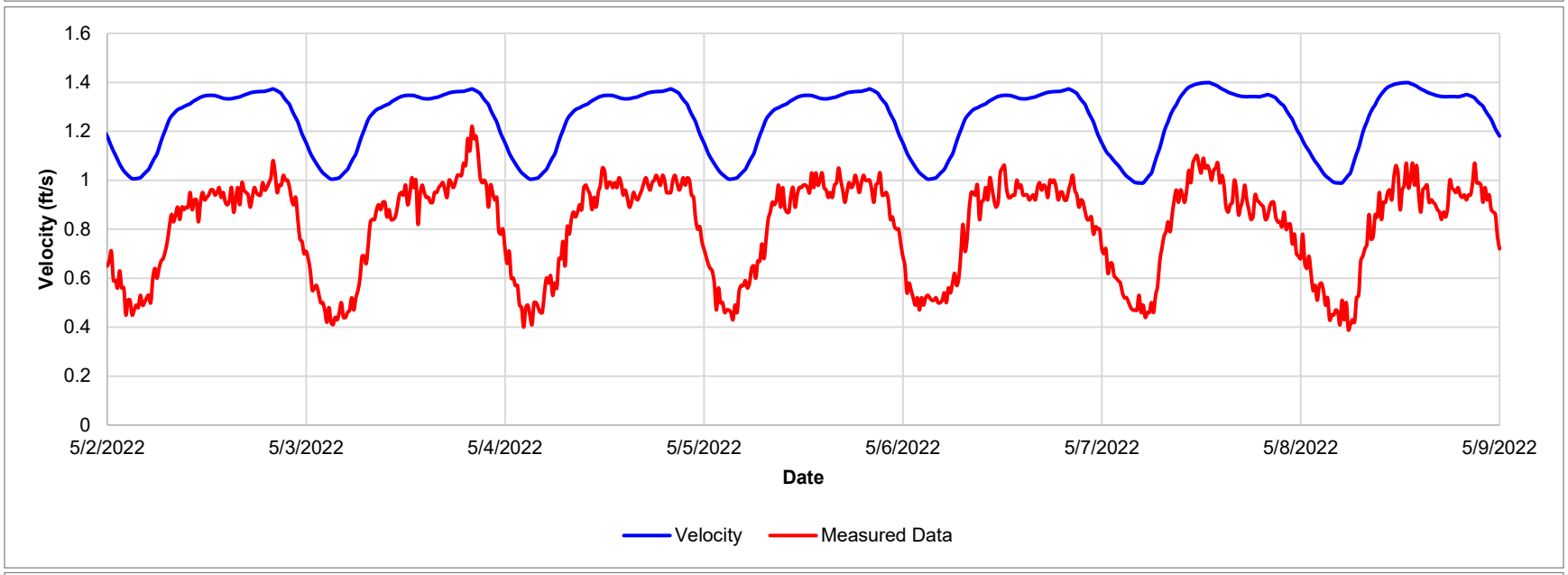


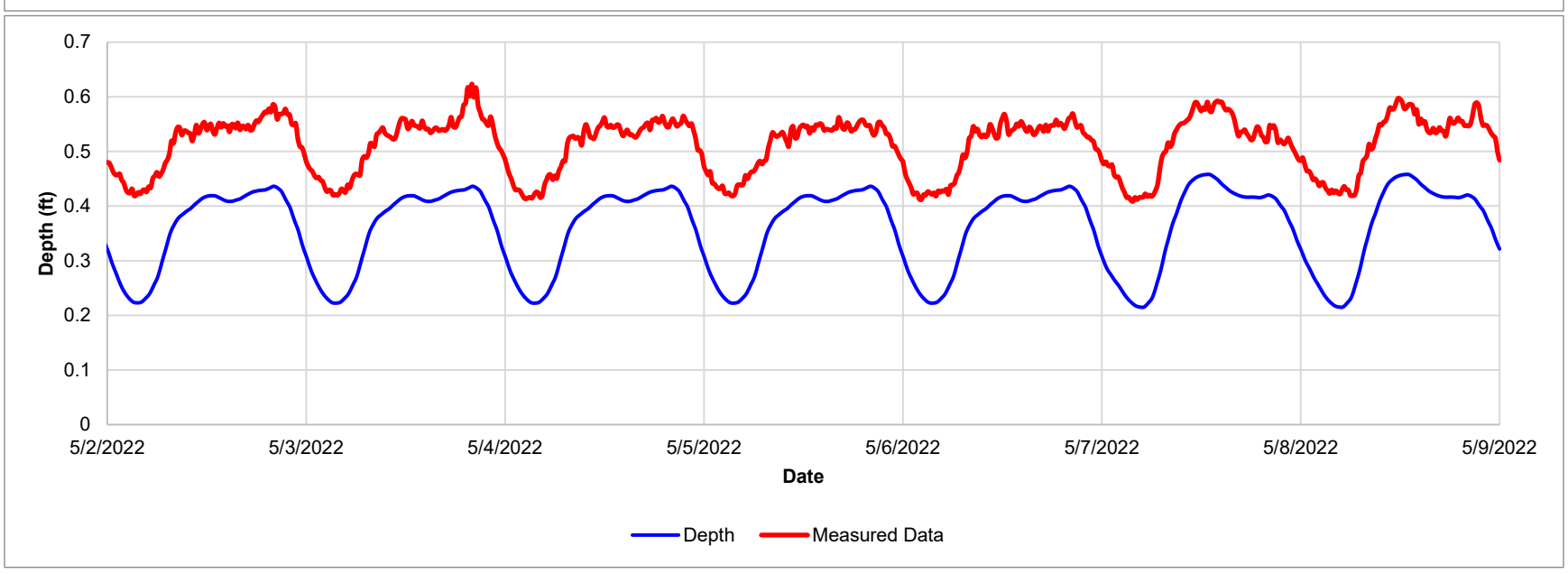


Site 2	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.26	2.54	0.23	0.21	0.23	1.57	0.16	-11.9%	-38.1%	-31.5%	-25.6%
Min	0.09	0.72	0.02	0.03	0.11	0.96	0.03				
Avg	0.16	1.52	0.09	0.09	0.17	1.31	0.09	8.6%	-14.4%	-3.6%	-3.5%
Volume			188,340	188,307			181,630			-3.6%	-3.5%

2.3 SITE 3 – DWF

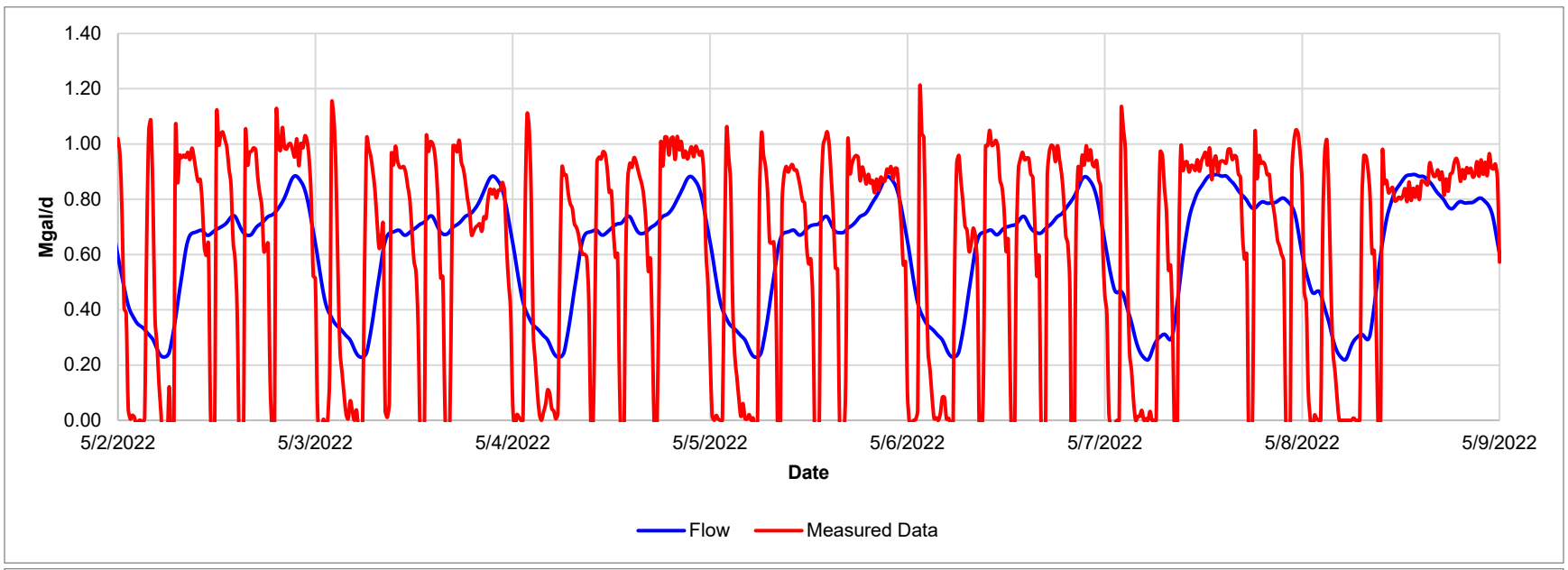


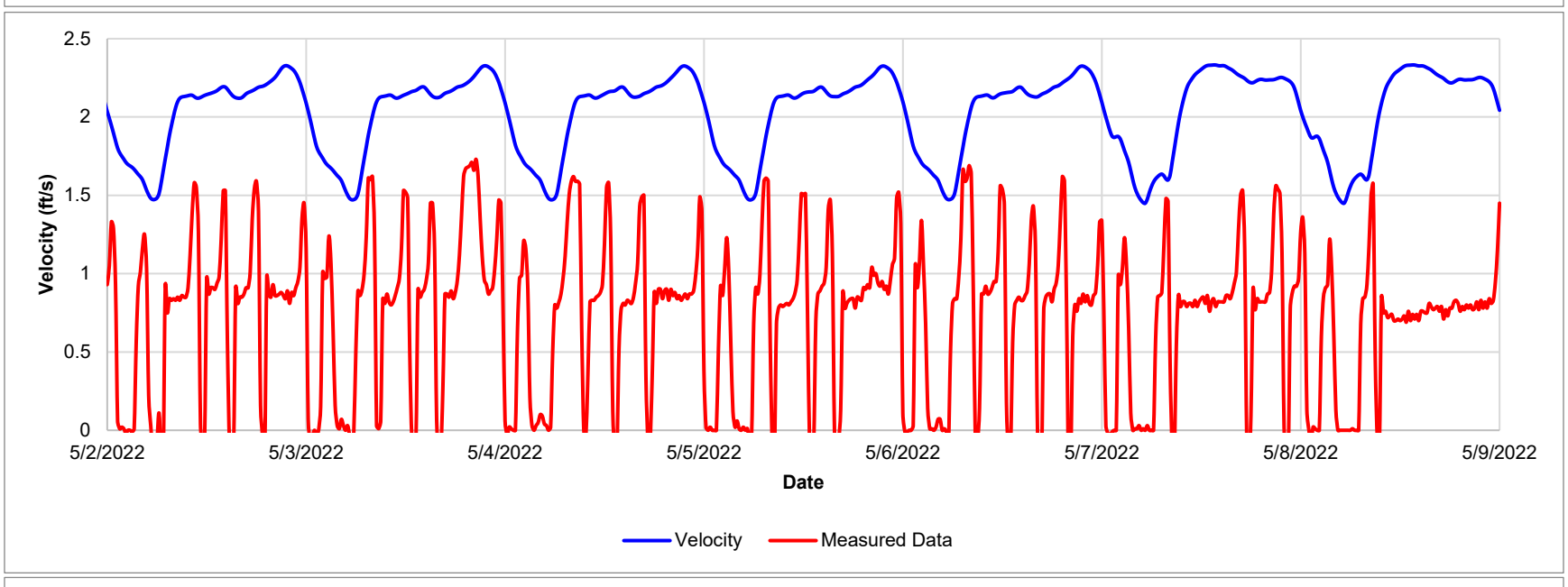


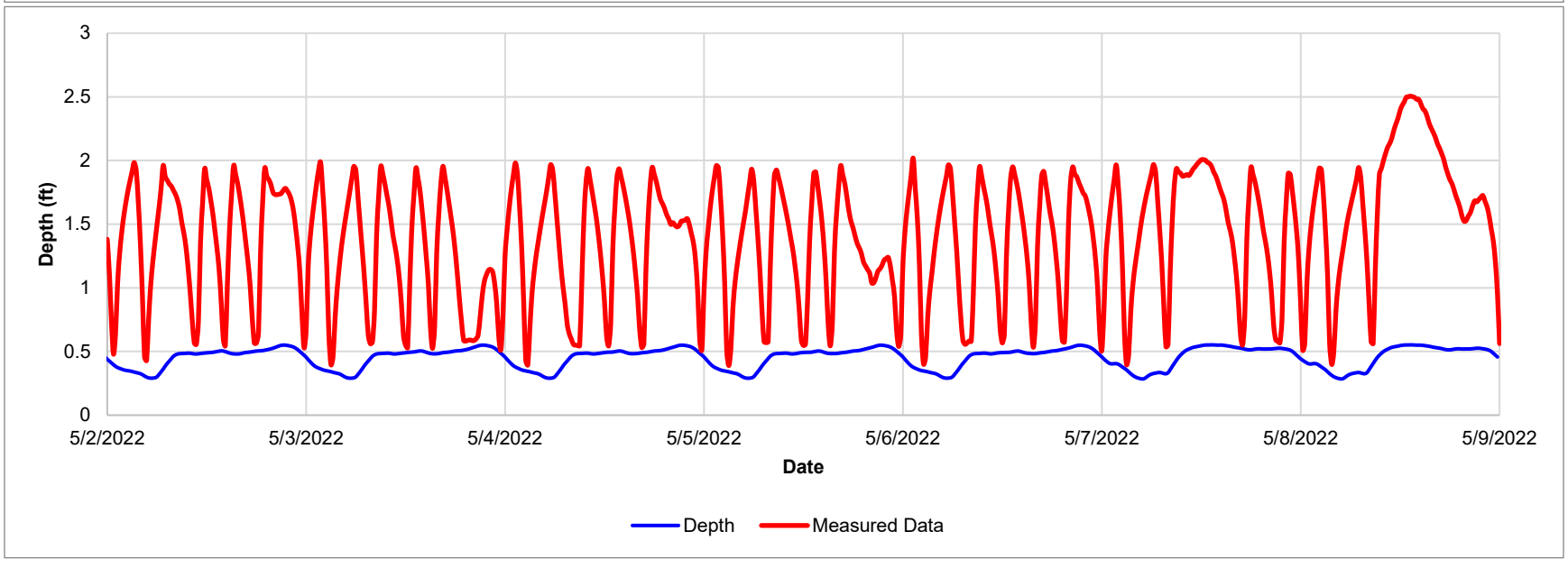


Site 3	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.62	1.22	0.48	0.45	0.46	1.40	0.37	-26.5%	14.6%	-23.4%	-18.2%
Min	0.41	0.39	0.09	0.10	0.21	0.99	0.09				
Avg	0.51	0.81	0.26	0.26	0.36	1.25	0.24	-29.8%	53.1%	-4.7%	-4.7%
Volume			514,002	514,023			489,838			-4.7%	-4.7%

2.4 SITE 4 – DWF

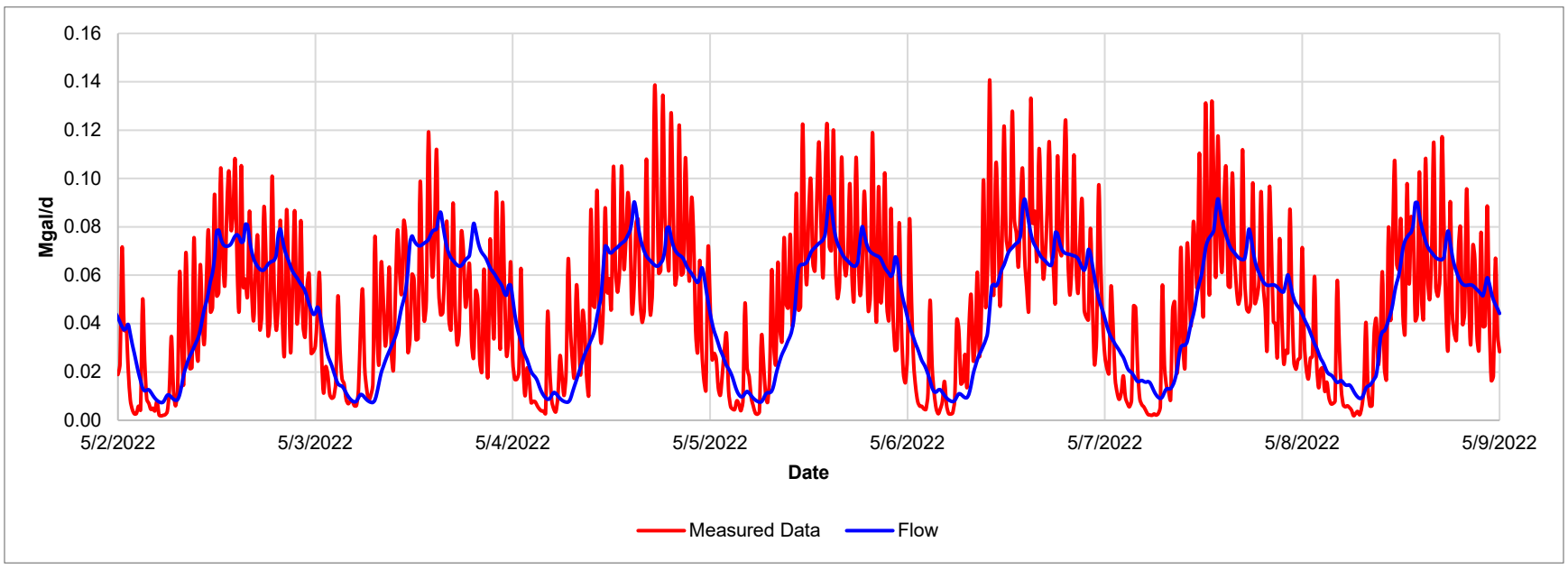


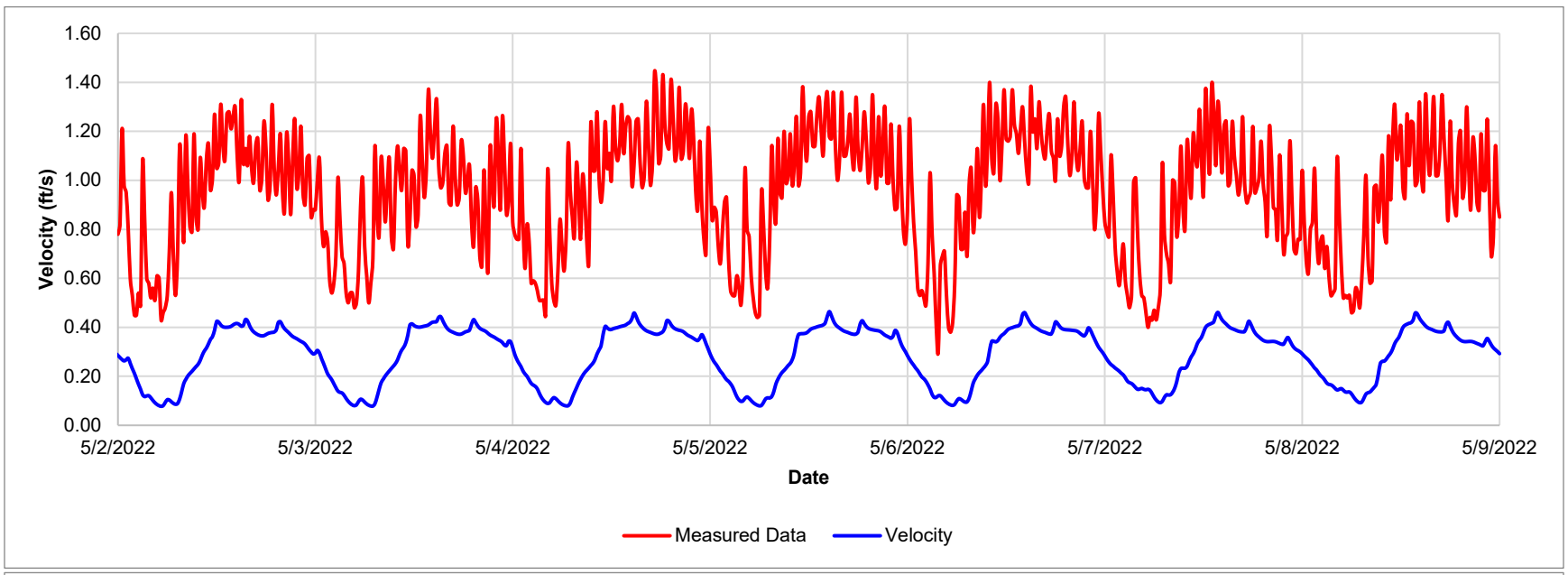


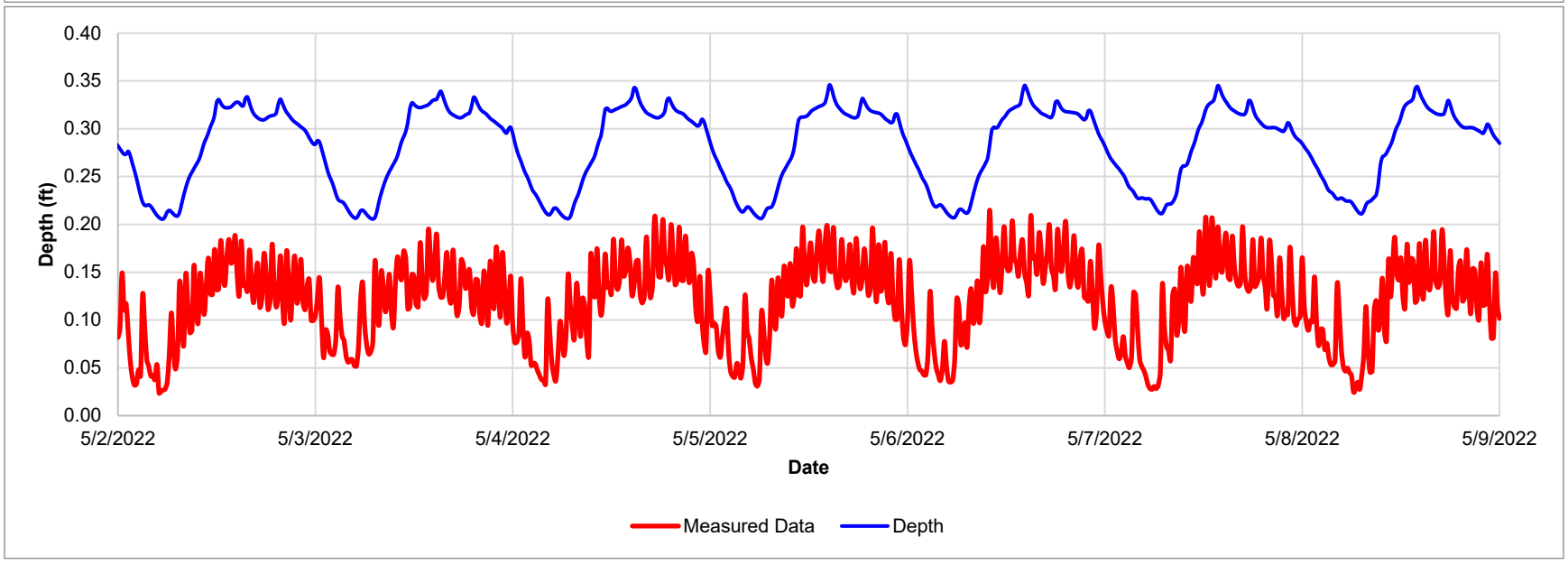


Site 4	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	2.51	1.73	1.20	1.05	0.55	2.33	0.89	-78.0%	34.8%	-25.7%	-15.0%
Min	0.39	-0.27	-0.30	-0.09	0.28	1.45	0.22				
Avg	1.39	0.72	0.60	0.60	0.45	2.03	0.61	-67.4%	181.0%	2.2%	2.2%
Volume			1,201,095	1,201,396			1,228,041			2.2%	2.2%

2.5 SITE 5 – DWF

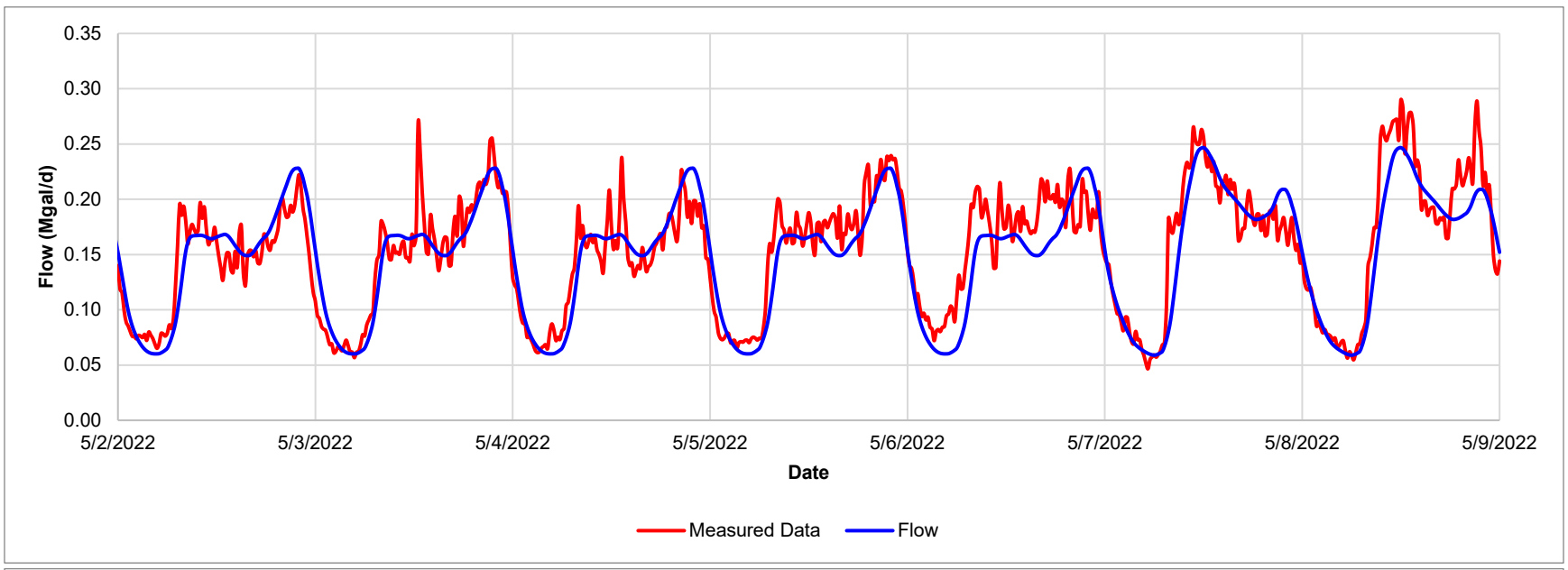


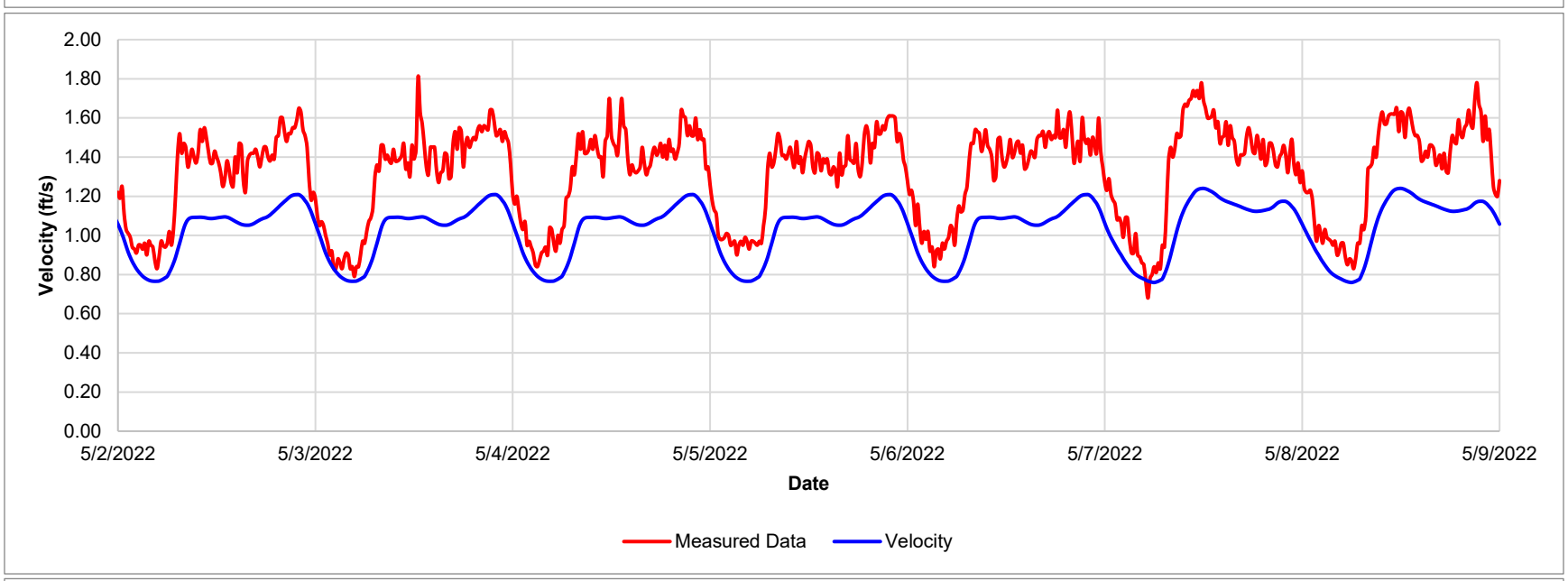


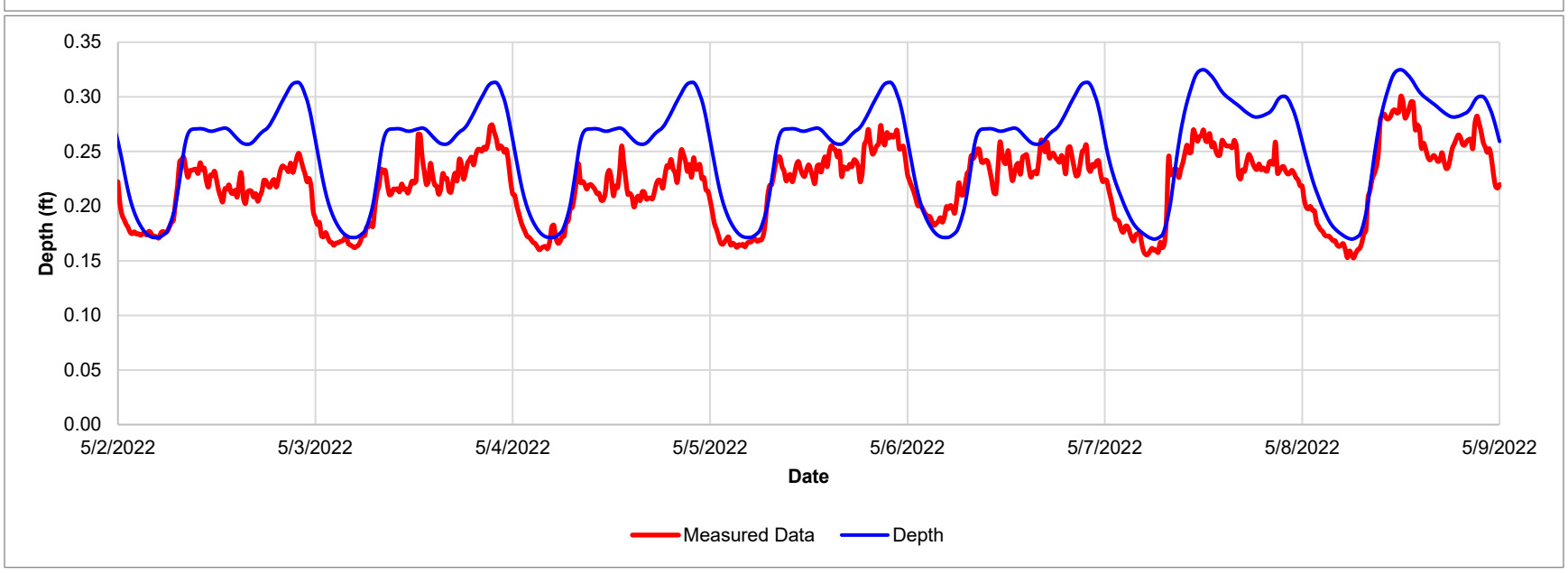


Site 5	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.22	1.44	0.14	0.10	0.35	0.46	0.09	60.8%	-67.8%	-34.3%	-9.0%
Min	0.02	0.30	0.00	0.00	0.21	0.08	0.01				
Avg	0.12	0.95	0.05	0.05	0.28	0.29	0.05	135.6%	-69.5%	-1.7%	-1.7%
Volume			94,964	94,973			93,382			-1.7%	-1.7%

2.6 SITE 6 – DWF

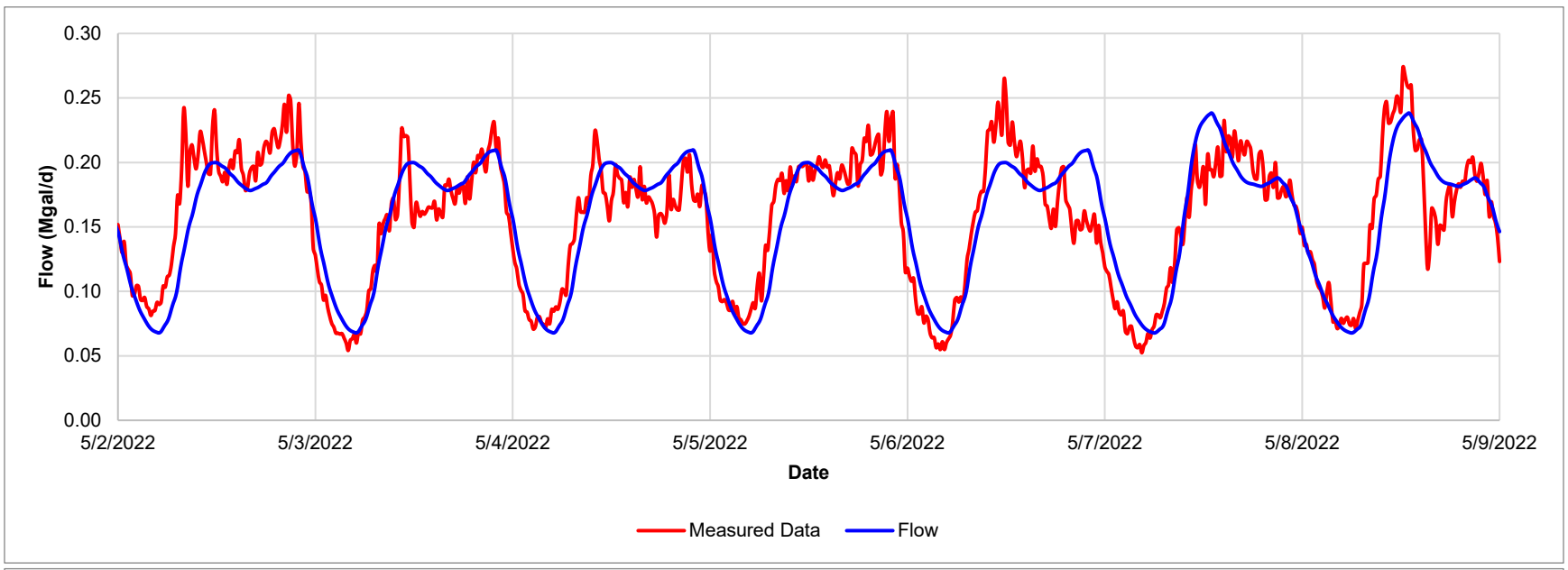


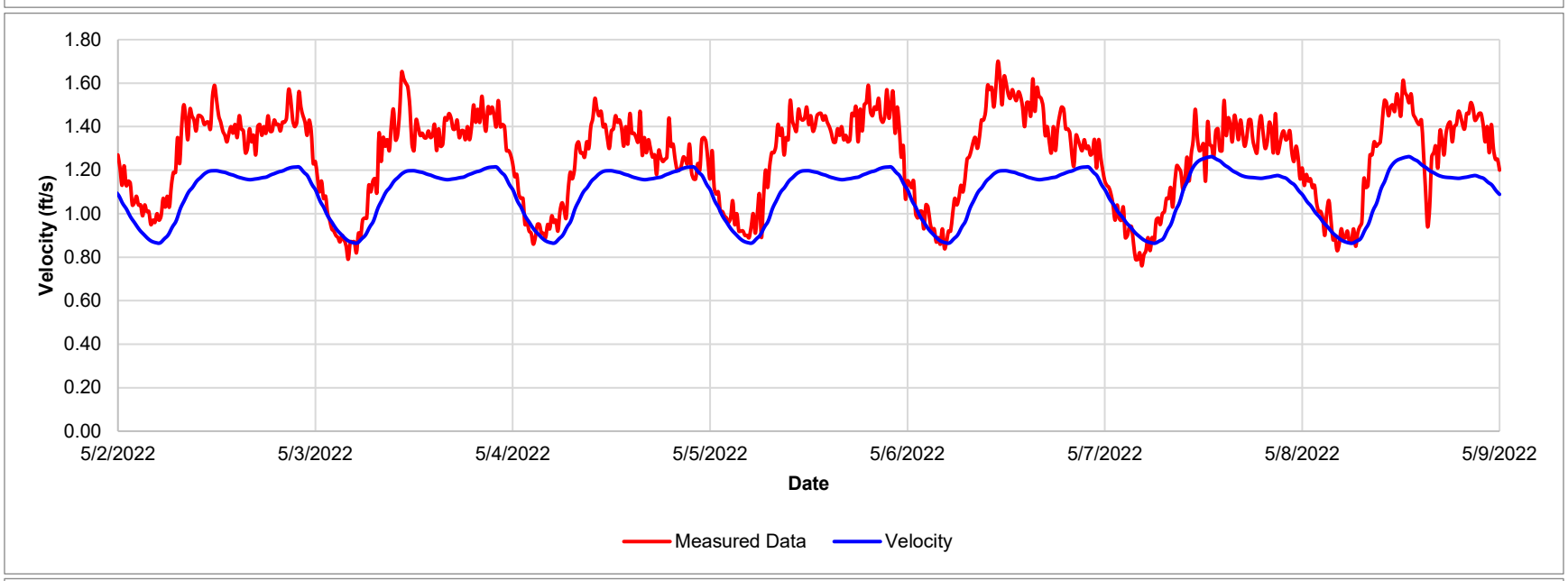


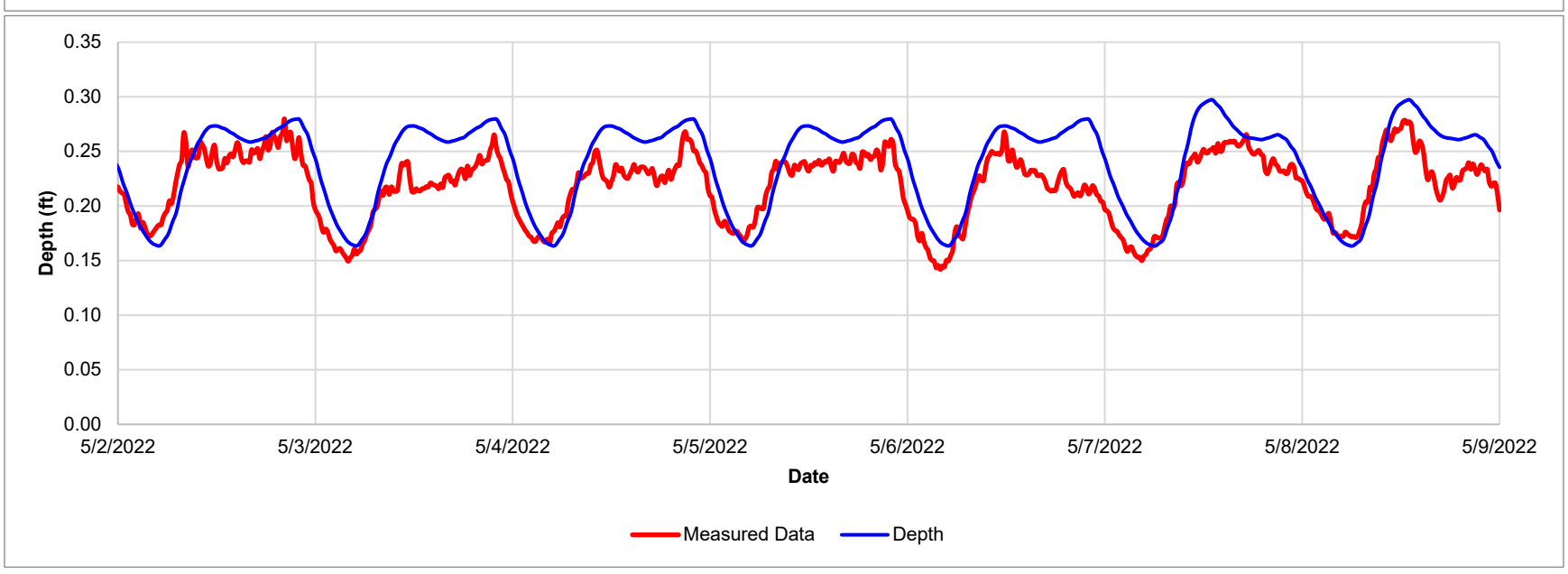


Site 6	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.30	1.81	0.29	0.27	0.32	1.24	0.25	8.1%	-31.5%	-14.9%	-10.1%
Min	0.15	0.68	0.05	0.05	0.17	0.76	0.06				
Avg	0.22	1.32	0.15	0.15	0.25	1.03	0.15	15.0%	-21.7%	-3.7%	-3.7%
Volume			309,497	309,498			298,127			-3.7%	-3.7%

2.7 SITE 7 – DWF

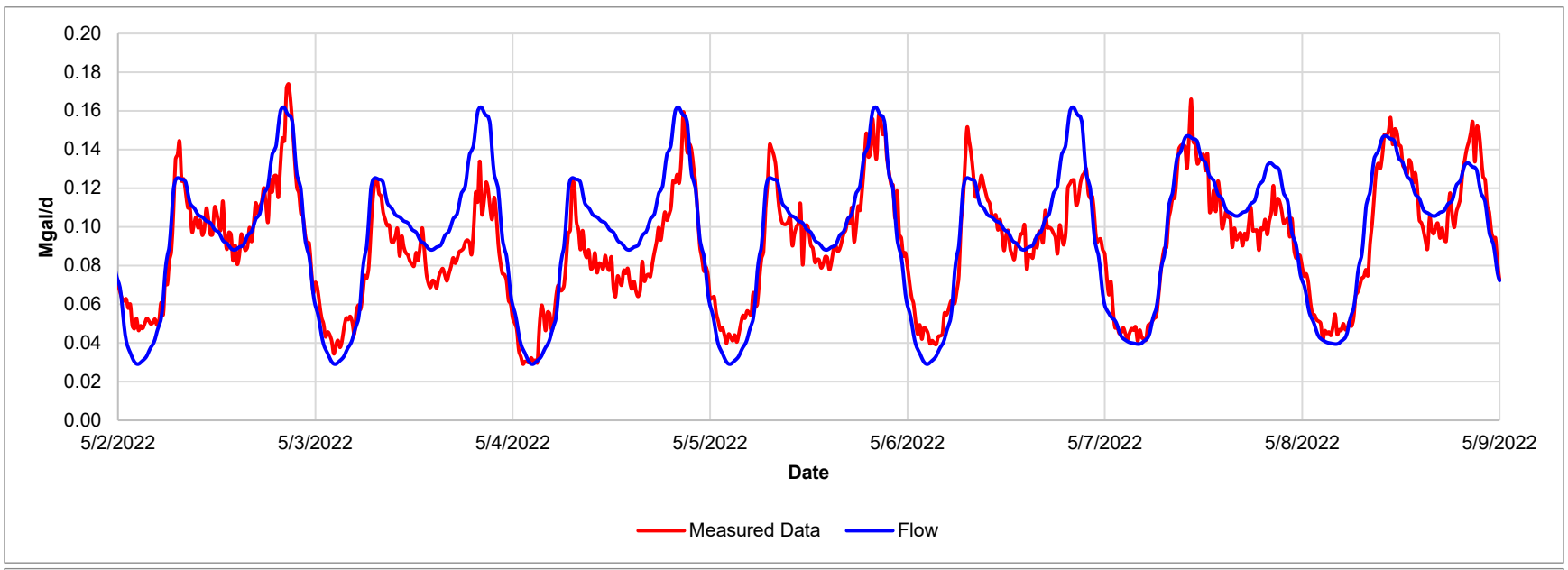


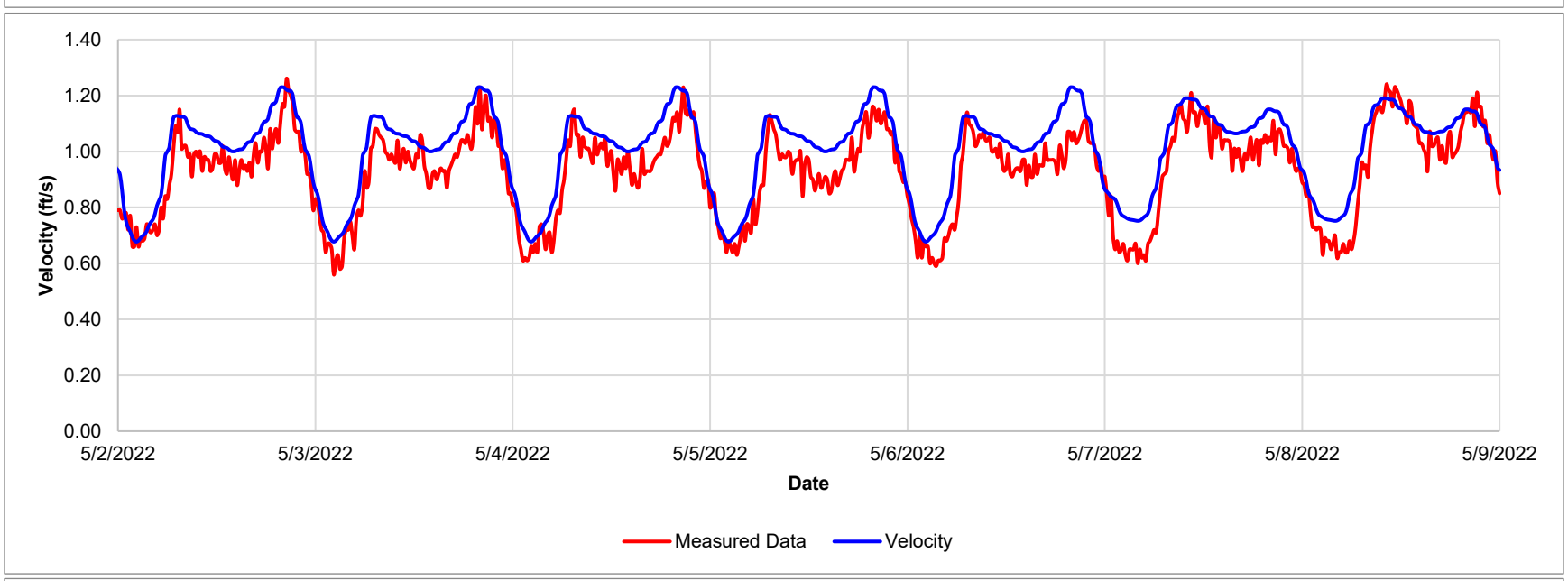


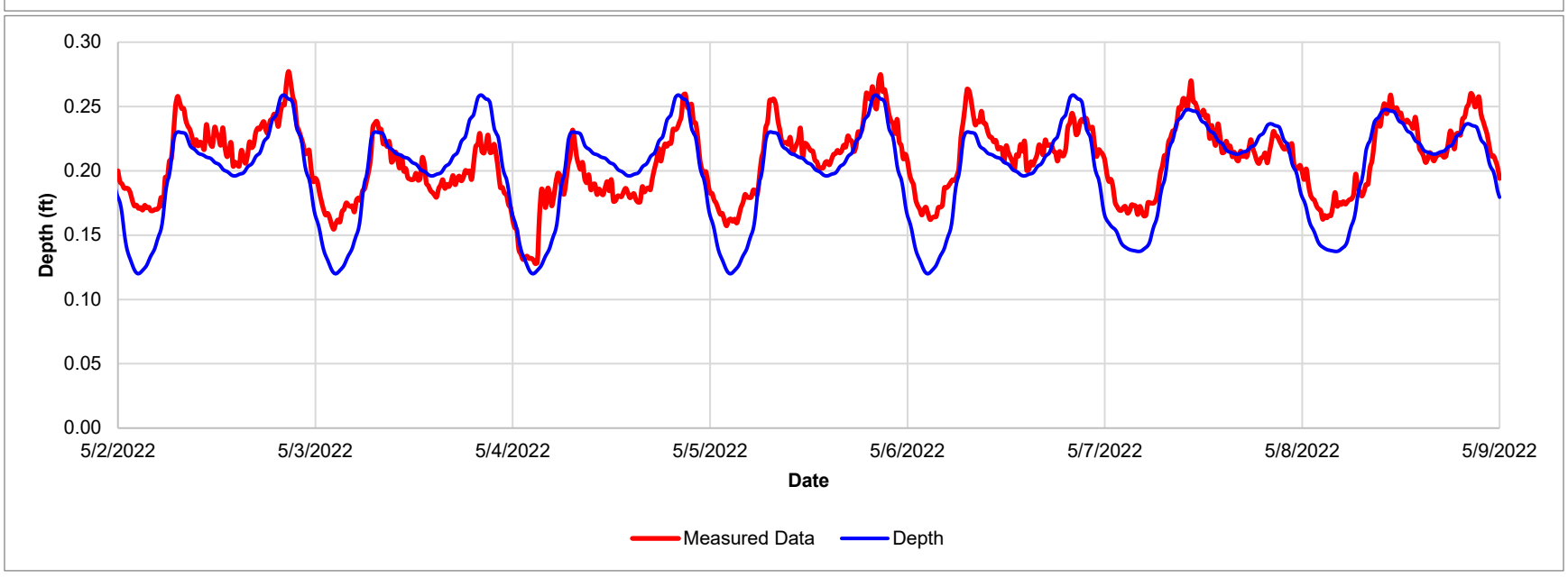


Site 7	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.28	1.70	0.27	0.26	0.30	1.26	0.24	6.3%	-25.8%	-12.9%	-10.0%
Min	0.14	0.76	0.05	0.06	0.16	0.86	0.07				
Avg	0.22	1.26	0.16	0.16	0.24	1.10	0.16	9.5%	-13.1%	-0.8%	-0.8%
Volume			314,158	314,211			311,797			-0.8%	-0.8%

2.8 SITE 8 – DWF

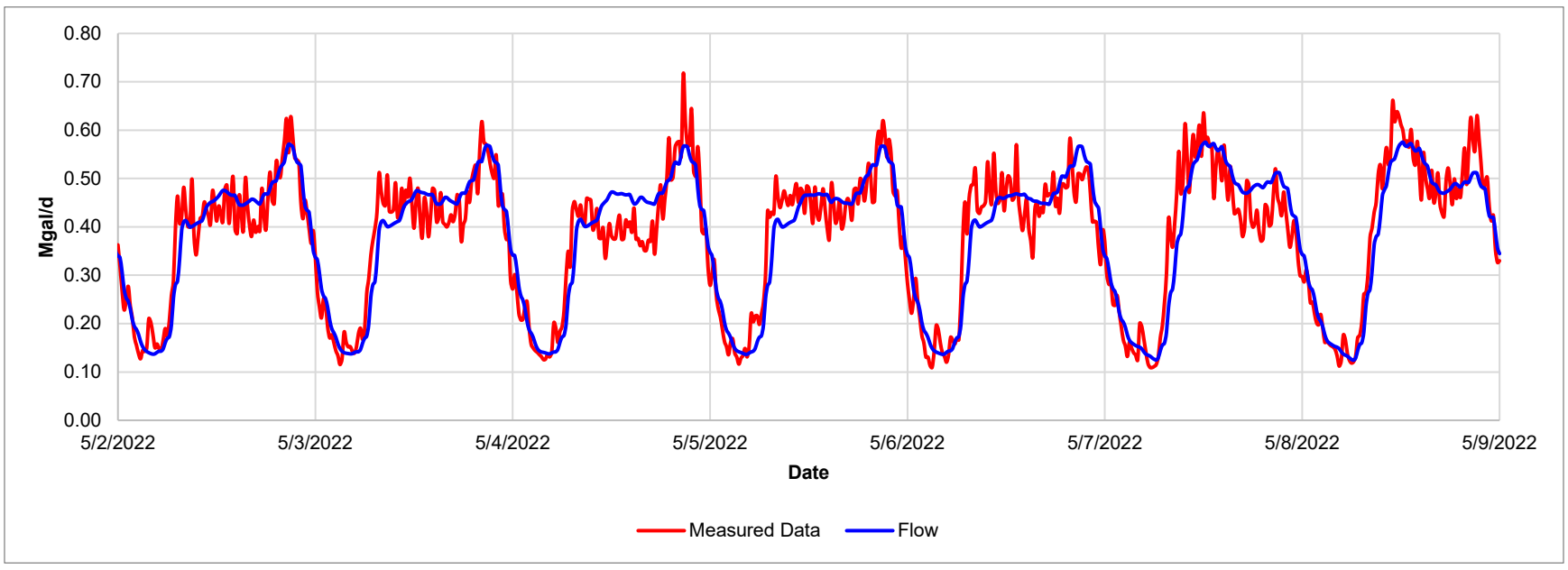


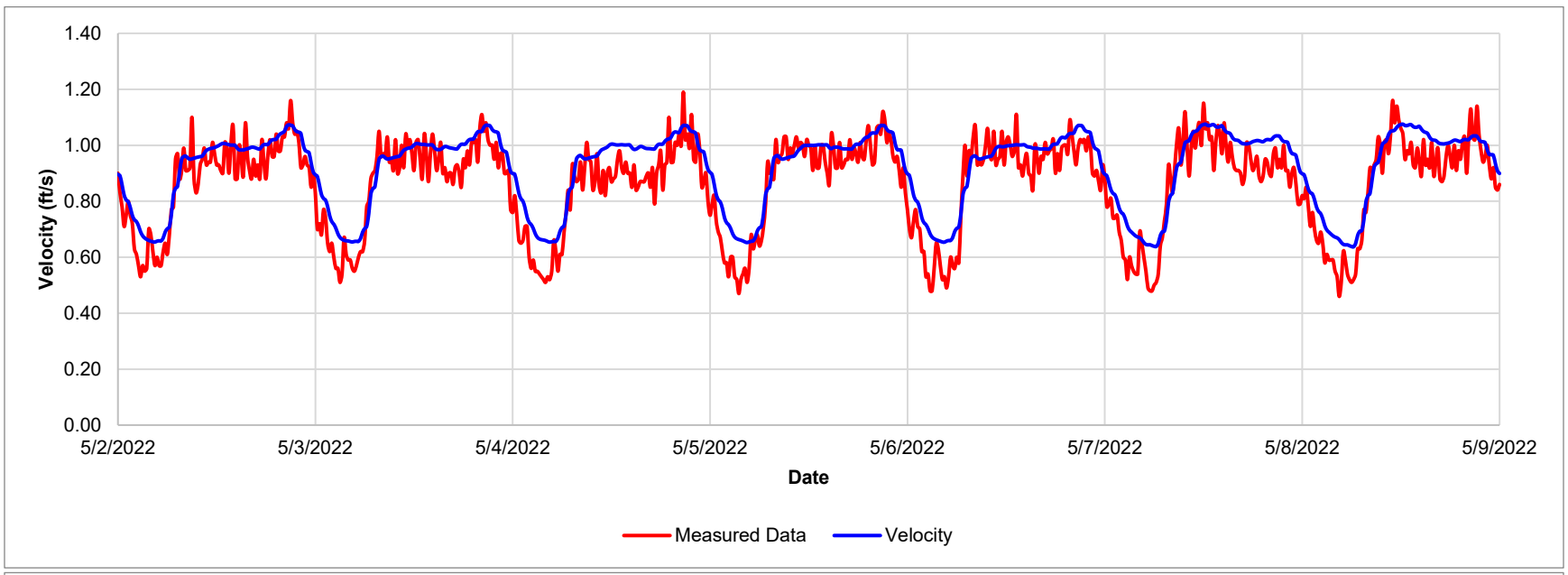


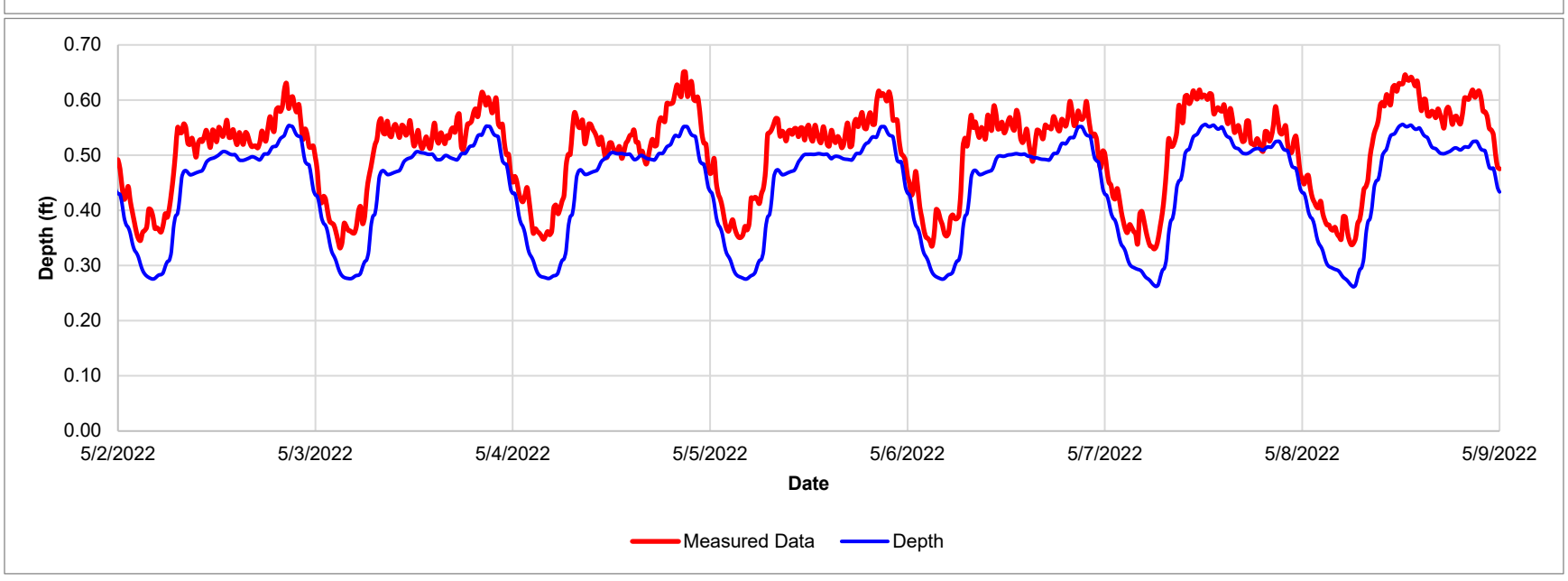


Site 8	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.28	1.26	0.17	0.17	0.26	1.23	0.16	-6.7%	-2.4%	-7.0%	-2.1%
Min	0.13	0.56	0.03	0.03	0.12	0.68	0.03				
Avg	0.21	0.93	0.09	0.09	0.20	1.01	0.10	-4.0%	8.0%	5.3%	5.3%
Volume			181,201	181,208			190,775			5.3%	5.3%

2.9 SITE 9 – DWF

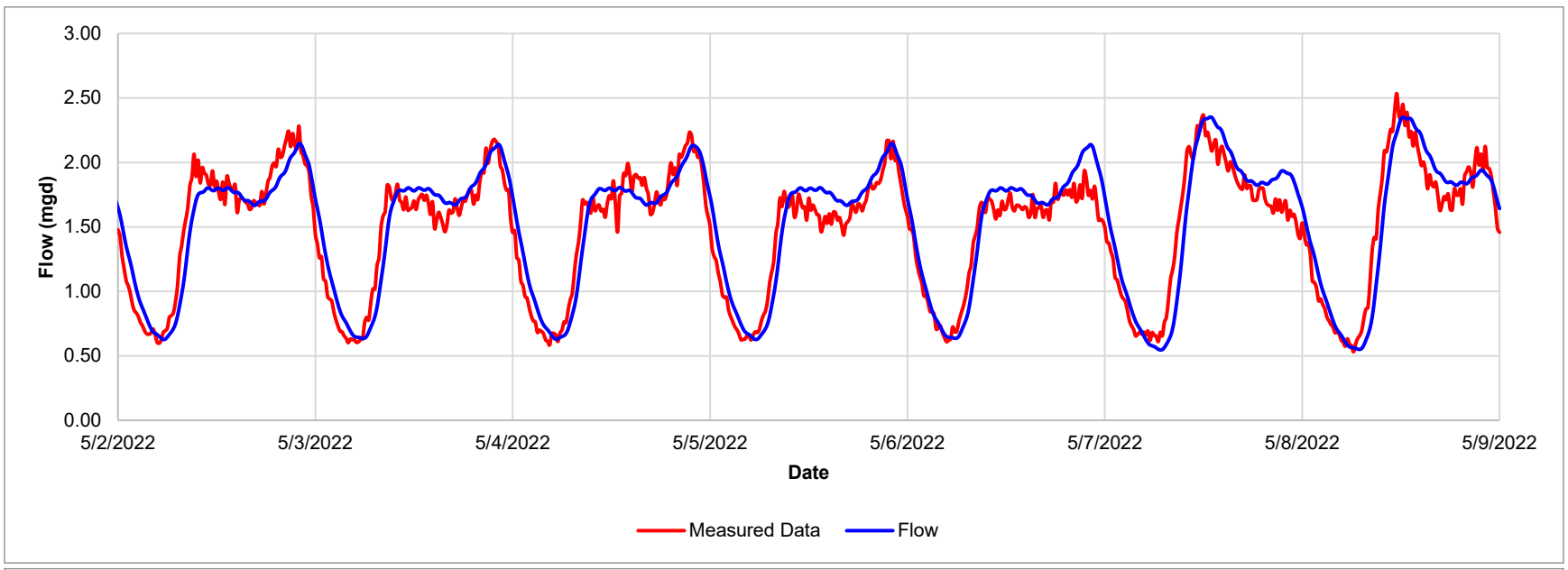


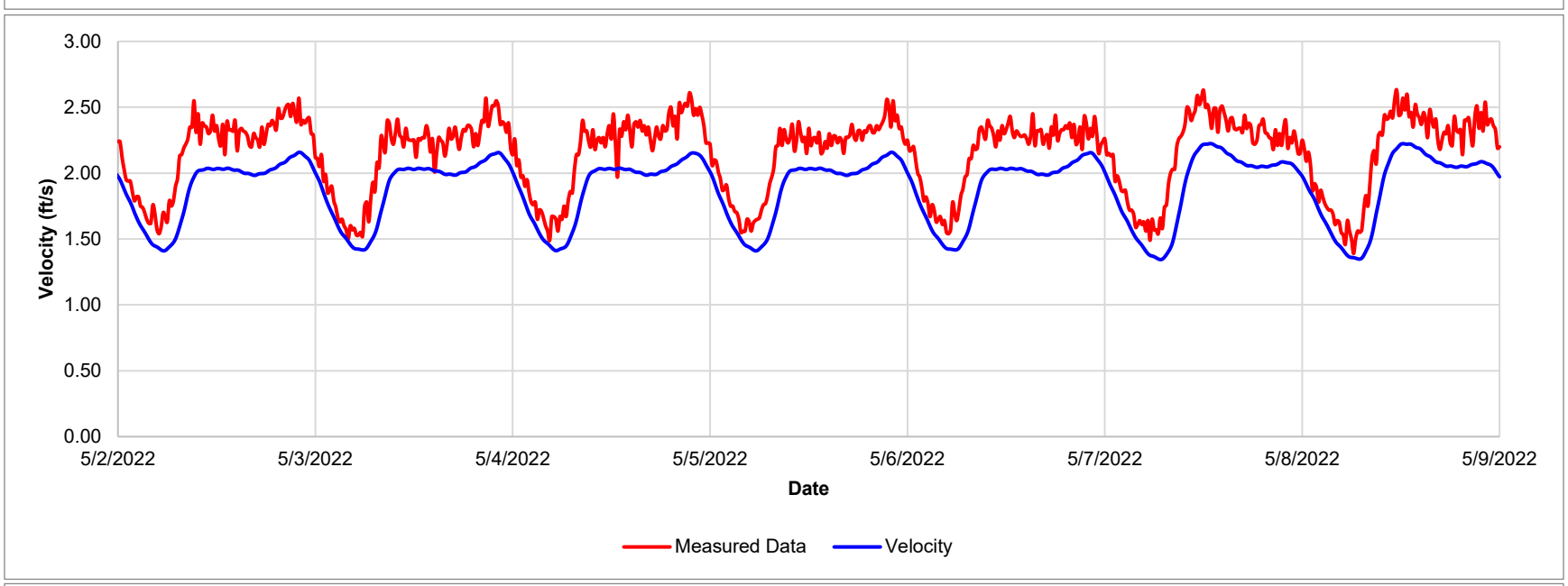


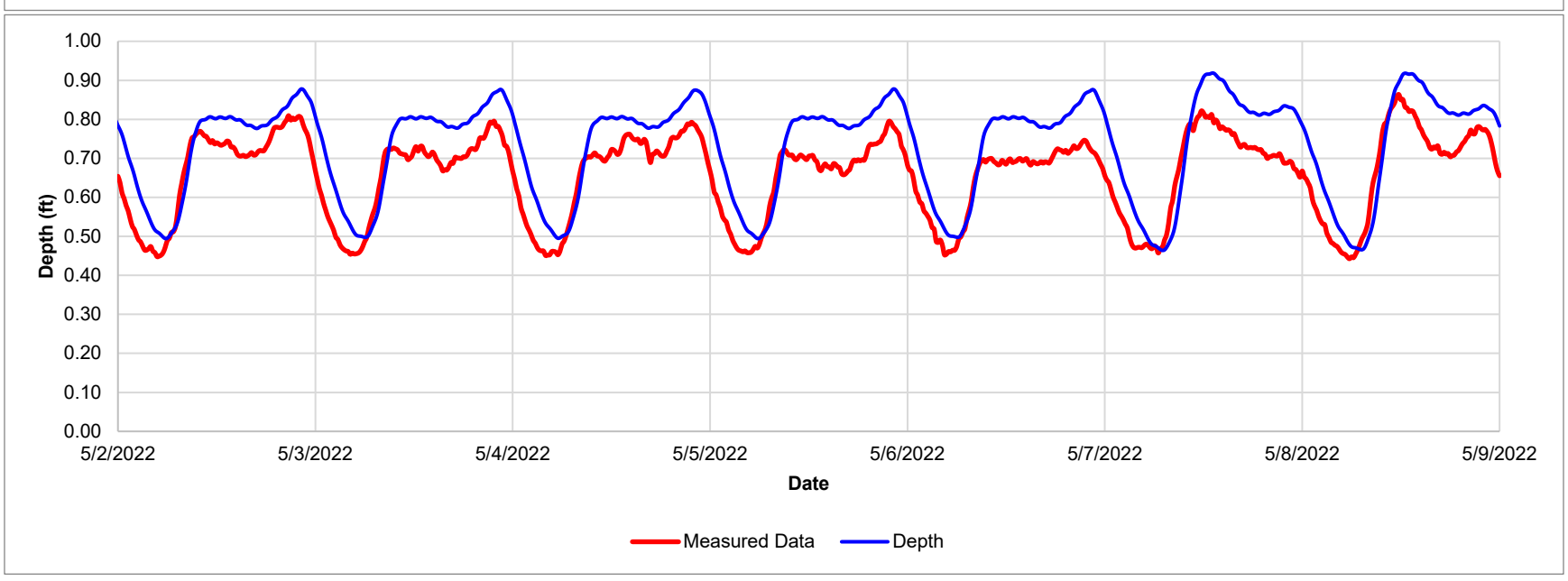


Site 9	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.65	1.19	0.72	0.64	0.56	1.08	0.58	-14.6%	-9.6%	-19.8%	-9.6%
Min	0.33	0.46	0.11	0.11	0.26	0.64	0.12				
Avg	0.51	0.86	0.38	0.38	0.45	0.92	0.38	-12.0%	6.3%	0.1%	0.1%
Volume			762,641	762,623			763,587			0.1%	0.1%

2.10 SITE 10 – DWF

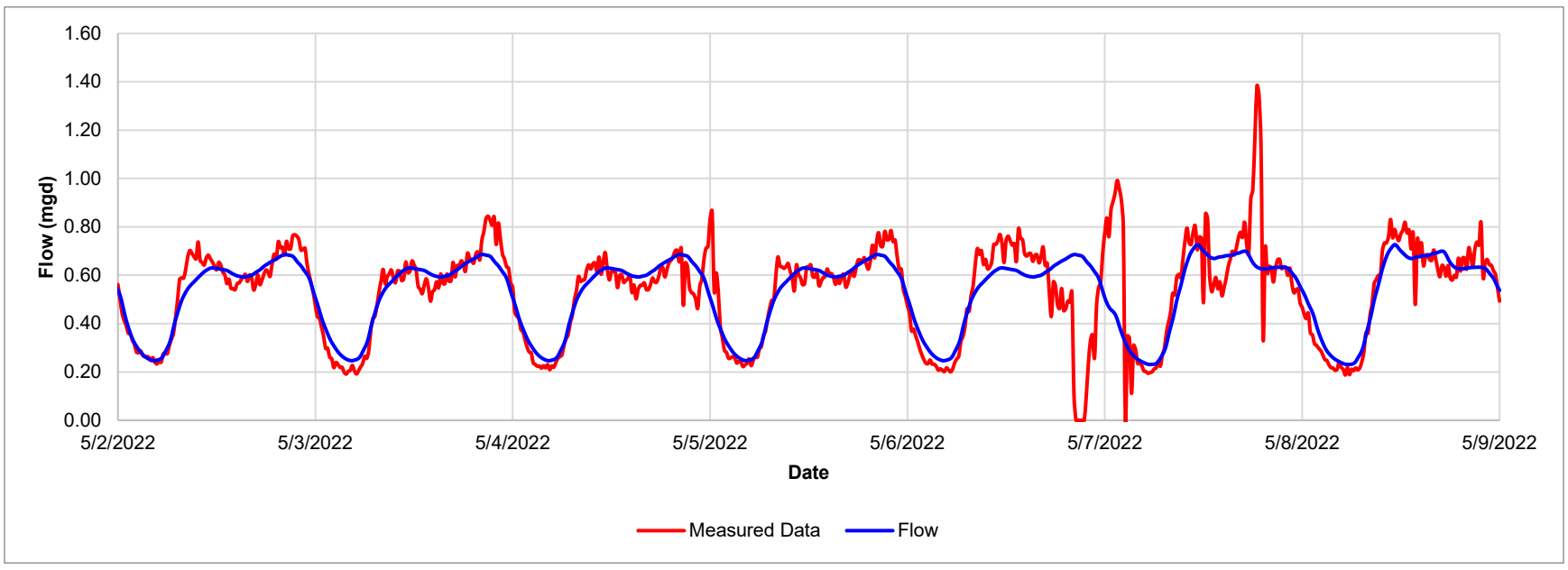


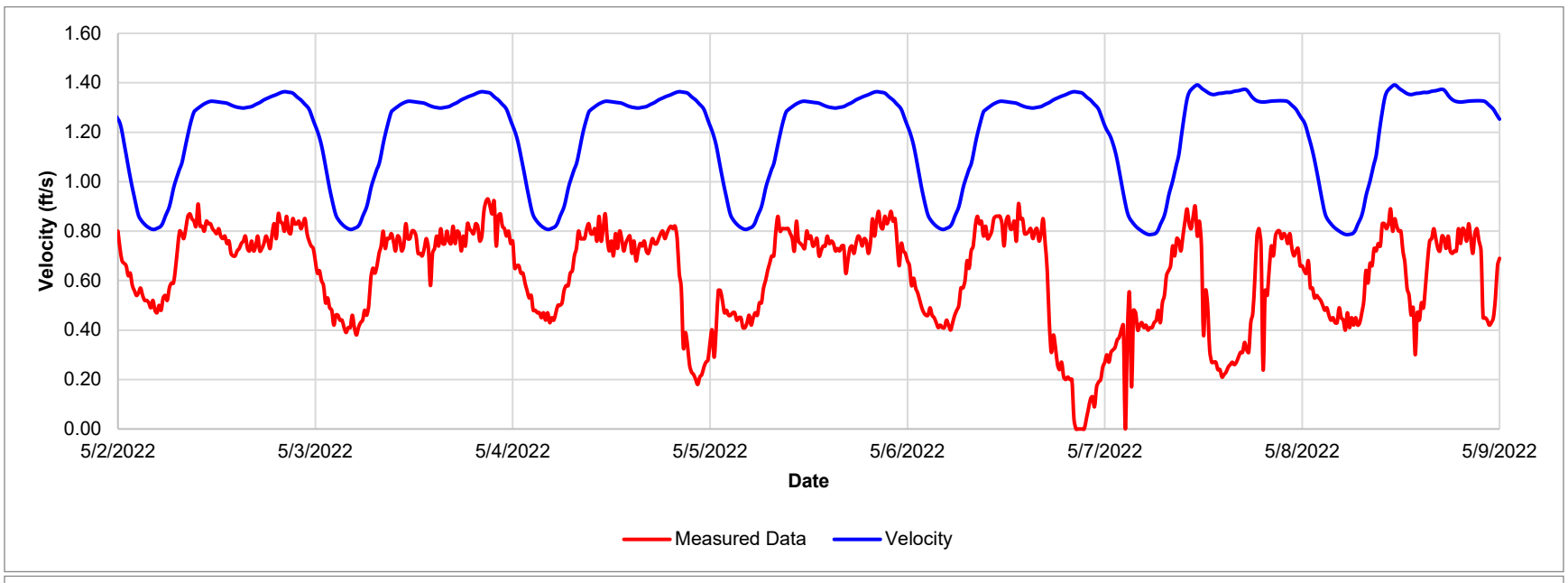


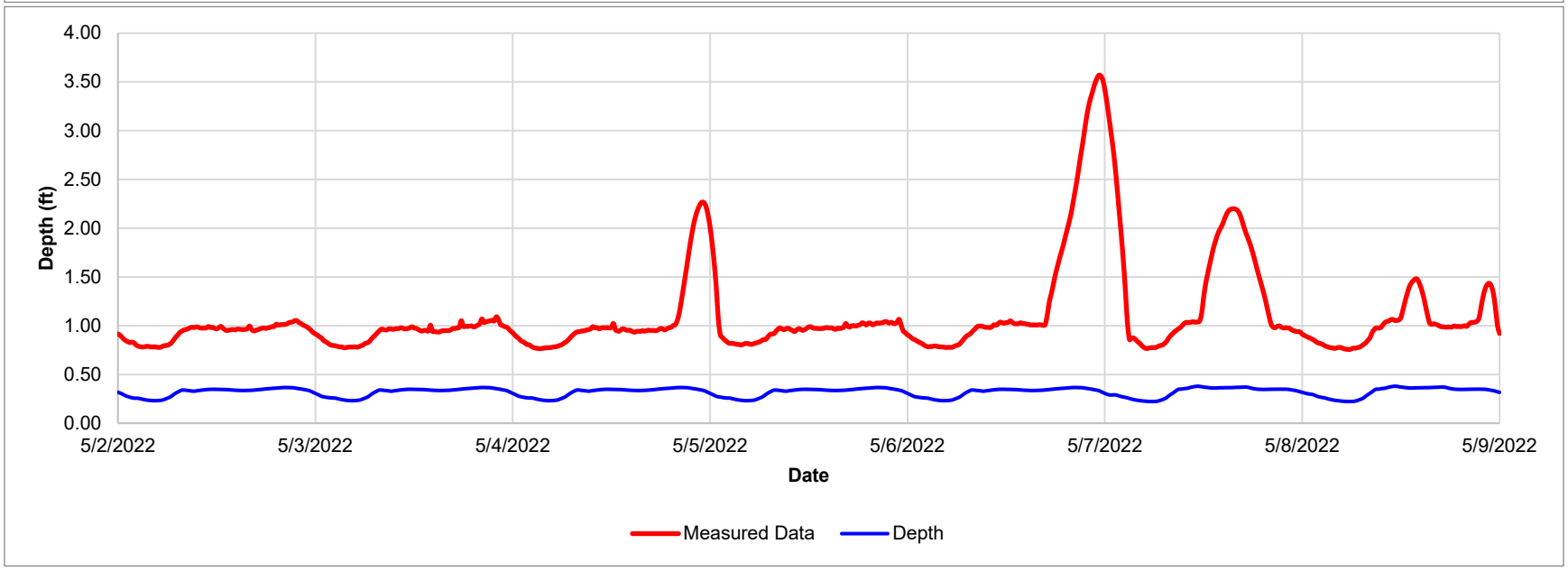


Site 10	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.86	2.63	2.53	2.42	0.92	2.22	2.35	6.3%	-15.4%	-7.2%	-3.0%
Min	0.44	1.39	0.53	0.57	0.46	1.34	0.55				
Avg	0.66	2.15	1.49	1.49	0.73	1.89	1.52	11.1%	-12.2%	1.9%	1.9%
Volume			2,974,654	2,974,852			3,032,040			1.9%	1.9%

2.11 SITE 11 – DWF

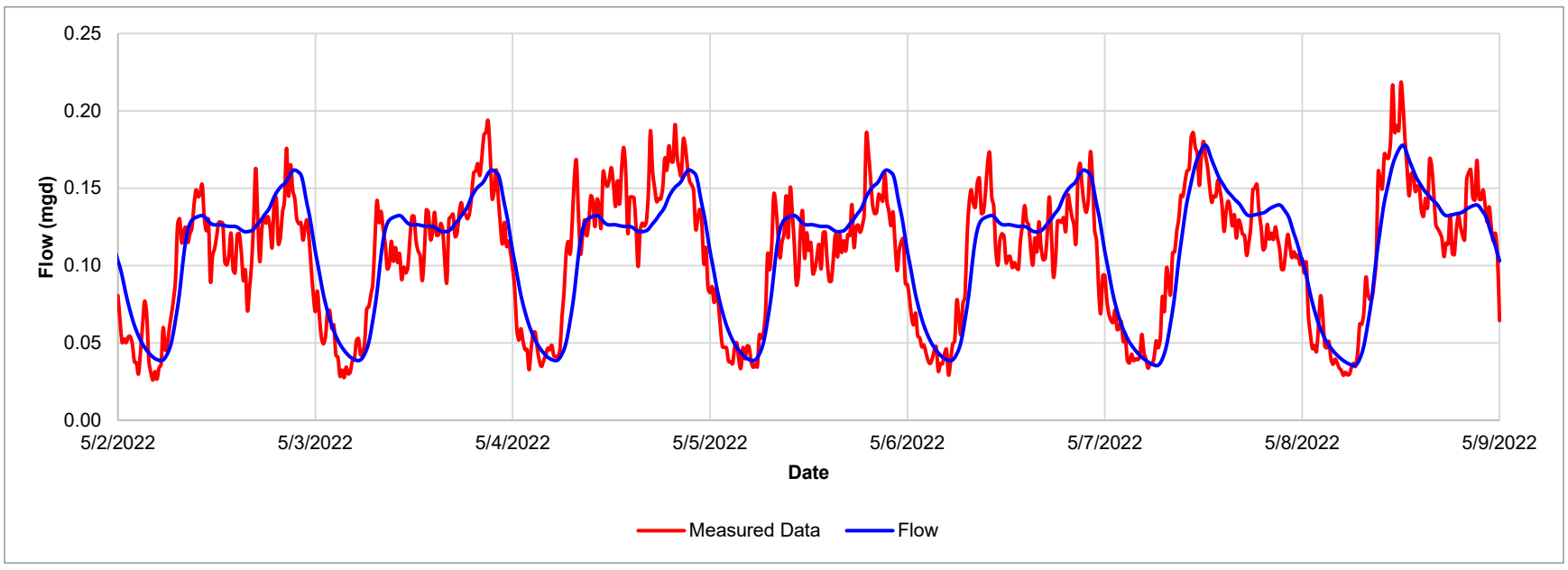


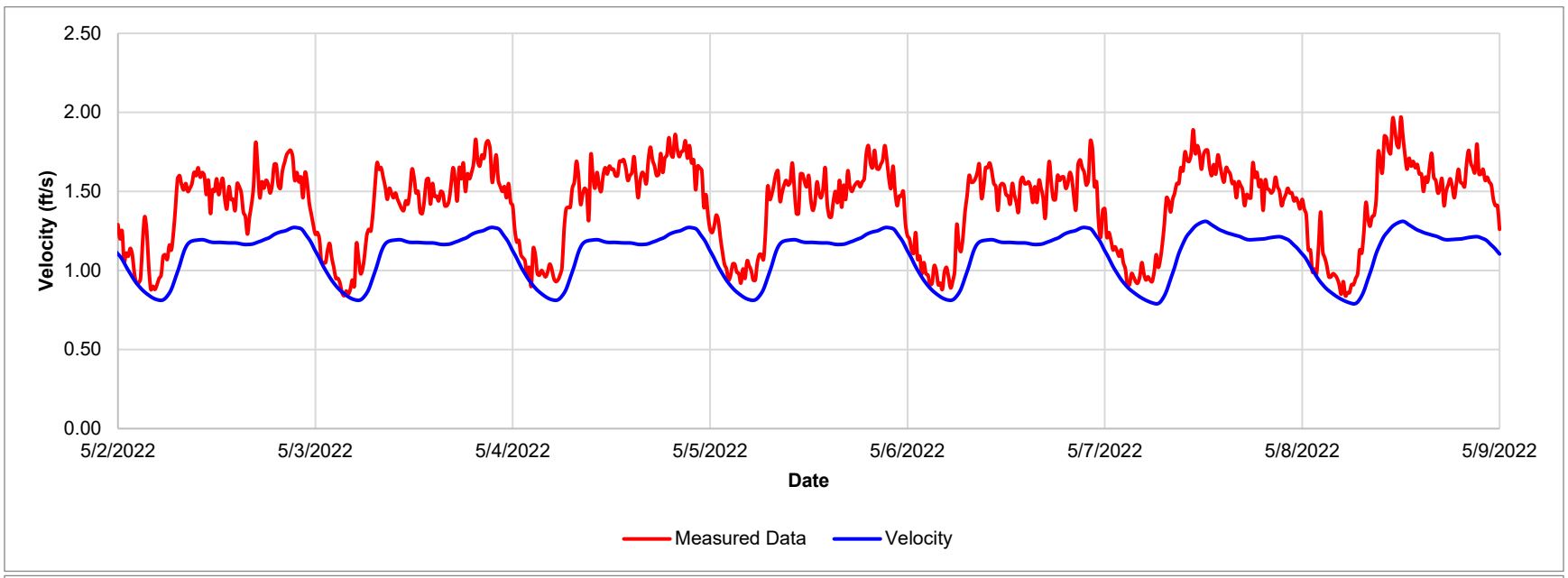


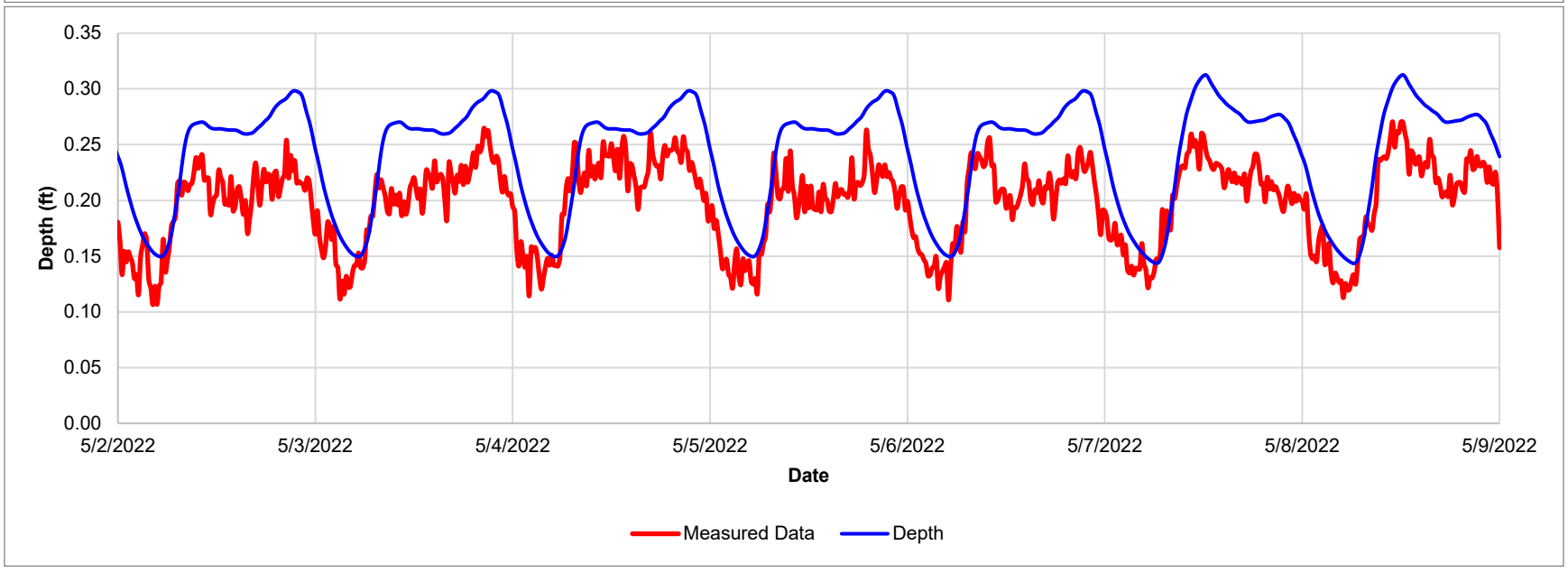


Site 11	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	3.57	0.93	1.38	1.25	0.38	1.39	0.73	-89.4%	49.6%	-47.4%	-42.1%
Min	0.76	0.00	0.00	0.00	0.22	0.79	0.23				
Avg	1.10	0.63	0.53	0.53	0.32	1.19	0.53	-70.8%	89.6%	-0.7%	-0.7%
Volume			1,062,660	1,062,706			1,055,574			-0.7%	-0.7%

2.12 SITE 12 – DWF



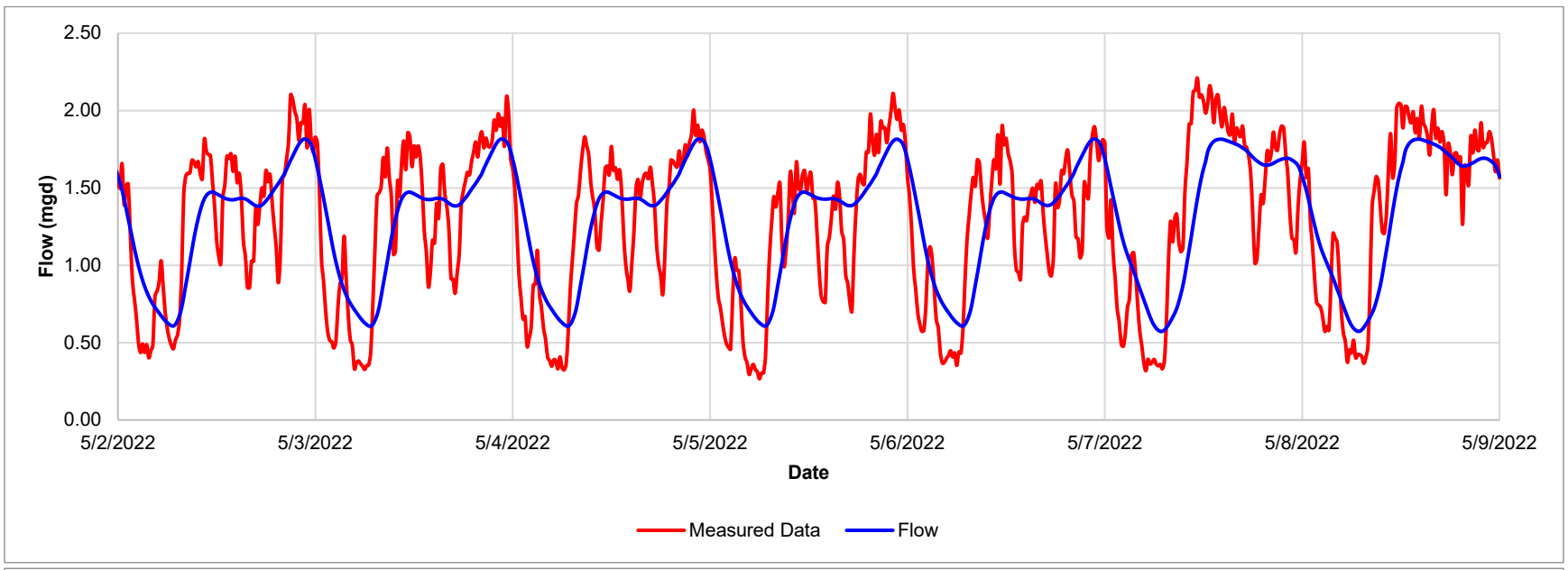


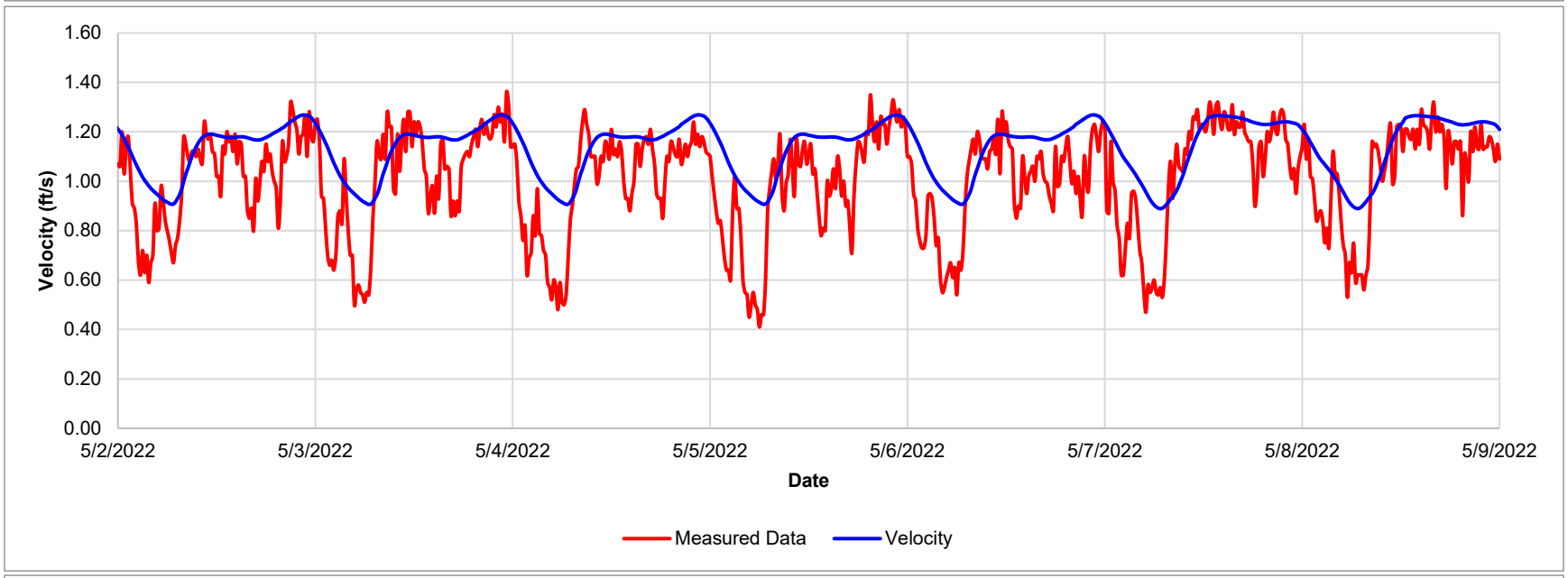


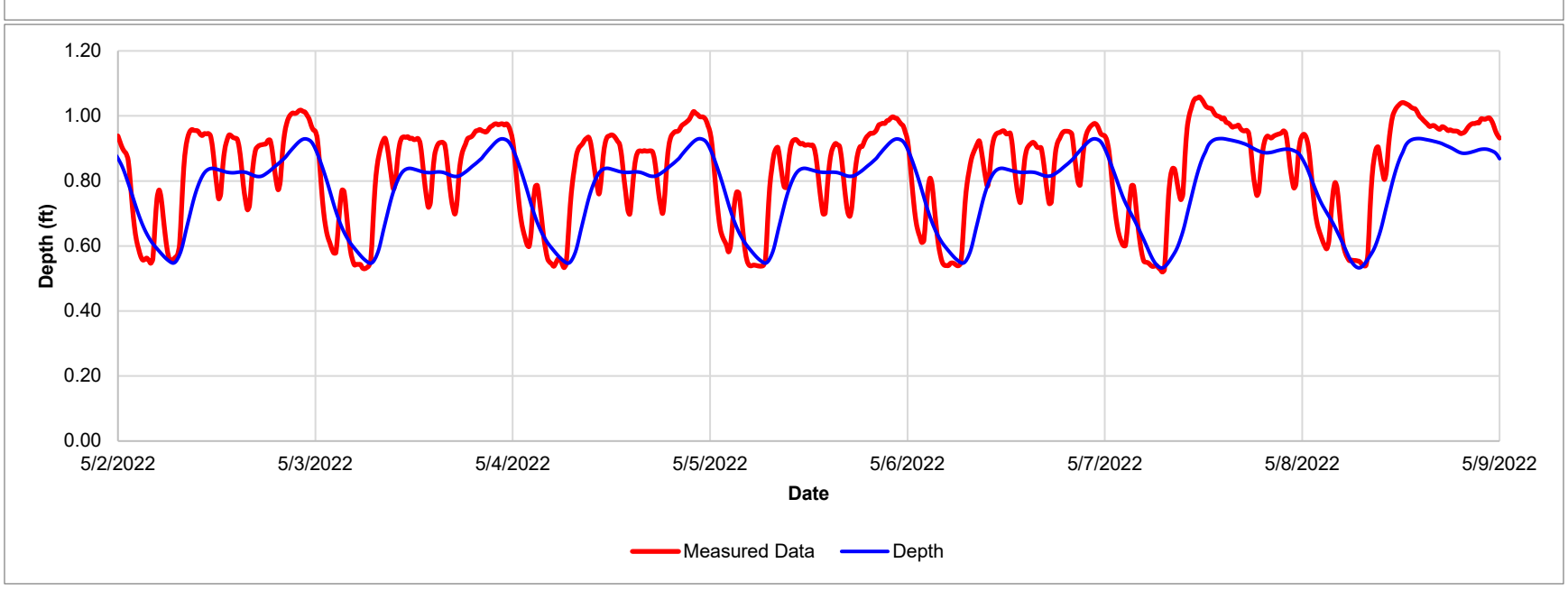
Site 12	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.27	1.97	0.22	0.20	0.31	1.31	0.18	15.6%	-33.5%	-18.5%	-11.2%
Min	0.11	0.84	0.03	0.03	0.14	0.79	0.04				
Avg	0.20	1.41	0.11	0.11	0.24	1.11	0.11	21.7%	-21.9%	2.5%	2.5%
Volume			213,885	213,912			219,331			2.5%	2.5%

2.13 SITE 13 – DWF (DATA COULD NOT BE USED)

2.14 SITE 14 – DWF

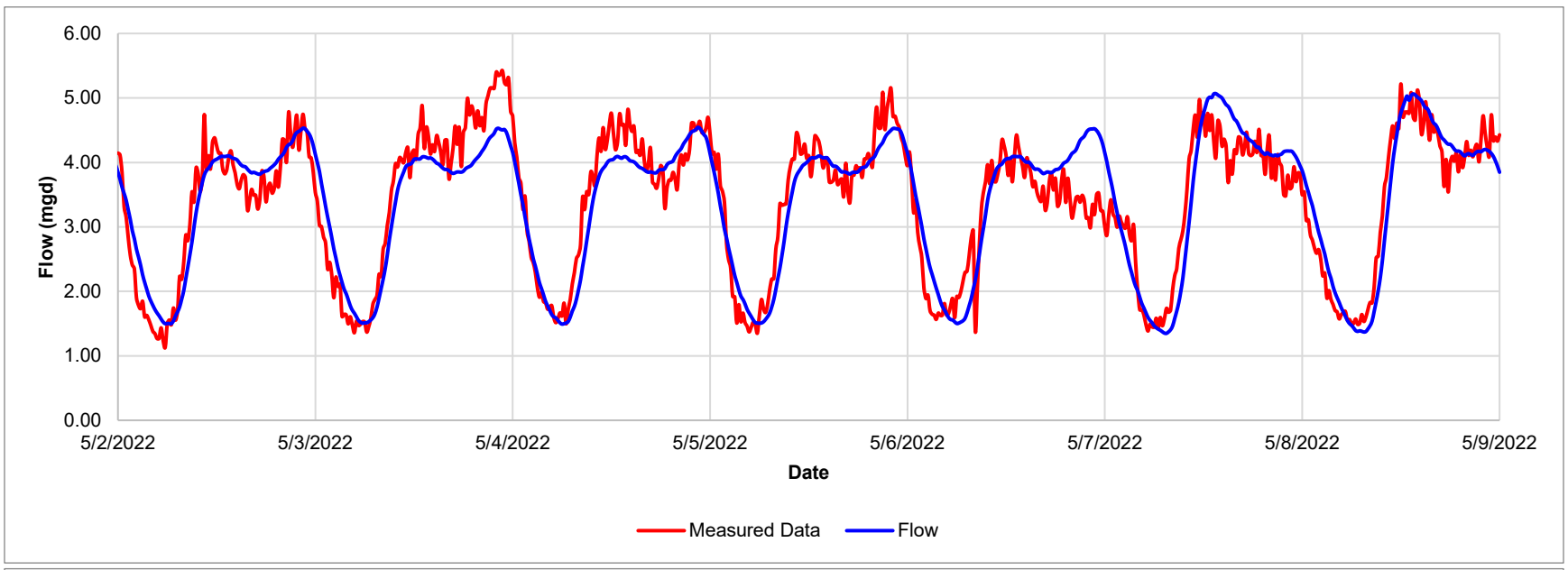


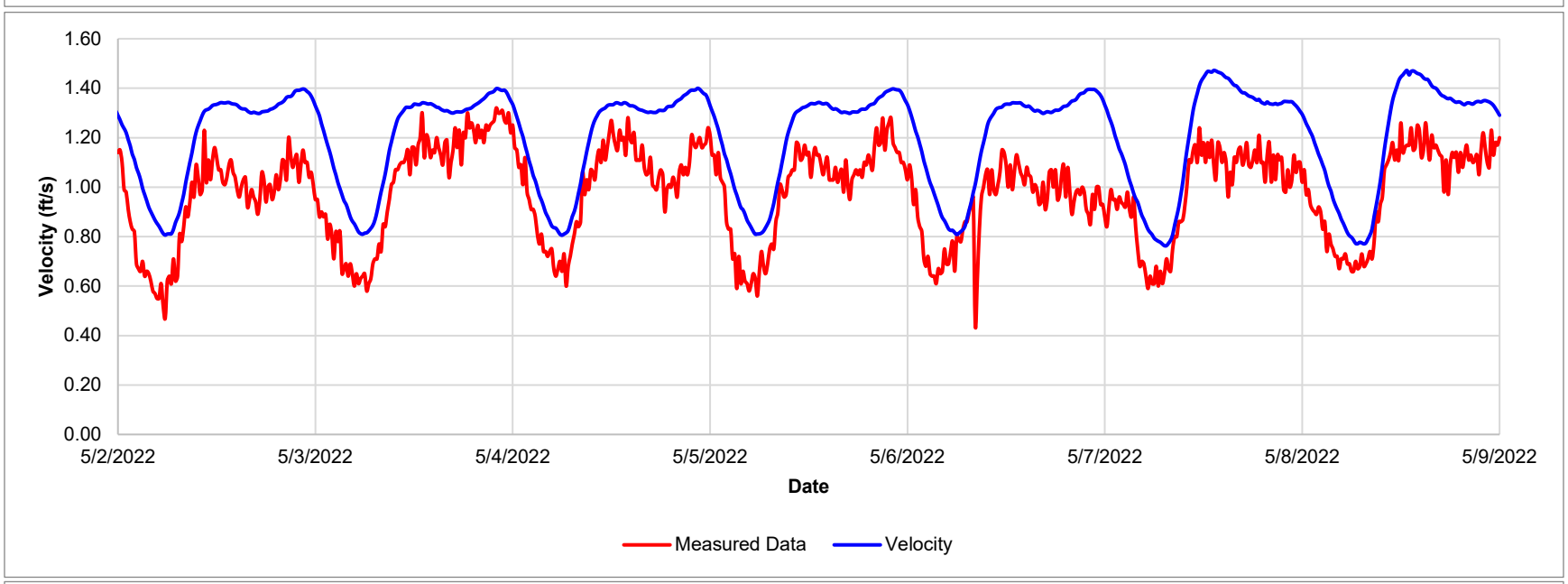


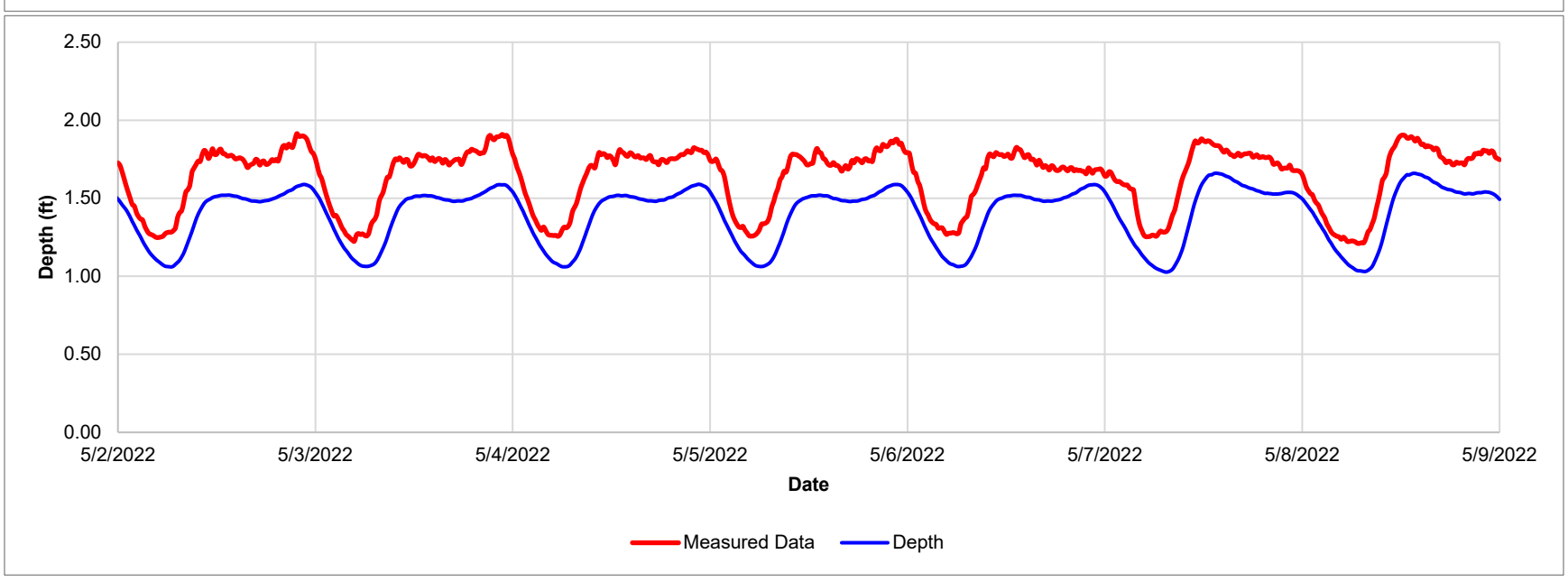


Site 14	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	1.06	1.36	2.21	2.14	0.93	1.27	1.82	-12.1%	-6.7%	-17.8%	-14.9%
Min	0.52	0.41	0.27	0.30	0.53	0.89	0.57				
Avg	0.83	1.01	1.29	1.29	0.78	1.13	1.31	-5.7%	12.8%	0.9%	0.9%
Volume			2,587,737	2,587,425			2,611,076			0.9%	0.9%

2.15 SITE 15 – DWF

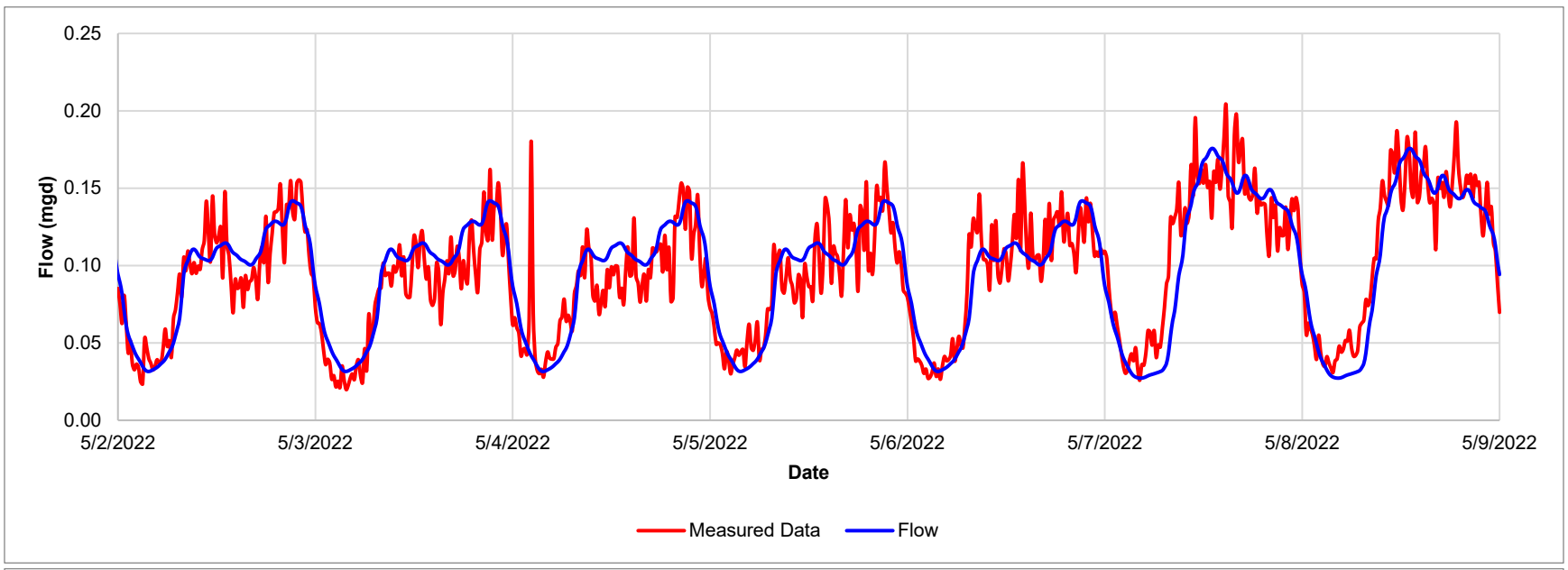


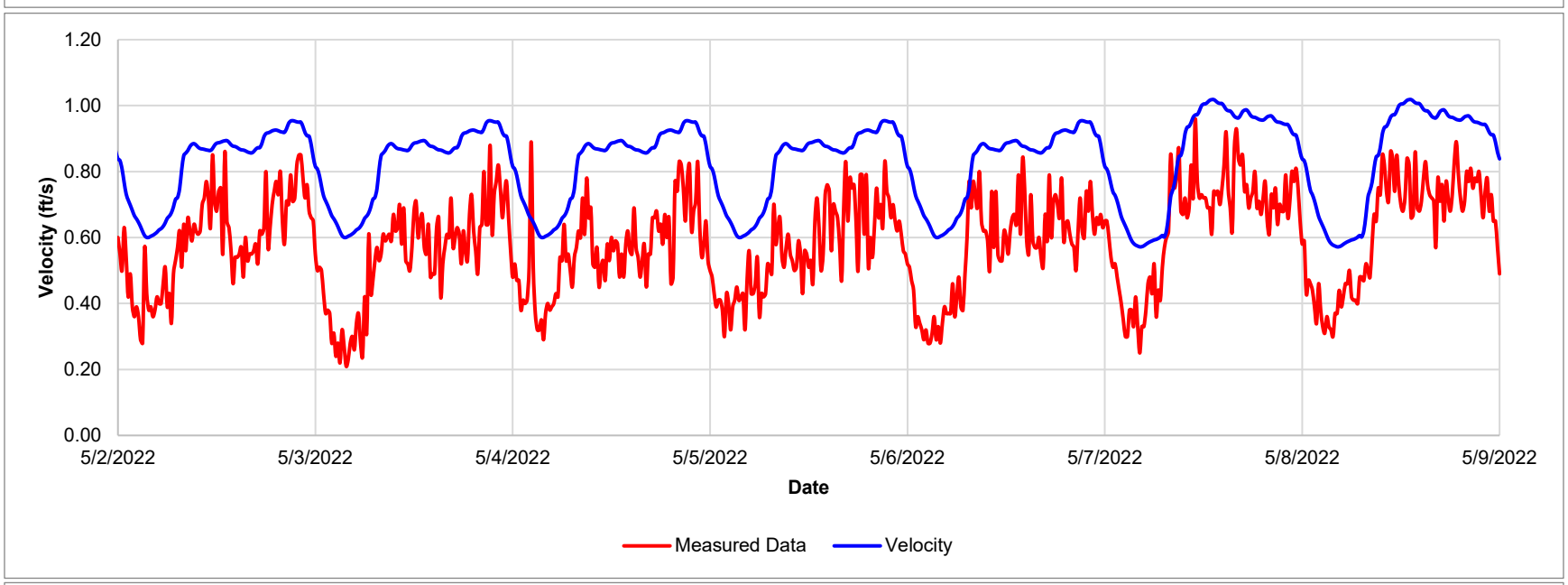


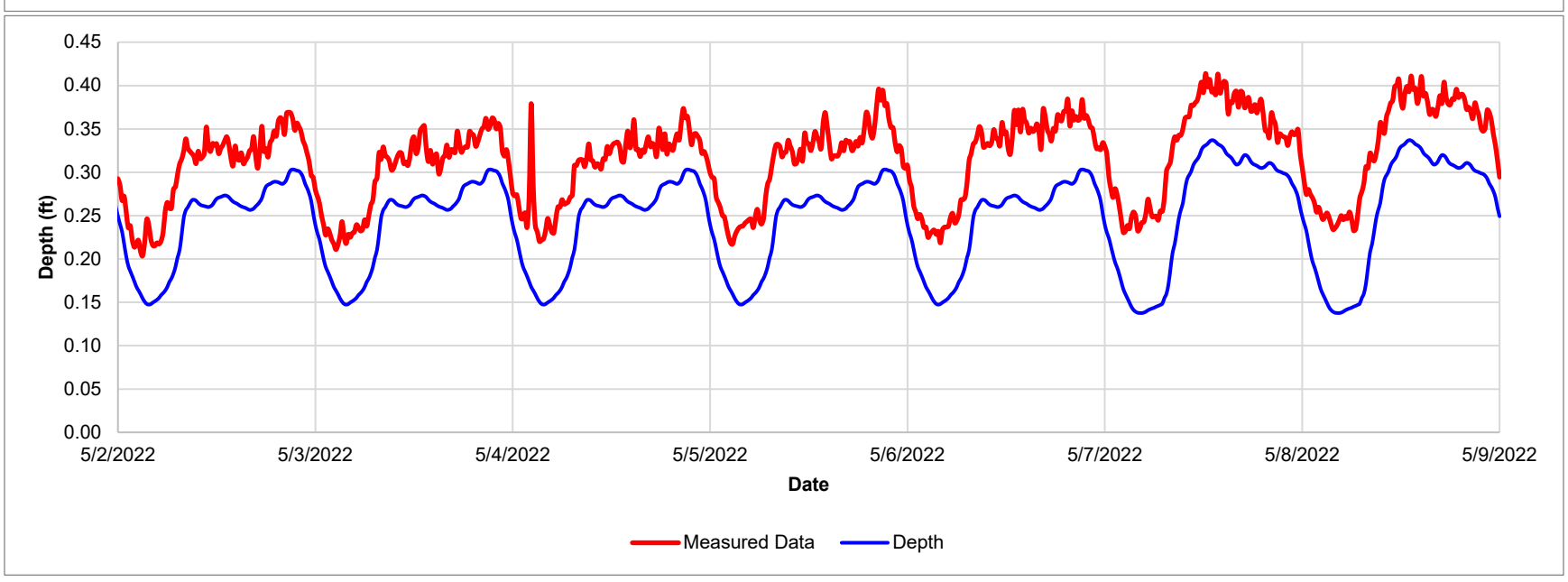


Site 15	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	1.91	1.32	5.42	5.38	1.66	1.47	5.07	-13.2%	11.5%	-6.6%	-5.9%
Min	1.21	0.44	1.13	1.27	1.03	0.76	1.35				
Avg	1.63	0.98	3.40	3.40	1.40	1.20	3.39	-14.3%	22.9%	-0.4%	-0.4%
Volume			6,807,116	6,806,770			6,778,721			-0.4%	-0.4%

2.16 SITE 16 – DWF

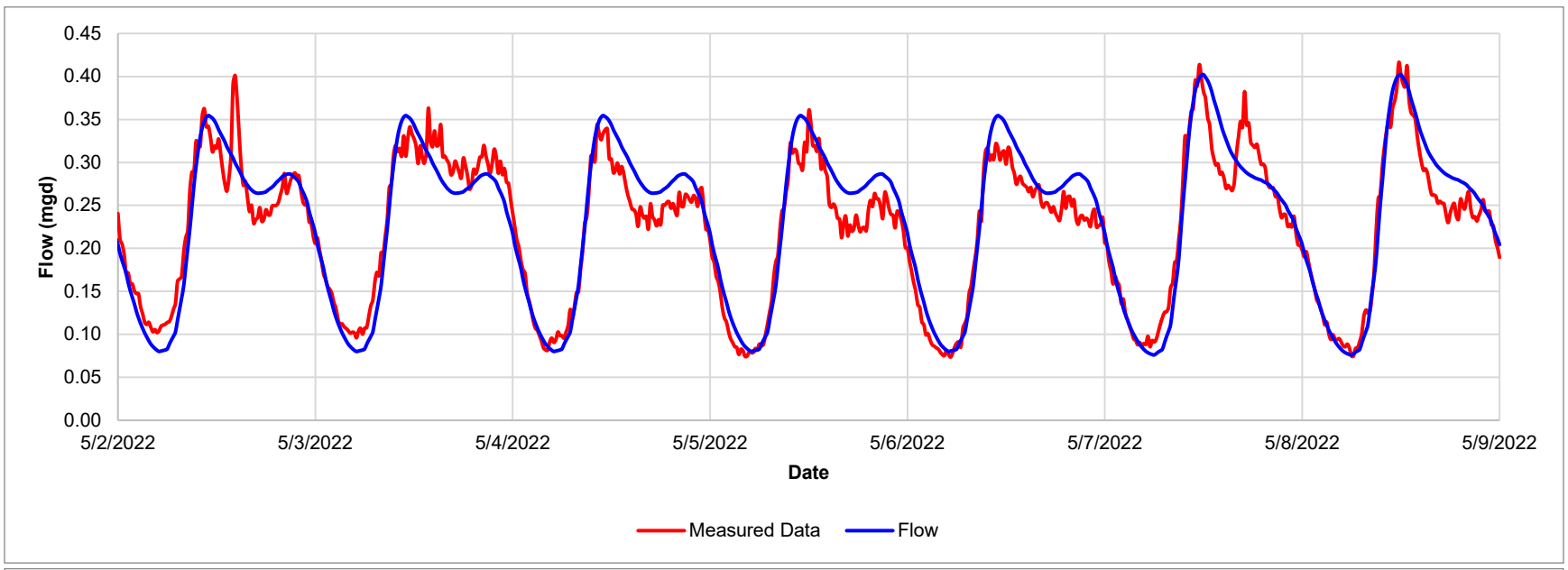


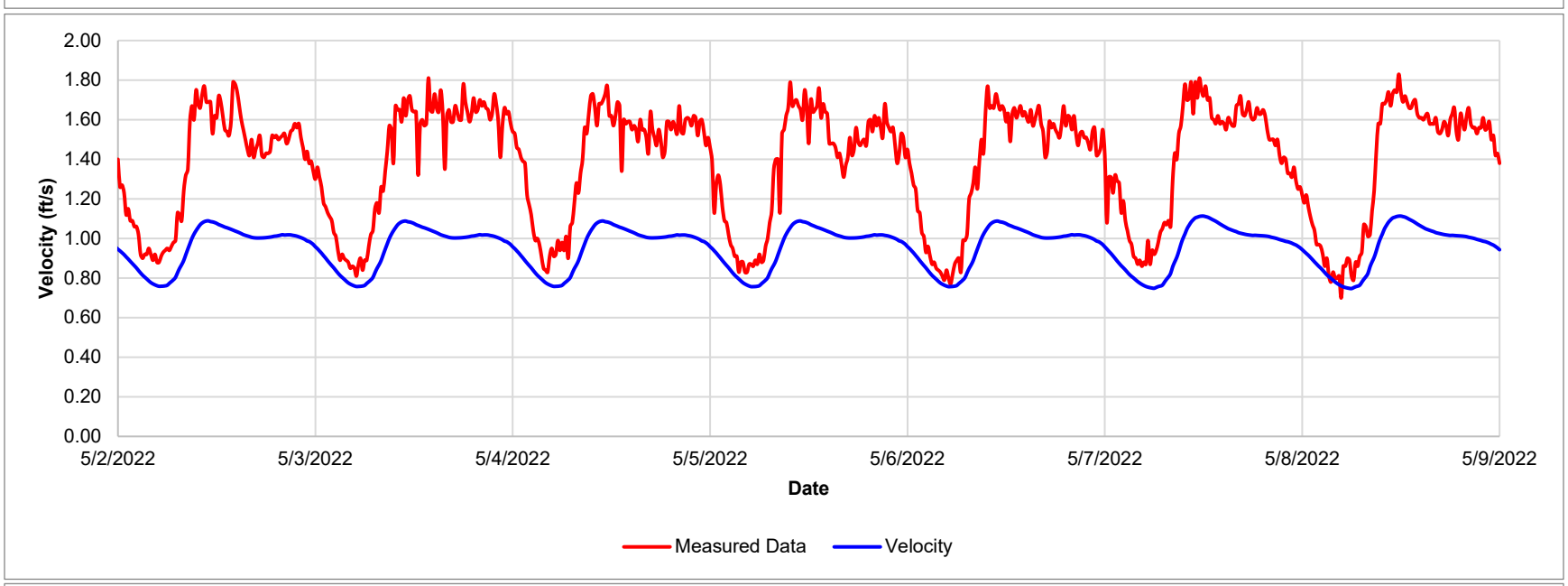


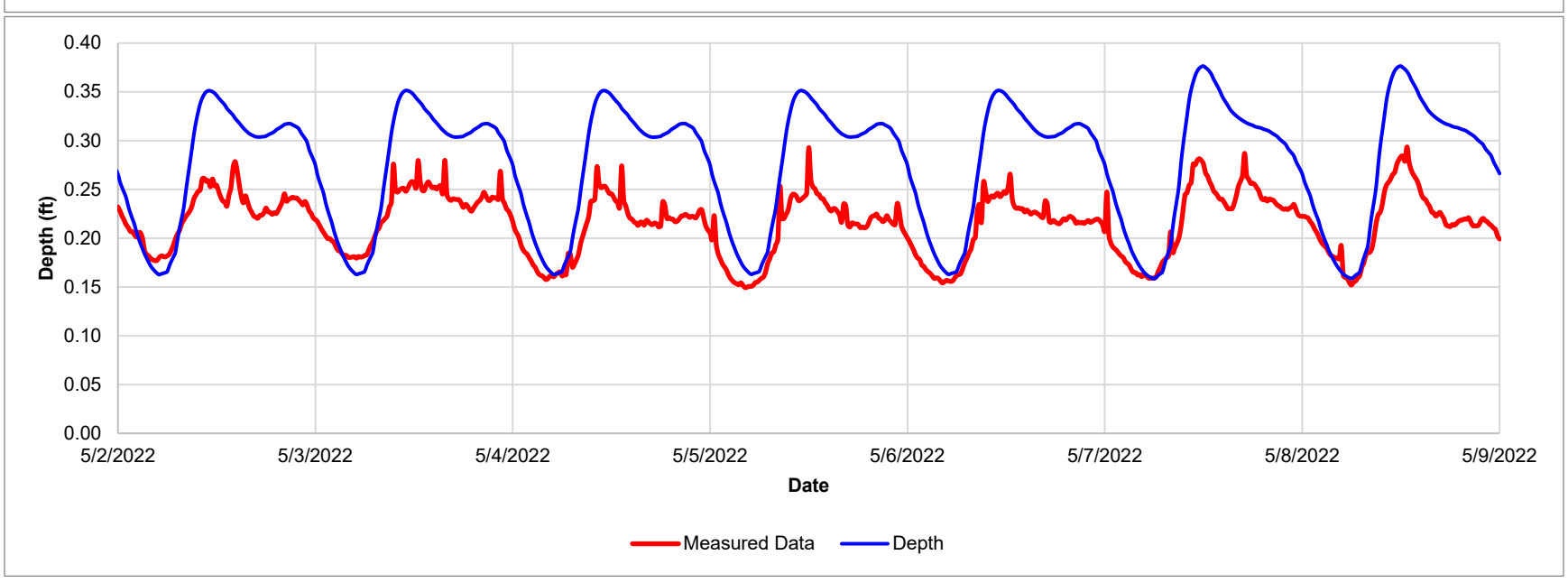


Site 16	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.41	0.96	0.20	0.18	0.34	1.02	0.18	-18.6%	6.1%	-13.6%	-3.1%
Min	0.20	0.21	0.02	0.02	0.14	0.57	0.03				
Avg	0.31	0.58	0.10	0.01	0.25	0.83	0.10	-22.0%	41.8%	0.5%	0.5%
Volume			193,148	193,169			194,184			0.5%	0.5%

2.17 SITE 17 – DWF

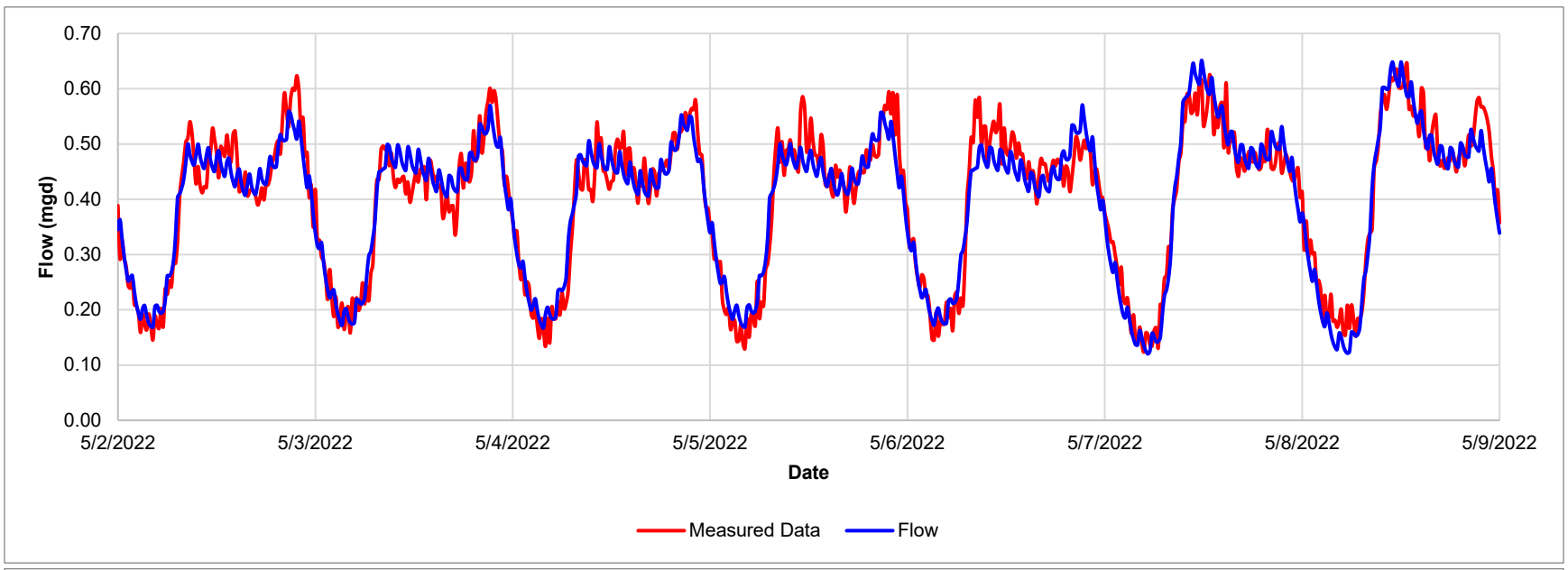


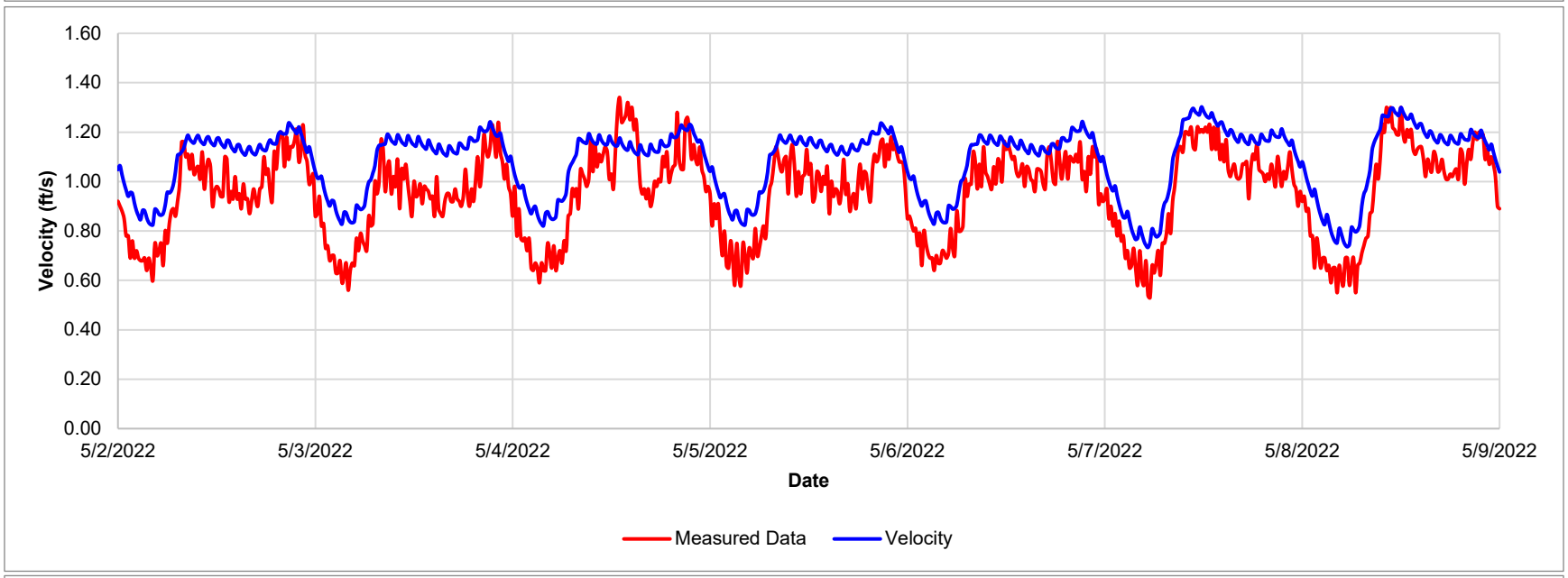


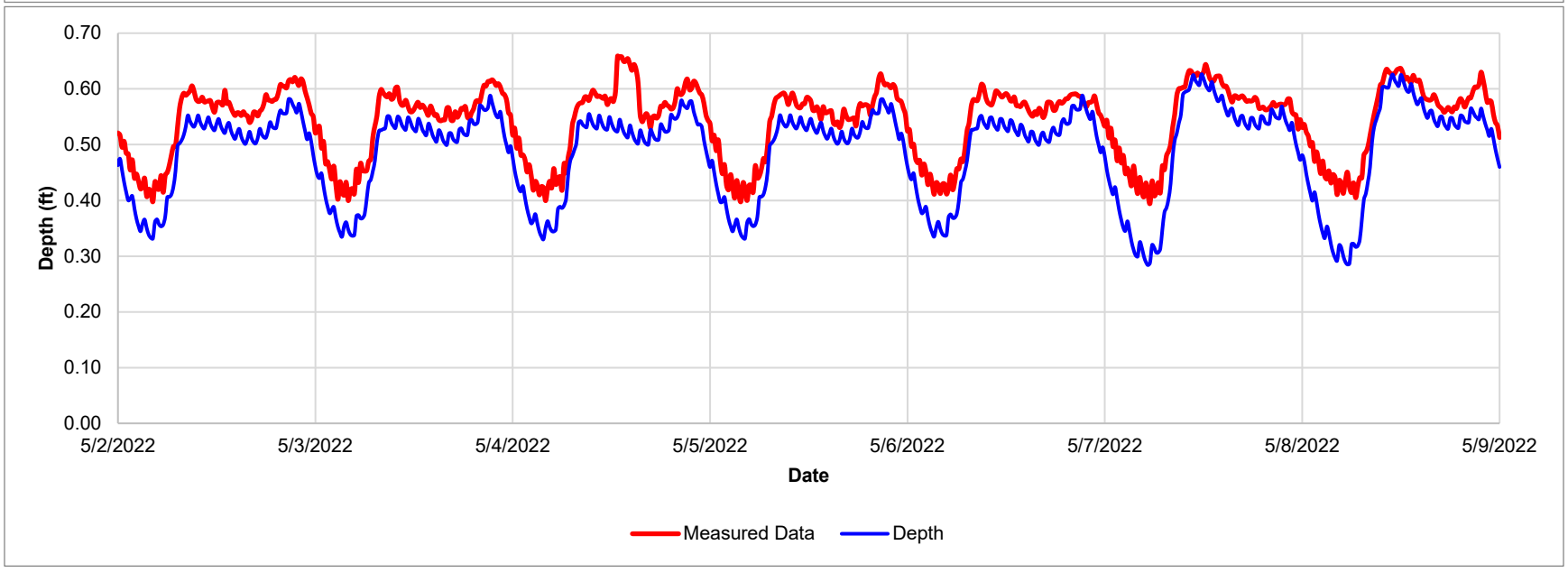


Site 17	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.29	1.83	0.42	0.40	0.38	1.11	0.40	28.2%	-39.2%	-3.4%	0.6%
Min	0.15	0.70	0.07	0.08	0.16	0.75	0.08				
Avg	0.22	1.38	0.22	0.22	0.28	0.96	0.23	27.6%	-31.0%	2.6%	2.6%
Volume			449,233	449,340			460,927			2.6%	2.6%

2.18 SITE 18 – DWF







Site 18	Measured				Modeled			Error			
DWF 2	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Hourly Rolling Average (Mgal/d)	Level (ft)	Vel (ft/s)	Flow (Mgal/d)	Level	Vel	Flow	Hourly Rolling Average
Max	0.66	1.30	0.65	0.68	0.63	1.30	0.65	-2.4%	0.1%	0.8%	-4.3%
Min	0.39	0.47	0.12	0.16	0.28	0.73	0.12				
Avg	0.54	0.95	0.40	0.40	0.49	1.08	0.40	-9.2%	13.5%	-0.7%	-1.4%
Volume			801,129	806,325			795,406			-0.7%	-1.4%

Stantec

PROJECT: WASTEWATER COLLECTION SYSTEM MASTER PLAN

DATE: Nov 2023

JOB NUMBER: 184031535

PREPARED BY: BEW

CLIENT: CITY OF MANTECA

CHECKED BY: SLB

DESCRIPTION: Model Data

TIME PATTERNS

Weekday - Hourly Time Patterns

Time	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Average
12:00 AM	0.4169	0.3792	0.2990	0.2611	0.4266	0.4160	0.5284	0.1457	0.5173	0.7245	0.4319	0.4632	1.0618	0.3947	0.7196	0.4682	0.3918	0.4070	0.4696
1:00 AM	0.2668	0.2241	0.2219	0.4360	0.1514	0.2675	0.3492	0.0378	0.3027	0.4746	0.3193	0.3133	1.0017	0.3445	0.4835	0.3045	0.2017	0.2709	0.3317
2:00 AM	0.2338	0.2174	0.2187	0.5988	0.0957	0.1818	0.2584	0.0939	0.1923	0.3189	0.2660	0.2282	0.5810	0.3530	0.3501	0.1761	0.0973	0.2408	0.2612
3:00 AM	0.2275	0.2357	0.2901	0.5633	0.1070	0.1814	0.1945	0.2039	0.2004	0.2402	0.2792	0.1792	1.1920	0.2829	0.2816	0.2126	0.1036	0.3085	0.2935
4:00 AM	0.3375	0.3115	0.4072	0.1472	0.0844	0.1954	0.2220	0.3745	0.2348	0.2122	0.3686	0.1924	0.7112	0.1360	0.3071	0.2665	0.1669	0.4102	0.2825
5:00 AM	0.5120	0.6116	0.6181	0.3224	0.0815	0.2957	0.3936	0.9113	0.3601	0.2782	0.6510	0.3800	0.5109	0.3036	0.4232	0.3679	0.2841	0.6574	0.4424
6:00 AM	1.0319	1.3328	0.9884	1.1070	0.4382	0.6632	0.5998	1.4656	0.7867	0.4723	1.0966	0.7795	0.4508	0.9280	0.6665	0.5576	0.6139	1.2022	0.8434
7:00 AM	1.5362	1.6986	1.1287	1.3175	0.6009	1.2258	0.9823	1.4419	1.2738	0.8342	1.2392	1.2606	1.2220	1.2967	0.9715	1.1036	1.1574	1.3227	1.2008
8:00 AM	1.4402	1.3031	1.1624	1.2752	0.7323	1.2101	1.1200	1.2354	1.1811	1.2023	1.2261	1.2526	1.5526	1.3461	1.1733	1.2452	1.6561	1.2817	1.2553
9:00 AM	1.3142	1.1763	1.2468	1.3008	1.1069	1.2182	1.3203	1.1643	1.1837	1.2521	1.2617	1.2690	1.8431	1.3471	1.2393	1.1577	1.7904	1.2750	1.3037
10:00 AM	1.1471	1.0675	1.3560	1.0502	1.4610	1.1725	1.4188	1.1230	1.2755	1.2673	1.2603	1.1777	1.3422	1.2176	1.2131	1.1362	1.6800	1.2559	1.2568
11:00 AM	1.1151	0.9880	1.3774	1.0856	1.6402	1.2146	1.3770	1.0528	1.2605	1.2556	1.1968	1.1981	1.8831	1.1342	1.2722	1.2606	1.5358	1.2481	1.2831
12:00 PM	1.0708	0.9286	1.3515	1.0839	1.7007	1.2293	1.3321	0.9663	1.2478	1.2611	1.1842	1.1778	1.8431	1.0902	1.2890	1.2931	1.4413	1.1985	1.2605
1:00 PM	1.0238	0.8774	1.2667	1.2747	1.8414	1.1014	1.2643	0.9111	1.2301	1.2421	1.1235	1.1824	1.5526	1.1115	1.1988	1.1959	1.3300	1.1341	1.2145
2:00 PM	0.9934	0.8432	1.3045	0.9390	1.6253	1.0256	1.2049	0.9420	1.1360	1.2019	1.1273	1.1293	0.9516	1.0217	1.1442	1.1400	1.2040	1.0916	1.1125
3:00 PM	1.0414	0.9212	1.3506	0.9655	1.5018	1.0486	1.1836	1.0443	1.1678	1.1634	1.1834	1.1550	0.9015	0.9743	1.1616	1.0975	1.1767	1.0991	1.1187
4:00 PM	1.0703	1.1161	1.4290	1.1663	1.4307	1.1782	1.2348	1.1718	1.1798	1.1733	1.2750	1.2436	0.8715	1.1474	1.2046	1.1859	1.2067	1.1494	1.1908
5:00 PM	1.2022	1.1914	1.4392	1.2822	1.5437	1.2304	1.2612	1.3731	1.2777	1.2292	1.3557	1.3215	0.5810	1.2779	1.2080	1.4317	1.2285	1.2155	1.2583
6:00 PM	1.3174	1.3623	1.4444	1.2368	1.5693	1.4272	1.3621	1.6738	1.3671	1.3116	1.4008	1.4685	0.9215	1.3320	1.2489	1.4785	1.3191	1.3256	1.3648
7:00 PM	1.4724	1.6513	1.5300	1.3418	1.5462	1.6269	1.4007	1.9973	1.4731	1.3861	1.4407	1.5060	0.6311	1.4740	1.3126	1.4399	1.3555	1.5016	1.4493
8:00 PM	1.6790	1.9262	1.3247	1.5175	1.3751	1.8099	1.4896	1.9188	1.6348	1.4978	1.3810	1.6239	0.5209	1.5888	1.4173	1.6552	1.2910	1.5370	1.5105
9:00 PM	1.6091	1.7300	1.0763	1.4945	1.2609	1.7896	1.4692	1.4140	1.5221	1.5694	1.1945	1.5524	0.5609	1.6035	1.4018	1.6222	1.1715	1.2964	1.4077
10:00 PM	1.2054	1.1903	0.7220	1.3736	0.9914	1.4408	1.1836	0.8893	1.1698	1.3657	1.0434	1.1733	0.7112	1.4380	1.2965	1.3593	0.9474	0.9429	1.1358
11:00 PM	0.7357	0.7162	0.4466	0.8594	0.6873	0.8499	0.8497	0.4483	0.8250	1.0657	0.6940	0.7726	0.6010	0.8562	1.0156	0.8440	0.6496	0.6280	0.7525

Stantec

PROJECT: WASTEWATER COLLECTION SYSTEM MASTER PLAN

DATE: Nov 2023

JOB NUMBER: 184031535

PREPARED BY: BEW

CLIENT: CITY OF MANTECA

CHECKED BY: SLB

DESCRIPTION: Model Data

TIME PATTERNS

Weekend - Hourly Time Patterns

Time	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Average
12:00 AM	0.5119	0.4998	0.4167	0.4881	0.5795	0.5945	0.6280	0.3854	0.6014	0.7825	0.7387	0.4734	1.0017	0.5472	0.8050	0.5241	0.4158	0.3907	0.534
1:00 AM	0.3553	0.2497	0.2765	0.9961	0.3354	0.3956	0.4597	0.2361	0.3830	0.5460	0.3569	0.3286	1.7496	0.6337	0.6345	0.2714	0.2343	0.2003	0.444
2:00 AM	0.2842	0.1900	0.1942	0.5529	0.2436	0.2497	0.3414	0.2105	0.2400	0.3667	0.2514	0.2489	1.4023	0.3586	0.4544	0.1387	0.1157	0.1056	0.306
3:00 AM	0.1969	0.1630	0.1976	0.0662	0.2940	0.2141	0.2401	0.2017	0.2309	0.2435	0.2356	0.1871	0.7746	0.1026	0.3203	0.1296	0.1064	0.0837	0.205
4:00 AM	0.1701	0.1469	0.2273	0.1205	0.1118	0.1655	0.2074	0.2462	0.1786	0.1890	0.2292	0.1541	1.3222	0.0673	0.2991	0.1630	0.1082	0.1014	0.216
5:00 AM	0.2243	0.1753	0.4097	0.7853	0.1100	0.1733	0.2167	0.4573	0.1434	0.1679	0.2846	0.1411	2.0301	0.3366	0.3064	0.1815	0.1310	0.2123	0.333
6:00 AM	0.4151	0.5038	0.7741	0.8010	0.2556	0.2591	0.3138	0.8513	0.2973	0.2251	0.5420	0.3794	1.2821	0.4415	0.3529	0.2185	0.3429	0.5920	0.455
7:00 AM	0.9550	1.0649	1.0740	0.2886	0.3228	0.7609	0.5887	1.3260	0.7227	0.4355	1.0238	0.7522	1.4558	0.5477	0.5810	0.6389	0.7860	1.1875	0.746
8:00 AM	1.4548	1.6466	1.3121	1.0950	0.5843	1.2999	0.9322	1.6464	1.1354	0.8865	1.3856	1.2318	2.3907	1.1911	0.9397	1.0747	1.5320	1.6195	1.200
9:00 AM	1.7730	1.9941	1.5636	1.4535	0.9530	1.6868	1.3534	1.7767	1.4605	1.3145	1.6385	1.5253	1.9366	1.5563	1.2906	1.5490	1.9245	1.8195	1.468
10:00 AM	1.8167	1.9039	1.6210	1.4610	1.3398	1.9783	1.6759	1.7469	1.6327	1.5648	1.6148	1.7385	2.6311	1.6431	1.5330	1.7793	2.0621	1.8189	1.622
11:00 AM	1.7191	1.7986	1.6540	1.4483	1.7583	1.9770	1.6977	1.5832	1.7088	1.7114	1.3151	1.8034	1.6962	1.6459	1.5820	2.0064	1.9404	1.7584	1.583
12:00 PM	1.5789	1.6424	1.6435	1.4901	1.8141	1.8386	1.7448	1.4478	1.6320	1.6681	1.2116	1.5816	1.1219	1.5712	1.5398	2.1024	1.7009	1.6267	1.488
1:00 PM	1.4182	1.4710	1.5064	1.4859	1.7649	1.6460	1.5555	1.3113	1.5571	1.6066	1.2643	1.4715	2.2705	1.5209	1.4541	2.0114	1.5048	1.4773	1.454
2:00 PM	1.3320	1.2927	1.4086	1.5161	1.5856	1.5655	1.4002	1.1936	1.4345	1.4323	1.3330	1.3966	1.2154	1.4944	1.3873	1.8513	1.3952	1.3481	1.314
3:00 PM	1.2803	1.2451	1.3571	1.5192	1.5066	1.4863	1.2949	1.1675	1.3212	1.3212	1.4325	1.3389	1.7362	1.5017	1.3269	1.7095	1.3481	1.2918	1.294
4:00 PM	1.2271	1.1889	1.3317	1.4847	1.5173	1.3932	1.2306	1.2026	1.2664	1.2782	1.5069	1.2391	2.5109	1.4583	1.3669	1.8754	1.2924	1.2737	1.318
5:00 PM	1.2693	1.1718	1.3513	1.3015	1.3692	1.3399	1.2384	1.2752	1.2869	1.2722	1.2747	1.2740	1.6962	1.3814	1.3662	1.7207	1.2875	1.2729	1.241
6:00 PM	1.3241	1.2368	1.3281	1.4317	1.2343	1.3745	1.2154	1.4257	1.3238	1.2851	1.2589	1.2826	1.1352	1.3608	1.2963	1.6659	1.2683	1.3027	1.220
7:00 PM	1.4452	1.3793	1.4129	1.3648	1.2625	1.4285	1.2676	1.5724	1.3897	1.2884	1.2866	1.3331	0.9616	1.4516	1.2650	1.7516	1.2000	1.3803	1.256
8:00 PM	1.4907	1.4969	1.2458	1.3469	1.1761	1.6364	1.2979	1.5338	1.4713	1.3500	1.2777	1.3462	0.9349	1.4878	1.2659	1.6210	1.1169	1.4081	1.259
9:00 PM	1.3848	1.4070	1.0747	1.3780	1.0149	1.5973	1.1895	1.3043	1.3597	1.3313	1.2625	1.2387	1.8831	1.4364	1.2494	1.5793	1.0322	1.2416	1.231
10:00 PM	1.1174	1.0499	0.7934	1.3411	1.0154	1.3109	1.0297	0.9755	1.1168	1.2263	1.1295	1.0131	1.3088	1.2978	1.1174	1.3827	0.8643	0.9448	1.029
11:00 PM	0.7818	0.7418	0.5619	0.6395	0.8199	0.8964	0.8067	0.6541	0.8489	1.0094	0.9373	0.8010	1.8164	0.7435	0.9595	0.9638	0.6309	0.6689	0.785

Stantec

PROJECT: WASTEWATER COLLECTION SYSTEM MASTER PLAN

DATE: Nov 2023

JOB NUMBER: 184031535

PREPARED BY: BEW

CLIENT: CITY OF MANTECA

CHECKED BY: SLB

DESCRIPTION: Model Data

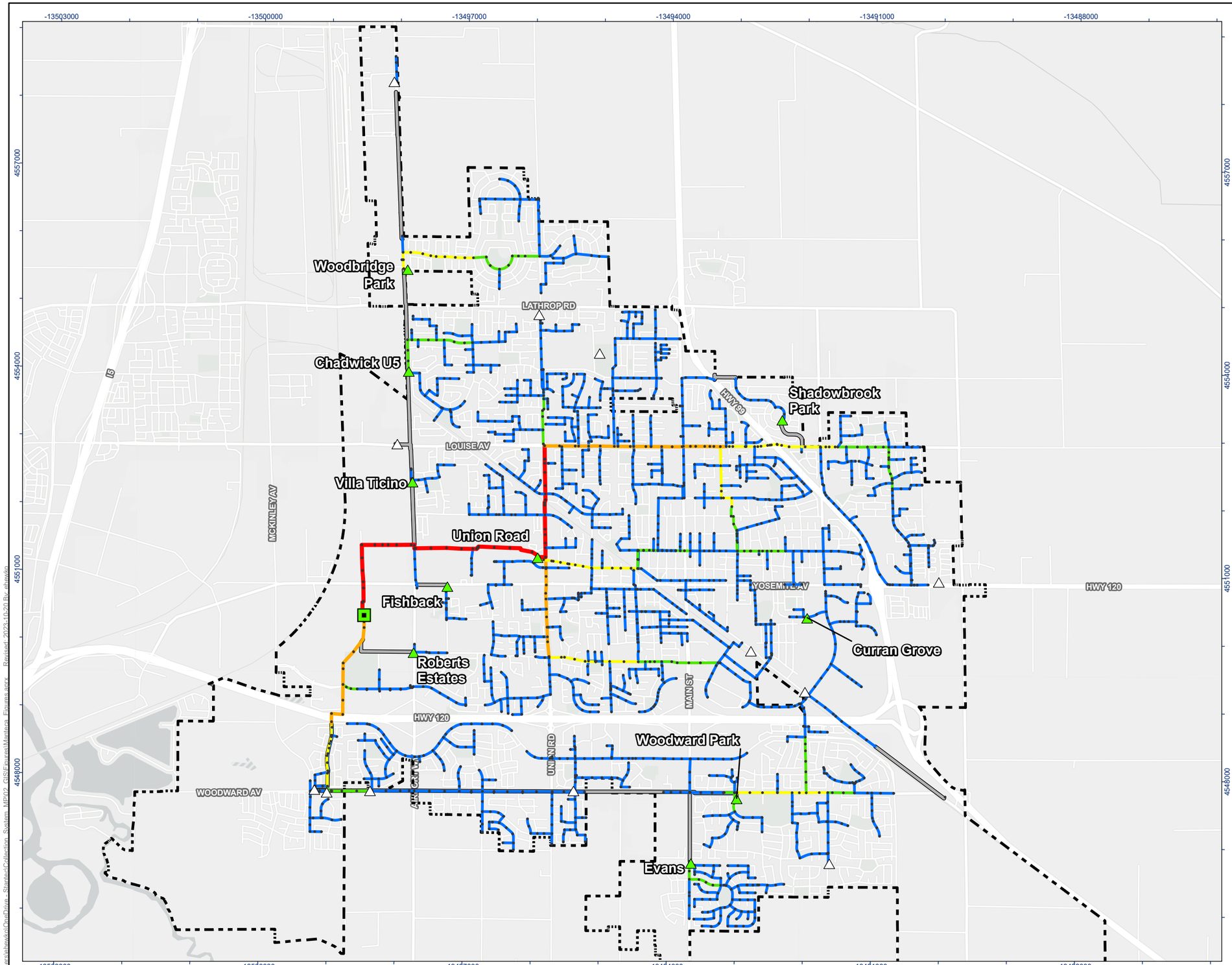
ENR: 13,176

Unit Hydrograph RTK Parameters

RTK Parameters

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Average
R - Short-Term	0.0150	0.0100	0.0130	0.0100	0.0030	0.0090	0.0170	0.0100	0.0110	0.0075	0.0080	0.0080	0.0010	0.0020	0.0110	0.0120	0.0110	0.0110	0.0094
R - Medium-Term	0.0150	0.0150	0.0100	0.0100	0.0050	0.0090	0.0110	0.0100	0.0070	0.0030	0.0030	0.0040	0.0015	0.0020	0.0050	0.0120	0.0050	0.0060	0.0074
R - Long-Term	0.0200	0.0150	0.0200	0.0200	0.0200	0.0100	0.0200	0.0100	0.0100	0.0100	0.0100	0.0100	0.0001	0.0010	0.0010	0.0100	0.0100	0.0100	0.0115
T - Short-Term	0.5	0.5	1.0	0.5	0.5	0.5	0.5	1.0	0.5	0.8	1.0	0.8	0.5	0.5	0.5	0.8	0.5	0.6	0.6
T - Medium-Term	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	4	4	2
T - Long-Term	20	20	20	20	20	20	20	20	20	20	20	20	10	20	20	20	20	20	19
K - Short-Term	3	3	1	3	3	3	3	2	3	3	2	2	3	3	3	3	4	1	3
K - Medium-Term	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
K - Long-Term	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

ATTACHMENT 2



Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Modeled Forcemain
- Modeled Wastewater Sewer

Peak Flow (Mgal/d)

- <= 0.5 Mgal/d
- > 0.5 Mgal/d - 1.0 Mgal/d
- > 1.0 Mgal/d - 2.0 Mgal/d
- > 2.0 Mgal/d - 5.0 Mgal/d
- > 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

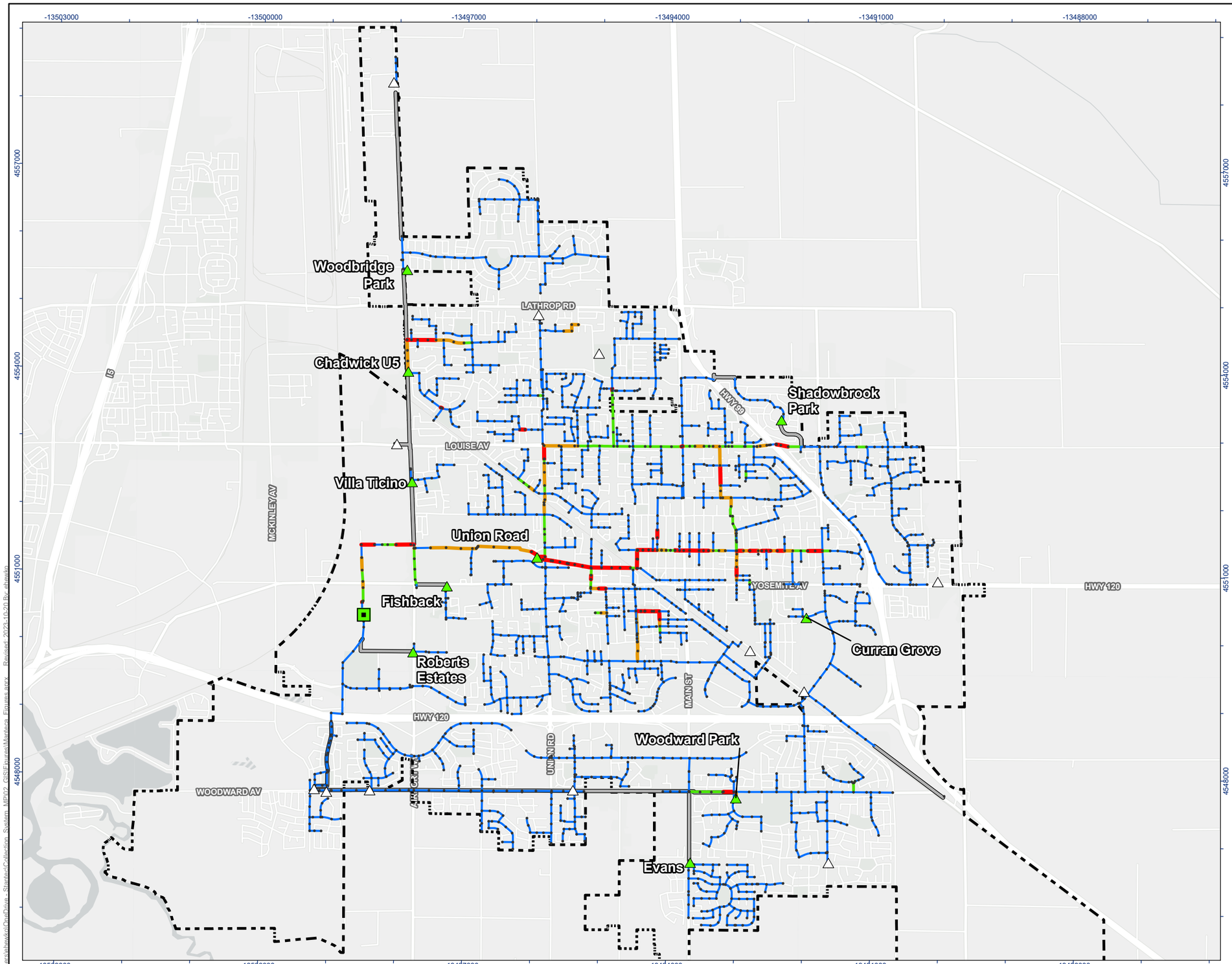
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Figure No.
F-1

Title
Scenario 1
Peak Sewer Flow

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Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Modeled Forcemain

Peak Pipe Utilization (% of FPC)

- <= 50%
- > 50% - 75%
- > 75% - 50%
- > 100%
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

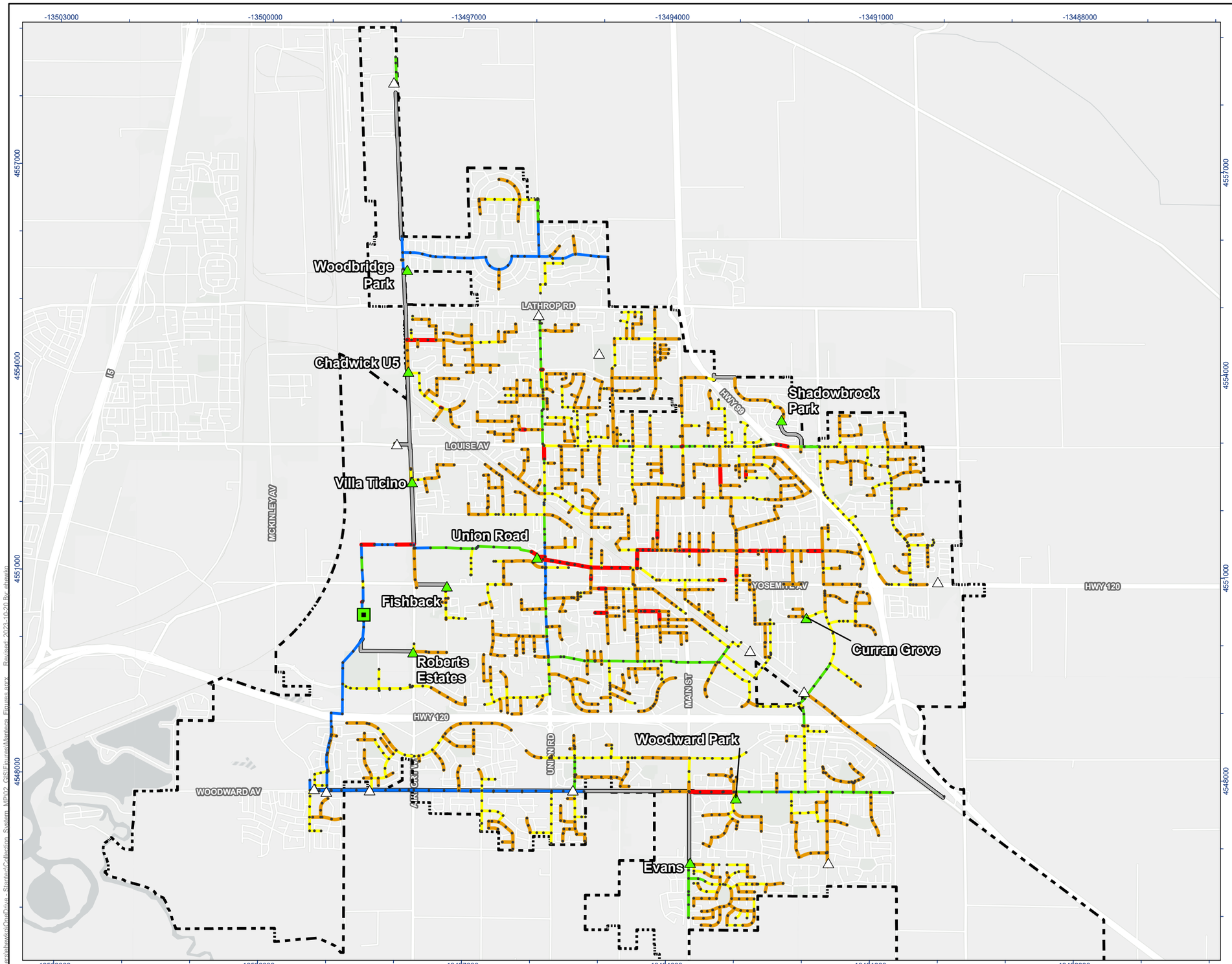
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Figure No.
F-2

Title
Scenario 1
Peak Pipe Utilization (% of FPC)

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Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Modeled Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

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3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

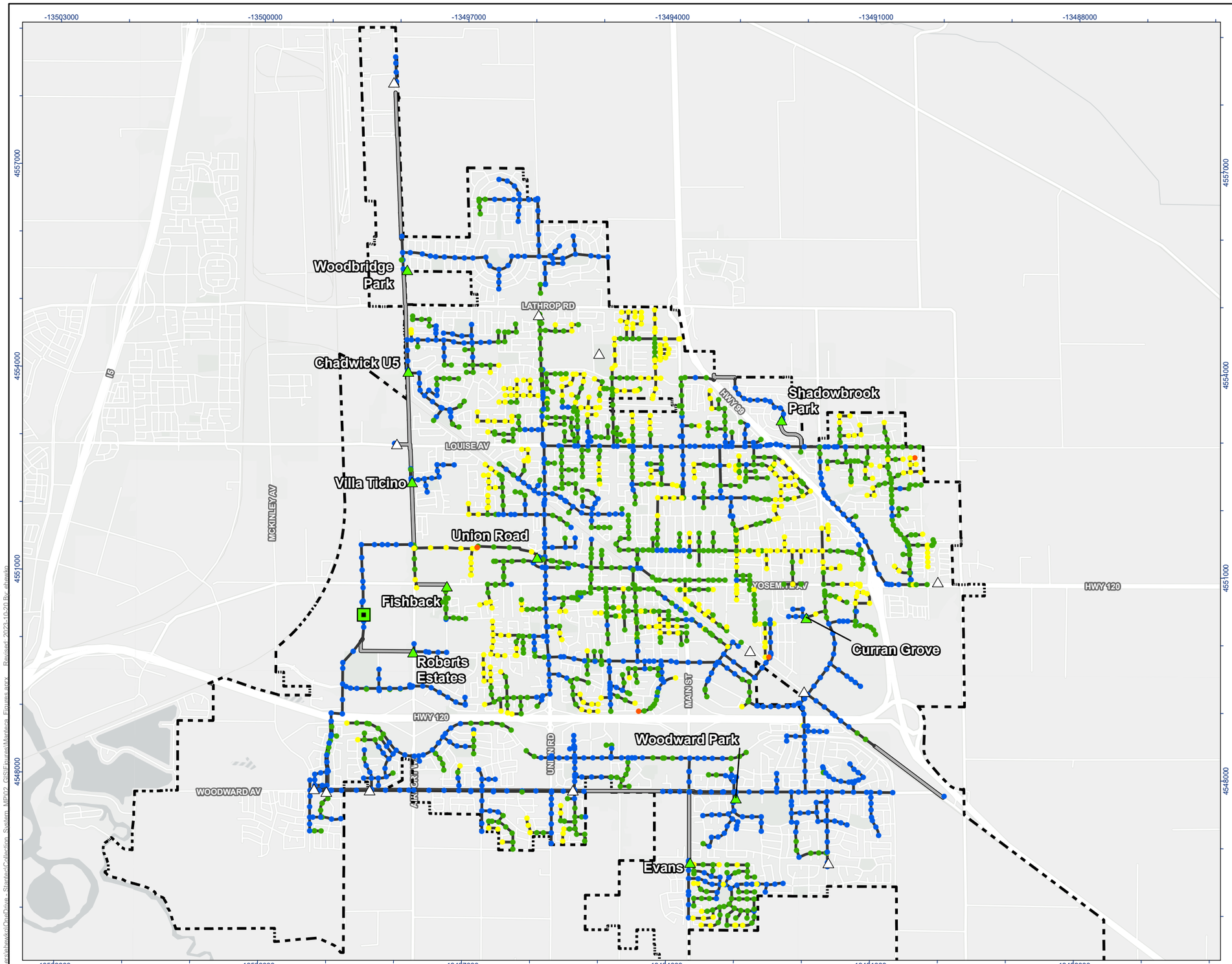
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Figure No.
F-3

Title
Scenario 1
Residual Capacity

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Stantec

MANTECA CALIFORNIA

Legend

- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Modeled Forcemain
- Modeled Sanitary Sewer

Manhole Freeboard (ft)

- <= 2 ft
- > 2 ft - 6 ft
- > 6 ft - 10 ft
- > 10 ft
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

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2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

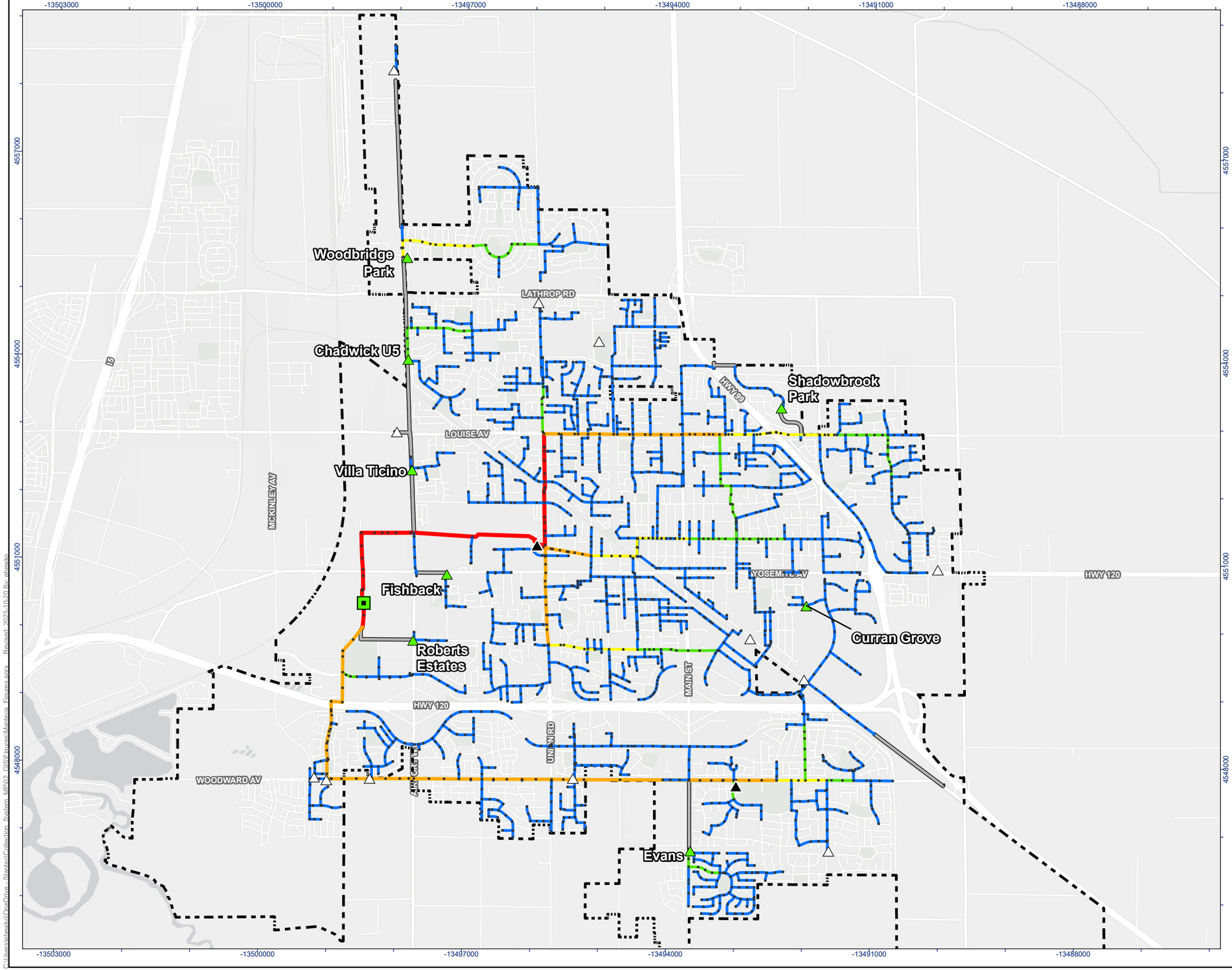
Figure No.
F-4

Title
Scenario 1
Manhole Surcharging (Depth Below Rim)

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Peak Flow (Mgal/d)

- <= 0.5 Mgal/d
- > 0.5 Mgal/d - 1.0 Mgal/d
- > 1.0 Mgal/d - 2.0 Mgal/d
- > 2.0 Mgal/d - 5.0 Mgal/d
- > 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: San Joaquin County GIS/Planning, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, Merced County Association of Gov, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

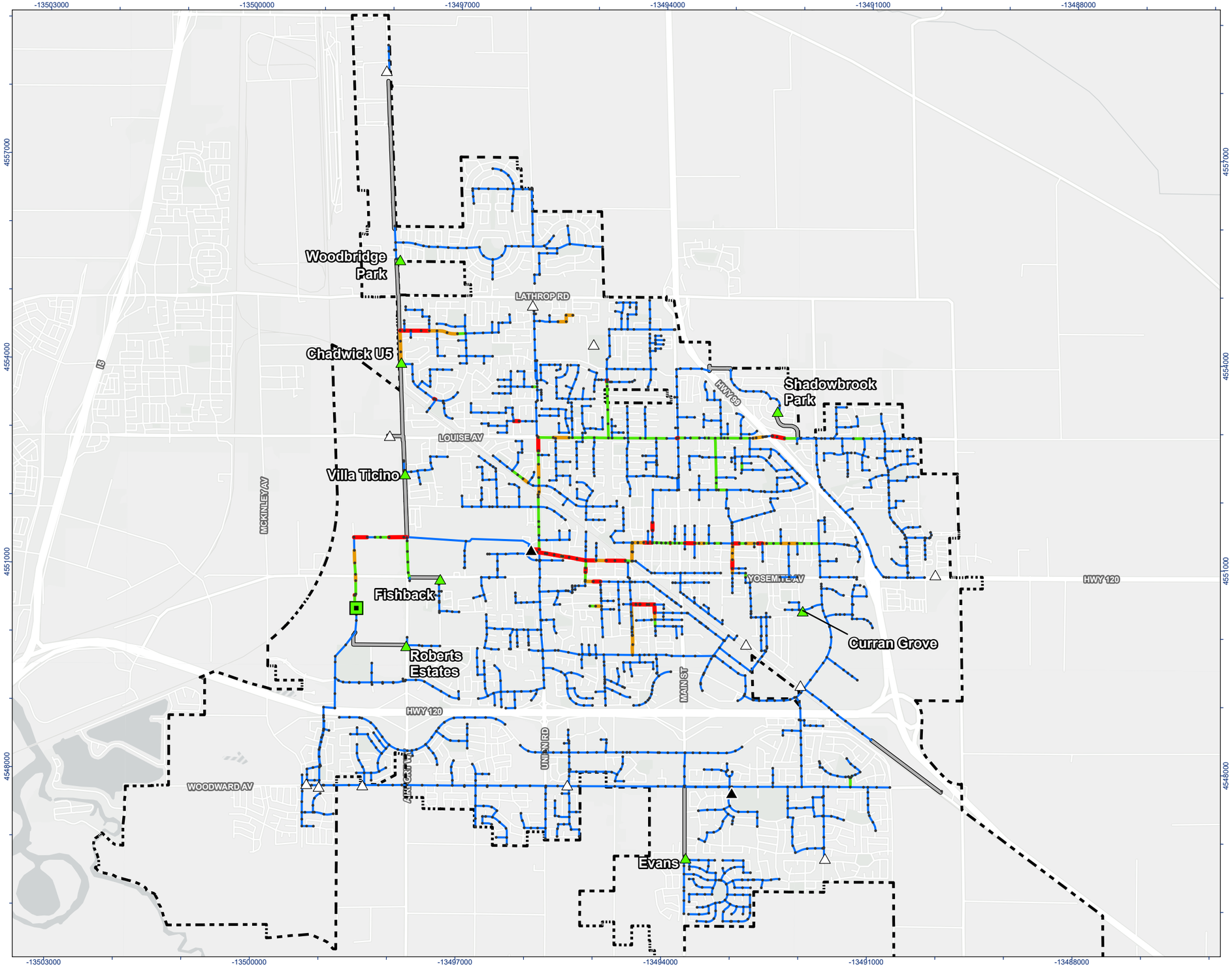
Figure No.
F-5

Title
Scenario 1 + Improvements 1-6
Peak Sewer Flow

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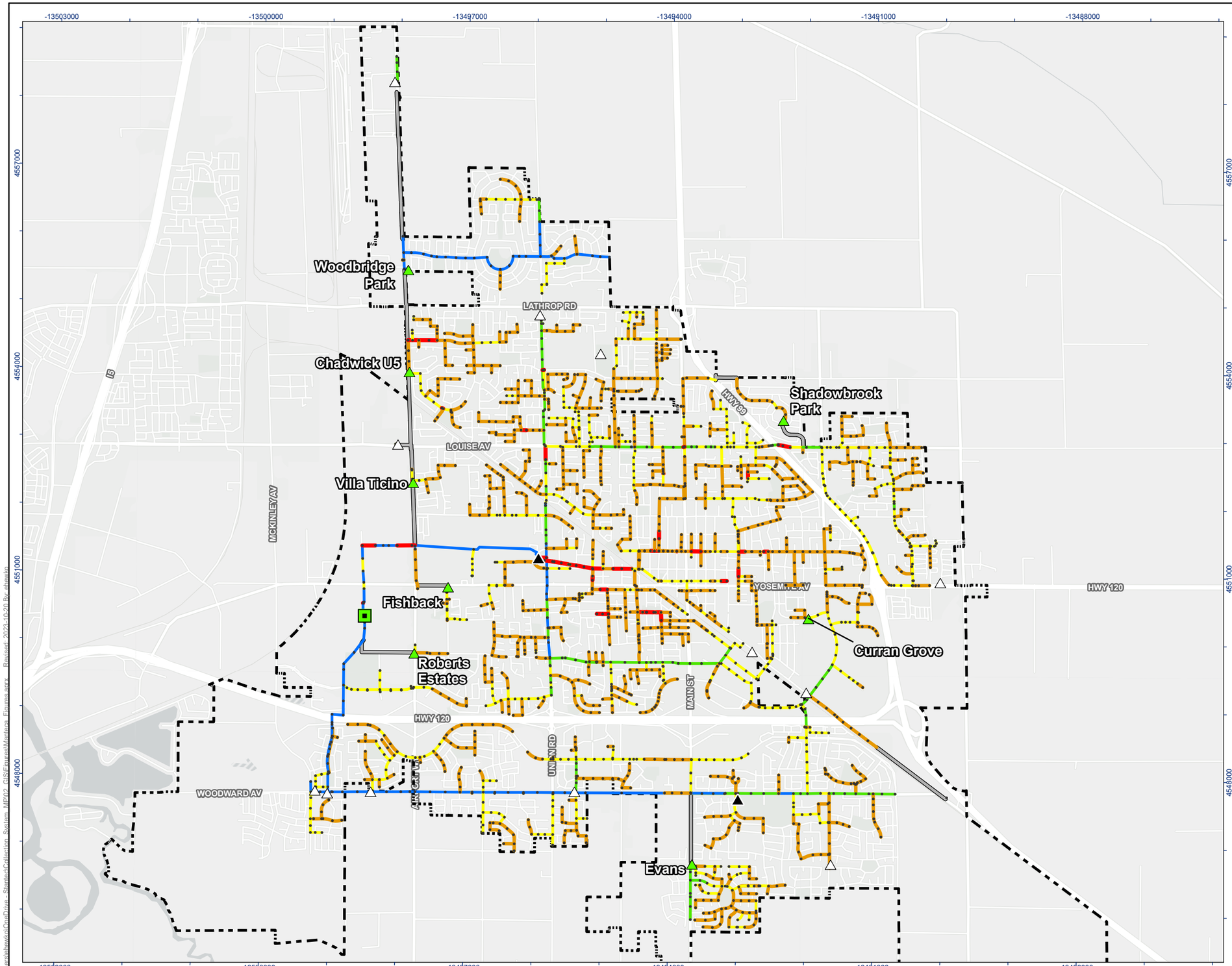
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ATTACHMENT 2



Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Modeled Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

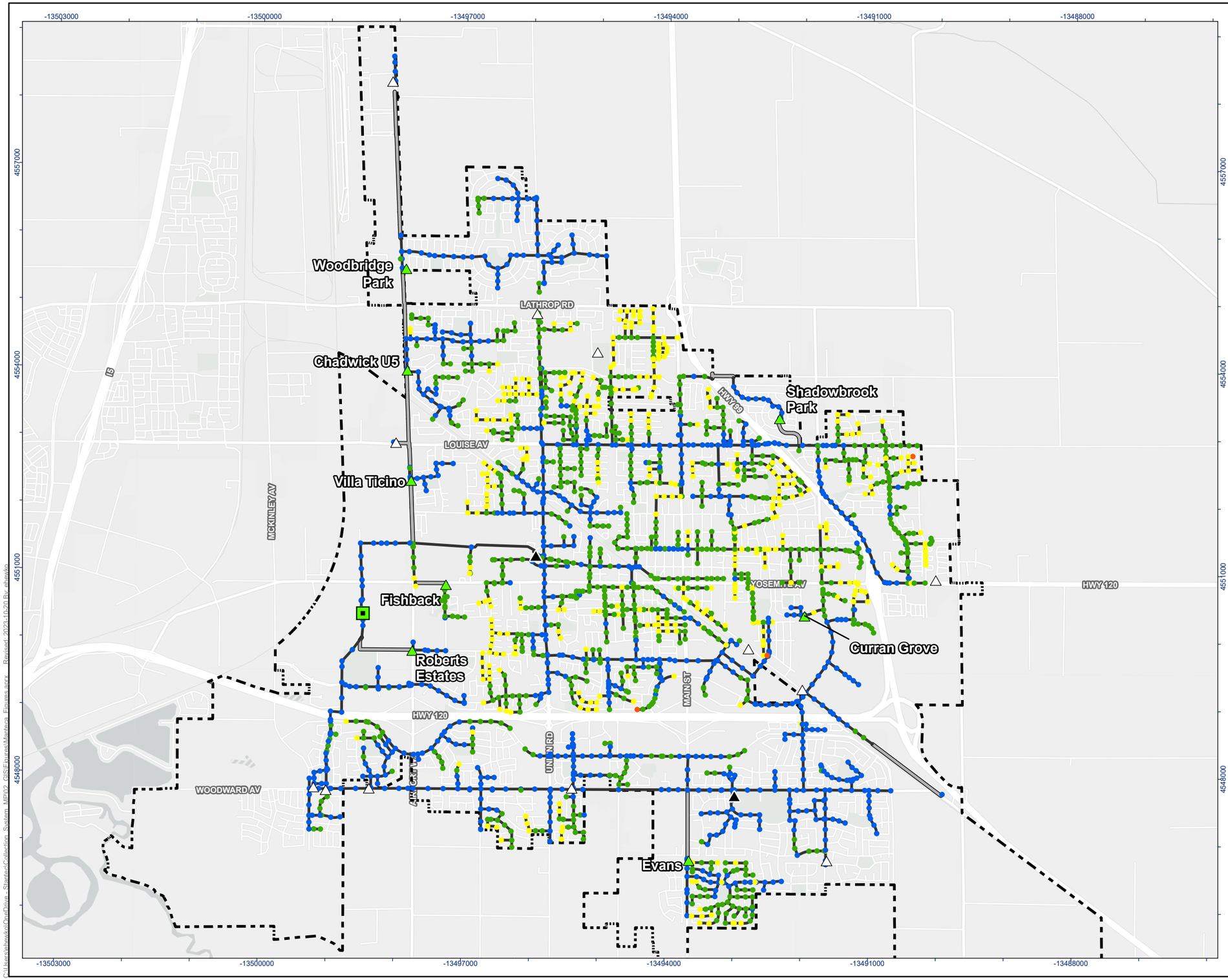
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Figure No.
F-7

Title
Scenario 1 + Improvements 1-6
Residual Capacity

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Stantec

MANTECA CALIFORNIA

Legend

- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain
- Modeled Sanitary Sewer

Manhole Freeboard (ft)

- <= 2 ft
- > 2 ft - 6 ft
- > 6 ft - 10 ft
- > 10 ft
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

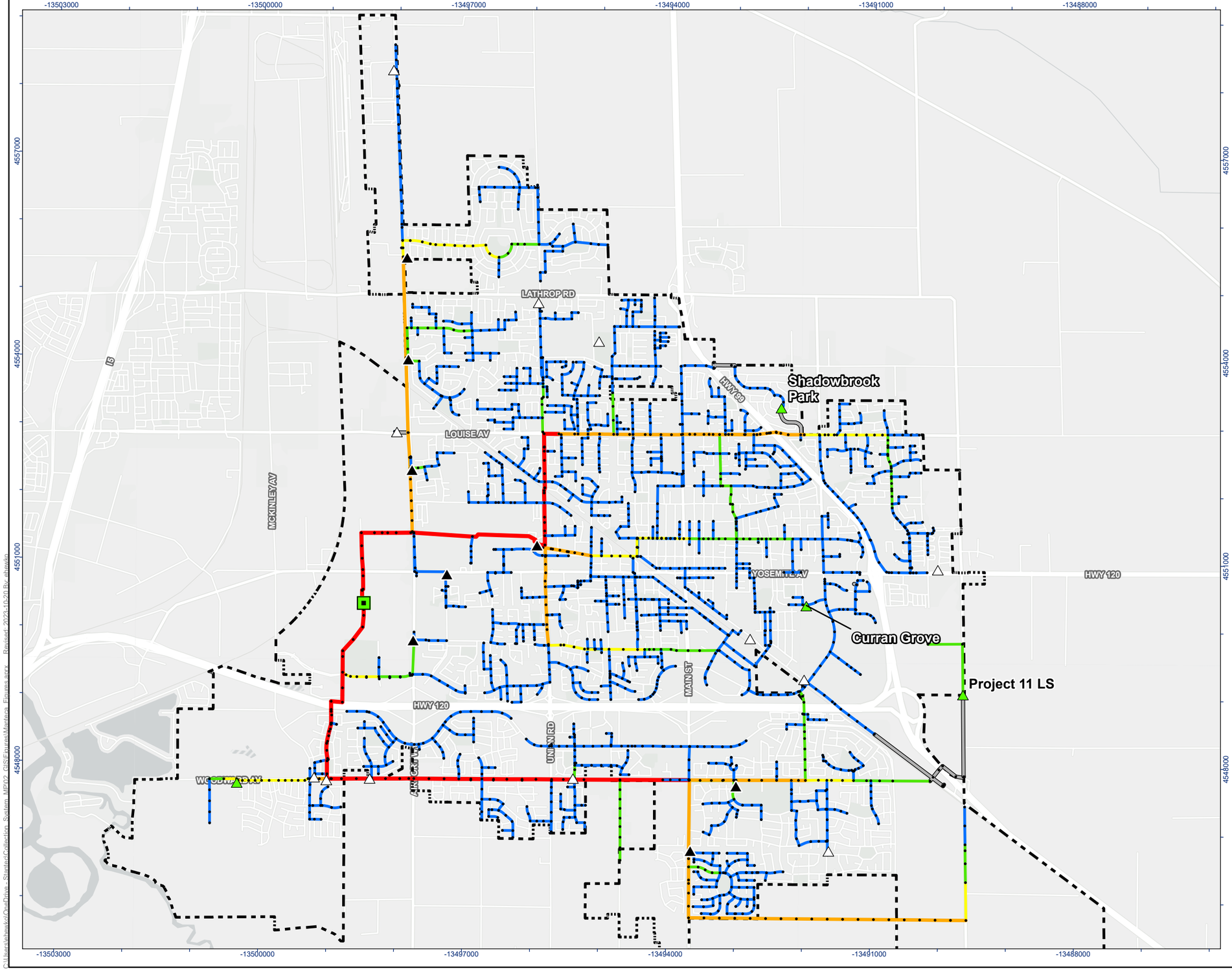
Figure No.
F-8

Title
Scenario 1 + Improvements 1-6
Manhole Surcharging (Depth Below Rim)

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Peak Flow (Mgal/d)

- <= 0.5 Mgal/d
- > 0.5 Mgal/d - 1.0 Mgal/d
- > 1.0 Mgal/d - 2.0 Mgal/d
- > 2.0 Mgal/d - 5.0 Mgal/d
- > 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

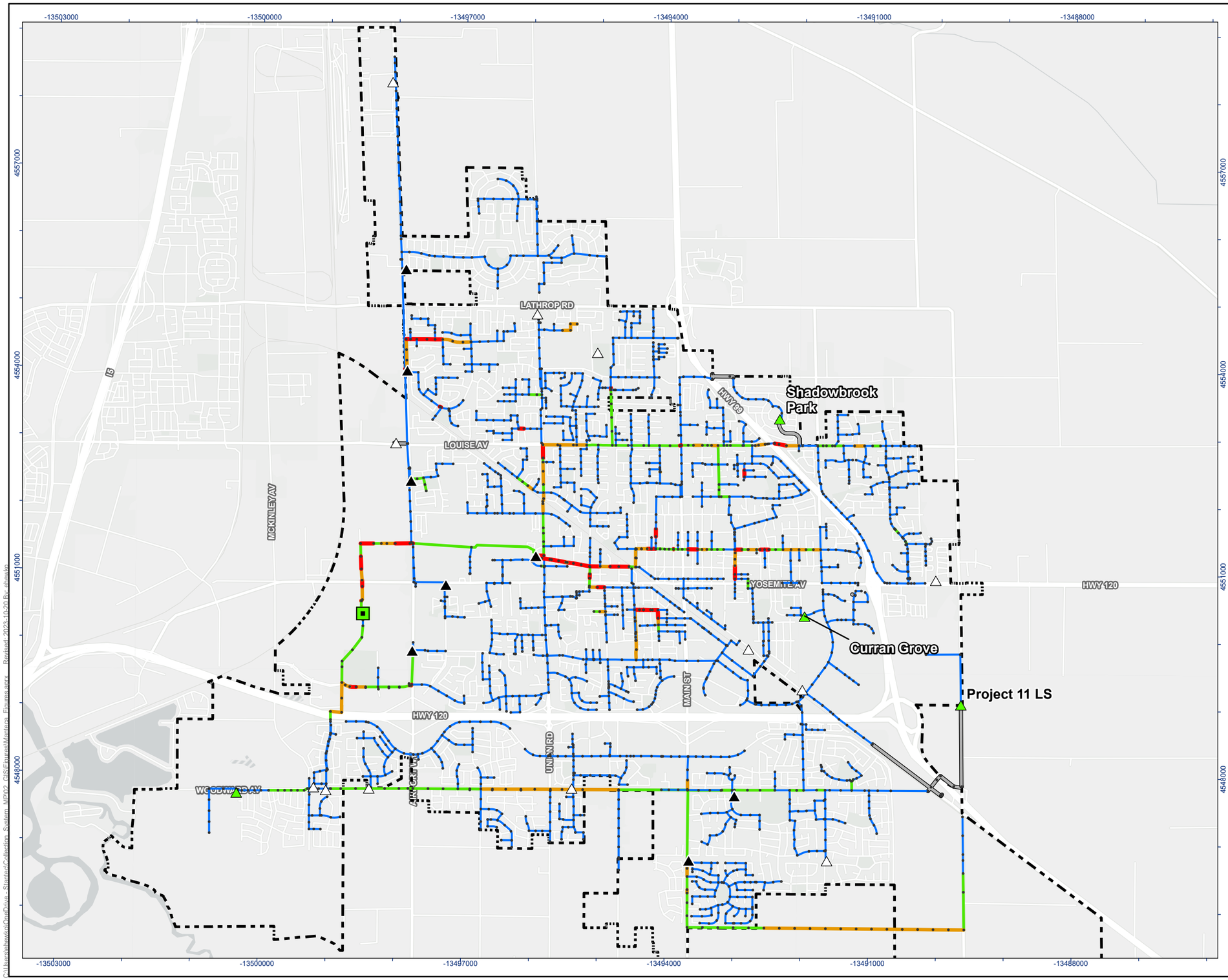
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Figure No.
F-9

Title
Scenario 2 + Improvements 1-15
Peak Sewer Flow

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Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Peak Pipe Utilization (% of FPC)

- <= 50%
- > 50% - 75%
- > 75% - 50%
- > 100%
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

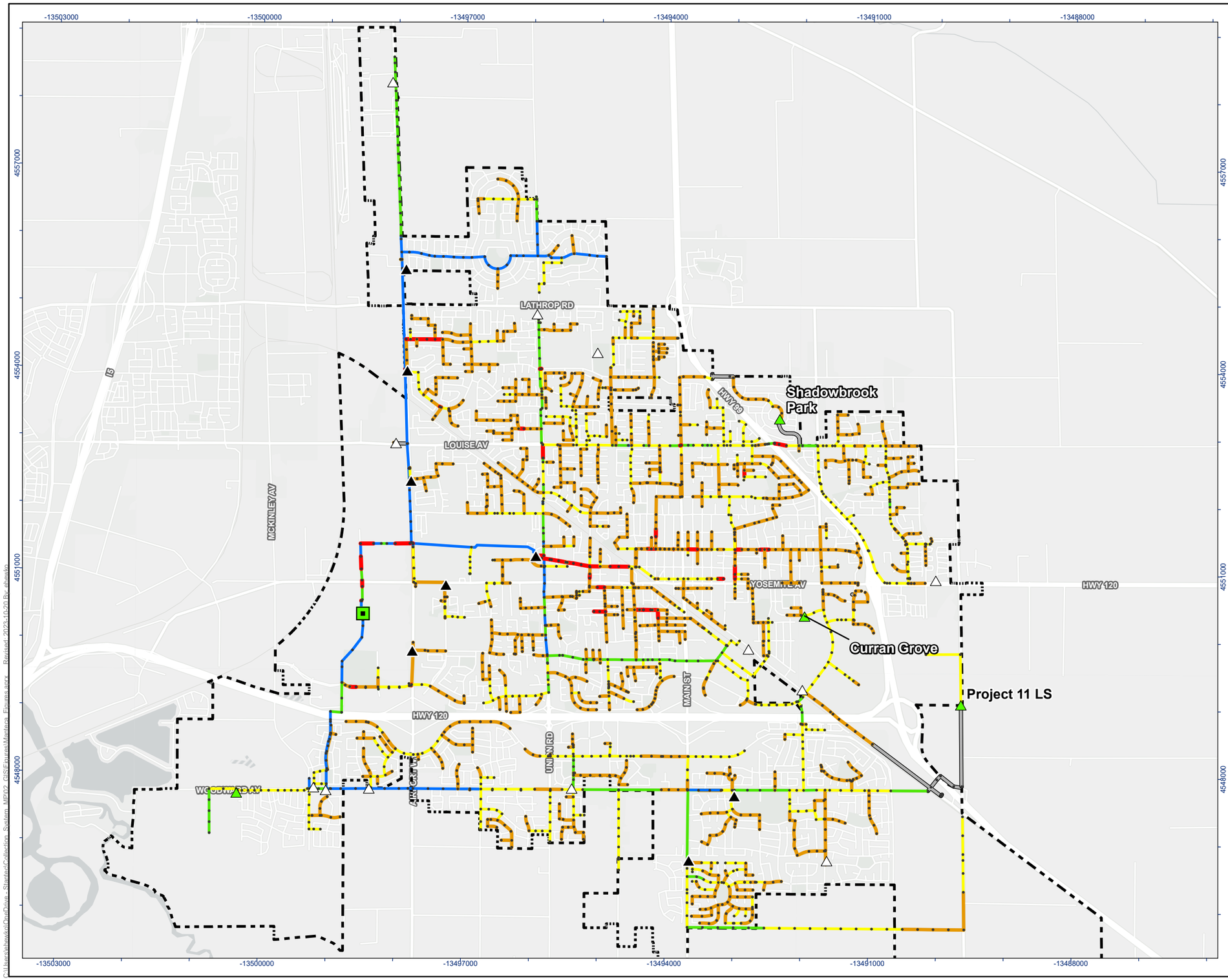
Figure No.
F-10

Title
Scenario 2 + Improvements 1-15
Peak Pipe Utilization (% of FPC)

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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
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IR Review by MVD on 10/20/2023

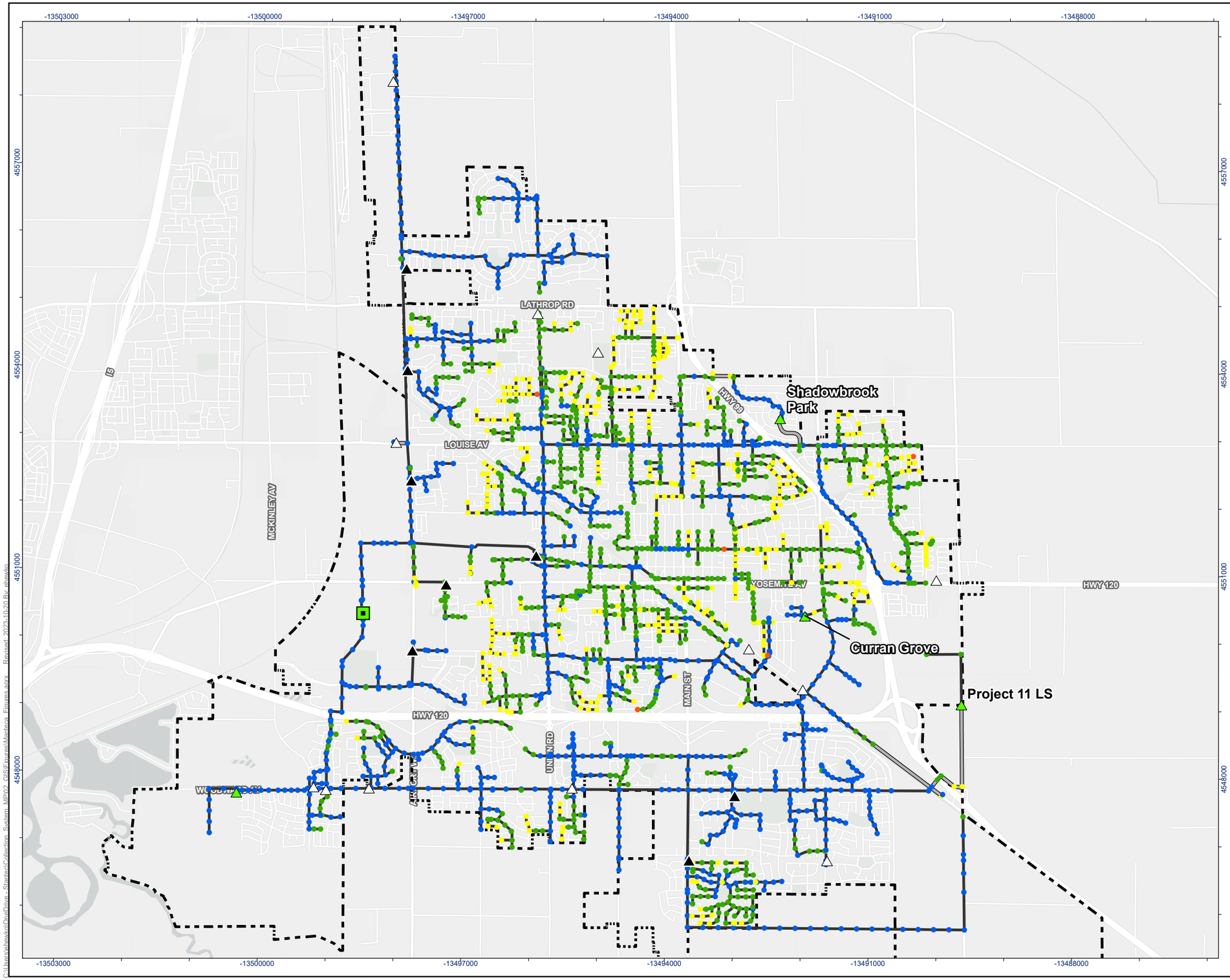
Client/Project
City of Manteca
Wastewater Servicing Master Plan

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Figure No.
F-11

Title
Scenario 2 + Improvements 1-15
Residual Capacity

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Legend

- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain
- Modeled Sanitary Sewer

Manhole Freeboard (ft)

- <= 2 ft
- > 2 ft - 6 ft
- > 6 ft - 10 ft
- > 10 ft
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
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IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

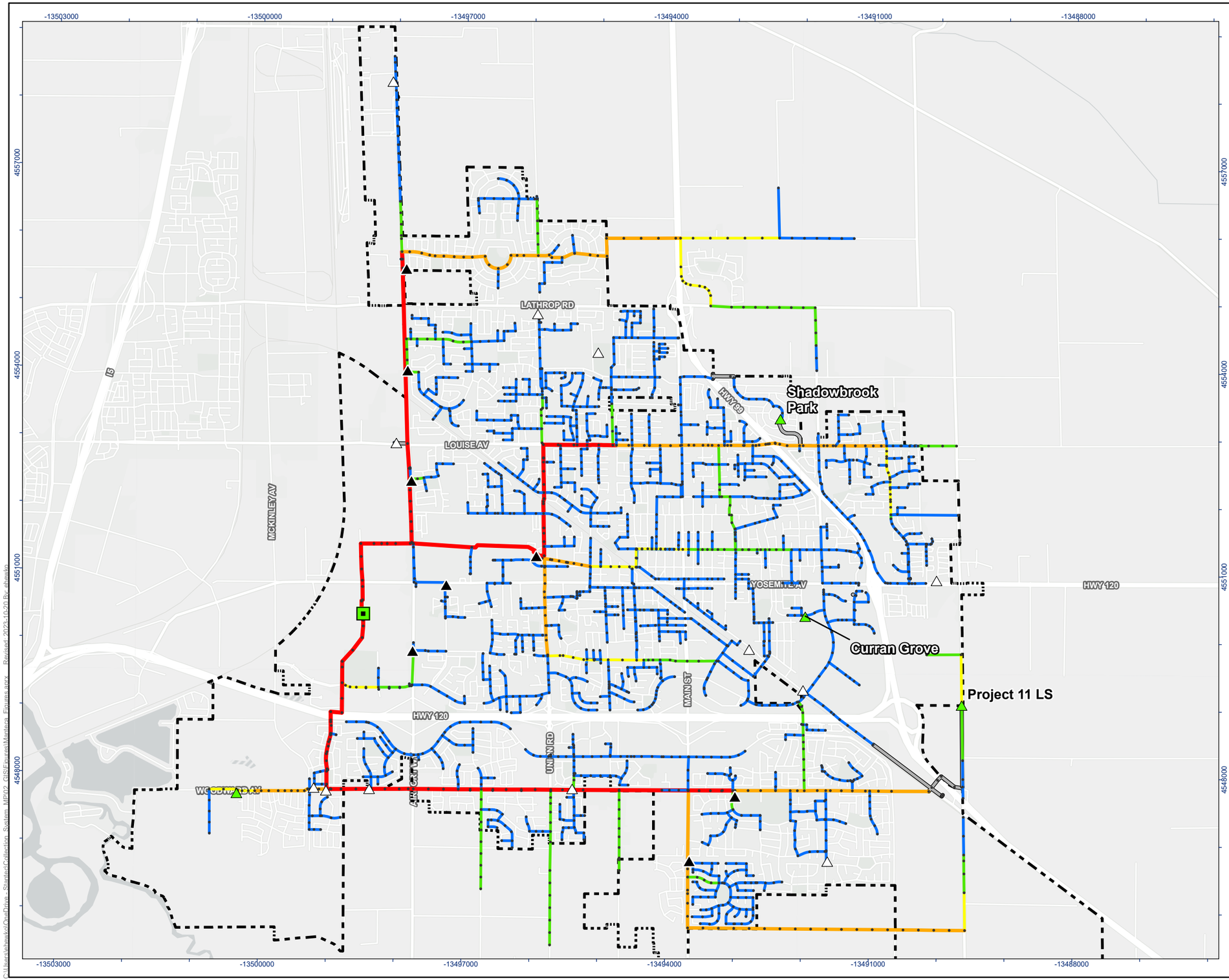
184031535

Figure No.
F-12

Title
Scenario 2 + Improvements 1-15
Manhole Surcharging (Depth Below Rim)

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Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Peak Flow (Mgal/d)

- <= 0.5 Mgal/d
- > 0.5 Mgal/d - 1.0 Mgal/d
- > 1.0 Mgal/d - 2.0 Mgal/d
- > 2.0 Mgal/d - 5.0 Mgal/d
- > 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

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1:45,000

Notes

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Project Location
Manteca,
California

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TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

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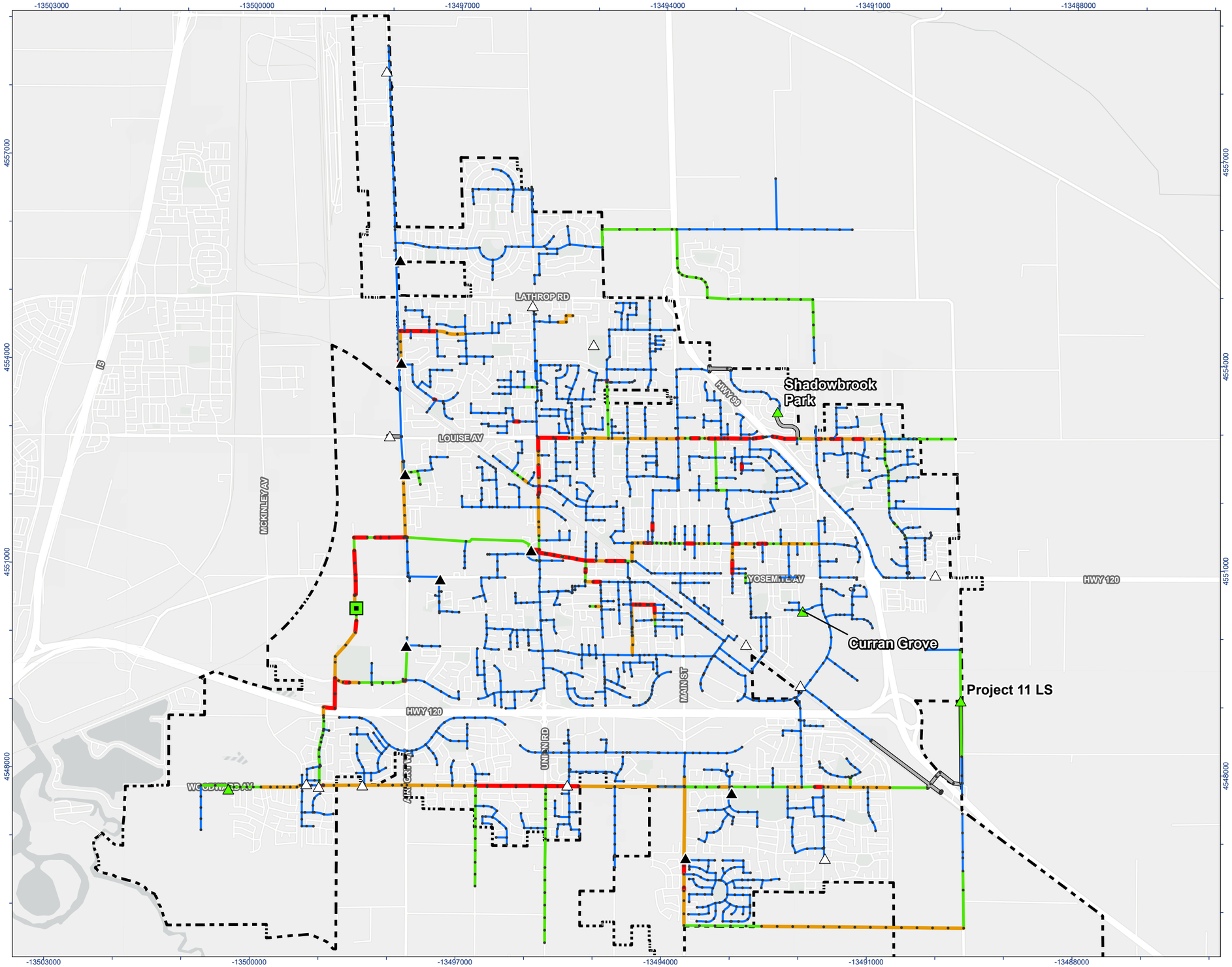
Figure No.
F-13

Title
Scenario 3 + Improvements 1-22
Peak Sewer Flow

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Peak Pipe Utilization (% of FPC)

- <= 50%
- > 50% - 75%
- > 75% - 50%
- > 100%
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

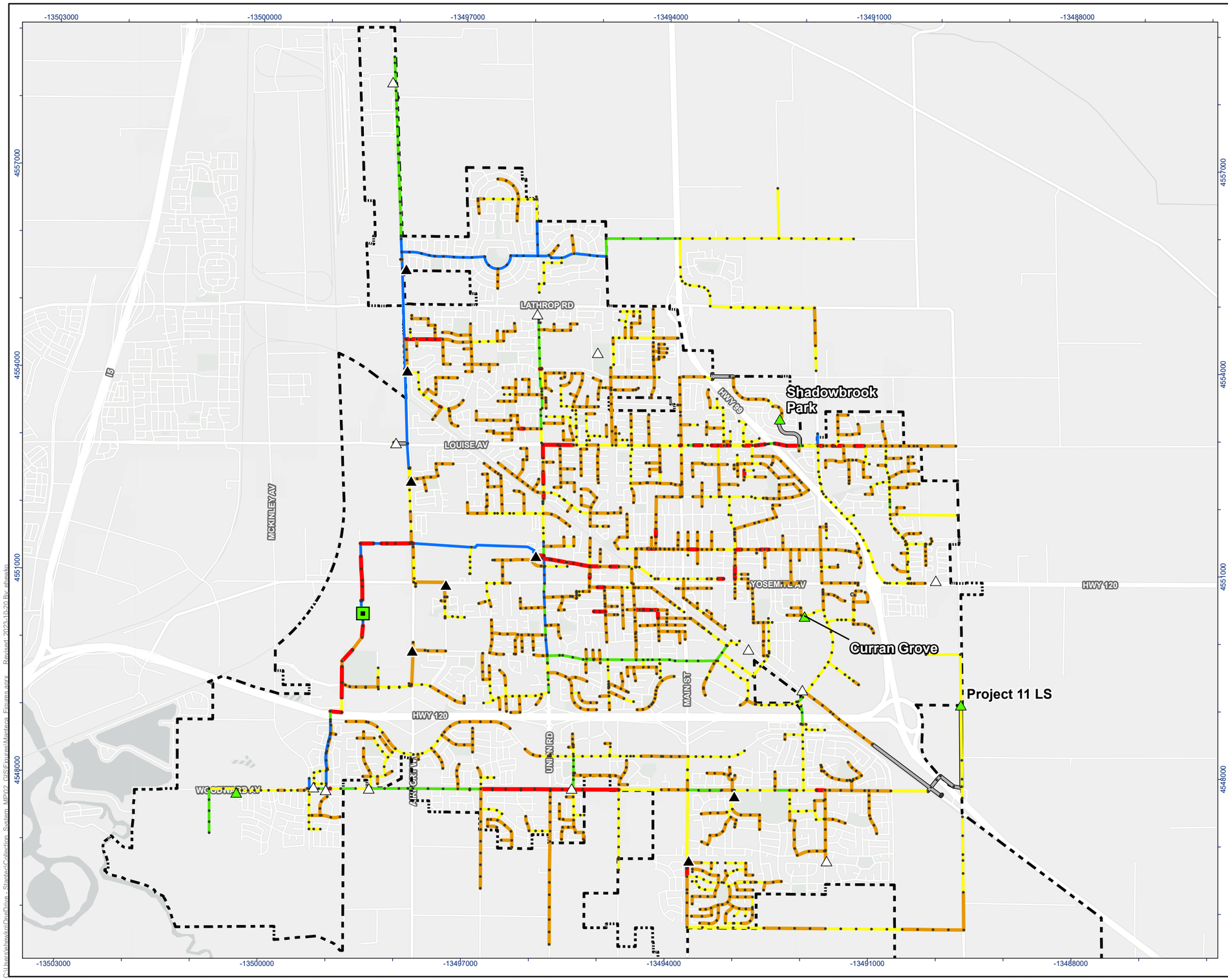
Figure No.
F-14

Title
Scenario 3 + Improvements 1-22
Peak Pipe Utilization (% of FPC)

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

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Project Location
Manteca,
California

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IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

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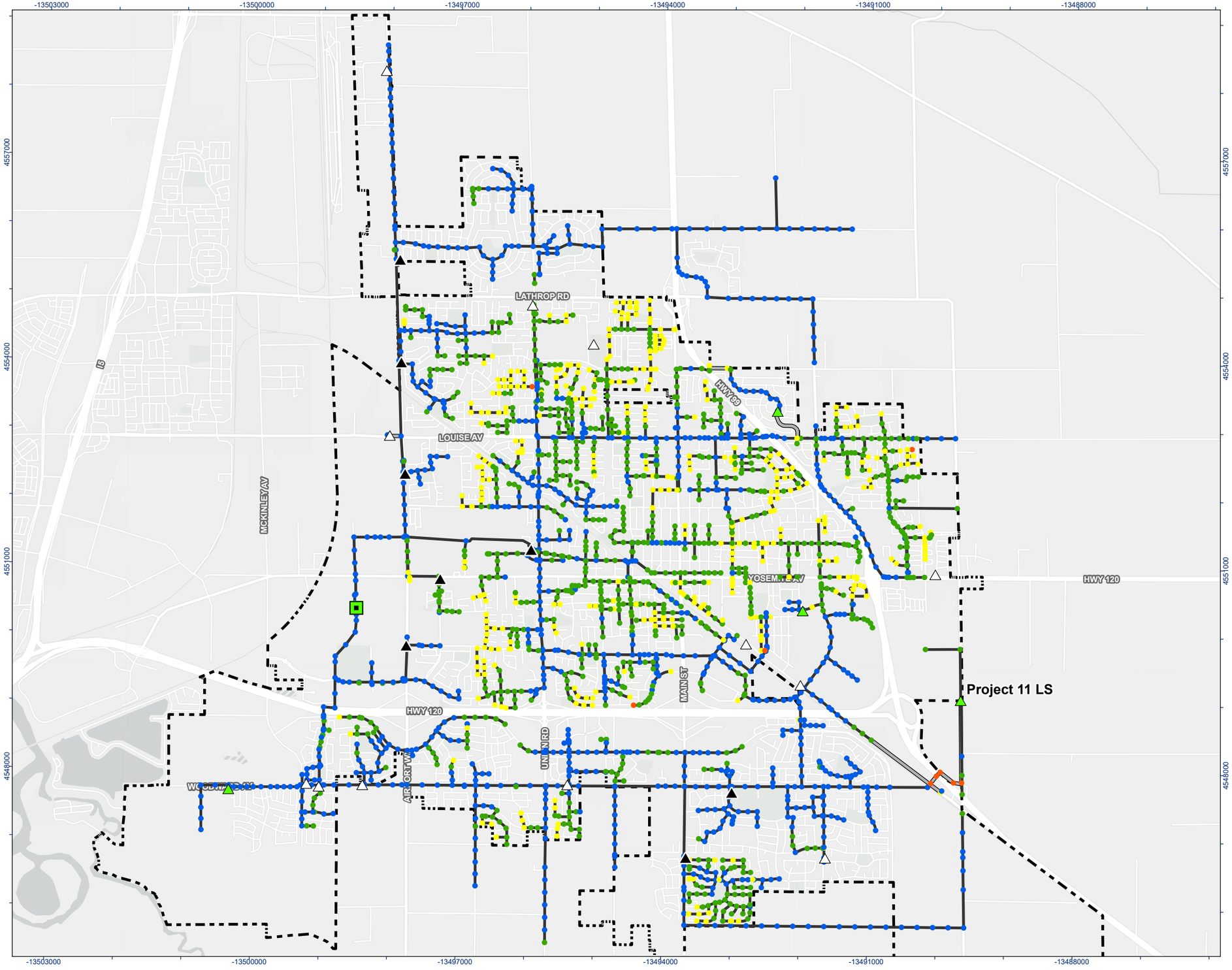
Figure No.
F-15

Title
Scenario 3 + Improvements 1-22
Residual Capacity

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain
- Modeled Sanitary Sewer

Manhole Freeboard (ft)

- <= 2 ft
- > 2 ft - 6 ft
- > 6 ft - 10 ft
- > 10 ft
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:45,000

Notes

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Project Location
Manteca,
California

Prepared by EH on 10/20/2023
TR by MA on 10/20/2023
IR Review by MVD on 10/20/2023

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

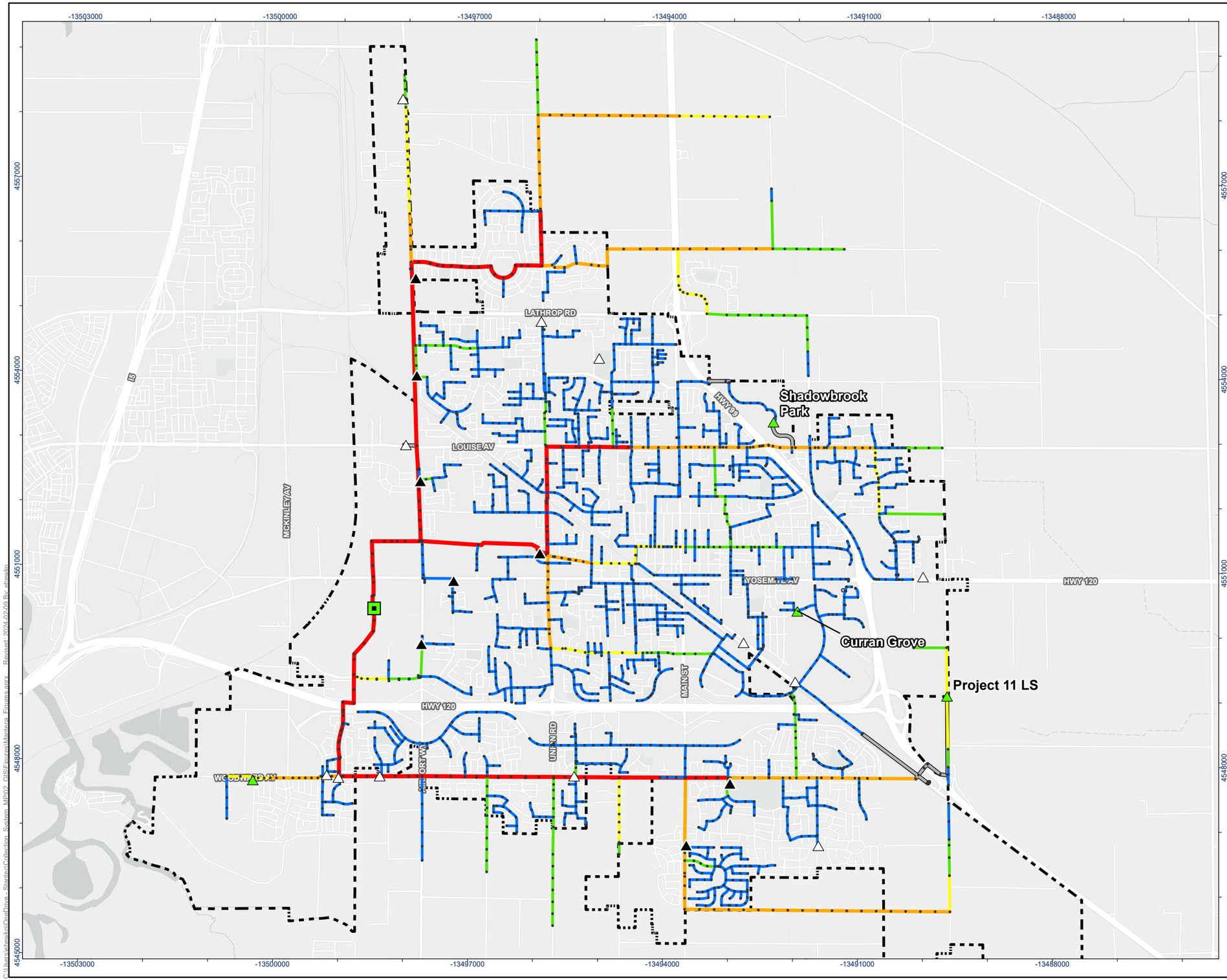
Figure No.
F-16

Title
Scenario 3 + Improvements 1-22
Manhole Surcharging (Depth Below Rim)

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain
- Modeled Wastewater Sewer

Peak Flow (Mgal/d)

- <= 0.5 Mgal/d
- > 0.5 Mgal/d - 1.0 Mgal/d
- > 1.0 Mgal/d - 2.0 Mgal/d
- > 2.0 Mgal/d - 5.0 Mgal/d
- > 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 2/9/2024
TR by MA on 2/9/2024
IR Review by MVD on 2/9/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

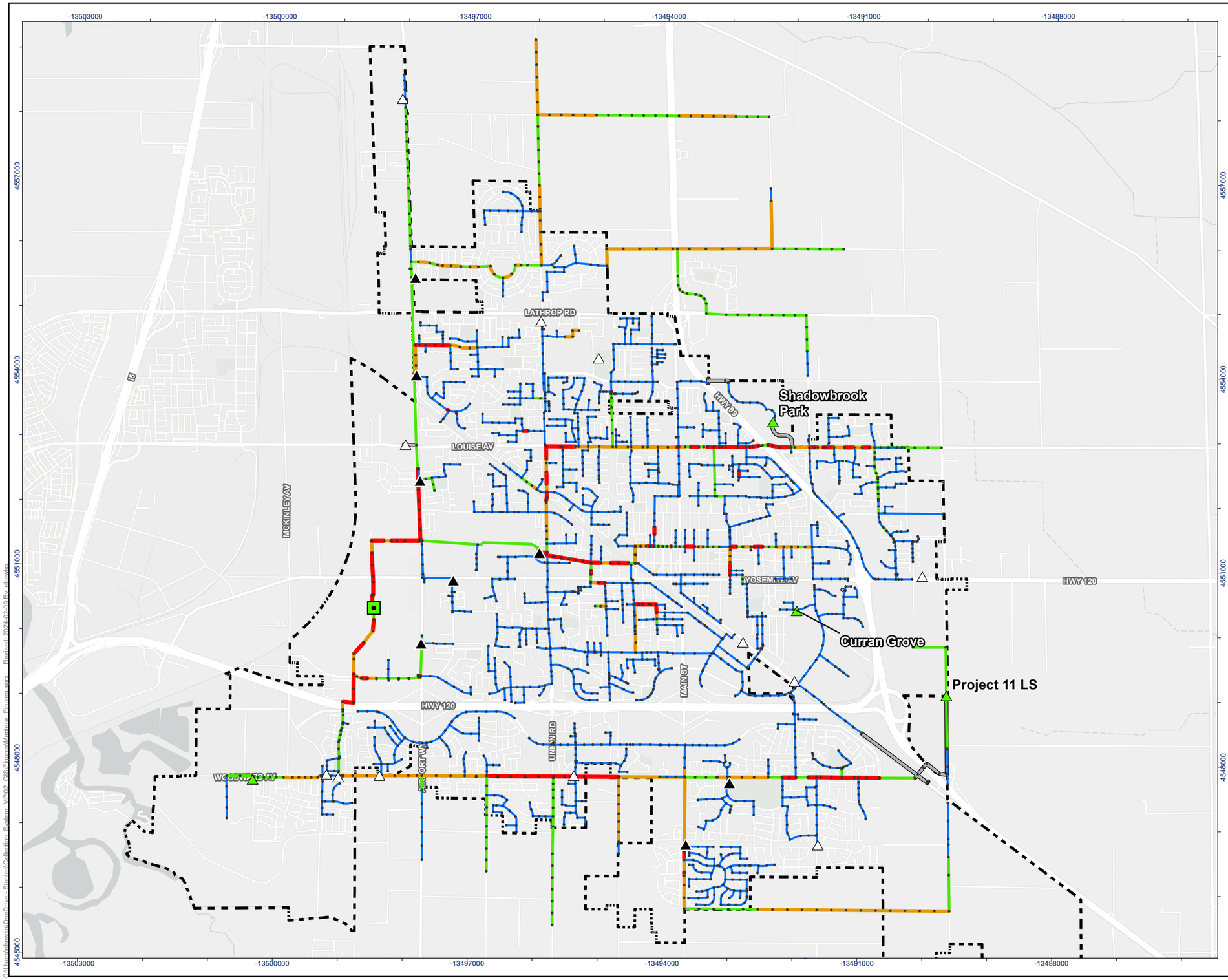
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Figure No.
F-17

Title
Scenario 4 + Improvements 1-25
Peak Sewer Flow

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Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Peak Pipe Utilization (% of FPC)

- <= 50%
- > 50% - 75%
- > 75% - 50%
- > 100%
- City of Manteca Limit

N

0 0.5 1 Miles

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Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 2/9/2024
TR by MA on 2/9/2024
IR Review by MVD on 2/9/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

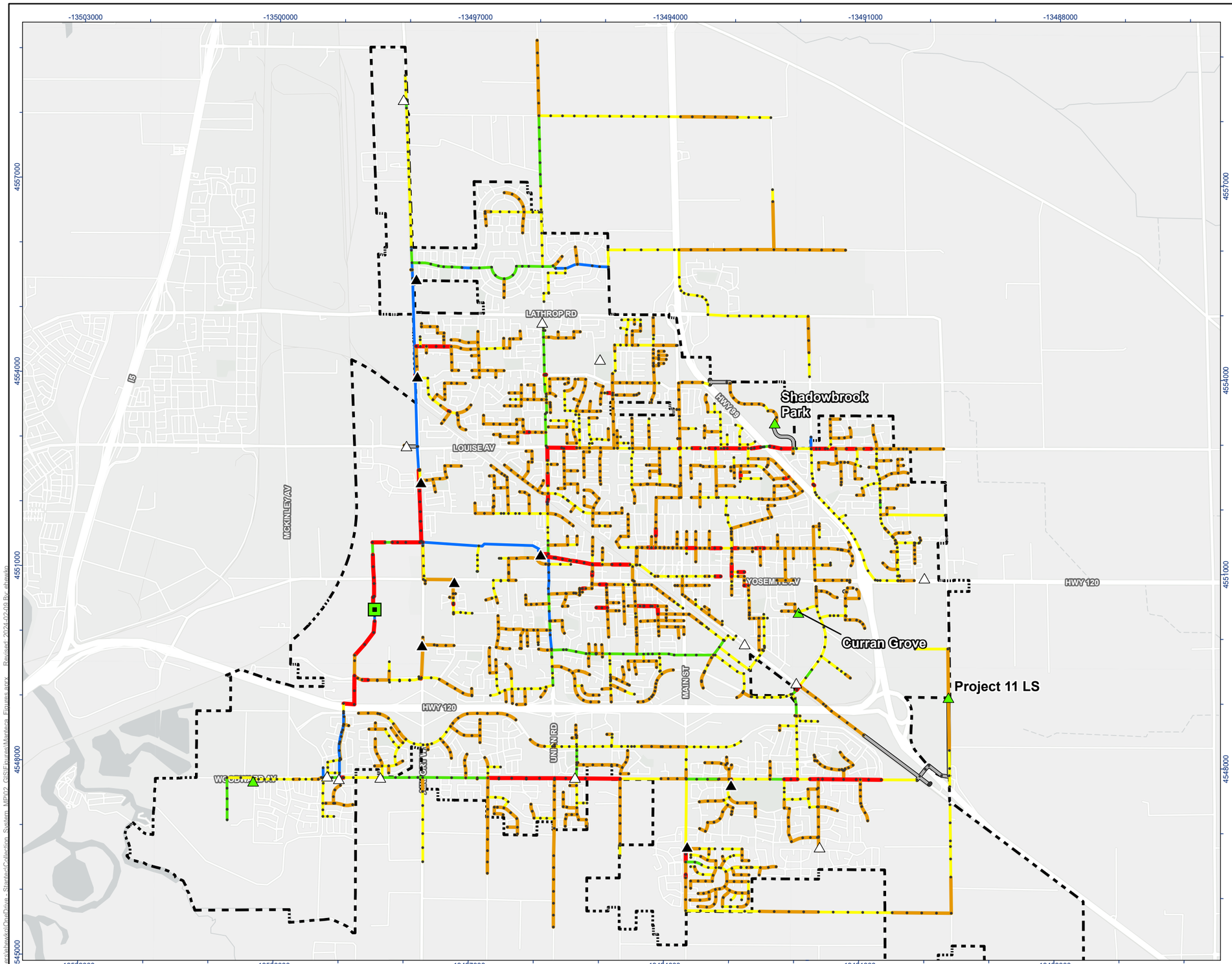
Figure No.
F-18

Title
Scenario 4 + Improvements 1-25
Peak Pipe Utilization (% of FPC)

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ATTACHMENT 2



Stantec

MANTECA CALIFORNIA

Legend

- Modeled Sanitary Manholes
- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain

Residual Capacity

- No Residual Capacity
- < 0.0 Mgal/d - 0.5 Mgal/d
- < 0.5 Mgal/d - 2.0 Mgal/d
- < 2.0 Mgal/d - 5.0 Mgal/d
- < 5.0 Mgal/d
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:47,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 2/9/2024
TR by MA on 2/9/2024
IR Review by MVD on 2/9/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

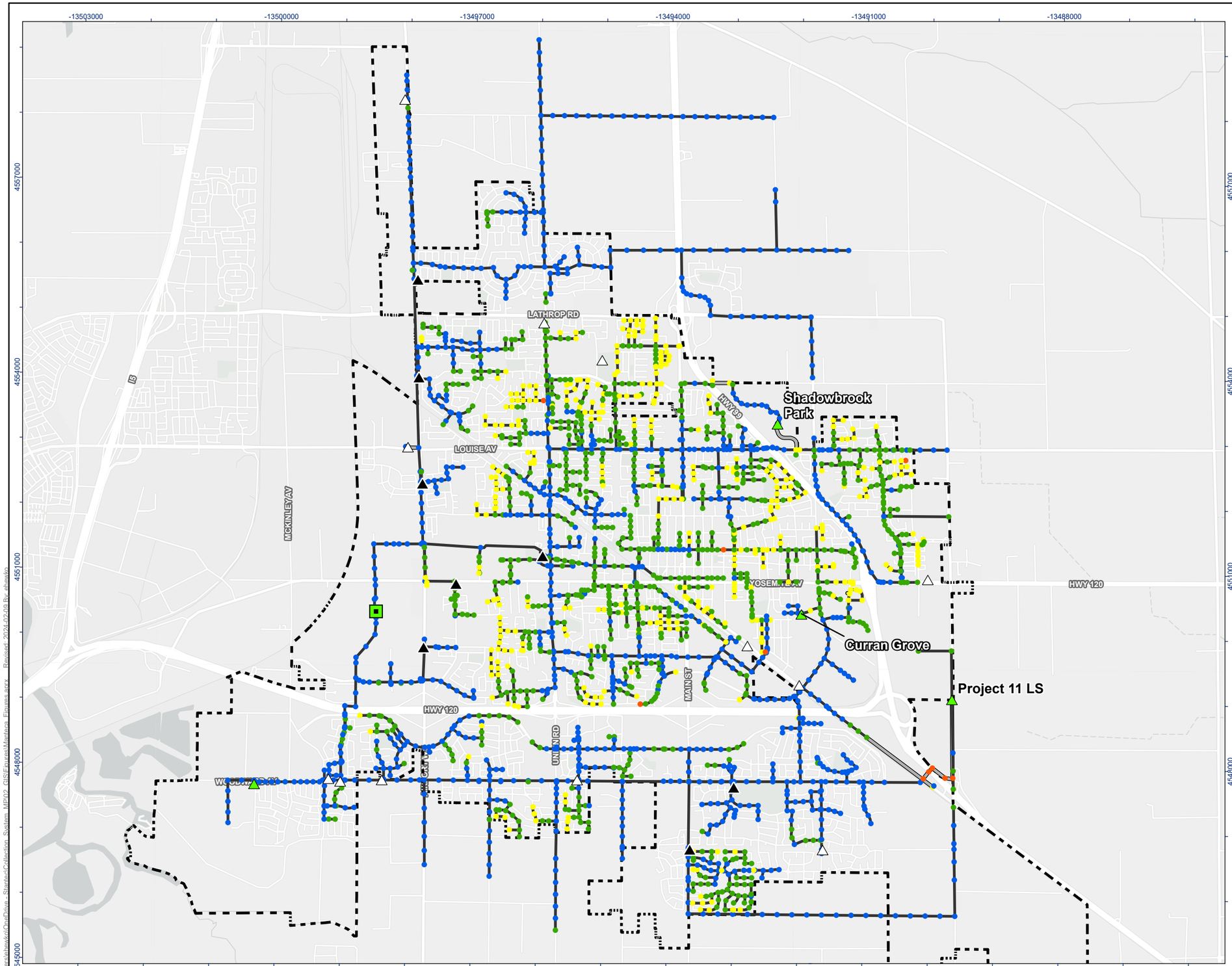
Figure No.
F-19

Title
Scenario 4 + Improvements 1-25
Residual Capacity

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ATTACHMENT 2



Legend

- Water Quality Control Facility
- Modeled Lift Station
- Unmodeled Lift Station
- Lift Station No Longer Needed
- Modeled Forcemain
- Modeled Sanitary Sewer

Manhole Freeboard (ft)

- <= 2 ft
- > 2 ft - 6 ft
- > 6 ft - 10 ft
- > 10 ft
- City of Manteca Limit

N

0 0.5 1 Miles

(At original document size of 11x17)
1:47,000

Notes

1. Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet
2. Data Sources: City of Manteca
3. Background: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, San Joaquin County GIS/Planning, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS, Esri, USGS



Project Location
Manteca,
California

Prepared by EH on 2/9/2024
TR by MA on 2/9/2024
IR Review by MVD on 2/9/2024

Client/Project
City of Manteca
Wastewater Servicing Master Plan

184031535

Figure No.
F-20

Title
Scenario 4 + Improvements 1-25
Manhole Surcharging (Depth Below Rim)

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APPENDIX G

Collection System Capacity Improvement Cost Estimate Details

Stantec

PROJECT: WASTEWATER COLLECTION SYSTEM MASTER PLAN
PROJECT COSTS

DATE: 9/1/2023

JOB NUMBER: 184031535

PREPARED BY: BEW

CLIENT: CITY OF MANTECA

CHECKED BY: SLB

DESCRIPTION: Unit Costs

ENR: 13,176

UNIT COST TABLES

TABLE 1 - GRAVITY SEWER UNIT COST ($/LF) *Scaled to match bids provided by the City of Manteca, scaled and correlated with North Trunk Sewer bid results. 10-inch pipes use 12-inch costs for conservative estimates.*

Size	Pipe Depth (ft) < same cost under 9-feet																					
(in)	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12	$ 514	$ 551	$ 588	$ 624	$ 661	$ 707	$ 717	$ 727	$ 737	$ 747	$ 757	$ 767	$ 792	$ 818	$ 844	$ 870	$ 917	$ 961	$ 983	$ 1,005	$ 1,027	$ 1,049
15	$ 603	$ 639	$ 675	$ 710	$ 746	$ 794	$ 807	$ 820	$ 832	$ 845	$ 858	$ 871	$ 891	$ 912	$ 933	$ 954	$ 1,004	$ 1,062	$ 1,091	$ 1,120	$ 1,149	$ 1,178
18	$ 648	$ 696	$ 745	$ 793	$ 842	$ 906	$ 921	$ 937	$ 953	$ 968	$ 984	$ 999	$ 1,024	$ 1,049	$ 1,073	$ 1,098	$ 1,156	$ 1,222	$ 1,255	$ 1,288	$ 1,321	$ 1,354
21	$ 757	$ 801	$ 846	$ 890	$ 935	$ 1,003	$ 1,027	$ 1,052	$ 1,076	$ 1,100	$ 1,124	$ 1,148	$ 1,180	$ 1,213	$ 1,246	$ 1,278	$ 1,348	$ 1,421	$ 1,458	$ 1,495	$ 1,532	$ 1,569
24	$ 846	$ 903	$ 961	$ 1,018	$ 1,075	$ 1,156	$ 1,179	$ 1,203	$ 1,226	$ 1,249	$ 1,273	$ 1,296	$ 1,328	$ 1,359	$ 1,391	$ 1,423	$ 1,496	$ 1,578	$ 1,619	$ 1,660	$ 1,702	$ 1,743
27	$ 915	$ 975	$ 1,036	$ 1,096	$ 1,157	$ 1,244	$ 1,271	$ 1,297	$ 1,324	$ 1,351	$ 1,378	$ 1,405	$ 1,443	$ 1,482	$ 1,521	$ 1,559	$ 1,639	$ 1,721	$ 1,763	$ 1,804	$ 1,845	$ 1,886
30	$ 1,004	$ 1,077	$ 1,151	$ 1,224	$ 1,297	$ 1,394	$ 1,417	$ 1,440	$ 1,463	$ 1,487	$ 1,510	$ 1,533	$ 1,567	$ 1,601	$ 1,634	$ 1,668	$ 1,747	$ 1,837	$ 1,882	$ 1,927	$ 1,972	$ 2,017
33	$ 1,158	$ 1,222	$ 1,286	$ 1,350	$ 1,415	$ 1,502	$ 1,524	$ 1,547	$ 1,569	$ 1,592	$ 1,615	$ 1,637	$ 1,676	$ 1,714	$ 1,753	$ 1,792	$ 1,893	$ 2,018	$ 2,081	$ 2,144	$ 2,206	$ 2,269
36	$ 1,271	$ 1,331	$ 1,390	$ 1,449	$ 1,509	$ 1,599	$ 1,630	$ 1,661	$ 1,692	$ 1,724	$ 1,755	$ 1,786	$ 1,819	$ 1,853	$ 1,887	$ 1,920	$ 2,030	$ 2,181	$ 2,257	$ 2,333	$ 2,409	$ 2,485
39	$ 1,360	$ 1,433	$ 1,505	$ 1,577	$ 1,649	$ 1,749	$ 1,777	$ 1,804	$ 1,832	$ 1,859	$ 1,887	$ 1,914	$ 1,972	$ 2,029	$ 2,086	$ 2,144	$ 2,268	$ 2,401	$ 2,467	$ 2,534	$ 2,600	$ 2,667
42	$ 1,469	$ 1,541	$ 1,614	$ 1,686	$ 1,758	$ 1,879	$ 1,928	$ 1,977	$ 2,025	$ 2,074	$ 2,123	$ 2,172	$ 2,223	$ 2,274	$ 2,326	$ 2,377	$ 2,490	$ 2,613	$ 2,675	$ 2,737	$ 2,798	$ 2,860
48	$ 1,583	$ 1,698	$ 1,812	$ 1,927	$ 2,042	$ 2,198	$ 2,240	$ 2,282	$ 2,323	$ 2,365	$ 2,407	$ 2,449	$ 2,503	$ 2,557	$ 2,612	$ 2,666	$ 2,770	$ 2,869	$ 2,919	$ 2,968	$ 3,017	$ 3,067
54	$ 1,697	$ 1,854	$ 2,011	$ 2,169	$ 2,326	$ 2,518	$ 2,552	$ 2,587	$ 2,622	$ 2,656	$ 2,691	$ 2,726	$ 2,783	$ 2,840	$ 2,898	$ 2,955	$ 3,050	$ 3,125	$ 3,162	$ 3,199	$ 3,237	$ 3,274
60	$ 1,810	$ 2,010	$ 2,210	$ 2,410	$ 2,610	$ 2,837	$ 2,865	$ 2,892	$ 2,920	$ 2,947	$ 2,975	$ 3,003	$ 3,063	$ 3,123	$ 3,184	$ 3,244	$ 3,330	$ 3,380	$ 3,405	$ 3,431	$ 3,456	$ 3,481
66	$ 1,924	$ 2,167	$ 2,409	$ 2,651	$ 2,894	$ 3,157	$ 3,177	$ 3,198	$ 3,218	$ 3,239	$ 3,259	$ 3,280	$ 3,343	$ 3,406	$ 3,470	$ 3,533	$ 3,609	$ 3,636	$ 3,649	$ 3,662	$ 3,675	$ 3,689
72	$ 2,038	$ 2,323	$ 2,608	$ 2,893	$ 3,178	$ 3,476	$ 3,489	$ 3,503	$ 3,516	$ 3,530	$ 3,543	$ 3,557	$ 3,623	$ 3,689	$ 3,755	$ 3,822	$ 3,889	$ 3,891	$ 3,892	$ 3,894	$ 3,895	$ 3,896

TABLE 2 - FORCEMAIN UNIT COSTS (< 10 feet deep)

Size	Cost
4-inch	$ 194/LF
6-inch	$ 207/LF
8-inch	$ 221/LF
10-inch	$ 235/LF
12-inch	$ 249/LF
14-inch	$ 339/LF
16-inch	$ 380/LF
18-inch	$ 415/LF
20-inch	$ 491/LF

TABLE 3 - LIFT STATION COST ESTIMATES

Item	Description	*Yosemite Square* Cost	*Woodbridge Park* Cost	*Villa Ticino* Cost	*Chadwick Unit 5* Cost
1	Pump Station (PS)	$1,578,000	$5,407,000	$818,000	$1,578,000
2	Wet-well	$65,000	$223,000	$34,000	$65,000
3	Emergency Storage or Power	$515,000	$1,766,000	$267,000	$515,000
4	Yard Piping	$182,000	$622,000	$94,000	$182,000
5	Biofilter/Odor Control	$84,000	$289,000	$44,000	$84,000
6	SCADA & PLC Instrumentation	$91,000	$311,000	$47,000	$91,000
7	Decommissioning, Demo, Restoration	$0	$1,474,000	$223,000	$430,000
	Project Subtotal	**$2,515,000**	**$10,092,000**	**$1,527,000**	**$2,945,000**
9	Bonds, Insurance, Overhead, Supervision (5.5%)	$138,325	$555,060	$83,985	$161,975
10	Contractor Profit (10%)	$251,500	$1,009,200	$152,700	$294,500
	Base Construction Costs	**$2,900,000**	**$11,660,000**	**$1,760,000**	**$3,400,000**

Stantec

PROJECT: WASTEWATER COLLECTION SYSTEM MASTER PLAN PROJECT COSTS
DATE: 9/1/2023

JOB NUMBER: 184031535
PREPARED BY: BEW

CLIENT: CITY OF MANTECA
CHECKED BY: SLB

DESCRIPTION: Project Costs
ENR: 13,176

PIPELINE IMPROVEMENT PROJECTS

North Trunk Cost Estimate

Bid estimate used to calibrate unit costs table (NOT A PROJECT)

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
C13	SSMH-01	WWMH3995	29.1	29.2	16	29.1	60	$ 3,456	$ 54,008
C14	SSMH-02	SSMH-01	28.5	29.1	54	28.8	54	$ 3,199	$ 173,642
C15	SSMH-03	SSMH-02	28.9	28.5	503	28.7	54	$ 3,199	$ 1,609,280
C16	SSMH-04	SSMH-03	30.1	28.9	240	29.5	54	$ 3,237	$ 777,455
C17	SSMH-05	SSMH-04	28.3	30.1	432	29.2	54	$ 3,237	$ 1,398,815
C18	SSMH-07	SSMH-06	24.4	26.4	496	25.4	54	$ 3,050	$ 1,514,003
C19	SSMH-06	SSMH-05	26.4	28.3	477	27.3	54	$ 3,162	$ 1,509,322
C20	SSMH-08	SSMH-07	23.7	24.4	502	24.0	54	$ 2,955	$ 1,483,271
C21	SSMH-09	SSMH-08	24.1	23.7	293	23.9	54	$ 2,898	$ 849,864
C22	SSMH-10	SSMH-09	24.3	24.1	212	24.2	54	$ 2,955	$ 626,132
C23	SSMH-11	SSMH-10	24.1	24.3	324	24.2	54	$ 2,955	$ 958,860
C24	SSMH-12	SSMH-11	25.7	24.1	557	24.9	54	$ 3,012	$ 1,679,097
C25	SSMH-13	SSMH-12	24.8	25.7	115	25.2	36	$ 2,030	$ 233,423
C26	SSFMManifo	SSMH-13	5.4	24.8	23	15.1	24	$ 1,179	$ 26,589
C27	WWMH1204	36x36T	7.6	7.3	120	7.4	36	$ 1,271	$ 152,219
C30	36x36T	SSMH-13	7.3	24.8	25	16.0	36	$ 1,661	$ 41,544
Subtotal	North Trunk Cost Estimate							**Base Construction Costs:**	**$ 13,088,000**

Calibration				
Final Bid		**ENR**	**Date**	
$	11,323,175	11,396	2/1/2020	
$	**13,091,800**	13,176	3/1/2023	

Estimating Contingency (30%)	$ 3,926,000
Total Construction Costs:	**$ 17,014,000**
Engineering and Environmental Documentation (35%)	$ 5,955,000
Total Project Costs:	**$ 22,970,000**

W Center Street Trunk

Project No. 1

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM056	WWMH0344	WWMH0342	11.5	11.4	404	11.5	18	$ 745	$ 300,964
WWGM056	WWMH0341	WWMH0344	10.6	11.5	386	11.0	18	$ 745	$ 287,555
WWGM056	WWMH0346	WWMH0341	11.4	10.6	325	11.0	18	$ 696	$ 226,357
WWGM057	WWMH0348	WWMH0346	13.6	11.4	392	12.5	18	$ 793	$ 311,028
WWGM057	WWMH0349	WWMH0348	14.1	13.6	250	13.9	18	$ 890	$ 222,598
WWGM088	WWMH0342	WWMH5062	11.4	12.5	330	12.0	18	$ 745	$ 245,837
WWGM088	WWMH0369	WWMH5063	9.5	7.7	238	8.6	18	$ 648	$ 154,226
WWGM088	WWMH0368	WWMH0370	9.8	8.0	279	8.9	18	$ 648	$ 180,794
WWGM088	WWMH0370	WWMH1132	8.0	8.4	278	8.2	18	$ 648	$ 180,146
WWGM088	WWMH5090	WWMH0373	8.3	9.2	310	8.7	18	$ 648	$ 200,882
WWGM088	WWMH0373	WWMH3125	9.2	18.5	189	13.9	18	$ 890	$ 168,284
WWGM597	WWMH5063	WWMH0368	7.7	9.8	57	8.8	18	$ 648	$ 36,936
WWGM597	WWMH5062	WWMH0369	12.5	9.5	301	11.0	18	$ 745	$ 224,233
WWGM600	WWMH1132	WWMH5090	8.4	8.3	63	8.3	18	$ 648	$ 40,824
Subtotal	W Center Street Trunk							**Base Construction Costs:**	**$ 2,781,000**

Estimating Contingency (30%)	$ 834,000
Total Construction Costs:	**$ 3,615,000**
Engineering and Environmental Documentation (35%)	$ 1,265,000
Total Project Costs:	**$ 4,880,000**

Elm/West North Street Trunk — Project No. 2

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM031	WWMH0883	WWMH1021	5.9	9.2	17	7.5	15	$ 603	$ 10,259
WWGM033	WWMH1021	WWMH0477	9.2	8.0	424	8.6	15	$ 603	$ 255,879
WWGM034	WWMH0477	WWMH0473	8.0	8.5	243	8.2	15	$ 603	$ 146,648
WWGM034	WWMH0473	WWMH0480	8.5	10.1	218	9.3	15	$ 603	$ 131,560
WWGM036	WWMH1112	WWMH1115	12.1	10.0	169	11.1	15	$ 675	$ 114,028
WWGM036	WWMH1109	WWMH1112	12.6	12.1	171	12.4	15	$ 710	$ 121,467
WWGM041	WWMH0479	WWMH3168	9.5	10.5	169	10.0	15	$ 639	$ 108,008
WWGM041	WWMH0445	WWMH0446	12.4	12.6	220	12.5	15	$ 710	$ 156,274
WWGM041	WWMH0446	WWMH1107	12.6	12.2	159	12.4	15	$ 710	$ 112,943
WWGM041	WWMH1107	WWMH1109	12.2	12.6	175	12.4	15	$ 710	$ 124,309
WWGM042	WWMH1118	WWMH1121	9.7	10.0	168	9.8	15	$ 603	$ 101,386
WWGM042	WWMH1119	WWMH1118	12.1	9.7	167	10.9	15	$ 639	$ 106,730
WWGM042	WWMH1115	WWMH1119	10.0	12.1	173	11.1	15	$ 675	$ 116,726
WWGM057	WWMH1127	WWMH0349	8.5	14.1	348	11.3	15	$ 675	$ 234,802
WWGM057	WWMH4278	WWMH1127	9.2	8.5	326	8.8	15	$ 603	$ 196,737
WWGM058	WWMH1121	WWMH1123	10.0	10.1	158	10.0	15	$ 639	$ 100,978
WWGM058	WWMH1123	WWMH1125	10.1	9.4	221	9.8	15	$ 603	$ 133,371
WWGM058	WWMH1125	WWMH1128	9.4	9.1	221	9.2	15	$ 603	$ 133,371
WWGM153	WWMH0480	WWMH0478	10.1	9.3	182	9.7	15	$ 603	$ 109,835
WWGM153	WWMH0478	WWMH0479	9.3	9.5	190	9.4	15	$ 603	$ 114,663
WWGM380	WWMH3168	WWMH0445	10.5	12.4	366	11.4	15	$ 675	$ 246,947
WWGM536	WWMH1128	WWMH4278	9.1	9.2	25	9.1	15	$ 603	$ 15,087
Subtotal	Elm/West North Street Trunk							**Base Construction Costs:**	**$ 2,892,000**
								Estimating Contingency (30%)	$ 868,000
								Total Construction Costs:	**$ 3,760,000**
								Engineering and Environmental Documentation (35%)	$ 1,316,000
								Total Project Costs:	**$ 5,080,000**

10-inch East North Street Trunk — Project No. 3

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM199	WWMH0885	WWMH0883	6.0	5.9	255	6.0	12	$ 514	$ 131,184
WWGM199	WWMH3060	WWMH0885	8.1	6.0	231	7.1	12	$ 514	$ 118,838
WWGM199	WWMH0884	WWMH3060	4.9	8.1	19	6.5	12	$ 514	$ 9,775
WWGM200	WWMH0844	WWMH0747	6.5	6.3	261	6.4	12	$ 514	$ 134,271
WWGM200	WWMH0901	WWMH0844	6.7	6.5	281	6.6	12	$ 514	$ 144,560
WWGM203	WWMH0747	WWMH0755	6.3	6.2	162	6.3	12	$ 514	$ 83,341
WWGM212	WWMH0757	WWMH0884	5.4	4.9	312	5.2	12	$ 514	$ 160,508
WWGM212	WWMH0442	WWMH0757	8.7	5.4	136	7.1	12	$ 514	$ 69,965
WWGM213	WWMH0755	WWMH0442	6.2	8.7	173	7.5	12	$ 514	$ 89,000
Subtotal	10-inch East North Street Trunk							**Base Construction Costs:**	**$ 941,000**
								Estimating Contingency (30%)	$ 282,000
								Total Construction Costs:	**$ 1,223,000**
								Engineering and Environmental Documentation (35%)	$ 428,000
								Total Project Costs:	**$ 1,660,000**

8-inch East North Street Trunk — Project No. 4

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM202	WWMH1433	WWMH0896	7.1	7.2	280	7.1	10	$ 514	$ 144,046
WWGM202	WWMH1432	WWMH1433	7.5	7.1	280	7.3	10	$ 514	$ 144,046
Subtotal	8-inch East North Street Trunk							**Base Construction Costs:**	**$ 288,000**
								Estimating Contingency (30%)	$ 86,000
								Total Construction Costs:	**$ 374,000**
								Engineering and Environmental Documentation (35%)	$ 131,000
								Total Project Costs:	**$ 510,000**

Stantec

PROJECT: WASTEWATER COLLECTION SYSTEM MASTER PLAN PROJECT COSTS
DATE: 9/1/2023

JOB NUMBER: 184031535
PREPARED BY: BEW

CLIENT: CITY OF MANTECA
CHECKED BY: SLB

DESCRIPTION: Project Costs
ENR: 13,176

IMPROVEMENT PROJECTS

South Woodward Trunk Extension — Project No. 5

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC5_1	WWMH0481	BOSSMH9	23.1	19.3	2,653	21.2	36	$ 1,819	$ 4,827,062
BOC5_2	BOSSMH9	WWMH4162	19.3	17.5	1,377	18.4	36	$ 1,724	$ 2,372,526
Subtotal	South Woodward Trunk Extension							**Base Construction Costs:**	**$ 7,200,000**
								Estimating Contingency (30%)	$ 2,160,000
								Total Construction Costs:	**$ 9,360,000**
								Engineering and Environmental Documentation (35%)	$ 3,276,000
								Total Project Costs:	**$ 12,640,000**

Central Union Road Trunk Extension — Project No. 6

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC4_1	WWMH3125	SSMH2	18.5	22.0	2,788	20.2	36	$ 1,786	$ 4,979,469
BOC4_28	SSMH2	SSMH-13	22.0	24.8	2,242	23.4	36	$ 1,887	$ 4,229,959
Subtotal	Central Union Road Trunk Extension							**Base Construction Costs:**	**$ 9,209,000**
								Estimating Contingency (30%)	$ 2,763,000
								Total Construction Costs:	**$ 11,972,000**
								Engineering and Environmental Documentation (35%)	$ 4,190,000
								Total Project Costs:	**$ 16,170,000**

North Trunk Extension on Airport Way — Project No. 7A

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC16_1	SSMH1	73	23.6	26.2	952	24.9	48	$ 2,721	$ 2,591,359
BOC16_6	WWMH3392	BOSSMH92	20.3	22.2	3,851	21.2	48	$ 2,503	$ 9,638,820
BOC16_8	BOSSMH92	BOSSMH93	22.2	22.3	134	22.3	48	$ 2,557	$ 342,779
BOC16_9	BOSSMH93	SSMH1	22.3	23.6	2,734	22.9	48	$ 2,557	$ 6,991,119
Subtotal	North Trunk Extension on Airport Way							**Base Construction Costs:**	**$ 19,564,000**
								Estimating Contingency (30%)	$ 5,869,000
								Total Construction Costs:	**$ 25,433,000**
								Engineering and Environmental Documentation (35%)	$ 8,902,000
								Total Project Costs:	**$ 34,340,000**

Expand North Shed Lift Stations — Project No. 7B

Lift Station	Capacity Mgal/d							Cost
Woodbridge Park	12.4							$ 11,660,000
Villa Ticino	1.0							$ 1,760,000
Chadwick Unit 5	2.4							$ 3,400,000
Subtotal Expand North Shed Lift Stations							**Base Construction Costs:**	**$ 16,820,000**
							Estimating Contingency (30%)	$ 5,050,000
							Total Construction Costs:	**$ 21,870,000**
							Engineering and Environmental Documentation (35%)	$ 7,655,000
							Total Project Costs:	**$ 29,530,000**

S. Main Trunk to Evans — Project No. 8

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
1	WWMH5022	WWMH0481	23.6	23.1	2,688	23.3	27	$ 1,521	$ 4,087,094
Subtotal S. Main Trunk to Evans								**Base Construction Costs:**	**$ 4,087,000**
								Estimating Contingency (30%)	$ 1,226,000
								Total Construction Costs:	**$ 5,313,000**
								Engineering and Environmental Documentation (35%)	$ 1,860,000
								Total Project Costs:	**$ 7,180,000**

S. Airport Way and Yosemite Ave. (Fishback) — Project No. 9

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_12	10	SSMH-13	11.7	24.8	1,490	18.2	10	$ 747	$ 1,113,278
2_14	BOSSMH400	10	10.1	11.7	1,179	10.9	10	$ 551	$ 649,450
Subtotal S. Airport Way and Yosemite Ave. (Fishback)								**Base Construction Costs:**	**$ 1,763,000**
								Estimating Contingency (30%)	$ 529,000
								Total Construction Costs:	**$ 2,292,000**
								Engineering and Environmental Documentation (35%)	$ 802,000
								Total Project Costs:	**$ 3,100,000**

S. Airport Way Roberts Estates to Daniels — Project No. 10

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_11	WWMH2754	WWMH2321	19.0	20.0	1,317	19.5	10	$ 757	$ 996,427
Subtotal S. Airport Way Roberts Estates to Daniels								**Base Construction Costs:**	**$ 996,000**
								Estimating Contingency (30%)	$ 299,000
								Total Construction Costs:	**$ 1,295,000**
								Engineering and Environmental Documentation (35%)	$ 453,000
								Total Project Costs:	**$ 1,750,000**

Yosemite Square Lift Station and Improvements — Project No. 11

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
12_2	24	50	14.6	11.0	205	12.8	8	$ 221	$ 45,195
12_4	50	51	11.0	14.7	354	12.8	8	$ 221	$ 78,202
12_5	51	20	14.7	14.6	188	14.6	8	$ 221	$ 41,584
8	49	29	11.0	11.2	321	11.1	8	$ 221	$ 70,842
8_11	29	24	11.2	14.6	645	12.9	8	$ 221	$ 142,532
13	20	WWMH3342	14.6	18.4	1,425	16.5	15	$ 820	$ 1,168,426
2	BOSSMH41	BOSSMH45	7.6	8.7	1,315	8.1	15	$ 603	$ 793,454
BOC6_1	BOSSMH45	12	8.7	12.0	1,919	10.3	15	$ 639	$ 1,226,201
Lift Station									$ 2,900,000
force main					3,143		8	$ 221	$ 870,000
Subtotal	Yosemite Square Lift Station and Improvements							**Base Construction Costs:**	**$ 7,336,000**
								Estimating Contingency (30%)	$ 2,201,000
								Total Construction Costs:	**$ 9,537,000**
								Engineering and Environmental Documentation (35%)	$ 3,338,000
								Total Project Costs:	**$ 12,880,000**

Austin Road Industrial Area Trunk — Project No. 12

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC7_1	BOSSMH23	BOSSMH32	19.3	19.4	589	19.4	18	$ 984	$ 579,171
BOC7_10	BOSSMH6	BOSSMH31	16.6	17.4	589	17.0	18	$ 937	$ 551,710
BOC7_11	BOSSMH31	BOSSMH23	17.4	19.3	589	18.4	18	$ 968	$ 570,017
BOC7_12	BOSSMH32	BOSSMH24	19.4	19.8	589	19.6	18	$ 984	$ 579,171
BOC7_13	BOSSMH33	BOSSMH25	18.4	16.8	589	17.6	21	$ 1,076	$ 633,260
BOC7_14	BOSSMH34	BOSSMH26	17.8	17.6	589	17.7	21	$ 1,076	$ 633,260
BOC7_15	BOSSMH35	BOSSMH27	18.6	19.5	589	19.0	21	$ 1,124	$ 661,553
BOC7_16	BOSSMH36	BOSSMH28	19.9	19.7	589	19.8	21	$ 1,124	$ 661,553
BOC7_2	BOSSMH24	BOSSMH33	19.8	18.4	589	19.1	21	$ 1,124	$ 661,553
BOC7_3	BOSSMH25	BOSSMH34	16.8	17.8	589	17.3	21	$ 1,076	$ 633,260
BOC7_4	BOSSMH26	BOSSMH35	17.6	18.6	589	18.1	21	$ 1,100	$ 647,406
BOC7_5	BOSSMH27	BOSSMH36	19.5	19.9	589	19.7	21	$ 1,124	$ 661,553
BOC7_6	BOSSMH28	BOSSMH37	19.7	19.2	589	19.5	21	$ 1,124	$ 661,553
BOC7_17	BOSSMH37	BOSSMH29	19.2	19.3	589	19.3	24	$ 1,273	$ 749,344
BOC7_18	BOSSMH38	BOSSMH30	18.9	18.6	589	18.7	24	$ 1,249	$ 735,613
BOC7_19	BOSSMH39	BOSSMH8	18.9	19.6	589	19.3	24	$ 1,273	$ 749,344
BOC7_7	BOSSMH29	BOSSMH38	19.3	18.9	589	19.1	24	$ 1,273	$ 749,344
BOC7_8	BOSSMH30	BOSSMH39	18.6	18.9	589	18.8	24	$ 1,249	$ 735,613
Subtotal	Austin Road Industrial Area Trunk							**Base Construction Costs:**	**$ 11,854,000**
								Estimating Contingency (30%)	$ 3,556,000
								Total Construction Costs:	**$ 15,410,000**
								Engineering and Environmental Documentation (35%)	$ 5,394,000
								Total Project Costs:	**$ 20,810,000**

South Austin Road - Industrial Area — Project No. 13

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
12_1	BOSSMH54	BOSSMH6	18.5	16.6	1,444	17.6	15	$ 832	$ 1,202,375
BOC6_12	BOSSMH50	BOSSMH51	9.6	10.5	722	10.0	15	$ 639	$ 461,493
BOC6_13	BOSSMH51	BOSSMH52	10.5	11.7	722	11.1	15	$ 675	$ 487,223
BOC6_15	BOSSMH53	BOSSMH54	15.4	18.5	722	17.0	15	$ 820	$ 591,967
BOC6_25	42	BOSSMH53	12.5	15.4	497	14.0	15	$ 782	$ 388,780
BOC6_7	BOSSMH52	42	11.7	12.5	225	12.1	15	$ 710	$ 159,610
Subtotal	South Austin Road - Industrial Area							**Base Construction Costs:**	**$ 3,291,000**
								Estimating Contingency (30%)	$ 987,000
								Total Construction Costs:	**$ 4,278,000**
								Engineering and Environmental Documentation (35%)	$ 1,497,000
								Total Project Costs:	**$ 5,780,000**

Yosemite Square Service Area — Project No. 14

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC6_10	BOSSMH49	BOSSMH48	7.7	8.9	722	8.3	15	$ 603	$ 435,753
BOC6_11	BOSSMH47	12	11.7	13.2	2,132	12.5	15	$ 710	$ 1,514,541
BOC6_9	BOSSMH48	BOSSMH47	8.9	11.7	722	10.3	15	$ 639	$ 461,457
Subtotal	Yosemite Square Service Area							**Base Construction Costs:**	**$ 2,412,000**
								Estimating Contingency (30%)	$ 724,000
								Total Construction Costs:	**$ 3,136,000**
								Engineering and Environmental Documentation (35%)	$ 1,098,000
								Total Project Costs:	**$ 4,240,000**

Oleander Avenue Extension — Project No. 15

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC18_15	77	78	19.4	15.6	451	17.5	12	$ 737	$ 332,068
BOC18_16	78	79	15.6	14.8	451	15.2	12	$ 717	$ 323,154
BOC18_17	79	WWMH4922	14.8	10.5	451	12.6	12	$ 624	$ 281,255
BOC18_2	BOSSMH19	25	13.3	13.8	451	13.6	12	$ 697	$ 314,239
BOC18_3	25	77	13.8	19.4	451	16.6	12	$ 727	$ 327,611
Subtotal	Oleander Avenue Extension							**Base Construction Costs:**	**$ 1,578,000**
								Estimating Contingency (30%)	$ 473,000
								Total Construction Costs:	**$ 2,051,000**
								Engineering and Environmental Documentation (35%)	$ 718,000
								Total Project Costs:	**$ 2,770,000**

Highway 99 Crossing At Northland Road — Project No. 16

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_10	9	BOSSMH108	25.9	25.3	662	25.6	24	$ 1,537	$ 1,017,578
2_15	BOSSMH020	6	24.8	25.2	184	25.0	24	$ 1,454	$ 268,004
2_7	6	7	25.2	25.2	662	25.2	24	$ 1,496	$ 990,282
2_8	7	8	25.2	25.8	662	25.5	24	$ 1,496	$ 990,282
2_9	8	9	25.8	25.9	662	25.9	24	$ 1,537	$ 1,017,578
BOC25	BOSSMH108	WWMH3470	25.3	25.3	682	25.3	24	$ 1,496	$ 1,019,541
Subtotal	Highway 99 Crossing At Northland Road							**Base Construction Costs:**	**$ 5,303,000**
								Estimating Contingency (30%)	$ 1,591,000
								Total Construction Costs:	**$ 6,894,000**
								Engineering and Environmental Documentation (35%)	$ 2,413,000
								Total Project Costs:	**$ 9,310,000**

East Lathrop Road Trunk — Project No. 17

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
10	18	19	21.2	21.9	366	21.5	18	$ 1,024	$ 375,175
11	19	BOSSMH020	21.9	24.8	1,098	23.3	18	$ 1,073	$ 1,178,417
14	11	34	23.7	20.2	457	22.0	15	$ 891	$ 407,718
3_2	23	BOMH00012	22.6	18.7	796	20.6	15	$ 871	$ 693,378
3_4	34	35	20.2	18.3	457	19.2	15	$ 858	$ 392,397
3_5	35	36	18.3	18.1	457	18.2	15	$ 845	$ 386,579
3_6	36	37	18.1	17.7	457	17.9	15	$ 832	$ 380,761
3_7	37	38	17.7	18.2	457	17.9	15	$ 832	$ 380,761
3_8	38	39	18.2	19.9	457	19.0	15	$ 858	$ 392,397
3_9	39	23	19.9	22.6	457	21.2	15	$ 891	$ 407,718
4	BOMH00012	13	18.7	20.2	397	19.4	18	$ 984	$ 390,919
5	13	14	20.2	20.6	205	20.4	18	$ 999	$ 204,842
6	14	15	20.6	20.7	193	20.6	18	$ 999	$ 192,729
7	15	16	20.7	20.8	208	20.7	18	$ 999	$ 207,531
8_1	16	21	20.8	20.9	353	20.8	18	$ 999	$ 352,769
8_3	21	22	20.9	21.0	180	20.9	18	$ 999	$ 180,060
8_4	22	17	21.0	21.1	159	21.0	18	$ 1,024	$ 162,805
9	17	18	21.1	21.2	178	21.1	18	$ 1,024	$ 182,168
Subtotal	East Lathrop Road Trunk							**Base Construction Costs:**	**$ 6,869,000**
								Estimating Contingency (30%)	$ 2,061,000
								Total Construction Costs:	**$ 8,930,000**
								Engineering and Environmental Documentation (35%)	$ 3,126,000
								Total Project Costs:	**$ 12,060,000**

Northland Road Trunk — Project No. 18

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_1	BOSSMH89	1	19.2	22.2	662	20.7	18	$ 999	$ 661,644
2_13	5	BOSSMH020	16.2	24.8	478	20.5	18	$ 999	$ 477,505
2_2	1	2	22.2	18.9	662	20.6	18	$ 999	$ 661,644
2_3	2	3	18.9	24.9	662	21.9	18	$ 1,024	$ 678,021
2_4	3	4	24.9	17.8	662	21.3	18	$ 1,024	$ 678,021
2_5	4	5	17.8	16.2	662	17.0	18	$ 937	$ 620,467
Subtotal	Northland Road Trunk							**Base Construction Costs:**	**$ 3,777,000**
								Estimating Contingency (30%)	$ 1,133,000
								Total Construction Costs:	**$ 4,910,000**
								Engineering and Environmental Documentation (35%)	$ 1,719,000
								Total Project Costs:	**$ 6,630,000**

Northland Road Branches — Project No. 19

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC18_10	BOSSMH169	BOSSMH170	12.1	13.0	476	12.5	12	$ 624	$ 297,390
BOC18_11	BOSSMH170	BOSSMH171	13.0	14.2	476	13.6	12	$ 697	$ 332,265
BOC18_12	BOSSMH171	BOSSMH172	14.2	15.5	476	14.8	12	$ 707	$ 336,978
BOC18_13	BOSSMH172	BOSSMH173	15.5	16.7	476	16.1	12	$ 727	$ 346,404
BOC18_14	BOSSMH173	BOSSMH89	16.7	19.2	476	17.9	12	$ 737	$ 351,117
BOC18_9	BOSSMH168	BOSSMH169	12.2	12.1	476	12.2	12	$ 624	$ 297,389
BOC19_7	BOSSMH178	BOSSMH177	11.3	11.7	479	11.5	12	$ 588	$ 281,612
BOC19_8	BOSSMH177	BOSSMH89	11.7	19.2	1,917	15.4	12	$ 717	$ 1,374,998
Subtotal	Northland Road Branches							**Base Construction Costs:**	**$ 3,618,000**
								Estimating Contingency (30%)	$ 1,085,000
								Total Construction Costs:	**$ 4,703,000**
								Engineering and Environmental Documentation (35%)	$ 1,646,000
								Total Project Costs:	**$ 6,350,000**

Louise/ Nehemiah Branches — Project No. 20

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_31	BOSSMH99	53	15.8	11.6	535	13.7	12	$ 697	$ 372,885
2_32	53	54	11.6	11.9	535	11.7	12	$ 588	$ 314,176
2_33	54	55	11.9	11.9	535	11.9	12	$ 588	$ 314,176
2_34	55	56	11.9	11.4	535	11.6	12	$ 588	$ 314,176
2_35	56	WWMH2114	11.4	9.5	535	10.4	12	$ 551	$ 294,606
BOC3_2	BOSSMH3	WWMH1430	9.1	10.9	2,579	10.0	12	$ 514	$ 1,326,509
Subtotal	Louise/ Nehemiah Branches							**Base Construction Costs:**	**$ 2,937,000**
								Estimating Contingency (30%)	$ 881,000
								Total Construction Costs:	**$ 3,818,000**
								Engineering and Environmental Documentation (35%)	$ 1,336,000
								Total Project Costs:	**$ 5,160,000**

South Union Road Extension — Project No. 21

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
15_2	BOSSMH20	27	8.2	11.1	475	9.7	12	$ 514	$ 244,293
15_3	27	28	11.1	14.5	475	12.8	12	$ 624	$ 296,440
15_4	28	74	14.5	14.0	475	14.3	12	$ 707	$ 335,903
15_5	74	75	14.0	13.3	475	13.6	12	$ 697	$ 331,205
15_6	75	76	13.3	13.4	475	13.3	12	$ 661	$ 313,823
15_7	76	26	13.4	13.8	475	13.6	12	$ 697	$ 331,205
BOC17_1	26	WWMH4954	13.8	13.5	1,090	13.6	12	$ 697	$ 760,054
Subtotal	South Union Road Extension							**Base Construction Costs:**	**$ 2,613,000**
								Estimating Contingency (30%)	$ 784,000
								Total Construction Costs:	**$ 3,397,000**
								Engineering and Environmental Documentation (35%)	$ 1,189,000
								Total Project Costs:	**$ 4,590,000**

Cottage Avenue — Project No. 22

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_21	BOMH00029	30	12.4	13.7	482	13.0	12	$ 661	$ 318,278
2_22	30	BOMH00031	13.7	13.6	482	13.7	12	$ 697	$ 335,907
2_23	BOMH00031	32	13.6	17.0	482	15.3	12	$ 717	$ 345,437
2_24	32	33	17.0	20.9	482	18.9	12	$ 747	$ 359,731
2_25	33	11	20.9	23.7	482	22.3	12	$ 818	$ 394,036
Subtotal	Cottage Avenue							**Base Construction Costs:**	**$ 1,753,000**
								Estimating Contingency (30%)	$ 526,000
								Total Construction Costs:	**$ 2,279,000**
								Engineering and Environmental Documentation (35%)	$ 798,000
								Total Project Costs:	**$ 3,080,000**

North Shed Union Road Trunk — Project No. 23

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC4_13	BOSSMH18	BOSSMH205	21.0	20.4	469	20.7	30	$ 1,533	$ 719,386
BOC4_14	BOSSMH205	BOSSMH206	20.4	20.8	469	20.6	30	$ 1,533	$ 719,511
BOC4_15	BOSSMH206	BOSSMH207	20.8	21.7	469	21.3	30	$ 1,567	$ 735,294
BOC4_16	BOSSMH207	BOSSMH208	21.7	22.5	469	22.1	30	$ 1,601	$ 751,079
BOC4_17	BOSSMH208	BOSSMH209	22.5	23.4	469	22.9	30	$ 1,601	$ 751,077
BOC4_18	BOSSMH209	BOSSMH210	23.4	23.5	469	23.4	30	$ 1,634	$ 766,861
BOC4_19	BOSSMH210	BOSSMH211	23.5	23.7	469	23.6	30	$ 1,634	$ 766,860
BOC4_20	BOSSMH211	BOSSMH212	23.7	23.6	469	23.7	30	$ 1,634	$ 766,861
BOC4_21	BOSSMH212	WWMH3784_	23.6	23.7	100	23.6	30	$ 1,634	$ 164,252
BOC4_21.5	WWMH3784	BOSSMH213	23.7	23.7	369	23.7	30	$ 1,634	$ 602,608
BOC4_22	BOSSMH213	WWMH3782	23.7	19.4	469	21.6	30	$ 1,567	$ 735,426
Subtotal	North Shed Union Road Trunk							**Base Construction Costs:**	**$ 7,479,000**
								Estimating Contingency (30%)	$ 2,244,000
								Total Construction Costs:	**$ 9,723,000**
								Engineering and Environmental Documentation (35%)	$ 3,403,000
								Total Project Costs:	**$ 13,130,000**

Manteca Junction Trunk — Project No. 24

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC4_2	BOSSMH4	BOSSMH214	11.5	13.0	501	12.2	10	$ 624	$ 312,961
BOC4_23	BOSSMH214	BOSSMH215	13.0	14.4	501	13.7	10	$ 697	$ 349,703
BOC4_24	BOSSMH215	BOSSMH216	14.4	15.3	501	14.8	10	$ 707	$ 354,662
BOC4_25	BOSSMH216	BOSSMH217	15.3	16.3	501	15.8	10	$ 717	$ 359,623
BOC4_26	BOSSMH217	BOSSMH218	16.3	17.5	501	16.9	10	$ 727	$ 364,583
BOC4_27	BOSSMH218	BOSSMH18	17.5	21.0	501	19.2	10	$ 757	$ 379,506
Subtotal	Manteca Junction Trunk							**Base Construction Costs:**	**$ 2,121,000**
								Estimating Contingency (30%)	$ 636,000
								Total Construction Costs:	**$ 2,757,000**
								Engineering and Environmental Documentation (35%)	$ 965,000
								Total Project Costs:	**$ 3,730,000**

Lovelace Road - 99 Crossing Project No. 25

Pipeline ID	Upstream Manhole	Downstream Manhole	Upstream Depth (ft)	Downstream Depth (ft)	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC17_10	BOSSMH192	BOSSMH193	21.3	20.8	471	21.1	24	$ 1,328	$ 625,246
BOC17_11	BOSSMH193	BOSSMH194	20.8	20.0	471	20.4	24	$ 1,296	$ 610,337
BOC17_12	BOSSMH194	BOSSMH195	20.0	19.2	471	19.6	24	$ 1,273	$ 599,355
BOC17_13	BOSSMH195	BOSSMH196	19.2	19.1	471	19.2	24	$ 1,273	$ 599,355
BOC17_14	BOSSMH196	BOSSMH197	19.1	18.9	471	19.0	24	$ 1,273	$ 599,355
BOC17_15	BOSSMH197	BOSSMH198	18.9	19.5	471	19.2	24	$ 1,273	$ 599,355
BOC17_16	BOSSMH198	BOSSMH199	19.5	19.7	471	19.6	24	$ 1,273	$ 599,355
BOC17_17	BOSSMH199	BOSSMH200	19.7	19.5	471	19.6	24	$ 1,273	$ 599,355
BOC17_18	BOSSMH200	BOSSMH201	19.5	19.6	471	19.6	24	$ 1,273	$ 599,354
BOC17_19	BOSSMH201	BOSSMH18	19.6	21.0	471	20.3	24	$ 1,296	$ 610,337
BOC17_6	BOSSMH87	BOSSMH189	18.8	19.5	471	19.2	15	$ 858	$ 404,007
BOC17_7	BOSSMH189	BOSSMH190	19.5	21.0	471	20.3	15	$ 871	$ 409,998
BOC17_8	BOSSMH190	BOSSMH191	21.0	21.4	471	21.2	24	$ 1,328	$ 625,245
BOC17_9	BOSSMH191	BOSSMH192	21.4	21.3	471	21.4	24	$ 1,328	$ 625,248
BOC20_10	BOSSMH186	BOSSMH187	16.8	17.4	444	17.1	15	$ 832	$ 369,563
BOC20_11	BOSSMH187	BOSSMH188	17.4	18.1	444	17.8	15	$ 832	$ 369,563
BOC20_12	BOSSMH188	BOSSMH87	18.1	18.8	444	18.5	15	$ 845	$ 375,209
BOC20_7	BOSSMH88	BOSSMH184	14.8	15.6	444	15.2	15	$ 807	$ 358,269
BOC20_8	BOSSMH184	BOSSMH185	15.6	16.7	444	16.1	15	$ 820	$ 363,916
BOC20_9	BOSSMH185	BOSSMH186	16.7	16.8	444	16.7	15	$ 820	$ 363,916
Subtotal	Lovelace Road - 99 Crossing						**Base Construction Costs:**		**$ 10,306,000**
							Estimating Contingency (30%)		$ 3,092,000
							Total Construction Costs:		**$ 13,398,000**
							Engineering and Environmental Documentation (35%)		$ 4,689,000
							Total Project Costs:		**$ 18,090,000**

Stantec

PROJECT: WASTEWATER COLLECTION SYSTEM MASTER PLAN PROJECT COSTS
DATE: 9/1/2023

JOB NUMBER: 184031535
PREPARED BY: BEW

CLIENT: CITY OF MANTECA
CHECKED BY: SLB

DESCRIPTION: Project Costs
ENR: 13,176

PROJECT COSTS SUMMARY

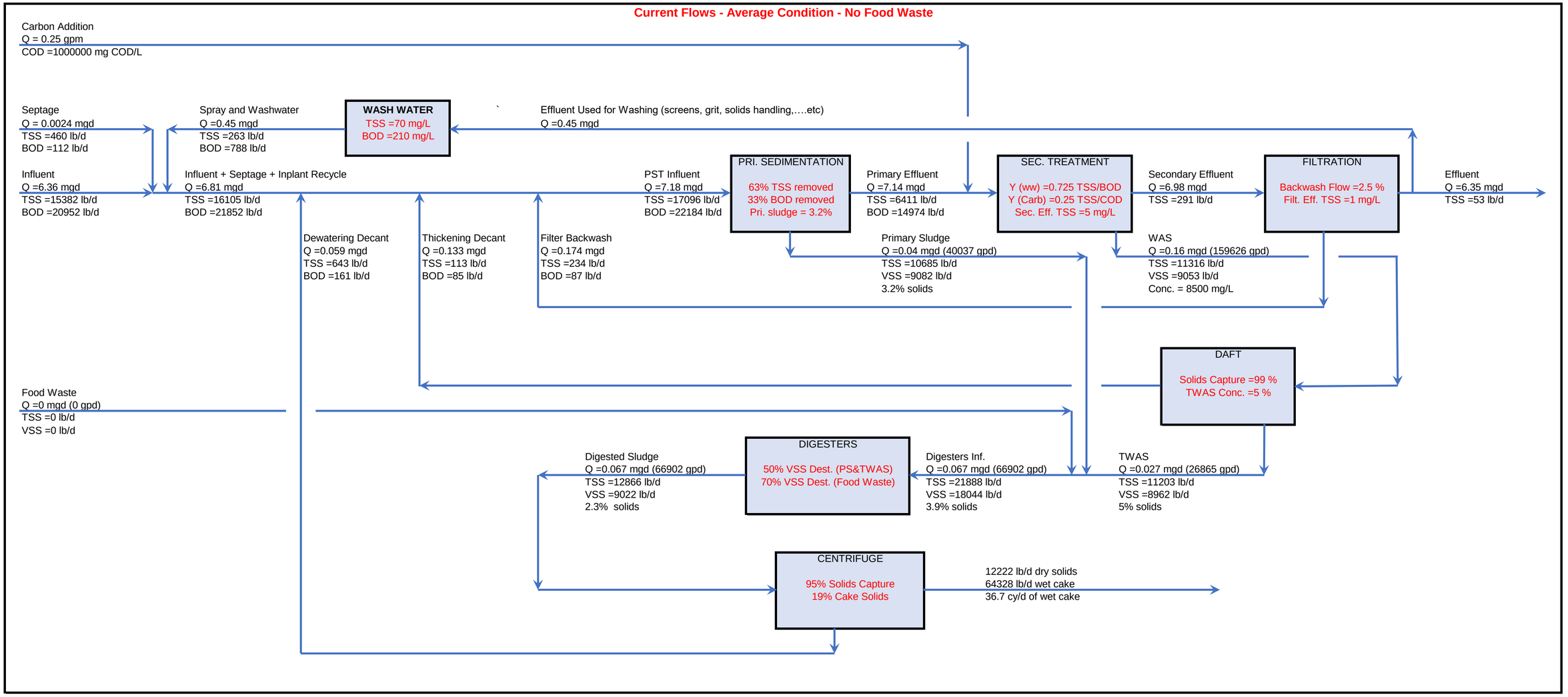
ID	Name	Base Construction Costs	Estimating Contingency (30%)	Total Construction Costs:	Engineering and Environmental Documentation (35%)	Total Project Costs:
Scenario 1 Improvements						
1	W Center Street Trunk	$2,781,000	$834,000	$3,615,000	$1,265,000	$4,880,000
2	Elm/West North Street Trunk	$2,892,000	$868,000	$3,760,000	$1,316,000	$5,080,000
3	10-inch East North Street Trunk	$941,000	$282,000	$1,223,000	$428,000	$1,660,000
4	8-inch East North Street Trunk	$288,000	$86,000	$374,000	$131,000	$510,000
5A	South Woodward Trunk Extension	$7,200,000	$2,160,000	$9,360,000	$3,276,000	$12,640,000
6	Central Union Road Trunk Extension	$9,209,000	$2,763,000	$11,972,000	$4,190,000	$16,170,000
Scenario 2 Improvements						
7A	North Trunk Extension on Airport Way	$19,564,000	$5,869,000	$25,433,000	$8,902,000	$34,340,000
8	S. Main Trunk to Evans	$4,087,000	$1,226,000	$5,313,000	$1,860,000	$7,180,000
9	S. Airport Way and Yosemite Ave. (Fishback)	$1,763,000	$529,000	$2,292,000	$802,000	$3,100,000
10	S. Airport Way Roberts Estates to Daniels	$996,000	$299,000	$1,295,000	$453,000	$1,750,000
11	Yosemite Square Lift Station and Improvements	$7,336,000	$2,201,000	$9,537,000	$3,338,000	$12,880,000
12	Austin Road Industrial Area Trunk	$11,854,000	$3,556,000	$15,410,000	$5,394,000	$20,810,000
13	South Austin Road - Industrial Area	$3,291,000	$987,000	$4,278,000	$1,497,000	$5,780,000
Scenario 3 Improvements						
14	Yosemite Square Service Area	$2,412,000	$724,000	$3,136,000	$1,098,000	$4,240,000
15	Oleander Avenue Extension	$1,578,000	$473,000	$2,051,000	$718,000	$2,770,000
16	Highway 99 Crossing at Northland Road	$5,303,000	$1,591,000	$6,894,000	$2,413,000	$9,310,000
17	East Lathrop Road Trunk	$6,869,000	$2,061,000	$8,930,000	$3,126,000	$12,060,000
18	Northland Road Trunk	$3,777,000	$1,133,000	$4,910,000	$1,719,000	$6,630,000
19	Northland Road Branches	$3,618,000	$1,085,000	$4,703,000	$1,646,000	$6,350,000
20	Louise/ Nehemiah Branches	$2,937,000	$881,000	$3,818,000	$1,336,000	$5,160,000
21	South Union Road Extension	$2,613,000	$784,000	$3,397,000	$1,189,000	$4,590,000
22	Cottage Avenue	$1,753,000	$526,000	$2,279,000	$798,000	$3,080,000
Scenario 4 Improvements						
23	North Shed Union Road Trunk	$7,479,000	$2,244,000	$9,723,000	$3,403,000	$13,130,000
24	Manteca Junction Trunk	$2,121,000	$636,000	$2,757,000	$965,000	$3,730,000
25	Lovelace Road - 99 Crossing	$10,306,000	$3,092,000	$13,398,000	$4,689,000	$18,090,000

APPENDIX H

Solids Mass Balances Flow Diagrams

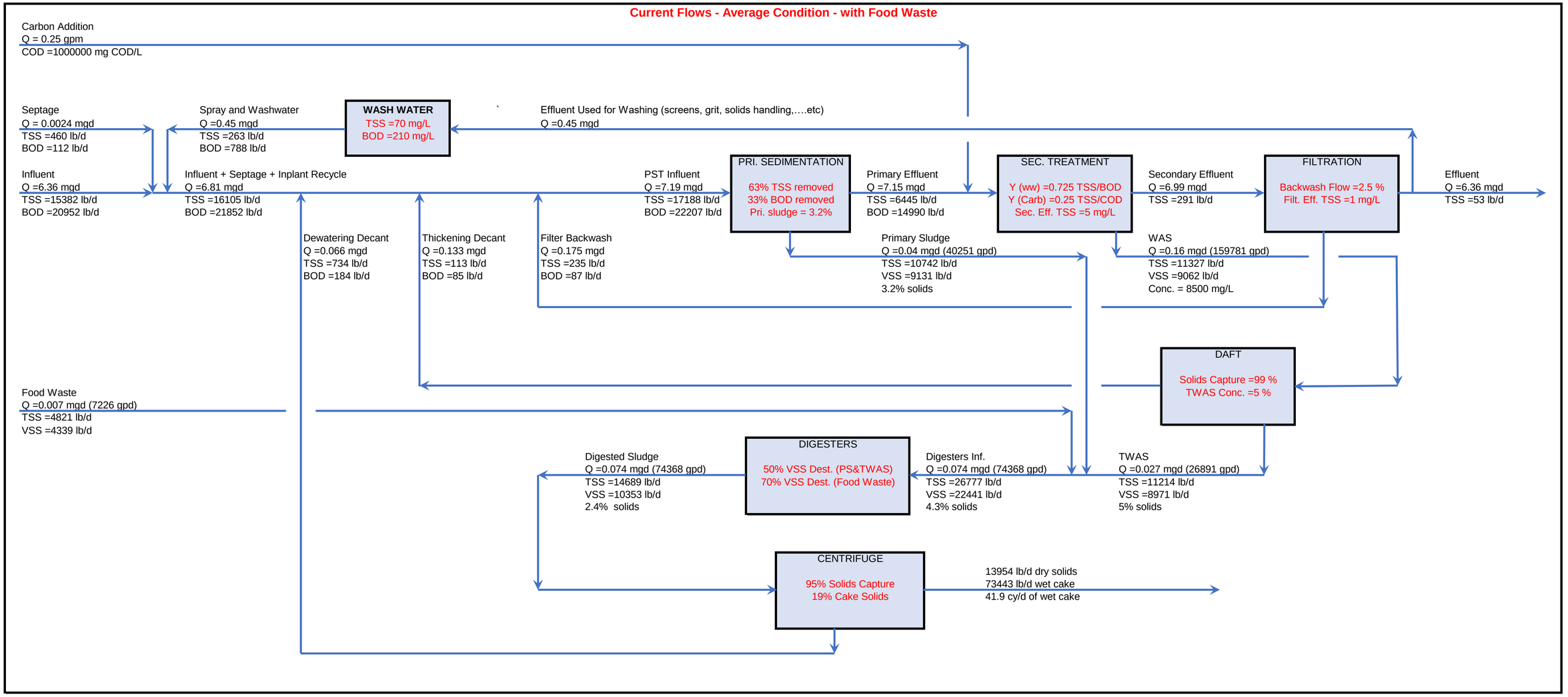
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Current Flows - Average Condition - No Food Waste



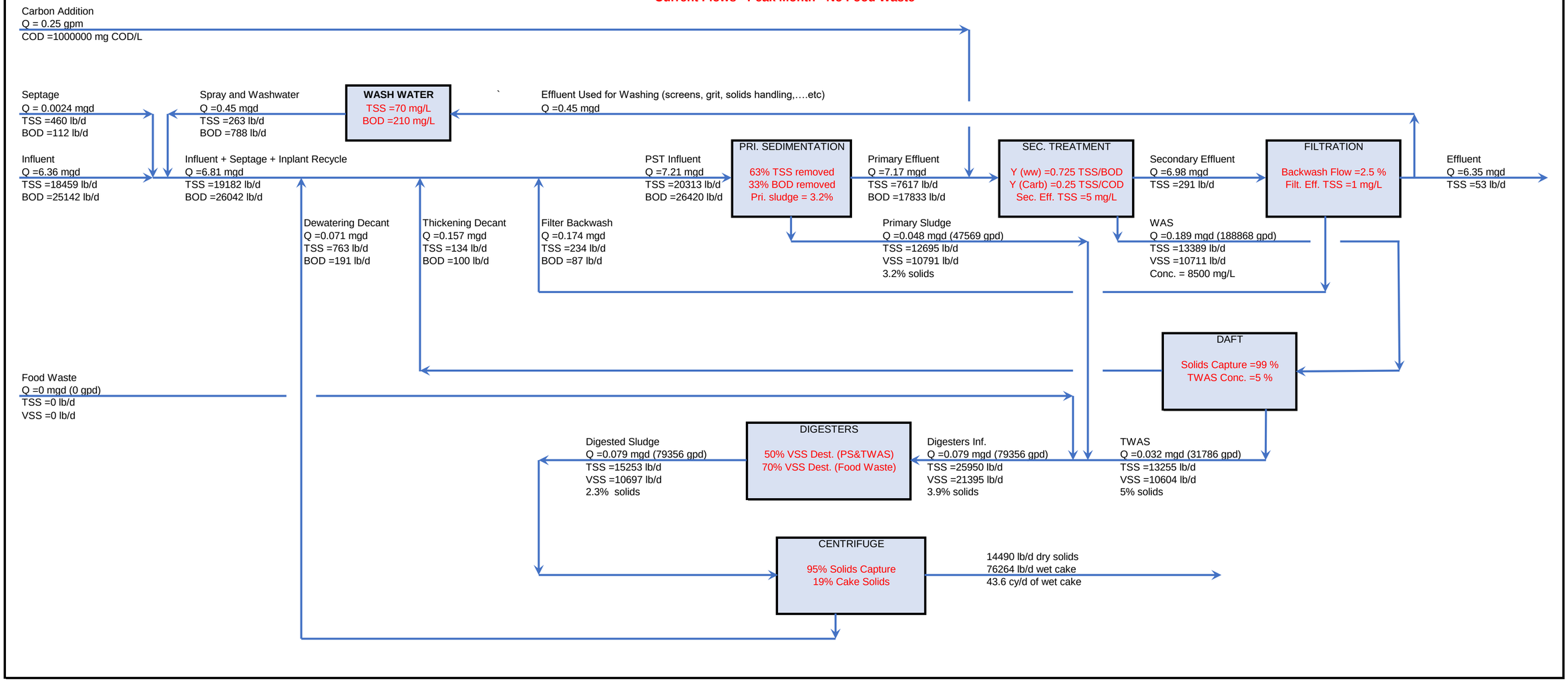
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SOLIDS MASS BALANCE

Current Flows - Average Condition - with Food Waste



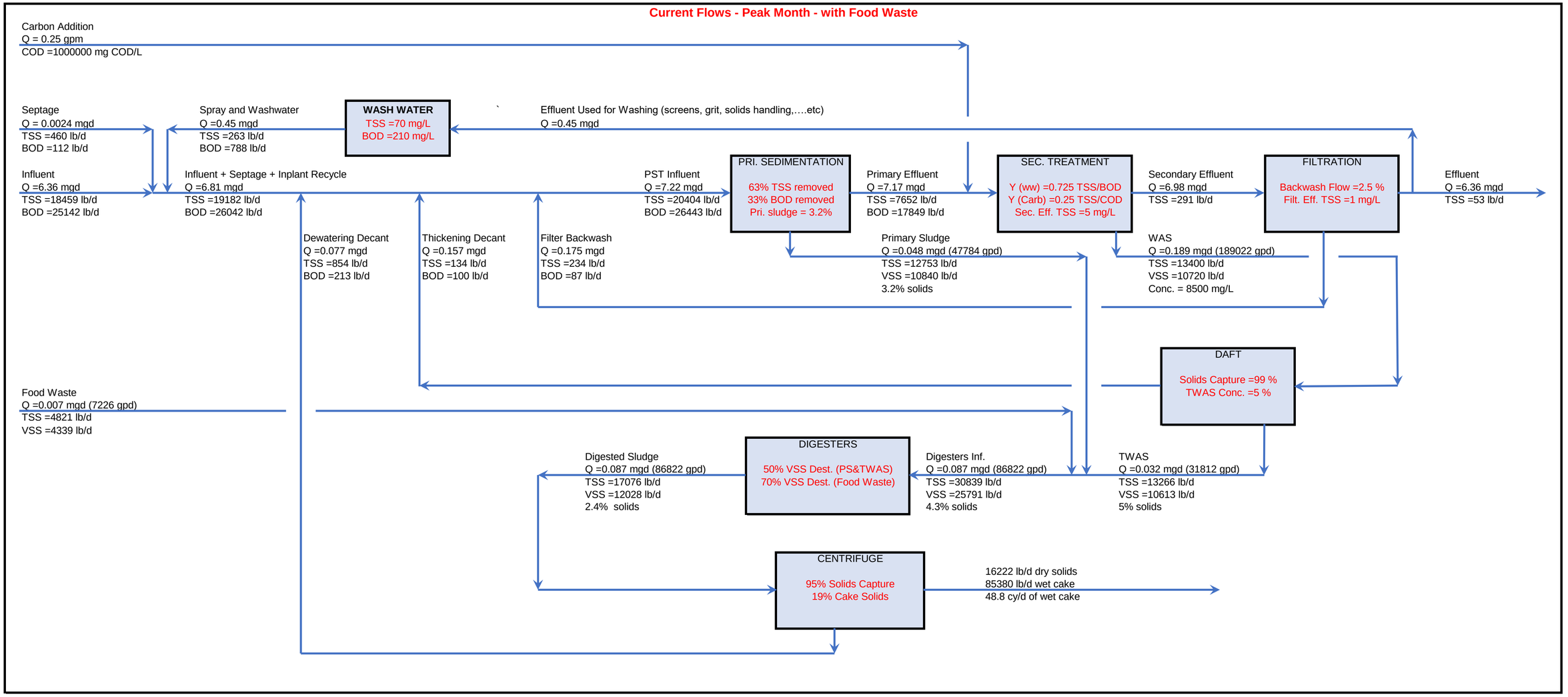
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Current Flows - Peak Month - No Food Waste

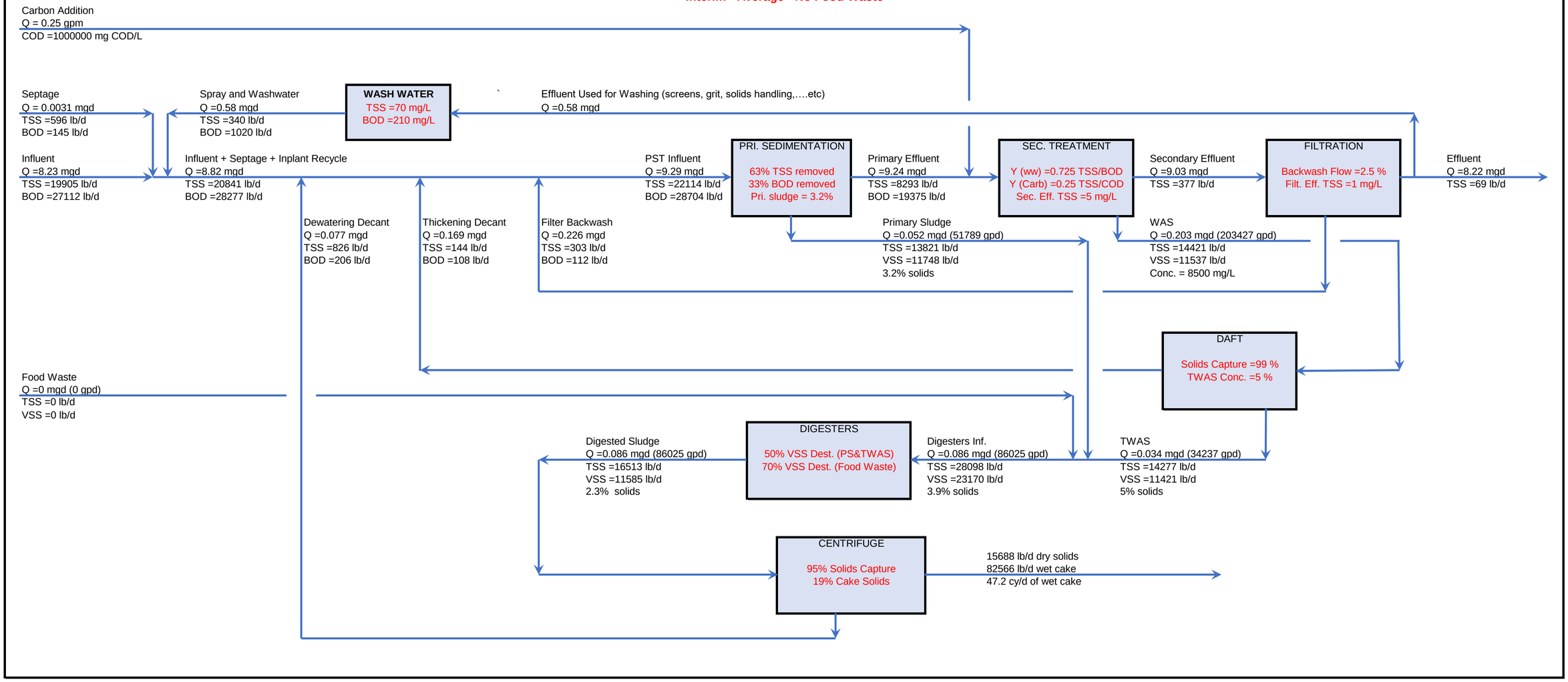


CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

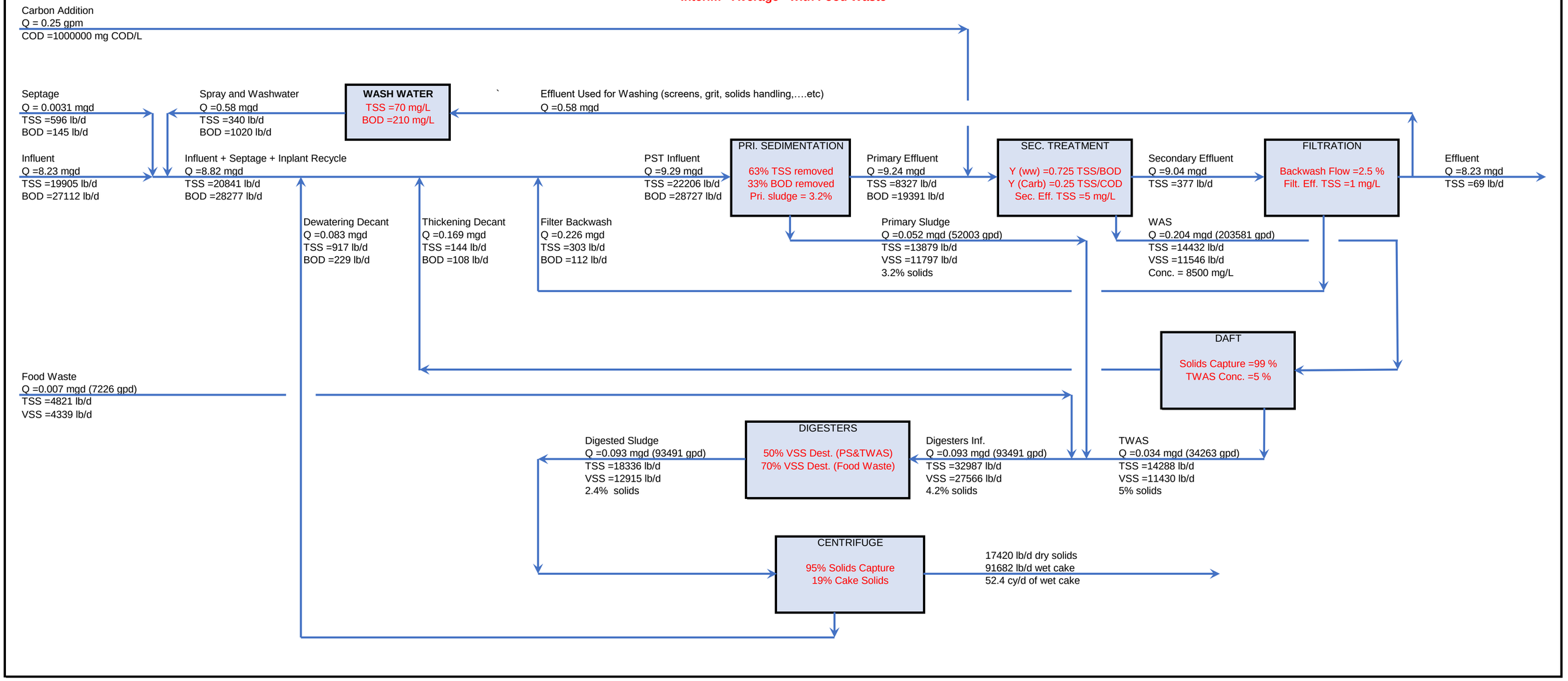
Current Flows - Peak Month - with Food Waste



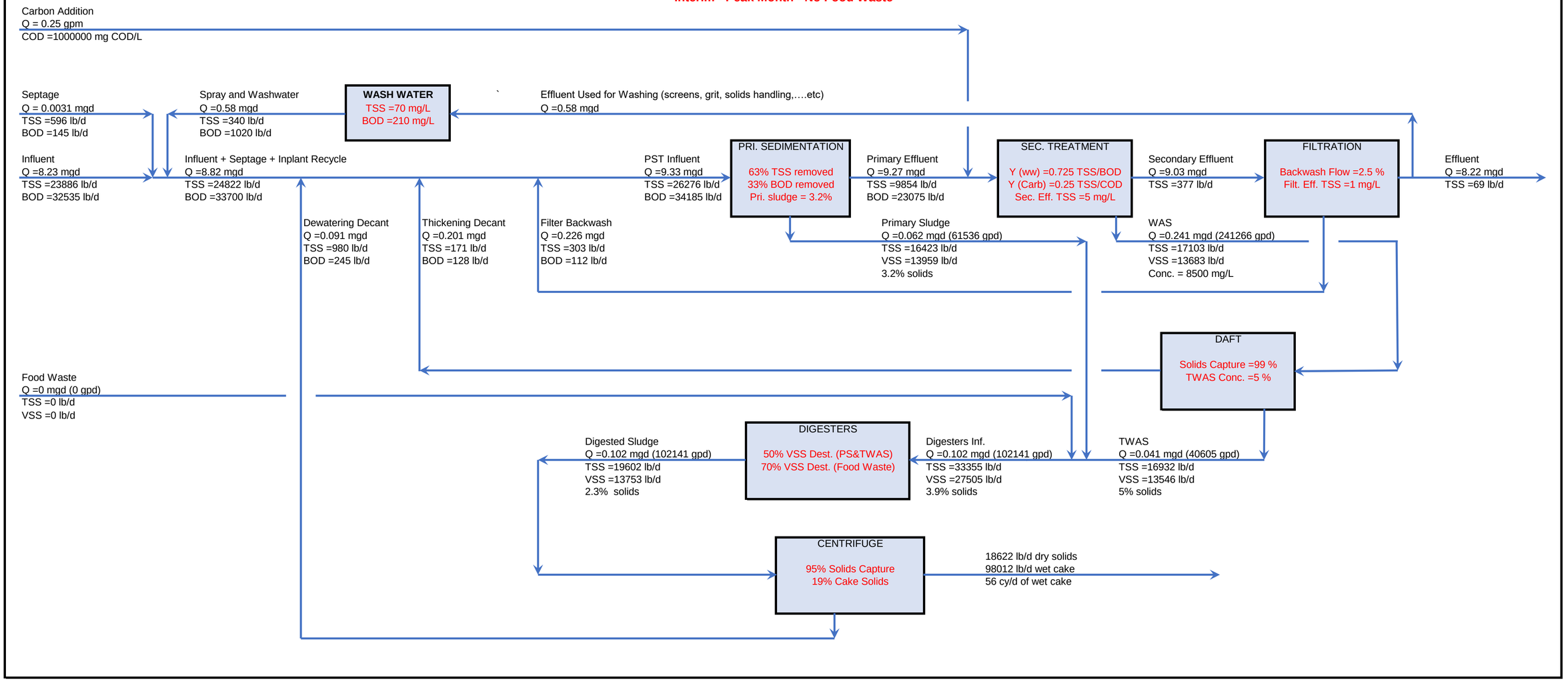
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE
Interim - Average - No Food Waste



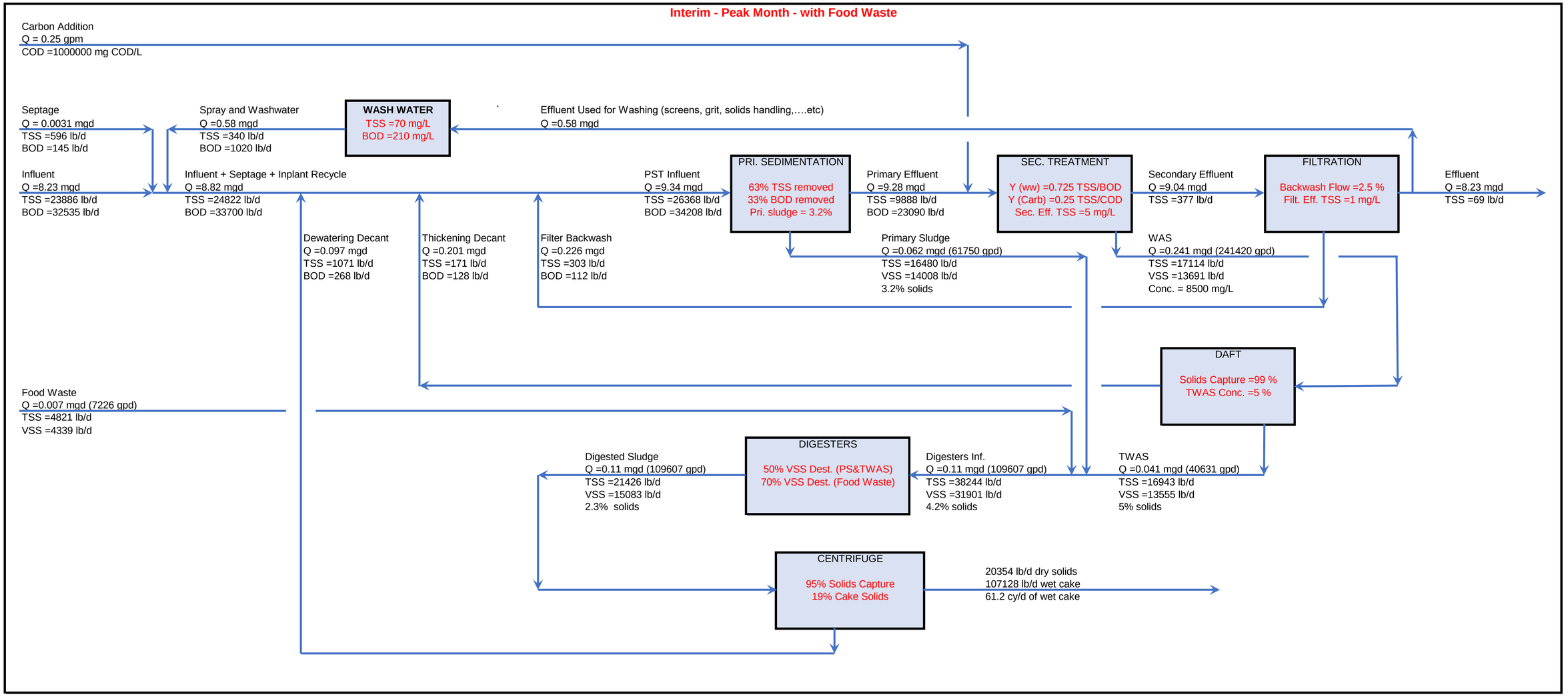
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE
Interim - Average - with Food Waste



CITY OF MANTECA WQCF
SOLIDS MASS BALANCE
Interim - Peak Month - No Food Waste

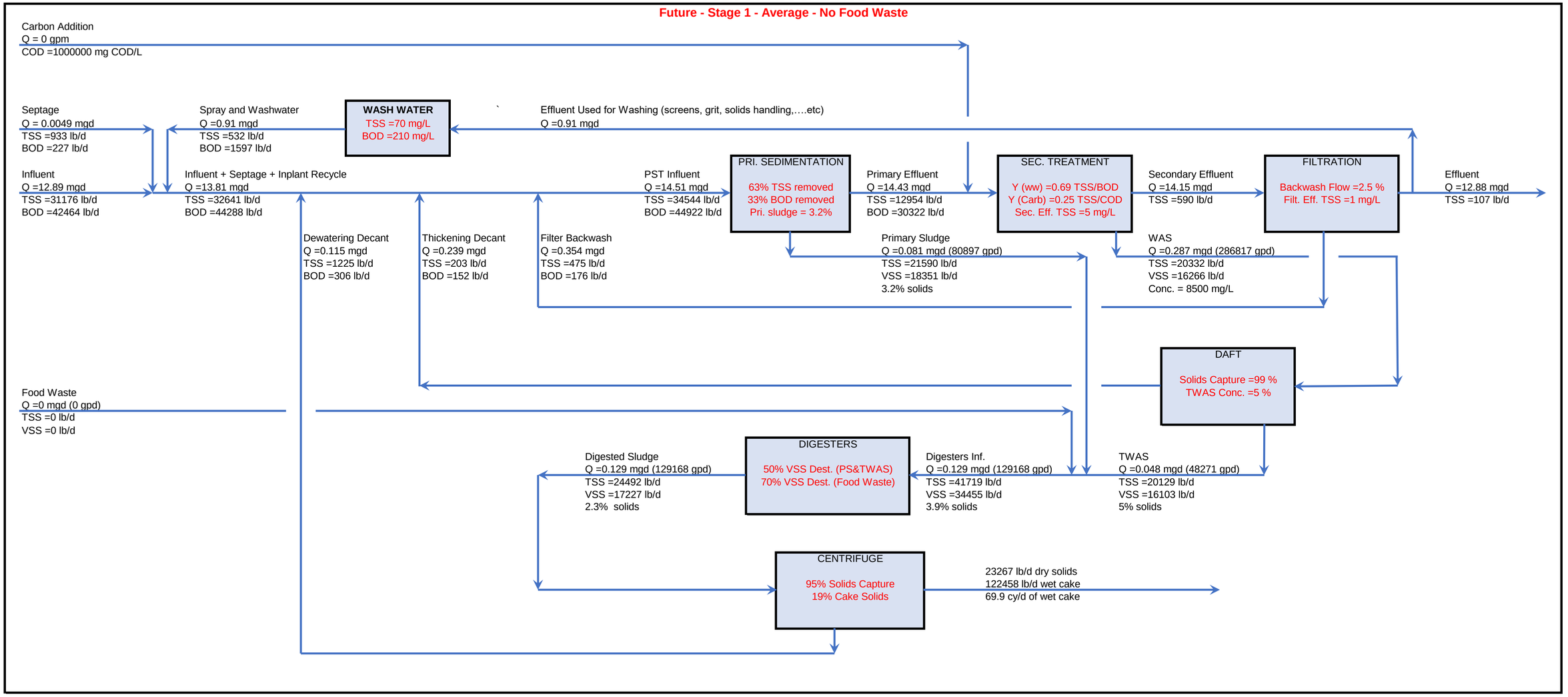


CITY OF MANTECA WQCF
SOLIDS MASS BALANCE
Interim - Peak Month - with Food Waste



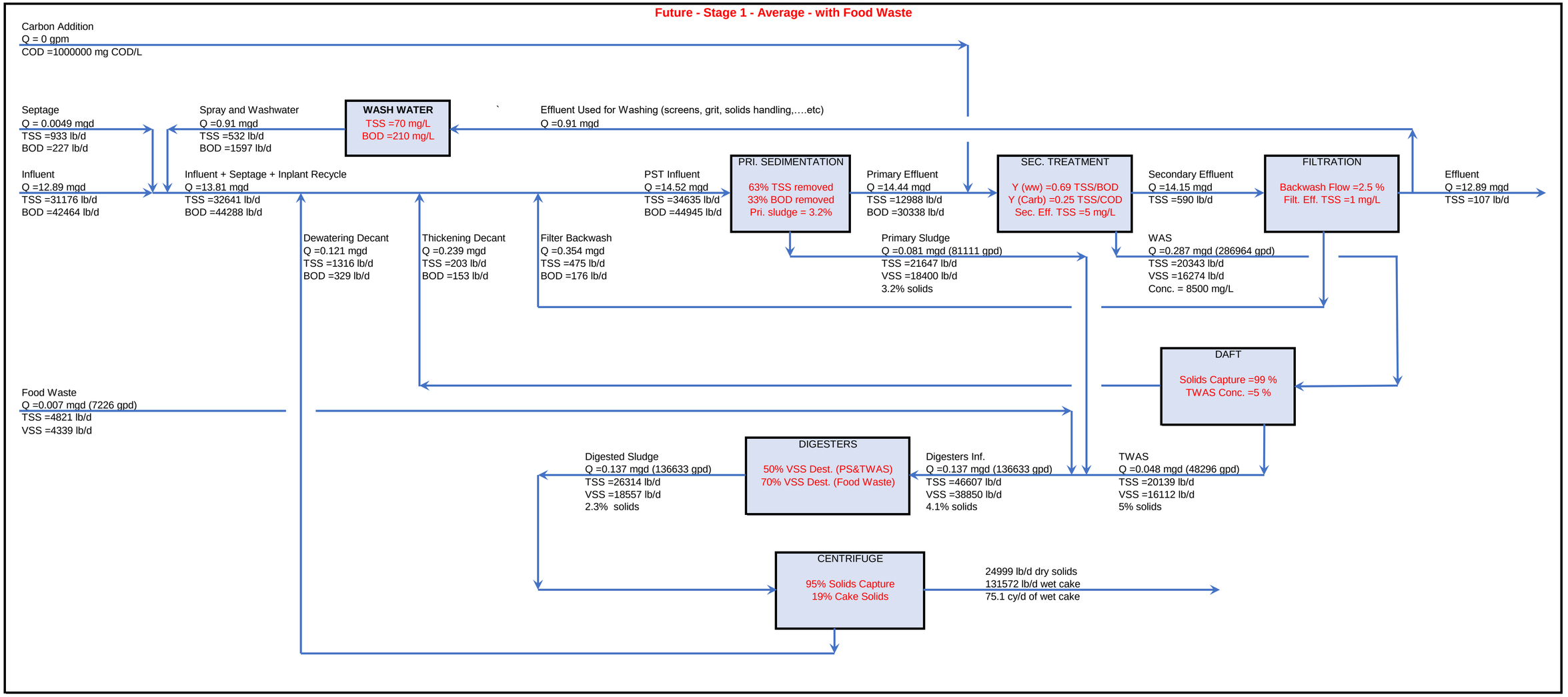
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 1 - Average - No Food Waste



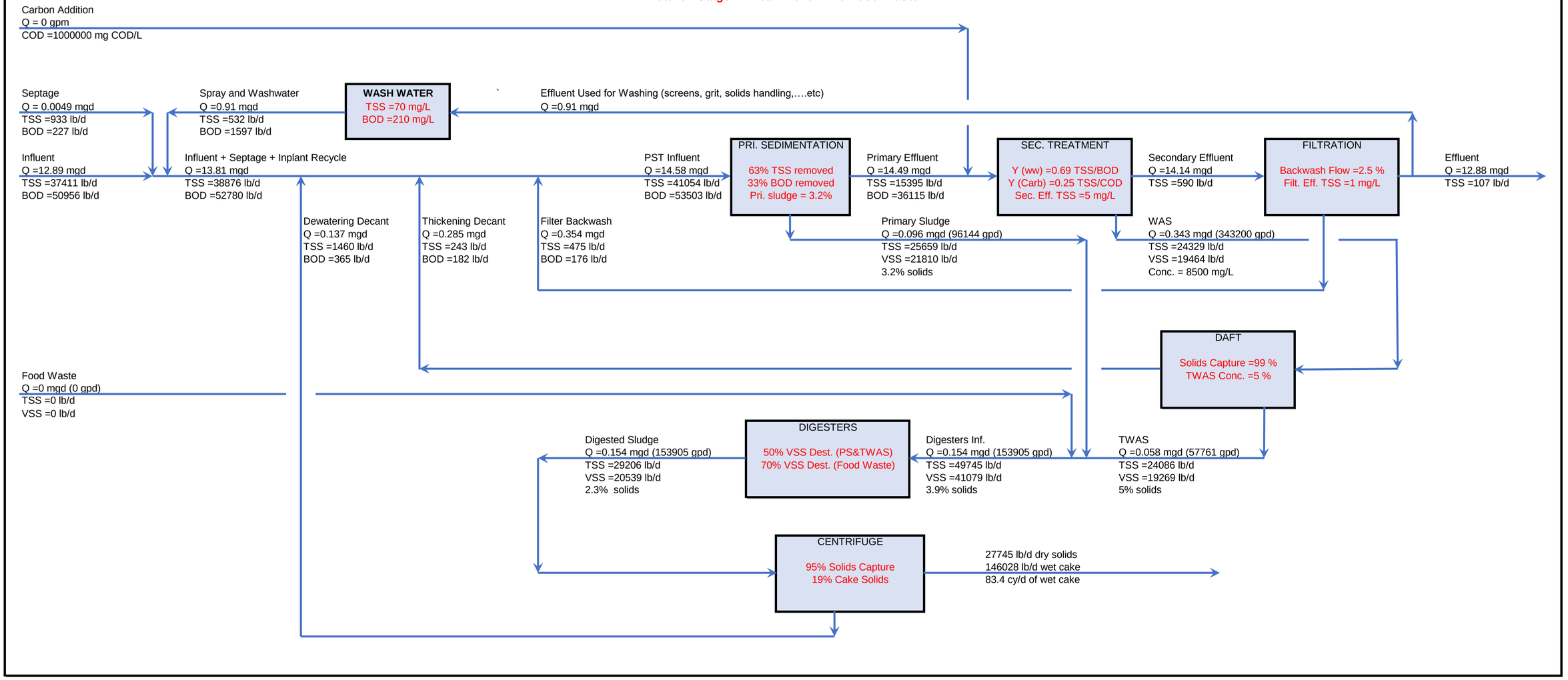
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 1 - Average - with Food Waste



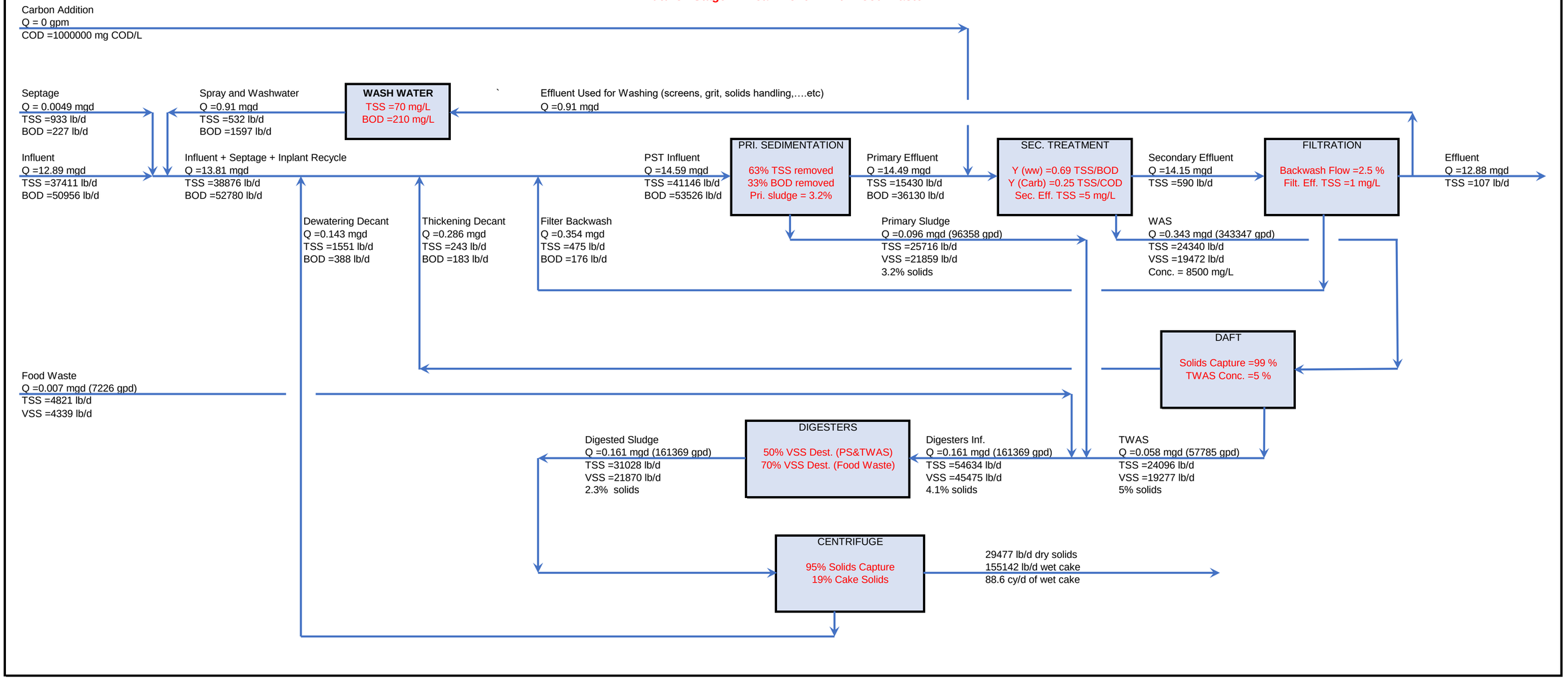
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 1 - Peak Month - No Food Waste



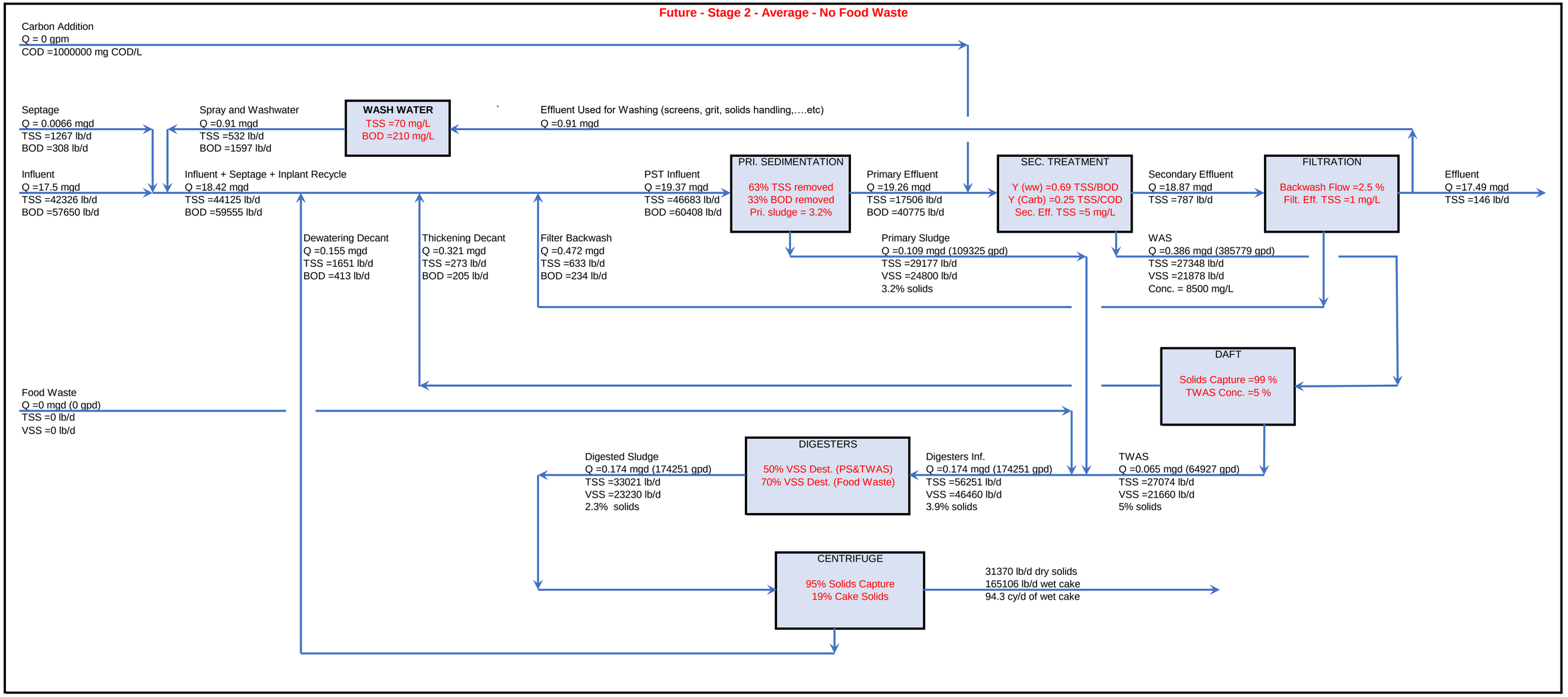
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 1 - Peak Month - with Food Waste



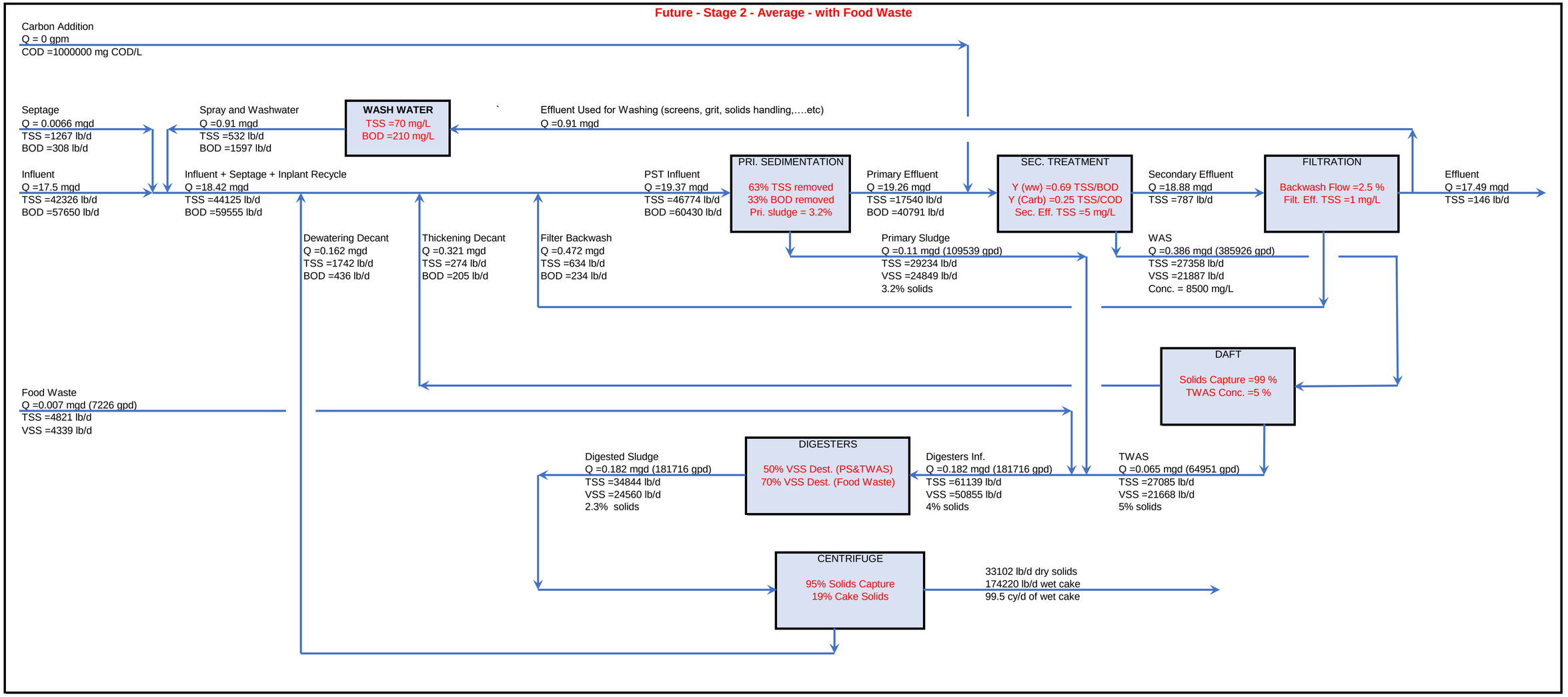
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 2 - Average - No Food Waste



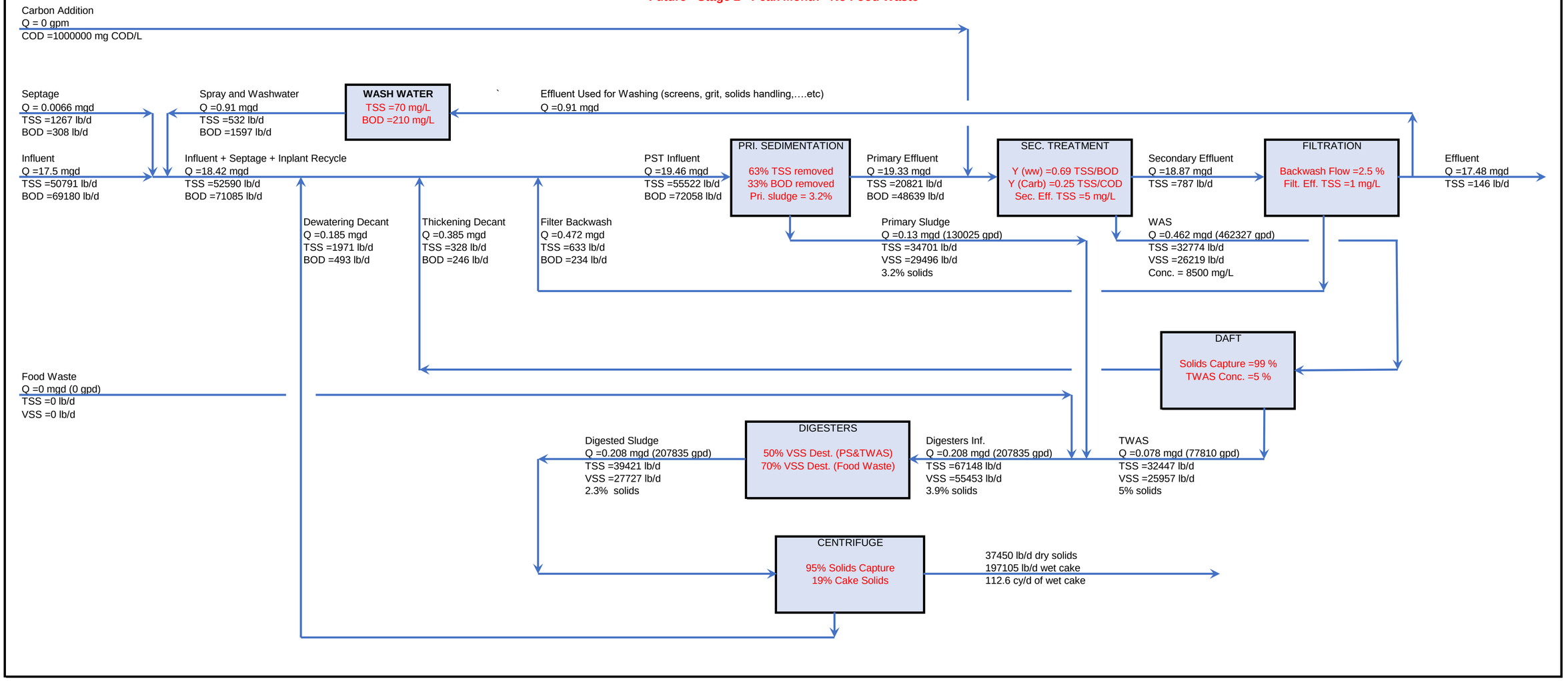
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 2 - Average - with Food Waste



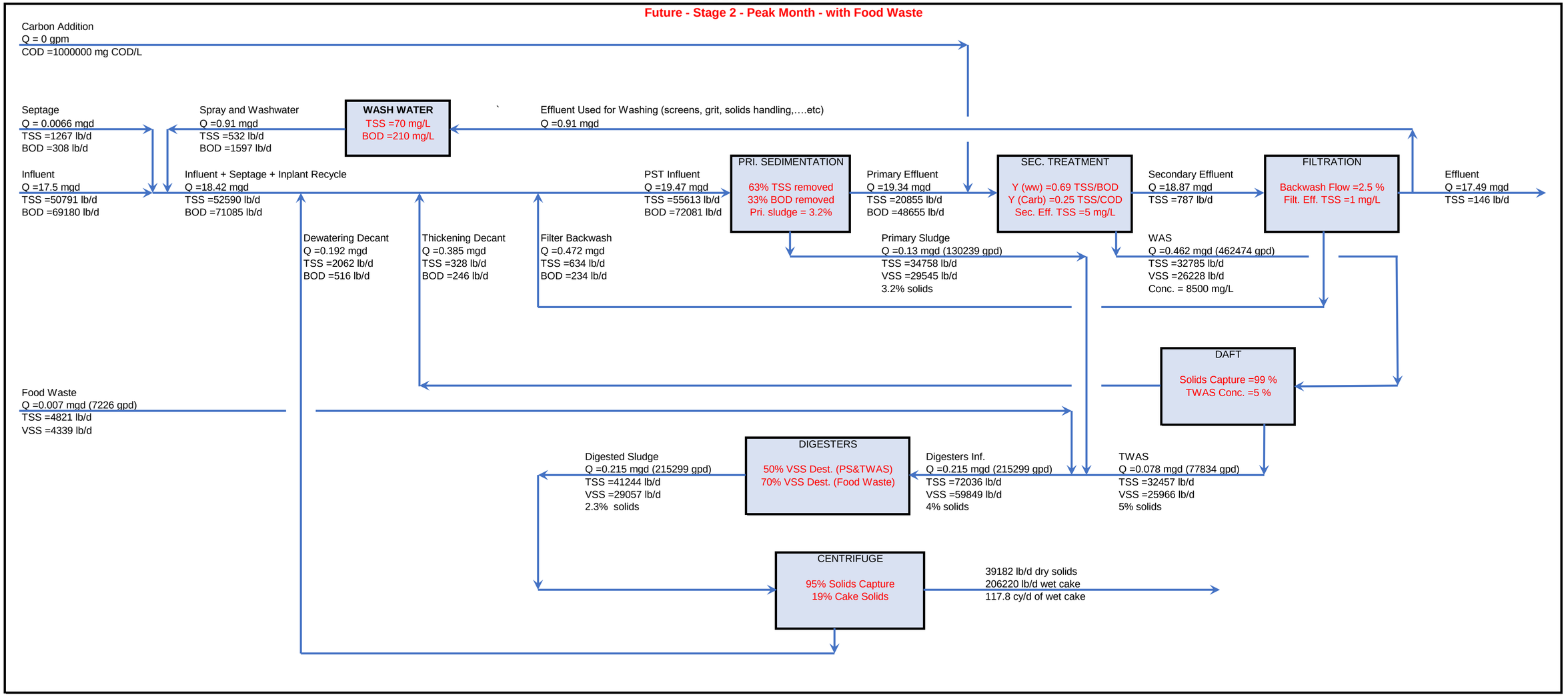
CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 2 - Peak Month - No Food Waste



CITY OF MANTECA WQCF
SOLIDS MASS BALANCE

Future - Stage 2 - Peak Month - with Food Waste



Appendix
February 2024

APPENDIX I

2017 Sanitary Sewer Condition Assessment Executive Summary Report

ATTACHMENT 2

City of Manteca Sanitary Sewer Conditions Assessment

Stantec

Prepared for:
City of Manteca
Public Works Department
1001 West Center Street
STE. E
Manteca, CA 95337

Prepared by:
Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765



August 2017

Stantec

Sign-off Sheet

This document entitled City of Manteca Sanitary Sewer Conditions Assessment was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of City of Manteca (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Noel Guercio
(signature)

Noel Guercio, P.E.

Reviewed by Steven T. Beck
(signature)

Steven L. Beck, P.E.

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Stantec

1.0 INTRODUCTION

1.1 BACKGROUND

The City of Manteca (City) is currently permitted to operate its sanitary sewer system under Waste Discharge Requirement (WDR) Order No. R5-2015-0026 and National Pollutant Discharge Elimination System (NPDES) Permit CA0081558. The City currently operates and maintains approximately a 257-mile sanitary sewer pipeline system, including 4,292 sanitary sewer manholes. As a requirement of the WDR/NPDES under Special Provision VII.B.5.c, the City is required to prepare a Sewer System Management Plan (SSMP) in accordance with the State Water Resources Control Board (SWRCB) general WDR provisions that requires all publicly-owned wastewater dischargers with a collection system greater than one-mile in length develop a SSMP. In 2014, the City adopted a SSMP which includes, under Section 6.8 (WDR Section D.13.iv.c), development of a rehabilitation and replacement program (Program)to identify and prioritize collection system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. This Program includes regular visual and television (TV) inspections of manholes and sewer pipes and a system for ranking the condition of the sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Also, the Program should include a capital improvement plan (CIP) that addresses proper management and protection of the sewer collection system assets. This CIP should include a time schedule for implementing the short-term and long-term plans plus a schedule for developing the funds needed for the CIP. The program will also utilize a Computerized Maintenance Management System (CMMS) to schedule preventative maintenance and capture maintenance records in accordance with the SSMP.

1.2 PURPOSE AND OBJECTIVES

The City of Manteca has adopted a proactive strategy with respect to developing the Program for rehabilitation and replacement of defective sewer pipes and manholes. Stantec Consulting Services Inc. (Stantec) was retained to conduct a detailed field investigation to assess the City's sanitary sewer pipes and manholes. Specific sewer assets included for inspection and condition assessment were selected by the City. Pipe cleaning and CCTV inspections were performed by Stantec's subcontractor, Professional Pipe Services (Pro-Pipe), on gravity sewer pipes ranging from 10-inch to 60-inch diameter. Visual inspection of approximately 190 manholes was also performed by Pro-Pipe.

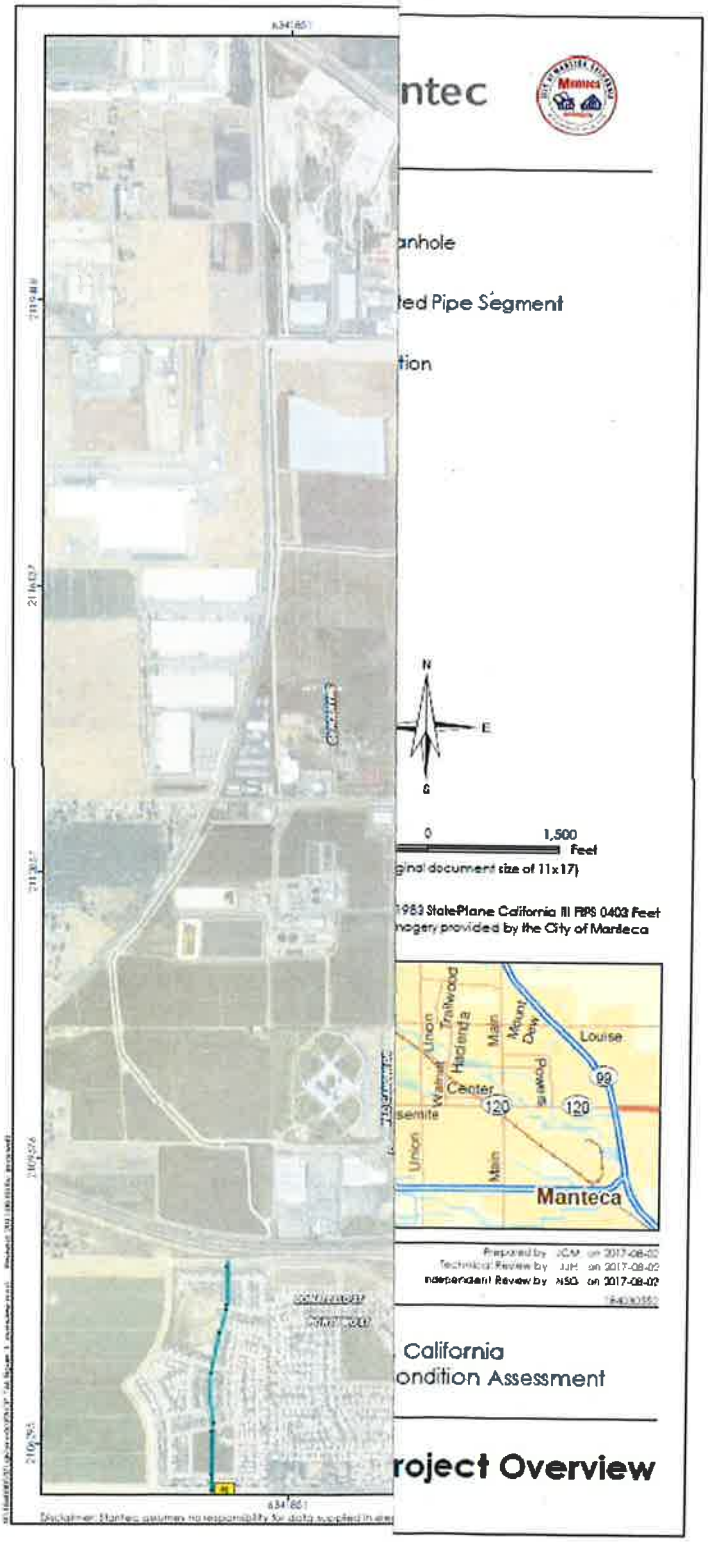
Upon completion of the inspection and condition assessment, Stantec is to prepare detailed recommendations for follow-up actions to address sewer repairs and/or rehabilitations. Additionally, Stantec is to provide cost opinions and priorities for recommended repairs/rehabilitations. Recommendations, cost opinions, and priorities will be used by the City for long-term planning and scheduling of their CIP program and entering a preventative maintenance schedule into their CMMS.

1.3 SCOPE OF WORK

The scope of work includes the assessment of 52,150 lineal feet of sanitary sewer line ranging in size from 10-inch to 60-inch and 187 manholes. **Table 1** lists the project cleaning and inspection quantities. **Figure 1** shows the location of the pipelines and manholes that are included in the scope

Table 1 Cleaning and Inspection Quantities

Item	Quantity
Clean and Inspect 10-inch Sewer Line	16,500 ft.
Clean and Inspect 12-inch Sewer Line	7,150 ft.
Clean and Inspect 15-inch Sewer Line	3,650 ft.
Clean and Inspect 21-inch Sewer Line	1,850 ft.
Clean and Inspect 24-inch Sewer Line	2,850 ft.
Clean and Inspect 30-inch Sewer Line	12,400 ft.
Clean and Inspect 36-inch Sewer Line	5,050 ft.
Clean and Inspect 60-inch Sewer Line	2,700 ft.
Inspect Manhole	187 ea.


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Technical Review by JJH on 2017-08-02
Independent Review by NSD on 2017-08-02
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1.3.1 Task 1 –Detailed Work Plan

Prepare a detailed work plan that includes the following:

- Scope of services
- Required permits
- Public agency contacts
- Project team contacts
- Project schedule

1.3.2 Task 2 –Health and Safety Plan

Prepare a Health and Safety Plan (HASP) that includes the following:

- A summary of health and safety measures/activities to be implemented when performing field activities
- Required Personal Protective Equipment
- List of required practices and testing to project workers
- Emergency protocol including contact numbers, addresses, and maps for local emergency crews

1.3.3 Task 3 –Traffic Control Plan

Prepare a Traffic Control Plan (TCP) that conforms to provisions of the CAMUTCD 2014, City of Manteca, and San Joaquin County standards or requirements and that includes the following:

- A summary of traffic control measures/activities required to conduct field activities
- Contact numbers for fire, police and other City or agency departments
- A preliminary implementation schedule
- Maps and figures showing the location of proposed traffic control measures

1.3.4 Task 4 – Sanitary Sewer and Manhole Cleaning and Inspection

Perform sanitary sewer and manhole cleaning and inspection for sewer lines and manholes within the project. The latest version of NASSCO's PACP and MACP shall be used during the inspection of the sanitary sewer lines and manholes.

1.3.5 Task 6 –Sanitary Sewer Conditions Assessment Report

Prepare a Sanitary Sewer Conditions Assessment Report that includes the following:

- Maps, tables, and graphical presentations to demonstrate findings
- Discussion of standards, procedures, materials and methods utilized, including precision and accuracy of findings
- Discussion regarding the components of the systems assessed, including grade/rank of the various components assessed, and a copy of the PACP and MACP Database output forms in the appendices

- Findings regarding deficiencies, defects, observations or potential failures and any conclusions relating to underlying cause of deficiencies, defects and failures
- Recommendations regarding repairs, replacement, operations and maintenance
- A prioritized list and schedule for implementing recommendations
- Itemized estimate of cost to implement each of the proposed recommendations and/or a table showing costs estimates for all recommendations
- A map summarizing the findings shall also be prepared in conjunction with the report.

1.3.6 Task 7 –Present Results at City Council Meeting

Prepare a presentation summarizing the inspection and assessment results and final report in collaboration with City staff and presented to City Council.

1.4 REPORT FORMAT

The report is divided into the following sections:

1. Introduction
2. Field Effort
3. GIS Rectification
4. Pipeline and Manhole Assessment
5. Recommendations

1.5 PROJECT TEAM

Stantec is responsible for all work related to the project including the development and management of project deliverables, reviewing and appending the portion of the City's GIS database related to the project, data compilation and analysis, and performing the condition assessment for the sewer lines and manholes.

Stantec sub-contracted specialty services from Pro-Pipe for sewer line cleaning, sewer line inspection, manhole inspection, and field support.

2.0 FIELD EFFORT

Field activities consisted of pipe and manhole cleaning and inspection. Pro-Pipe completed the pipe line inspection between October 11, 2016 and November 22, 2016 and the manhole inspection between November 30, 2016, and December 14, 2016. A detailed Work Plan, Health and Safety Plan, and Traffic Control Plan were all submitted to the City prior to commencing the work. The following sections outline the equipment and processes used and the deliverables that were received.

2.1 CLEANING AND INSPECTION

2.1.1 Cleaning

2.1.1.1 Equipment

The equipment used for cleaning consisted of a Hydro-Vac Combination Truck, **Figure 2**, equipped with a water tank, hose, fittings and nozzles used for cleaning the sewer by jetting water along the inside of the sewer line and a debris box and vacuum hose mounted on a telescoping boom for collecting debris.



Figure 2 Hydro-Vac Combination Truck

2.1.1.2 Process

Pipe cleaning is performed prior to the inspection of the pipelines. Before inserting the cleaning nozzle in the sewer line, the operator rinses down the inside of the manhole to remove any loose material and/or debris. When the manhole cleaning is complete, the operator inserts a high-pressure jetting hose with nozzle (jetting towards the hydro-vac truck) into the pipe. The hose and nozzle are propelled upstream to the end of the segment. The water pressure is increased as the hose is winched back to the truck pulling all debris to the downstream manhole. The operator uses the vacuum hose to extract the debris from the downstream manhole. Liquids are filtered back

to the sanitary sewer system and the debris contents are then hauled to the approved disposal facility.

2.1.2 Pipeline Inspection

2.1.2.1 Equipment

The IBAK Panoramo 3D Optoscanner (Panoramo), **Figure 3**, was used for the inspection of the sewer lines. The Panoramo unit use of two high-resolution digital cameras in the front and rear sections of the housing, with 185° wide-angle lenses capable of 360° spherical images, and parallel-mounted xenon flashlights. Pictures are taken at definite spatial lengths as the unit passes through the pipe and are digitally recorded. An operator monitors the unit's progress at a monitoring station inside a vehicle located at the entry manhole.



Figure 3 IBAK Panoramo (Digital Scanner)

2.1.2.2 Process

The CCTV operator, in most cases, will occupy the upstream manhole upon completion of the cleaning and will televise the pipeline segment in accordance with National Association of Sewer Service Companies (NASSCO) guidelines. In the event access is compromised at the upstream position (due to location or safety issues), a reverse run (travelling upstream) will be performed.

In the event a new manhole is discovered, it will be added manually to the inspection database using a predefined numbering process. This will also prompt the crew to add the manhole to the manhole inspection scope.

The inspection is digitally recorded and upon completion is submitted to the main office for coding. Coding is performed in accordance with NASSCO guidelines and the final coded video is submitted to the engineer for review.

2.1.2.3 Deliverables

Deliverables include a PACP database, PDF integrated reports including "pipe graph", "picture report" and "tabulation report with scoring" as well as the inspection videos for each line segment.

2.1.3 Manhole Inspection

2.1.3.1 Equipment

The IBAK Panoramo Si, **Figure 4**, was used for the inspection of the manholes. Like the Panoramo 3D Optoscanner, the Panoramo Si unit uses two high-resolution digital cameras except they are mounted on the top and bottom of the unit. Pictures are taken at definite spatial lengths as the unit passes through the manhole and are digitally recorded. An operator monitors the unit's progress at a monitoring station inside a vehicle located at the manhole.



Figure 4 IBAK Panoramo Si

2.1.3.2 Process

Manhole inspections are provided subsequent to mainline inspections. The inspection truck or van pulls over the manhole, temporarily parking with the rear truck bumper positioned within a foot outside of the manhole rim. The lid is lifted and a cone is placed adjacent to the manhole opening. The manhole camera is lowered to the bottom of the manhole during live view to ensure the camera is positioned at the lowest possible point. The camera is then raised at a steady rate (no swing) while the digital images are recorded with a synchronized flash. When the camera is raised to beyond the opening, the system is turned off and the lid placed over the manhole. The operator confirms data capture integrity and visual clarity, then the truck and crew will exit the setup and travel to the next manhole. The manhole inspections are submitted to the main office for coding.

Coding is performed in accordance with NASSCO guidelines and the final coded video is submitted to the engineer for review.

2.1.3.3 Deliverables

Deliverables include a MACP database, PDF integrated manhole reports as well as the inspection videos for each manhole.

2.2 MAP DISCREPANCY TRACKING

Differences between what is shown in the GIS and what is observed in the field can often occur. Mapping discrepancies encountered in the field can necessitate changes in pipe and manholes identification numbers/labels. This can create problems later when trying to integrate field inspection information into the GIS system.

A one-page Map Discrepancy Form (MDF) to track discrepancies between GIS mapping and field observations was used during the project. The form was also used to identify the locations of inspection survey abandonments for reasons such as debris or obstruction in the pipe. All of the MDFs for the project are located in **Appendix I**. Changes made to the GIS as a result of scenarios recorded in the MDFs are discussed further in **Section 3.0 GIS Rectification**.

3.0 GIS RECTIFICATION

Geographic Information System (GIS) data was provided by the City in August 2016. GIS data included: sanitary sewer pipes and manholes, stormwater features, potable water pipes, street center lines, parcel boundaries (no addresses), and aerial imagery. Attribute information for sanitary sewers was provided in a geodatabase that included: upstream and downstream manholes, pipe length, pipe material, and other general physical data. An updated GIS database was provided by the City again after the inspection of all the pipelines was completed. This final GIS database rectified all the discrepancies between what was in the field versus the what was in the City's GIS at the beginning of the project.

Pipes and manholes included in the CCTV inspection database were located in the GIS to verify that a one-to-one match existed. Discrepancies were noted, but have all been successfully resolved. Where the City's GIS data did not accurately match field observations, the City's GIS data was updated. The updates were limited to: correcting pipe connectivity, adding manholes observed in the field that were not present in the GIS, or removing manholes that do not exist.

Table 2 summarizes the changes that were made to the GIS as a result of what was noted during the field activities.

Table 2 GIS Amendments

Pipe Segment ID	Upstream Manhole ID	Downstream Manhole ID	Reason for Amendment	Amendment Made to GIS
WWGM0249	WWMH1181	WWMH4165	Extra Manhole	Label extra manhole as WWMH4165. Split WWGM0249 in two. Label upstream pipe WWGM0249 and downstream pipe as WWGM5721.
WWGM5208	WWMH4165	WWMH1156	Extra Manhole	Label extra manhole as WWMH4165. Split WWGM0249 in two. Label upstream pipe WWGM0249 and downstream pipe as WWGM5208.
WWGM0097	WWMH1156	WWMH5086	Extra Manhole	Label extra manhole as WWMH5086. Split WWGM0097 in two. Label upstream pipe WWGM0097 and downstream pipe as WWGM5722.
WWGM6024	WWMH5086	WWMH1155	Extra Manhole	Label extra manhole as WWMH5086. Split WWGM0097 in two. Label upstream pipe WWGM0097 and downstream pipe as WWGM6024.
WWGM0094	WWMH1155	WWMH4277	Two assets labeled as WWGM0094.	No change to this asset.

CITY OF MANTECA SANITARY SEWER CONDITIONS ASSESSMENT

GIS Rectification
August 2017

Pipe Segment ID	Upstream Manhole ID	Downstream Manhole ID	Reason for Amendment	Amendment Made to GIS
WWGM5360	WWMH4277	WWMH0521	Two assets labeled in GIS as WWGM0094.	Change pipe asset ID to WWGM5360.
WWGM5990	WWMH0521	WWMH5073	Extra Manhole	Label extra manhole as WWMH5073. Split WWGM0191 in two. Label upstream pipe WWGM5990 and downstream pipe as WWGM0191.
WWGM0191	WWMH5073	WWMH0323	Extra Manhole	Label extra manhole as WWMH5073. Split WWGM0191 in two. Label upstream pipe WWGM5990 and downstream pipe as WWGM0191.
WWGM0880	WWMH0342	WWMH5062	Extra Manhole	Label extra manhole as WWMH5062. Split WWGM0880 in two. Label upstream pipe WWGM0880 and downstream pipe as WWGM5977.
WWGM5977	WWMH5062	WWMH0369	Extra Manhole	Label extra manhole as WWMH5062. Split WWGM0880 in two. Label upstream pipe WWGM0880 and downstream pipe as WWGM5977.
WWGM0881	WWMH0369	WWMH5063	Extra Manhole	Label extra manhole as WWMH5063. Split WWGM0881 in two. Label upstream pipe WWGM0881 and downstream pipe as WWGM5733.
WWGM5976	WWMH5063	WWMH0368	Extra Manhole	Label extra manhole as WWMH5063. Split WWGM0881 in two. Label upstream pipe WWGM0881 and downstream pipe as WWGM5976.
WWGM6003	WWMH1132	WWMH5090	Extra Manhole	Label extra manhole as WWMH5090. Split WWGM0888 in two. Label upstream pipe WWGM6003 and downstream pipe as WWGM0888.
WWGM0888	WWMH5090	WWMH0373	Extra Manhole	Label extra manhole as WWMH5090. Split WWGM0888 in two. Label upstream pipe WWGM6003 and downstream pipe as WWGM0888.
WWGM5974	WWMH3125	Lift Station WWC-WW06	GIS Incorrect and Extra Manhole	Extra manhole found between manhole WWMH3125 and WWMH2727. Split pipes as follows: WWGM3527- WWMH3125 to Lift Station (WWC-WW06) WWGM5999 - Lift Station (WWC-WW06) to WWMH5080 WWGM3528 – WWMH5080 to WWMH2746

CITY OF MANTECA SANITARY SEWER CONDITIONS ASSESSMENT

GIS Rectification
August 2017

Pipe Segment ID	Upstream Manhole ID	Downstream Manhole ID	Reason for Amendment	Amendment Made to GIS
WWGM5999	Lift Station WWC-WW06	WWMH5080	GIS Incorrect and Extra Manhole	Extra manhole found between manhole WWMH3125 and WWMH2727. Split pipes as follows: WWGM3527- WWMH3125 to Lift Station (WWC-WW06) WWGM5999 - Lift Station (WWC-WW06) to WWMH5080 WWGM3528 – WWMH5080 to WWMH2746
WWGM3527	WWMH5080	WWMH2746	GIS Incorrect and Extra Manhole	Extra manhole found between manhole WWMH3125 and WWMH2727. Split pipes as follows: WWGM3527- WWMH3125 to Lift Station (WWC-WW06) WWGM5999 - Lift Station (WWC-WW06) to WWMH5080 WWGM3528 – WWMH5080 to WWMH2746
WWGM6022	WWMH1222	WWMH5074	Two Extra Manholes	WWGM6022 (New Pipe ID) - Upstream WWMH1222, Downstream WWMH5074 (New Manhole)
WWGM6023	WWMH5074	WWMH5075	Two Extra Manholes	WWGM6023 (New Pipe ID) - Upstream WWMH5074 (New Manhole), Downstream WWMH5075 (New Manhole)
WWGM1013	WWMH5075	WWMH1221	Two Extra Manholes	WWGM1013 - Upstream WWMH5075 (New Manhole), Downstream WWMH1221
WWGM5998	WWMH1406	WWMH5084	Extra Manhole	Label extra manhole as WWMH5084. Split WWGM1737 in two. Label upstream pipe WWGM5998 and downstream pipe as WWGM1737.
WWGM1737	WWMH5084	WWMH2766	Extra Manhole	Label extra manhole as WWMH5084. Split WWGM1737 in two. Label upstream pipe WWGM5998 and downstream pipe as WWGM1737.
WWGM5997	WWMH1763	WWMH5083	Extra Manhole	Label extra manhole as WWMH5083. Split WWGM3275 in two. Label upstream pipe WWGM5997 and downstream pipe as WWGM3275.
WWGM3275	WWMH5083	WWMH1445	Extra Manhole	Label extra manhole as WWMH5083. Split WWGM3275 in two. Label upstream pipe WWGM5997 and downstream pipe as WWGM3275.
WWGM1518	WWMH0540	WWMH3157	WWMH0969 does not exist.	Remove manhole WWMH0969. Combine WWGM1518 and WWGM3788 and label as WWGM1518.

CITY OF MANTECA SANITARY SEWER CONDITIONS ASSESSMENT

GIS Rectification
August 2017

Pipe Segment ID	Upstream Manhole ID	Downstream Manhole ID	Reason for Amendment	Amendment Made to GIS
WWGM4839	WWMH3157	WWMH3954	Two assets labeled as WWGM1515.	Change pipe ID to WWGM4839.
WWGM1515	WWMH3954	WWMH0401	Two assets labeled as WWGM1515.	No change to this asset.
WWGM5985	WWMH0546	WWMH5069	Extra Manhole	Label extra manhole as WWMH5069. Split WWGM0018 in two. Label upstream pipe WWGM5985 and downstream pipe as WWGM0018.
WWGM0018	WWMH5069	WWMH1149	Extra Manhole	Label extra manhole as WWMH5069. Split WWGM0018 in two. Label upstream pipe WWGM5985 and downstream pipe as WWGM0018.
WWGM5995	WWMH3001	WWMH5081	Extra Manhole	Label extra manhole as WWMH5081. Split WWGM0020 in two. Label upstream pipe WWGM5995 and downstream pipe as WWGM0020.
WWGM0416	WWMH1107	WWMH1109	Incorrect connectivity	WWGM0416 connects downstream to manhole WWMH1109 not manhole WWMH1108.
WWGM0020	WWMH5081	WWMH3000	Extra Manhole	Label extra manhole as WWMH5081. Split WWGM0020 in two. Label upstream pipe WWGM5995 and downstream pipe as WWGM0020.
WWGM5363	WWMH1128	WWMH4278	Two assets labeled as WWGM0577.	Change pipe asset ID to WWGM5363.
WWGM0577	WWMH4278	WWMH1127	Two assets labeled as WWGM0577.	No change to this asset.
WWGM0394	WWMH1097	WWMH0352	WWMH3167 does not exist.	Remove manhole WWMH3167. Combine WWGM3806 and WWGM0394 and label as WWGM0394.
WWGM5992	WWMH1985	WWMH5078	Extra Manhole	Label extra manhole as WWMH5078. Split WWGM2754 in two. Label upstream pipe WWGM5992 and downstream pipe as WWGM2754.
WWGM2754	WWMH5078	WWMH1984	Extra Manhole	Label extra manhole as WWMH5078. Split WWGM2754 in two. Label upstream pipe WWGM5992 and downstream pipe as WWGM2754.
WWGM3486	WWMH0575	WWMH3178	WWMH2729 does not exist.	Remove manhole WWMH2729. Combine WWGM3485 and WWGM3486 and label as WWGM3486.

CITY OF MANTECA SANITARY SEWER CONDITIONS ASSESSMENT

GIS Rectification
August 2017

Pipe Segment ID	Upstream Manhole ID	Downstream Manhole ID	Reason for Amendment	Amendment Made to GIS
WWGM5374	WWMH3178	WWMH2730	WWMH3966 does not exist.	Remove manhole WWMH3966. Combine WWGM3814 and WWGM5374 and label as WWGM5374.
WWGM0473	WWMH1373	WWMH0940	Two assets labeled as WWGM0473 and WWMH3943 does not exist.	Remove manhole WWMH3943. Only require one asset for WWGM0473.
WWGM1292	WWMH0390	WWMH5082	Extra Manhole	Label extra manhole as WWMH5082. Split WWGM1292 in two. Label upstream pipe WWGM1292 and downstream pipe as WWGM5996.
WWGM5996	WWMH5082	WWMH0189	Extra Manhole	Label extra manhole as WWMH5082. Split WWGM1292 in two. Label upstream pipe WWGM1292 and downstream pipe as WWGM5996.
WWGM0553	WWLH0286	WWMH1131	WWMH3162 does not exist and upstream manhole is a lamphole.	Remove manhole WWMH3162. Change upstream manhole to WWLH0286. Combine WWGM0553 and WWGM0804 and label as WWGM0553.
WWGM3874	WWMH3226	Dead End	Downstream manhole is a dead end.	Label downstream manhole Dead End.

4.0 PIPELINE AND MANHOLE ASSESSMENT

The following sections summarize the results of the inspection and the assessment that was completed. Two technical memorandums were prepared that detailed the assessment of the sanitary sewer pipelines and the sanitary sewer manholes. Each memorandum is included as an appendix, **Appendix II** for pipelines and **Appendix III** for manholes.

4.1 INSPECTION RESULTS

4.1.1 Pipelines

Pipe inspection logs, videos, and databases were provided for approximately 48,498 linear feet of CCTV inspections (190 unique pipe segments) completed between October 2016 and November 2016. CCTV inspections were coded in accordance with the Pipeline Assessment Certification Program © (PACP) standards (version 6.0.2) developed by the National Association of Sewer Service Companies (NASSCO). Information collected during the CCTV inspections was documented using the commercially available PipeLogix software (version 6.4.10). PipeLogix is recognized by NASSCO as a PACP-certified software vendor.

A summary of the gravity sewer pipes included in the PACP database is presented in **Table 3**. The PACP database contained thirty-one (31) instances where more than one inspection record was present for a pipe segment. No pipe had more than two inspections present in the database. In all 31 cases of dual inspections, the additional inspection represented a reverse inspection (i.e. inspection of the pipe from the opposite manhole due to an obstruction/debris in the pipe that prevents the CCTV camera/equipment from advancing further in the pipe). No truly duplicate inspections were included in the PACP database and all records in the database were used in the RCT analysis.

Table 3 Pipe Inspection Summary by Length

Pipe Inspections (from PACP database)1		
Total Number of Valid Inspections	221	
Total Number of Unique Pipes	190	
Total Length - All Pipes	55,562 linear feet (LF)	
Total Length Inspected – All Pipes	48,748 LF (87.7%)	
Pipe Summary by Material	**No. of Pipes**	**Length**
Vitrified Clay Pipe (VCP)	104 (54.7%)	28,754 LF (51.8%)
Polyvinyl Chloride (PVC) Pipe	9 (4.7%)	2,774 LF (5.0%)
Reinforced Concrete Pipe (RCP)	52 (27.4%)	18,182 LF (32.7%)
Reinforced Plastic Pipe (Truss Pipe)	1 (0.5%)	381 LF (0.7%)
Lined Pipe	24 (12.6%)	5,471 LF (9.8%)
Pipe Summary by Diameter	**No. of Pipes**	**Length**
10-inch diameter	70 (36.8%)	18,618 LF (33.5%)
12-inch diameter	23 (12.1%)	7,477 LF (13.5%)
15-inch diameter	14 (7.4%)	4,447 LF (8.0%)
18-inch diameter	0 (0.0%)	0 (0.0%)
21-inch diameter	9 (4.7%)	2,330 LF (4.2%)
24-inch diameter	14 (7.4%)	3,376 LF (6.1%)
30-inch diameter	37 (19.5%)	12,645 LF (22.8%)
36-inch diameter	14 (7.4%)	3,999 LF (7.2%)
60-inch diameter	9 (4.7%)	2,670 LF (4.8%)

1. *Unless noted to the contrary, length values in table are based on the total pipe length data field in the pipe inspection database.*

Table 4 provides the pipeline cleaning and inspection cost and time breakdown for the project. Note that the costs and times shown do not include items such as traffic control, hauling, dumping, or permits.

Table 4 Pipeline Cleaning and Inspection Cost and Time Breakdown

Item	Total Footage	Total Cost	Average Cost Per Foot	Total Minutes (Hours)	Minutes (Hours) Per Foot
Cleaning	48,748	$53,244.57	$1.09	7,732 (128.87)	6.3 (0.11)
Inspection	48,748	$58,542.59	$1.20	21,249 (354.15)	2.3 (0.04)
Overall Project	48,748	$111,787.16	$2.29	28,981 (483.02)	8.6 (0.14)

There were four pipe segments that were not inspected. **Table 5** lists each segment along with the respective upstream and downstream manholes and reason for not inspecting.

Table 5 Uninspected Pipe Segments

Pipe Segment ID	Upstream Manhole ID	Downstream Manhole ID	Reason for Not Inspecting
WWGM5977	WWMH5062	WWMH0369	Debris in line.
WWGM6023	WWMH5074	WWMH5075	Debris in line.
WWGM0012	WWMH2991	WWMH2990	Upstream manhole surcharged and downstream manhole has drop with odd angle.
WWGM0317	WWMH0883	WWMH1021	Debris in line.
WWGM5974	WWMH3125	WWC-WW06	Could not inspect pipe into the lift station.

4.1.2 Manholes

Manhole inspection logs, 360-degree photographs, and databases were provided for 186 manholes completed between November 2016 and December 2016. Manhole inspections were coded in accordance with the Manhole Assessment Certification Program © (PACP) standards (version 6.0) developed by the National Association of Sewer Service Companies (NASSCO). MACP Level 2 inspections were performed. Information collected during the manhole inspections was documented using the commercially available PipeLogix software (version 6.4.10). PipeLogix is recognized by NASSCO as a MACP-certified software vendor.

A summary of the manholes included in the MACP database is presented in **Table 6**. The summary provides a breakdown of inspected manholes by depth, diameter, material and cover type.

Table 6 Manhole Inspection Summary by Physical Characteristic

Manholes Inspections (from MACP database)		
Total Number of Manhole Inspections	186	
Total Number of Unique Manhole Inspections	186	
By Wall Material	**Number of Manholes**	**Percent of All Manholes**
Concrete (reinforced)	118	63.4%
Brick	68	36.6%
By Cover Type	**Number of Manholes**	**Percent of All Manholes**
Solid	185	99.5%
Vented	1	0.5%
By Wall Diameter	**Number of Manholes**	**Percent of All Manholes**
Less than 40-inch	0	0.0%
40-inch to 49-inch	167	89.8%
50-inch to 59-inch	14	7.5%
60-inch to 69 inch	3	1.6%
70-inch to 79-inch	0	0.0%
80-inch to 89-inch	0	0.0%
90-inch to 99-inch	2	1.1%
100-inch or greater	0	0.0%
By Depth (Rim to Invert)	**Number of Manholes**	**Percent of All Manholes**
3.0 feet or less[1]	0	0.0%
3.1 feet to 5 feet	9	4.8%
5.1 feet to 10 feet	105	56.5%
10.1 feet to 15 feet	49	26.3%
15.1 feet to 20 feet	19	10.2%
20.1 feet or greater[1]	4	2.2%

1. *Deepest inspected manhole was 21.2 feet (measured from rim to invert).*

Table 7 provides the manhole inspection cost and time breakdown for the project. Note that the costs and times shown do not include items such as traffic control or permits.

Table 7 Manhole Inspection Cost and Time Breakdown

Total Number of Manholes	Total Cost	Cost Per Manhole	Total Minutes (Hours)	Minutes (Hours) Per Manhole
186	$37,200.00	$200	6,938 (115.63)	37.3 (0.62)

There were nine manholes that were not inspected. **Table 8** lists each manhole along with the reason for not inspecting.

Table 8 Uninspected Manholes

Manhole ID	Reason for Not Inspecting
WWMH0263	Located in gated yard (southwest corner of Sandalwood Ln. and Olivewood Ave.).
WWMH1218	Located in field. Ground too soft, truck would get stuck.
WWMH1219	Located in field. Ground too soft, truck would get stuck.
WWMH1220	Located in field. Ground too soft, truck would get stuck.
WWMH1982	Located in field. Ground too soft, truck would get stuck.
WWMH3036	Not Part of Scope
WWMH3506	Could not locate in intersection (Louis Ave. and Main St.).
WWMH5073	Manhole found after inspection services were complete.
WWMH5080	Could not access. Tripod for inspection cannot be setup.
WWMH5086	Paved over.
WWMH5090	Paved over.

4.2 PIPELINE AND MANHOLE REPAIR, RENOVATION AND REPLACEMENT

Selecting the appropriate measure to address defects in pipelines and manholes is critical to ensure that budget and life cycle goals are met. Pipe repair, renovation and replacement techniques are evaluated to restore or upgrade the performance of the existing utility system. Pipe and manhole repair is applied to address localized defects. Renovation of pipe or manhole is considered when numerous defects are present and/or the structural integrity of asset is in question. Full replacement of the asset is implemented when the extent of the defects is extreme, the structural integrity of the asset has been compromised and/or system upgrades are required.

Several construction techniques are available within each category. The following is a list of some of the items that should be considered when selecting a technique:

- Pipe application
- Number and types of defects
- Structural condition of existing asset
- Asset location and physical environment
- Site access
- Asset age
- Asset material
- Asset physical dimensions
- Existing repairs
- Soil condition
- Existing utilities
- Budget requirements
- Life cycle requirements
- System upgrades
- Reduction of capacity from applied repair or renovation
- Service connections
- Permitted service interruption
- Providing service during construction
- Social impacts
- Environmental impacts
- Availability of qualified contractors

Evaluation of these considerations will assist in the selection of the technique and provide for a better means of reaching system budget and life cycle goals. The following tables summarize the some of the techniques that are available for pipeline defect and joint repair, renovation, and replacement.

Table 9 Pipeline Defect and Joint Repair

Technology	Description	Advantages	Disadvantages
Dig and Replace Point Repair	Repair of pipe defects using trenching techniques.	• Can install new pipe. • Availability of experienced contractors. • Have ability to install fully structural repair. • Can repair alignment and grade issues. • Can be used in all soil conditions.	• Longer construction schedule. • Larger construction footprint. • Requires excavation. • Significant amount of surface disruption. • Disruption to existing utilities. • Potential for high social and economic costs.
Chemical Grouting	Leaking joints and defects are repaired by inject grout into the gap using an inflatable packer. Grout enters the soil behind the pipe and fills the gap in the pipe, forming a seal.	• Short installation period. • Can be used on a variety of pipe materials.	• Cannot correct alignment and grade issues. • Cannot be installed in live flow conditions. • Nonstructural repair. • Cannot repair all defects. • Potential for ground water contamination.
Internal Joint Seals	Leaking joints are sealed by applying grout to the joint to make it flush with the internal pipe surface. A seal is placed over top of the joint, spanning the gap and held in place with stainless steel retaining bands.	• Short installation period. • Relatively inexpensive.	• Cannot correct alignment and grade issues. • Cannot be installed during live flow conditions. • Only addresses joint issues.

Table 10 Pipeline Renovation

Technology	Description	Advantages	Disadvantages
Sprayed Coating and Liner Systems	Application of cement mortar, epoxy or polyurethane liner using a high speed rotating nozzle that is pulled through the pipe.	• Short installation period. • Can be installed around bends.	• Cannot correct alignment and grade issues. • Cannot be installed in live flow conditions. • Nonstructural repair. • Short life cycle.
Cured-in-Place Pipe (CIPP)	Insertion of a resin impregnated liner into the existing pipe by either inversion or pulling in place. The liner is inflated using water pressure or air pressure to fit closely to the existing pipe. It is then cured using hot water, steam or ultraviolet light.	• Installation of a new pipe. • Installed in most pipe types. • Short installation period. • Minimal loss of cross-sectional capacity. • Usually improves friction coefficient. • Can provide full structural integrity. • One continuous pipe without joints. • Can be installed around bends. • Able to reinstate connections internally. • Widely used technique	• Cannot correct alignment and grade issues. • Requires liner manufactured specifically for pipe being rehabilitated. • Cannot be installed in live flow conditions. • May require special disposal of construction water used during curing process. • Shrinkage can occur after installation.
Spiral-Wound Liners	Installation of strips of thermoplastic material by winding the strip and interlocking the edges together. As the strip is wound together it advances through the existing pipe.	• Installation of a new pipe. • Installed in most pipe types. • Short installation period. • Usually improves friction coefficient. • Can provide full structural integrity.	• Cannot correct alignment and grade issues. • Requires excavation for the connection of lateral and service connections. • Can only be used on gradual bends. • Cannot be installed in live flow conditions.
Close-Fit Liners	Insertion of a thermoplastic tube inside the existing pipe. The thermoplastic tube is deformed by tension or compression, effectively reducing the diameter of the pipe for insertion. Once inserted, it is returned to its original shape for a close fit to the existing pipe.	• Installation of a new pipe. • Installed in most pipe types. • Short installation period. • Minimal loss of cross-sectional capacity. • Usually improves friction coefficient. • Can provide full structural integrity. •	• Cannot correct alignment and grade issues. • Cannot be installed in live flow conditions.

Technology	Description	Advantages	Disadvantages
Panel and Section Insert Linings	Installation of panels or sections of material inside an existing pipe to form a continuous liner.	• Installation of a new pipe. • Specialized equipment is not required. • Installed in most pipe types. • Usually improves friction coefficient. • Can provide full structural integrity.	• Cannot correct alignment and grade issues. • Requires man entry. Only suitable for large diameter pipe. • Larger loss of cross-sectional capacity. • Cannot be installed in live flow conditions.
Sliplining	Insertion of a new pipe inside the existing pipe by either pulling or pushing the new pipe through the existing pipe. The annular space between the existing pipe and new pipe is filled with grout.	• Installation of a new pipe • Specialized equipment is not required. • Installed in most pipe types. • Usually improves the friction coefficient. • Can be installed during live flow conditions. • Can provide full structural integrity.	• Larger loss of cross-sectional capacity. • Cannot correct alignment and grade issues. • Entry and exit pits required. • Requires excavation for the connection of lateral and service connections. • Can only rehabilitate straight segments. • Used only for straight pipe sections.
Grout-In-Place (GIP) Liners	A plastic liner with a smooth side facing inward and a studded side facing outward is inserted into the existing pipe. The annular space between the plastic liner and the existing pipe is filled with grout. With the studs from the liner secured inside the grout, the grout fixes the liner permanently in place and fills any defects present in the pipe.	• Usually improves friction coefficient. • Can provide full structural integrity. • Specialized equipment is not required.	• Cannot correct alignment and grade issues. • Cannot be installed in live flow conditions. • Requires man entry. Only suitable for large diameter pipe. • Larger loss of cross-sectional capacity.
Pipe Bursting	Installation of a new pipe in the corridor of the existing pipe by pulling in the new pipe behind a bursting head. As the bursting head passes through the existing pipe, the existing pipe is broken into pieces that are then displaced into the surrounding soil and the new pipe is pulled into place.	• Installation of a new pipe. • Can install larger pipe diameter than the existing pipe. • Does not require the removal of the existing pipe.	• Cannot correct alignment and grade issues. • Requires excavation for the connection of lateral and service connections. • Used only for straight pipe sections. • Potential for surface heave. • Difficult to use around small bends and cannot be used on large bends. • Entry and exit pits required.

Table 11 Pipeline Replacement

Technology	Description	Advantages	Disadvantages
Open Cut	Installation of a new pipe using trenching techniques.	• Installation of a new pipe. • Does not rely on an existing pipeline corridor. • Availability of experienced contractors. • Can be used in all soil conditions.	• Longer construction schedule. • Larger construction footprint. • Large amount of excavation. • Significant amount of surface disruption. • Disruption to existing utilities. • Potential for high social and economic costs.
Horizontal Directional Drilling	Installation of a new pipe by drilling a hole horizontally through the ground. The drilling operation utilizes a sonde and tracker system to steer the drill head through the soil to the exit point. Shallow bends can be made along the alignment. Once the drill head reaches the exit point, the new pipe is attached to the drill string and pulled through the ground from the exit point to the entry point. The hole can be enlarged by pulling a reamer through prior to installation of the new pipe if necessary.	• Installation of a new pipe. • Does not rely on an existing pipeline corridor. • Suitable for a variety soil conditions.	• Not as accurate for grade and alignment as other trenchless techniques. • Requires disposal of drilling fluid. • Can only install gradual bends.
Micro-Tunneling	Installation of a new pipe through the use of a laser guided remotely controlled micro-tunnel boring machine (MTBM). The MTBM is advanced through the soil and new pipe is installed by pushing or jacking the pipe in behind the MTBM as it moves forward. The MTBM is equipped with a rotating cutting head to excavate the soil and slurry system to remove the cuttings from the excavation.	• Installation of a new pipe. • Does not rely on an existing pipeline corridor. • Very accurate. • Suitable for a variety soil conditions.	• Expensive. • Used only for straight pipe sections. • Requires a large jacking and exit pit. • Specialty engineer and contractor.

Technology	Description	Advantages	Disadvantages
Axis Guided Boring System	Installation of a new pipe by drilling a hole horizontally through the ground from an entry pit to an exit pit. The drilling operation utilizes a laser guide system to assist in maintaining grade during the drilling operation. Once the drill head reaches the exit pit, the new pipe is attached to the drill string and pulled through the ground from the exit pit to the entry pit. The hole can be enlarged by pulling a reamer through prior to installation of the new pipe if necessary.	• Installation of a new pipe. • Does not rely on an existing pipeline corridor. • Very accurate. • Suitable for a variety soil conditions.	• Newer technology with limited availability. • Used only for straight pipe sections. • Requires entry and exit pits. • Limited to 12" to 18" diameter pipe. • Requires disposal of drilling fluid.

For the purposes of this assessment the following is recommended for the pipeline segments:

1. Dig and replace is recommended for all point repairs because it will address all types of point repairs, it provides for a 50-year design life, and there are a number of contractors available.
2. Cure-in-place pipe is recommended for renovation of existing pipelines because it provides a 50-year design life, there is a minimal reduction of the inside diameter of the pipeline, and there are a number of contractors available.
3. Open cut is recommended for all pipeline replacement because it is the least costly between the available pipeline replacement techniques that would be considered, it provides a 50-year design life, and there are a number of contractors available.

Unlike pipes, manholes consist of multiple parts that are addressed separately when considering repair, renovation, or replacement. A typical manhole, depicted in **Figure 5**, has a frame and cover, grade rings/chimney, cone, barrel and base.

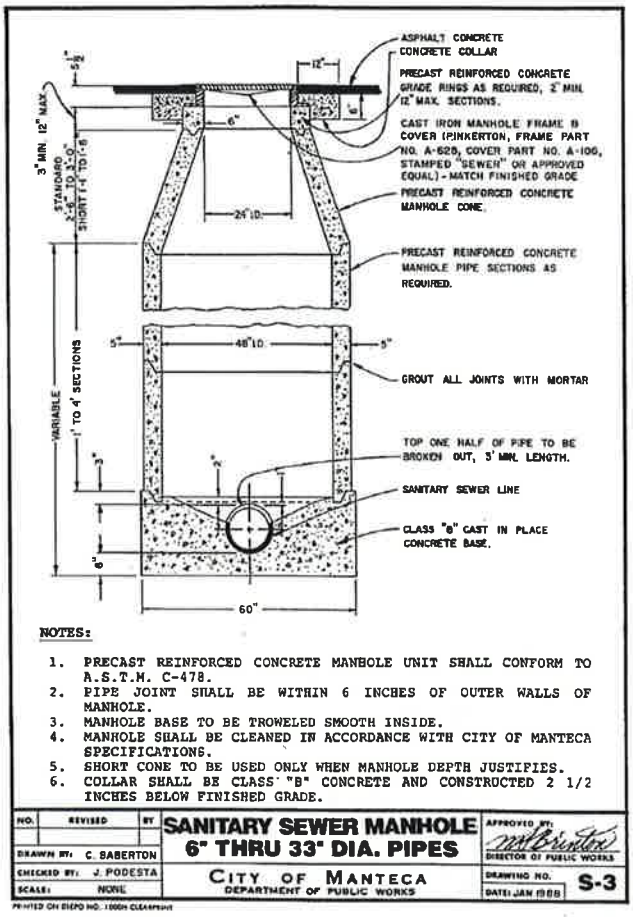


Figure 5 Typical Manhole Detail

There are a variety of products, vendors, and contractors that are available for manhole repair or renovation. The available techniques fall under the following categories: sliplining products, poured-in-place concrete liners, cured-in-place liners, cementitious or polymer based coatings that are sprayed, pumped or troweled on, and mechanical inserts. For the purposes of this assessment the following is recommended for the manholes:

1. Frame and cover defects will be addressed by replacing the frame and cover. Renovation or repair techniques are not typically used for the frame and cover.
2. Grade rings/chimney defects will be addressed by installing a chimney seal/liner. This is the least invasive option for renovation or repair.
3. Cone, barrel and base defects will be addressed with full-depth rehabilitation if not considered severe or full manhole replacement if it is considered severe. It is recommended a polymer based coating be used for full-depth rehabilitation.

Further investigation during detail design is recommended to refine the recommended technique to use for pipeline and manhole repair, renovation, and replacement.

4.3 ASSESSMENT RESULTS

4.3.1 Rehabilitation Costing Tool

Stantec utilized a Rehabilitation Costing Tool (RCT) that they developed to aid in financial planning and programming. The Tool applies a customizable decision support system, based on rehabilitation industry "rules of thumb" and local preferences, to generate preliminary rehabilitation recommendations from the PACP and MACP inspection databases. The Tool integrates defect filtering techniques and is linked with local rehabilitation unit cost data to generate budgetary cost estimates for sewer rehabilitation. Output from the Tool includes a detailed schedule of recommended repairs/rehabilitations and a detailed summary of estimated capital construction costs for each pipe segment.

Filtered defects and preliminary rehabilitation recommendations from the RCT are stored in an Access-compatible database that can be linked to City's GIS sewer attribute data.

Rehabilitation recommendations and cost opinions developed by the RCT should be considered budgetary, suitable for planning or as a preliminary screening tool to expedite engineering review/design. Results from the RCT should not replace detailed engineering design, as the RCT considers only pipe condition information included in the CCTV inspection databases. Site constraints (such as sewer proximity to buildings, disruption to high traffic routes, impact to emergency/critical facilities, and other design factors) are not considered by the RCT.

The methodology used for the assessment along with the rehabilitation preferences, unit costs analysis, and defect summary are detailed for both the pipeline assessment and manhole assessment in **Appendix II** and **Appendix III** respectively. The following section provides the results of the analysis.

4.3.2 Pipelines

4.3.2.1 Rehabilitation Recommendations

A summary of preliminary rehabilitation recommendations from the RCT analysis is presented in **Table 12**. Recommendations in the table are based on the "triggers" described in **Section 5.5** of **Appendix II**. Recommendations based only on addressing the PACP Grade 4 and Grade 5 defects (i.e. ignoring the recommendations triggered solely from exceeding the Rehabilitation Threshold Score) are also included in the table.

Table 12 Preliminary Rehabilitation Recommendations

All Pipes	
Total No. of Unique Pipes	190
Total Length of Inspected Pipes	55,562 LF
All PACP Defect Grades	
No. of Point Repairs	36 (25 pipes)[1]
Length of CIPP Liner Installation	3,544 LF (10 pipes)
Length of Open Cut Replacement	5,693 LF (17 pipes)
PACP Grade 4 and Grade 5 Defects Only	
No. of Point Repairs	21 (15 pipes)[1]
Length of CIPP Liner Installation	2,838 LF (8 pipes)
Length of Open Cut Replacement	4,620 LF (14 pipes)

1. *Includes pipes where only a point repair is recommended and pipes where both a point repair and a CIPP liner installation is recommended.*

A map illustrating those pipes recommended for point repair, open cut replacement, or installation of a CIPP liner is presented in **Appendix E** of **Appendix II**. Pipes evaluated by the RCT, but where no improvement is recommended, are also shown. Pipes in which inspection information was not provided are shown as gray lines.

A map illustrating those pipes recommended for point repair, open cut replacement, or installation of a CIPP liner that are based only on addressing PACP Grade 4 and Grade 5 defects is presented in **Appendix F** of **Appendix II**. The map in **Appendix F** does not include pipe improvement recommendations triggered solely from exceeding the Rehabilitation Threshold Score.

4.3.2.2 Rehabilitation Costs

Preliminary capital construction cost opinions for the rehabilitation recommendations presented in **Section 6.4** of **Appendix II** are summarized in **Table 13**. Cost opinions are based on the unit rates presented in **Appendix A** of **Appendix II** and the methodology discussed in **Section 4.2** of **Appendix II**.

Table 13 Budgetary Rehabilitation Cost Opinions

All Pipes	
Total No. of Unique Pipes	190
Total Length of Inspected Pipes	55,562 LF
All PACP Defect Grades	
Point Repairs	$149,594[1]
CIPP Liner Installation	$249,557[2]
Open Cut Replacement	$819,978
Total Cost (with Traffic Control, Surface Restoration, & Contingency)	$1,932,048
PACP Grade 4 and 5 Defects Only	
Point Repairs	$100,229[1]
CIPP Liner Installation	$199,857[2]
Open Cut Replacement	$666,999
Total Cost (with Traffic Control, Surface Restoration, & Contingency)	$1,532,581

1. *Cost is for pipes where only a point repair is recommended.*
2. *Includes the cost of any point repair(s) on pipe recommended in conjunction with CIPP liner.*

4.3.3 Manholes

4.3.3.1 Rehabilitation Recommendations

A summary of preliminary rehabilitation recommendations from the RCT analysis is presented in **Table 14**. Recommendations in the table are based on the "triggers" described in **Section 4** of **Appendix III**.

Table 14 Preliminary Rehabilitation Recommendations

All Pipes	
Total No. of Inspected Manholes	186
No Manhole Rehab/Renewal Recommended	45 (24.2%)
Replace Frame/Cover[1]	2 (1.1%)
Install Chimney Seal/Lining	2 (1.1%)
Full-Depth Rehabilitation	118 (63.4%)
Full-Depth Rehabilitation and Replace Frame/Cover	8 (4.3%)
Replace Manhole	11 (5.9%)

1. *Does not include manholes that full-depth rehabilitation is also recommended.*

A map illustrating the location of manhole recommendations is presented in **Appendix E** of **Appendix III**. Manholes evaluated by the RCT, but where no improvement is recommended, are also shown. Manholes in which inspection information was not provided are colored gray.

4.3.3.2 Rehabilitation Costs

Preliminary capital construction cost opinions for the rehabilitation recommendations presented in **Section 6.5** of **Appendix III** are summarized in **Table 15**. Cost opinions are based on the unit rates presented in **Appendix A** of **Appendix III** and the methodology discussed in **Section 4.2** of **Appendix III**.

Table 15 Budgetary Rehabilitation Cost Opinions

All Pipes	
Total No. of Inspected Manholes	186
Replace Frame/Cover[1]	$1,634
Install Chimney Seal/Lining	$1,500
Full-Depth Rehabilitation	$295,000
Full-Depth Rehabilitation and Replace Frame/Cover	$26,536
Replace Manhole	$66,000
Total Cost (All Manhole Improvements)	$390,670

1. *Does not include cost for manholes where full-depth rehabilitation is also recommended.*

5.0 RECOMMENDATIONS

The RCT looks at each individual line segment and each manhole and provides a recommendation for repair, rehabilitation, or replacement based on the defects that are present in the respective asset. It is beneficial to for planning purposes to bundle these recommendations into various areas to develop projects that can be included in a Capital Improvement Program. The project has been divided into 14 areas (essentially along each street).

1. Hearthsong Drive
2. UPRR Right of Way and Alley Between Center Street and Yosemite Avenue
3. Alley Between Yosemite Avenue and Nevada Street
4. Center Street
5. Moffat Boulevard and Main Street
6. North Street and Elm Avenue Parallel Lines
7. Oak Street
8. Sequoia Avenue
9. Tidewater Bike Path
10. Walnut Avenue
11. North of Yosemite Avenue in Golf Course and Field
12. Louise Avenue
13. St Dominic's Drive
14. Union Road

Appendix IV contains tables that list the pipe segment ID along with the respective upstream and downstream ID, pipe material, diameter, segment length, recommendation for the pipe repair/rehabilitation and cost of the recommended repair/rehabilitation. **Appendix V** contains tables that list the manholes along the manhole material, type of lining or coating, recommendation for the manhole repair/rehabilitation, and cost of the recommended repair/rehabilitation. Maps showing the final recommendations for all pipes and manholes are in **Appendix VI**. A description of each area along with as summary of the recommendations is provided in the following sections.

The recommendations from the RCT are being followed for the majority of the pipelines. Significant degradation as a result of hydrogen sulfide gas induced sulfuric acid corrosion has been observed for the pipelines that are constructed of Reinforced Concrete Pipe (RCP). Therefore, to supplement the results of the RCT analysis, it is recommended that all line segments that are constructed of RCP be rehabilitated with cured-in-place pipe. Cured-in-place pipeline rehabilitation is being selected as the preferred rehabilitation method because it provides for the least reduction in inside diameter when compared to other alternatives such a sliplining.

Like the RCP pipelines, degradation has been observed for unlined concrete manholes and the mortar joints of brick manholes as a result of hydrogen sulfide gas induced sulfuric acid corrosion. It is recommended, in addition to the recommendations from the RCT, that all manholes be rehabilitated with a polymer based coating to help prevent further degradation.

5.1 OPERATION AND MAINTENANCE

Regular inspection and maintenance of the sanitary sewer system is necessary to avoid critical failures and costly emergency repairs and fines. As part of the City of Manteca's permit, the Central Valley Regional Water Quality Control Board approved the City of Manteca, Sewer System Management Plan (SSMP), dated April 4, 2014. This SSMP outlines recommendations for the maintenance and operation of the sanitary sewer system in conformance with the permit. Section 6.8 of the SSMP specifically recommends the implementation of a Conditions Assessment Program. It recommends inspection and cleaning of the sanitary sewer at a rate of at least 5% and 10% per year (14 and 27 miles per year), respectively. Inspections should be conducted with a camera capable of a full 360-degree view to provide the opportunity to access and identify conditions early that could lead to interruption of service or incipient failures. The SSMP also recommends regular inspection of the sanitary sewer manholes for deficiencies and damage, with more frequent inspections where flow inconsistencies or indications of incipient failure may be present. Manholes should be inspected at a rate of at least 5% per year (215 manholes per year). Additionally, the SSMP recommends a standard set of specifications for pre-cleaning, identification, inspection, and CCTV documentation be implemented. For additional recommendations and details please refer to the SSMP.

5.2 HEARTHSONG DRIVE

5.2.1 Description

Location: Hearthsong Drive between Woodward Avenue and Highway 120

Pipe Material: T-Lock Lined RCP

Diameter: 60-inch

Approximate Length: 2,700 feet

Number of Manholes: 9

Manhole Material: T-Lock Lined Concrete

5.2.2 Recommendation

This is a newer sewer line that has yet to be placed in service. No significant defects where noted during the inspection and the pipelines and manholes are T-Lock lined to help prevent hydrogen sulfide gas induced sulfuric acid corrosion. Therefore, no action is recommended for repair, rehabilitation, or replacement.

5.3 UPRR RIGHT OF WAY AND ALLEY BETWEEN CENTER STREET AND YOSEMITE AVENUE

5.3.1 Description

Location: Alley between Center Street and Yosemite Avenue From west of Sherman Avenue toe the intersection of the UPRR right of way and Center Street.

Pipe Material: Vitrified Clay

Diameter: 12-inch

Approximate Length: 2,750 feet

Number of Manholes: 9

Manhole Material: Unlined Concrete and Brick

5.3.2 Recommendation

Pipeline: 4 segments with Point Repairs, 3 segments for Dig and Replace, and no segments for CIPP.

Manhole: no manholes with Frame/Cover replacements, 9 manholes to be rehabilitated, and no manholes to be replaced.

Table 16 UPRR Right of Way and Alley Between Center Street and Yosemite Avenue Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$157,363.30	$22,500.00	$179,863.30	$8,993.17	$8,993.17	$53,958.99	$251,808.62

5.4 ALLEY BETWEEN YOSEMITE AVENUE AND NEVADA STREET

5.4.1 Description

Location: Alley between Yosemite Avenue and Nevada Street between Willow Venue and Walnut Avenue.

Pipe Material: Vitrified Clay

Diameter: 10-inch

Approximate Length: 2,400 feet

Number of Manholes: 10

Manhole Material: Unlined Concrete and Brick

5.4.2 Recommendation

Pipeline: 3 segments with Point Repairs, 3 segments for Dig and Replace, and 1 segment for CIPP.

Manhole: no manholes with Frame/Cover replacements, 10 manholes to be rehabilitated, and no manholes to be replaced.

Table 17 Alley Between Yosemite Avenue and Nevada Street Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$200,388.05	$25,000.00	$225,388.05	$11,269.40	$11,269.40	$67,616.42	$315,543.27

5.5 CENTER STREET

5.5.1 Description

Location: Center Street from the intersection of the UPRR right of way to just west of Union Road.

Pipe Material: Vitrified Clay

Diameter: 12-inch and 15-inch

Approximate Length: 3,950 feet

Number of Manholes: 16

Manhole Material: Unlined Concrete and Brick

5.5.2 Recommendation

Pipeline: 1 segment with Point Repairs, no segments for Dig and Replace, and no segments for CIPP.

Manhole: 1 manhole with Frame/Cover replacement, 15 manholes to be rehabilitated, and 1 manhole to be replaced.

Table 18 Center Street Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$3,500.00	$44,317.00	$47,817.00	$9,563.40	$2,390.85	$14,345.10	$74,116.35

5.6 MOFFAT BOULEVARD AND MAIN STREET

5.6.1 Description

Location: Main Street from Garfield Avenue to Main Street then along Main Street to the alley north of Yosemite Avenue.

Pipe Material: Vitrified Clay and one segment of Truss Pipe

Diameter: 10-inch

Approximate Length: 2,900 feet

Number of Manholes: 10

Manhole Material: Unlined Concrete and Brick

5.6.2 Recommendation

Pipeline: no segments with Point Repairs, 3 segments for Dig and Replace, and 5 segments for CIPP.

Manhole: no manholes with Frame/Cover replacements, 10 manholes to be rehabilitated, and no manholes to be replaced.

Table 19 Moffat Boulevard and Main Street Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$314,261.23	$25,000.00	$339,261.23	$67,852.25	$16,963.06	$101,778.37	$525,854.91

5.7 NORTH STREET AND ELM AVENUE PARALLEL LINES

5.7.1 Description

Location: North Street from Roosevelt Avenue to Elm Avenue then along Elm Avenue to Center Street.

Pipe Material: Vitrified Clay

Diameter: 10-inch

Approximate Length: 7,150 feet

Number of Manholes: 34

Manhole Material: Unlined Concrete and Brick

5.7.2 Recommendation

Pipeline: 1 segments with Point Repairs, 4 segments for Dig and Replace, and 3 segments for CIPP.

Manhole: 2 manholes with Frame/Cover replacements, 33 manholes to be rehabilitated, and 1 manholes to be replaced.

Table 20 North Street and Elm Avenue Parallel Lines Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$218,606.33	$90,134.00	$308,740.33	$61,748.07	$15,437.02	$92,622.10	$478,547.51

5.8 OAK STREET

5.8.1 Description

Location: Oak Street from Main Street to Willow Avenue.

Pipe Material: Vitrified Clay

Diameter: 10-inch

Approximate Length: 1,600 feet

Number of Manholes: 7

Manhole Material: Unlined Concrete and Brick

5.8.2 Recommendation

Pipeline: 4 segments with Point Repairs, no segments for Dig and Replace, and no segments for CIPP.

Manhole: no manholes with Frame/Cover replacements, 7 manholes to be rehabilitated, and no manholes to be replaced.

Table 21 Oak Street Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$15,000.00	$17,500.00	$32,500.00	$6,500.00	$1,625.00	$9,750.00	$50,375.00

5.9 SEQUOIA AVENUE

5.9.1 Description

Location: Sequoia Avenue from Oregon Street to the alley north of Nevada Street.

Pipe Material: Vitrified Clay

Diameter: 10-inch

Approximate Length: 1,000 feet

Number of Manholes: 3

Manhole Material: Brick

5.9.2 Recommendation

Pipeline: 1 segments with Point Repairs, no segments for Dig and Replace, and no segments for CIPP.

Manhole: no manholes with Frame/Cover replacements, 1 manhole to be rehabilitated, and 2 manholes to be replaced.

Table 22 Sequoia Avenue Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$3,000.00	$14,500.00	$17,500.00	$3,500.00	$875.00	$5,250.00	$27,125.00

5.10 TIDEWATER BIKE PATH

5.10.1 Description

Location: Along Tidewater Bike Path from Sandalwood Lane to Louis Avenue.

Pipe Material: Vitrified Clay

Diameter: 12-inch

Approximate Length: 3,150 feet

Number of Manholes: 9

Manhole Material: Unlined Concrete

5.10.2 Recommendation

Pipeline: 1 segment with Point Repairs, 2 segments for Dig and Replace, and no segments for CIPP.

Manhole: no manholes with Frame/Cover replacements, 9 manholes to be rehabilitated, and no manholes to be replaced.

Table 23 Tidewater Bike Path Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$105,249.70	$22,500.00	$127,749.70	$6,387.49	$6,387.49	$38,324.91	$178,849.58

5.11 WALNUT AVENUE

5.11.1 Description

Location: Walnut Avenue from the alley north of Nevada Street to the UPRR right of way.

Pipe Material: Vitrified Clay

Diameter: 10-inch

Approximate Length: 1,900 feet

Number of Manholes: 7 and 1 Lamphole

Manhole Material: Unlined Concrete and Brick

5.11.2 Recommendation

Pipeline: 3 segments with Point Repairs, 1 segment for Dig and Replace, and 1 segment for CIPP.

Manhole: 2 manholes with Frame/Cover replacements, 7 manholes to be rehabilitated, and no manholes to be replaced.

Table 24 Walnut Avenue Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$73,624.27	$19,134.00	$92,758.27	$18,551.65	$4,637.91	$27,827.48	$143,775.31

5.12 NORTH OF YOSEMITE AVENUE IN GOLF COURSE AND FIELD

5.12.1 Description

Location: From the golf course maintenance yard located west of Union Road, north or Center Street, to 1,300 feet north of Yosemite Avenue, just west of Airport Way.

Pipe Material: Reinforce Concrete and Spiral Wound Lined Pipe.

Diameter: 30-inch and 36-inch

Approximate Length: 5,200 feet

Number of Manholes: 16

Manhole Material: Unlined Concrete

5.12.2 Recommendation

Pipeline: 3 segments with Point Repairs, no segments for Dig and Replace, and 13 segments for CIPP.

Manhole: no manholes with Frame/Cover replacements, 11 manholes to be rehabilitated, and 5 manholes to be replaced.

Table 25 North of Yosemite Avenue in Golf Course and Field Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$1,054,642.64	$57,500.00	$1,112,142.64	$55,607.13	$55,607.13	$333,642.79	$1,556,999.70

5.13 LOUISE AVENUE

5.13.1 Description

Location: Louise Avenue from Highway 99 to Union Road.

Pipe Material: Polyvinyl Chloride, Cured-in-Place Lined Pipe, and Reinforced Concrete

Diameter: 21-inch, 24-inch, and 30-inch

Approximate Length: 8,900 feet

Number of Manholes: 33

Manhole Material: Unlined Concrete

5.13.2 Recommendation

Pipeline: no segments with Point Repairs, no segments for Dig and Replace, and 10 segments for CIPP.

Manhole: 3 manholes with Frame/Cover replacements, 33 manholes to be rehabilitated, and no manholes to be replaced.

Table 26 Louise Avenue Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$610,354.00	$84,951.00	$695,305.00	$139,061.00	$34,765.25	$208,591.50	$1,077,722.75

5.14 ST DOMINIC'S DRIVE

5.14.1 Description

Location: Saint Dominic's Drive from just north of Yosemite Avenue to just south of the golf course.

Pipe Material: Polyvinyl Chloride

Diameter: 12-inch

Approximate Length: 1,000 feet

Number of Manholes: 4

Manhole Material: Unlined Concrete

5.14.2 Recommendation

Pipeline: no segments with Point Repairs, no segments for Dig and Replace, and no segments for CIPP.

Manhole: no manholes with Frame/Cover replacements, 4 manholes to be rehabilitated, and no manholes to be replaced.

Table 27 St Dominic's Drive Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$0.00	$10,000.00	$10,000.00	$2,000.00	$500.00	$3,000.00	$15,500.00

5.15 UNION ROAD

5.15.1 Description

Location: Union Road from Wawona Street to Louise Avenue.

Pipe Material: Vitrified Clay and Reinforced Concrete

Diameter: 30-inch

Approximate Length: 8,100 feet

Number of Manholes: 28

Manhole Material: Brick and Unlined Concrete

5.15.2 Recommendation

There have been several emergency repairs completed on sections of RCP within the Union Road sewer line because of collapses that occurred in February of 2017, after the assessment was complete. As was previously stated, it is also recommended that these segments of RCP sewer line, along with the other segments of RCP located in Union Road, be rehabilitated with cured-in-place pipe to prevent degradation as a result of hydrogen sulfide gas induced sulfuric acid corrosion. The estimated cost of the repairs that were completed in February of 2017 have been left in the report so the report provides a complete assessment of the results of the inspection.

Pipeline: 3 segments with Point Repairs, 1 segments for Dig and Replace, and 25 segments for CIPP.

Manhole: 1 manhole with Frame/Cover replacements, 27 manholes to be rehabilitated, and 1 manhole to be replaced.

Table 28 Union Road Repair/Rehab/Replacement Costs

Pipe Repair/Rehab/ Replace Cost	Manhole Repair/Rehab/ Replace Cost	Subtotal	Surface Restoration	Traffic Control	Contingency	Total
$1,319,484.00	$74,317.00	$1,393,801.00	$278,760.20	$69,690.05	$418,140.30	$2,160,391.55

5.16 SUMMARY OF RECOMMENDATIONS

Table 29 summarizes the combined pipeline and manhole repair, rehabilitation, and replacement costs for each area of the project. It is recommended to start improvements on Union Road, North of Yosemite Avenue in Golf Course and Field, and Louise Avenue and continue with the remaining system.

In addition to the improvements to the existing areas, the City should continue inspecting the remainder of their system. Recommendation from their Sewer System Management Plan should be implemented to continue cleaning and inspecting the pipelines and manholes within their system at a rate of approximately 5% and 10% per year, respectively.

Table 29 Summary of Project Repair/Rehab/Replacement Costs

Location	Total Repair/Rehab/ Replace Cost
Hearthsong Drive	$0.00
UPRR Right of Way and Alley Between Center Street and Yosemite Avenue	$251,808.62
Alley Between Yosemite Avenue and Nevada Street	$315,543.27
Center Street	$74,116.35
Moffat Boulevard and Main Street	$525,854.91
North Street and Elm Avenue Parallel Lines	$478,547.51
Oak Street	$50,375.00
Sequoia Avenue	$27,125.00
Tidewater Bike Path	$178,849.58
Walnut Avenue	$143,775.31
North of Yosemite Avenue in Golf Course and Field	$1,556,999.70
Louise Avenue	$1,077,722.75
St Dominic's Drive	$15,500.00
Union Road	$2,160,391.55
TOTAL	**$6,856,609.55**

APPENDIX J

25 Year CIP Schedule and Costs

CIP Project No.	Project Name	Planning and Design	Construction	CM and Admin	Total	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	46/47	Total
WCS-01	W. Center Street Trunk	$434,000	$3,615,000	$831,000	$4,880,000										$4,880,000																**$4,880,000**
WCS-02	Elm/West North Street Trunk	$451,000	$3,760,000	$869,000	$5,080,000										$5,080,000																**$5,080,000**
WCS-03	Upsize Existing 10-inch East North Street Trunk	$147,000	$1,223,000	$290,000	$1,660,000										$1,660,000																**$1,660,000**
WCS-04	Upsize Existing 8-inch East North Street Trunk	$45,000	$374,000	$91,000	$510,000										$510,000																**$510,000**
WCS-05	South Woodward Trunk Extension	$1,123,000	$9,360,000	$2,157,000	$12,640,000										$12,640,000																**$12,640,000**
WCS-06	Central Union Road Trunk Extension	$1,437,000	$11,972,000	$2,761,000	$16,170,000		$2,000,000	$7,500,000	$3,335,000	$3,335,000																					**$16,170,000**
WCS-07	North Trunk Extension on Airport Way	$3,052,000	$25,433,000	$5,855,000	$34,340,000												$11,446,667	$11,446,667	$11,446,667												**$34,340,000**
WCS-08	S. Main Trunk to Evans	$638,000	$5,313,000	$1,229,000	$7,180,000											$7,180,000															**$7,180,000**
WCS-09	S. Airport Way and Yosemite Ave. (Fishback)	$275,000	$2,292,000	$533,000	$3,100,000											$3,100,000															**$3,100,000**
WCS-10	S. Airport Way Roberts Estates to Daniels	$155,000	$1,295,000	$300,000	$1,750,000											$1,750,000															**$1,750,000**
WCS-11	Yosemite Square Lift Station and Improvements	$1,144,000	$9,537,000	$2,199,000	$12,880,000											$12,880,000															**$12,880,000**
WCS-12	Austin Road Industrial Area Trunk	$1,849,000	$15,410,000	$3,551,000	$20,810,000												$1,849,000	$9,480,500	$9,480,500												**$20,810,000**
WCS-13	South Austin Road - Industrial Area	$513,000	$4,278,000	$989,000	$5,780,000														$2,890,000	$2,890,000											**$5,780,000**
WCS-14	Yosemite Square Service Area	$376,000	$3,136,000	$728,000	$4,240,000															$2,120,000	$2,120,000										**$4,240,000**
WCS-15	Oleander Avenue Extension/ S. Airport Way Sewer	$592,000	$4,932,000	$1,136,000	$6,660,000														$592,000	$6,068,000											**$6,660,000**
WCS-16	Highway 99 Crossing at Northland Road	$827,000	$6,894,000	$1,589,000	$9,310,000																$4,655,000	$4,655,000									**$9,310,000**
WCS-17	East Lathrop Road Trunk	$1,072,000	$8,930,000	$2,058,000	$12,060,000																	$4,020,000	$4,020,000	$4,020,000							**$12,060,000**
WCS-18	Northland Road Trunk	$589,000	$4,910,000	$1,131,000	$6,630,000																	$3,315,000	$3,315,000								**$6,630,000**
WCS-19	Northland Road Branches	$564,000	$4,703,000	$1,083,000	$6,350,000																		$3,175,000	$3,175,000							**$6,350,000**
WCS-20	Louise/ Nehemiah Branches	$458,000	$3,818,000	$884,000	$5,160,000																			$5,160,000							**$5,160,000**
WCS-21	South Union Road Extension	$408,000	$3,397,000	$785,000	$4,590,000																				$4,590,000						**$4,590,000**
WCS-22	Cottage Avenue	$273,000	$2,279,000	$528,000	$3,080,000																				$1,540,000	$1,540,000					**$3,080,000**
WCS-23	North Shed Union Road Trunk	$1,167,000	$9,723,000	$2,240,000	$13,130,000																					$6,565,000	$6,565,000				**$13,130,000**
WCS-24	Manteca Junction Trunk	$331,000	$2,757,000	$642,000	$3,730,000																							$3,730,000			**$3,730,000**
WCS-25	Lovelace Road - 99 Crossing	$1,608,000	$13,398,000	$3,084,000	$18,090,000																						$9,045,000	$9,045,000			**$18,090,000**
WCS-26	UPRR Right of Way and Ally Between Center Street and Yosemite	$43,000	$362,000	$84,000	$489,000			$489,000																							**$489,000**
WCS-27	Moffat Boulevard and Main Street	$91,000	$757,000	$174,000	$1,022,000			$1,022,000																							**$1,022,000**
WCS-28	Oak Street from Main Street to Willow Avenue	$9,000	$73,000	$16,000	$98,000			$98,000																							**$98,000**
WCS-29	Sequoia Avenue from Oregon Street to Alley north of Nevada Street	$5,000	$39,000	$9,000	$53,000			$53,000																							**$53,000**
WCS-30	Tidewater Bike Path from Sandalwood Lane to Louis Avenue	$31,000	$258,000	$59,000	$348,000			$348,000																							**$348,000**
WCS-31	Walnut Avenue from the alley north of Nevada Street to the UPRR	$25,000	$207,000	$47,000	$279,000			$279,000																							**$279,000**
WCS-32	St. Dominic's Drive from north of Yosemite Avenue to Golf Course	$3,000	$21,000	$5,000	$29,000			$29,000																							**$29,000**
	TOTAL	**$19,735,000**	**$164,456,000**	**$37,937,000**	**$222,128,000**	**$0**	**$2,000,000**	**$9,818,000**	**$3,335,000**	**$3,335,000**	**$0**	**$0**	**$0**	**$0**	**$24,770,000**	**$24,910,000**	**$13,295,667**	**$20,927,167**	**$24,409,167**	**$11,078,000**	**$6,775,000**	**$11,990,000**	**$10,510,000**	**$12,355,000**	**$6,130,000**	**$8,105,000**	**$15,610,000**	**$12,775,000**	**$0**	**$0**	**$222,128,000**

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Figure J-1
WCS 25 Year CIP Schedule and Cost

CIP Project No.	Project Name	Planning and Design	Construction	CM and Admin	Total	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	46/47	Total
WQCF-01	North and South Plant WAS Pump Replacement Project	$251,000	$2,094,000	$482,000	$2,827,000	$251,000	$1,000,000	$1,576,000																							**$2,827,000**
WQCF-02	South Plant RAS Pump Replacement Project	$147,000	$1,224,000	$281,000	$1,652,000	$147,000	$500,000	$1,005,000																							**$1,652,000**
WQCF-03	North and South Plant Aeration Basins Improvements	$1,040,000	$8,664,000	$1,992,000	$11,696,000	$1,040,000	$1,000,000	$4,328,000	$5,328,000																						**$11,696,000**
WQCF-04	Sidestream Treatment System	$1,796,000	$14,967,000	$3,442,000	$20,205,000				$1,796,000	$6,136,333	$6,136,333	$6,136,333																			**$20,205,000**
WQCF-05	Add Centrifuge No. 3	$456,000	$3,800,000	$874,000	$5,130,000		$300,000	$156,000	$2,337,000	$2,337,000																					**$5,130,000**
WQCF-06	Add DAFT No. 3	$349,000	$2,911,000	$670,000	$3,930,000		$200,000	$149,000	$1,790,500	$1,790,500																					**$3,930,000**
WQCF-07	I&E Core Supervisory Control and Data Acquisition (SCADA) System	$100,000	$835,000	$192,000	$1,127,000					$1,127,000																					**$1,127,000**
WQCF-08	I&E Remote Site Process Logic Controller (PLC) Upgrades	$153,000	$1,279,000	$295,000	$1,727,000					$1,727,000																					**$1,727,000**
WQCF-09	I&E PLC and Operator Interfaced Terminal (OIT) Replacement	$122,000	$1,018,000	$234,000	$1,374,000								$1,374,000																		**$1,374,000**
WQCF-10	I&E Switchgear PLC Upgrades	$11,000	$94,000	$22,000	$127,000						$127,000																				**$127,000**
WQCF-11	Add Influent Pump No. 5	$93,000	$776,000	$179,000	$1,048,000			$1,048,000																							**$1,048,000**
WQCF-12	Lightweight Covers for Process Basins	$515,000	$4,290,000	$987,000	$5,792,000								$5,792,000																		**$5,792,000**
WQCF-13	Headworks, IPS and Biofilter Improvements	$185,000	$1,541,000	$354,000	$2,080,000			$185,000	$947,500	$947,500																					**$2,080,000**
WQCF-14	UV Disinfection System Upgrade	$1,385,000	$11,543,000	$2,655,000	$15,583,000			$1,385,000	$7,099,000	$7,099,000																					**$15,583,000**
WQCF-15	Plant Water System Piping Modifications	$57,000	$471,000	$108,000	$636,000			$636,000																							**$636,000**
WQCF-16	Replace Secondary Effluent Equalization Pond Liner	$187,000	$1,556,000	$358,000	$2,101,000			$2,101,000																							**$2,101,000**
WQCF-17	Headworks Screen No. 3	$80,000	$667,000	$153,000	$900,000						$900,000																				**$900,000**
WQCF-18	FOG Receiving Station Screening System	$18,000	$148,000	$34,000	$200,000			$200,000																							**$200,000**
WQCF-19	Bulk Ferric Chloride Solution Tanks	$31,000	$260,000	$60,000	$351,000			$351,000																							**$351,000**
WQCF-20	Digesters No. 1 and 2 Overflow Boxes	$63,000	$523,000	$120,000	$706,000			$706,000																							**$706,000**
WQCF-21	Digester Pressure Relief Valves Platform & Handrailing	$18,000	$152,000	$35,000	$205,000			$205,000																							**$205,000**
WQCF-22	Install New Waste Heat Radiator	$18,000	$147,000	$33,000	$198,000			$198,000																							**$198,000**
WQCF-23	WQCF Phase IV Stage 1 Expansion Project	$13,005,000	$108,375,000	$24,926,000	$146,306,000					$13,005,000	$33,325,250	$33,325,250	$33,325,250	$33,325,250																	**$146,306,000**
WQCF-24	WQCF Phase IV Stage 2 Expansion Project	$6,274,000	$52,287,000	$12,026,000	$70,587,000																						$6,274,000	$21,437,667	$21,437,667	$21,437,667	**$70,587,000**
	TOTAL	**$26,354,000**	**$219,622,000**	**$50,512,000**	**$296,488,000**	**$1,438,000**	**$3,000,000**	**$14,229,000**	**$19,298,000**	**$34,169,333**	**$40,488,583**	**$39,461,583**	**$40,491,250**	**$33,325,250**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$6,274,000**	**$21,437,667**	**$21,437,667**	**$21,437,667**	**$296,488,000**

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Figure J-2
WQCF 25 Year CIP Schedule and Cost

ATTACHMENT 2

Stantec

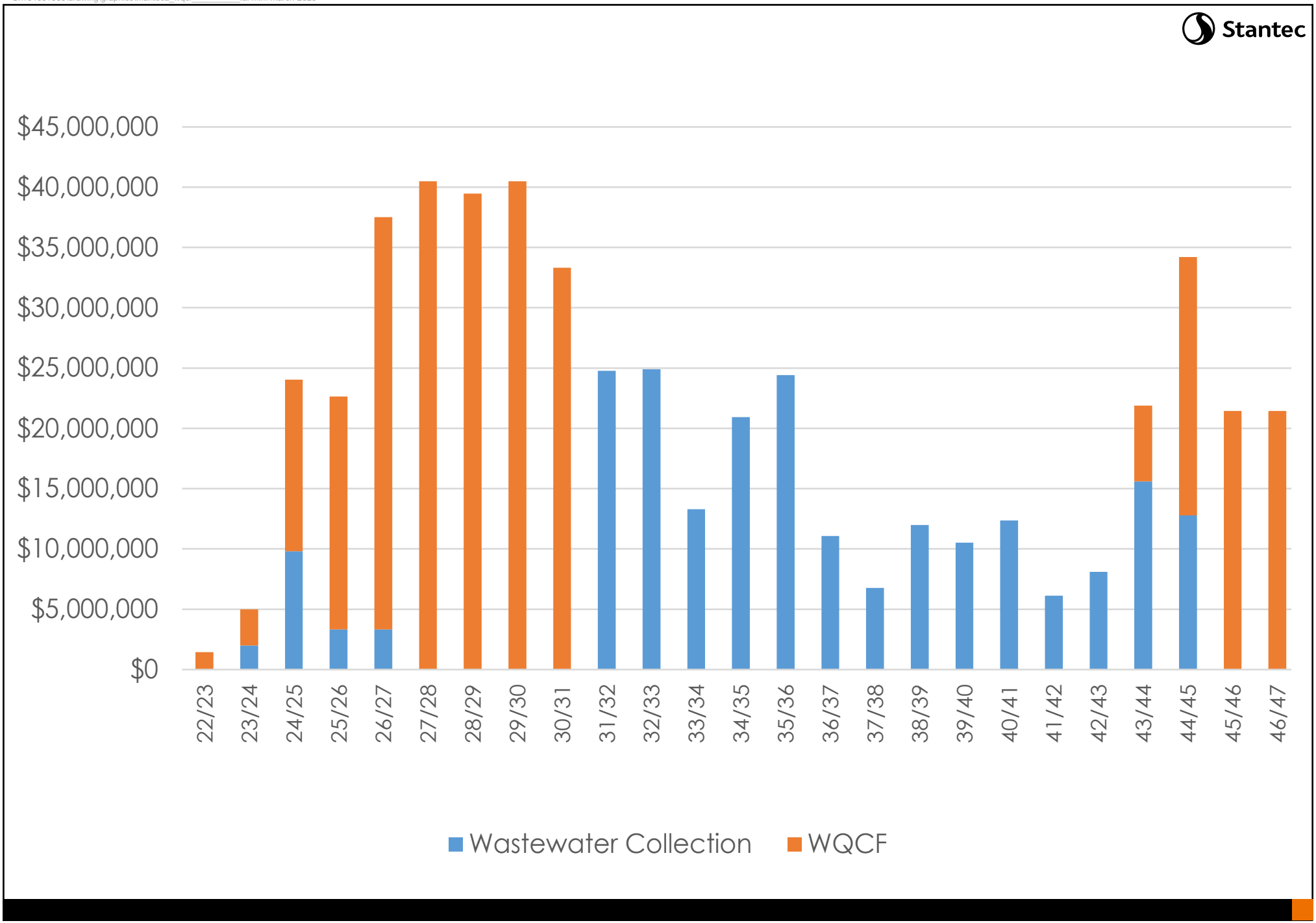


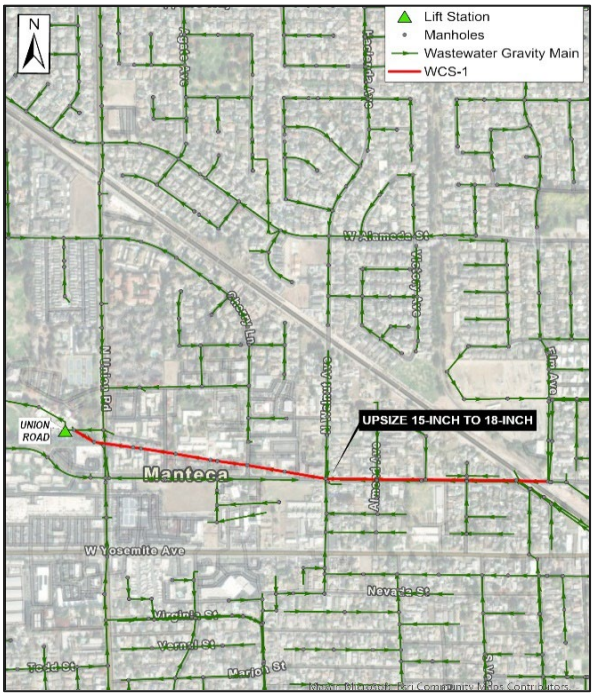
Figure J-3
Wasterwater CIP Expenditure

ATTACHMENT 2

Project: WCS-1
Name: W Center Street Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 Upsize existing 15-inch sewer to 18-inches.
2 Consider WCS-6 connection at downstream end of Project and decommissioning of Union Road LS.
3 Consider WCS-2 at upstream end of Project.
4 Average pipe slope to match existing (0.0012 ft/ft).

Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM0560	WWMH0344	WWMH0342	404	11.5	18	$ 745	$ 300,964
WWGM0564	WWMH0341	WWMH0344	386	11.0	18	$ 745	$ 287,555
WWGM0565	WWMH0346	WWMH0341	325	11.0	18	$ 696	$ 226,357
WWGM0570	WWMH0348	WWMH0346	392	12.5	18	$ 793	$ 311,028
WWGM0572	WWMH0349	WWMH0348	250	13.9	18	$ 890	$ 222,598
WWGM0880	WWMH0342	WWMH5062	330	12.0	18	$ 745	$ 245,837
WWGM0881	WWMH0369	WWMH5063	238	8.6	18	$ 648	$ 154,226
WWGM0883	WWMH0368	WWMH0370	279	8.9	18	$ 648	$ 180,794
WWGM0884	WWMH0370	WWMH1132	278	8.2	18	$ 648	$ 180,146
WWGM0888	WWMH5090	WWMH0373	310	8.7	18	$ 648	$ 200,882
WWGM0889	WWMH0373	WWMH3125	189	13.9	18	$ 890	$ 168,284
WWGM5976	WWMH5063	WWMH0368	57	8.8	18	$ 648	$ 36,936
WWGM5977	WWMH5062	WWMH0369	301	11.0	18	$ 745	$ 224,233
WWGM6003	WWMH1132	WWMH5090	63	8.3	18	$ 648	$ 40,824
		Total Length:	3,802			**Base Construction Costs:**	**$ 2,781,000**
						Construction Estimating Contingency @ 30%	$ 834,000
						Total Construction Costs:	**$ 3,615,000**
						Engineering, CM, and Admin @ 35%	$ 1,265,000
						Total Project Costs:	**$ 4,880,000**

ATTACHMENT 2

Project: WCS-2
Name: Elm/West North Street Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 Upsize existing 10-inch sewer to 15-inches.
2 WCS-1 is downstream of the project and WCS-2 is upstream of the project.
3 Average pipe slope to match existing (0.0012 ft/ft).

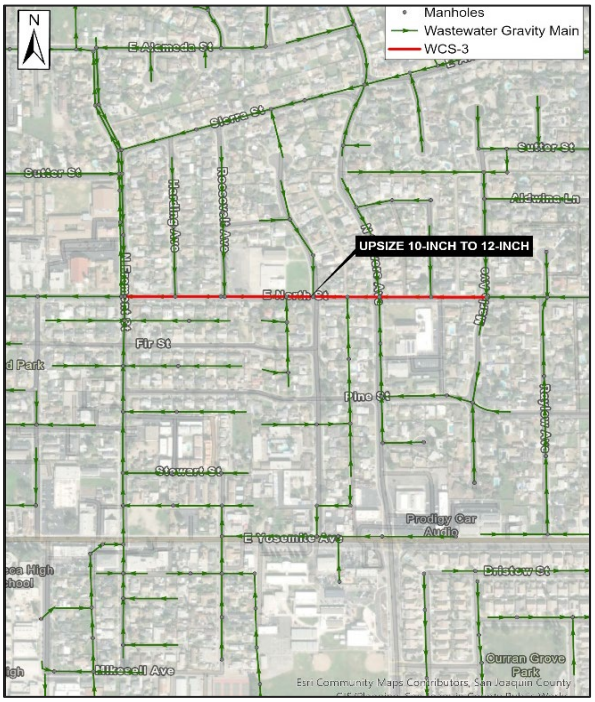
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM0317	WWMH0883	WWMH1021	17	7.5	15	$ 603	$ 10,259
WWGM0339	WWMH1021	WWMH0477	424	8.6	15	$ 603	$ 255,879
WWGM0340	WWMH0477	WWMH0473	243	8.2	15	$ 603	$ 146,648
WWGM0341	WWMH0473	WWMH0480	218	9.3	15	$ 603	$ 131,560
WWGM0367	WWMH1112	WWMH1115	169	11.1	15	$ 675	$ 114,028
WWGM0368	WWMH1109	WWMH1112	171	12.4	15	$ 710	$ 121,467
WWGM0413	WWMH0479	WWMH3168	169	10.0	15	$ 639	$ 108,008
WWGM0414	WWMH0445	WWMH0446	220	12.5	15	$ 710	$ 156,274
WWGM0415	WWMH0446	WWMH1107	159	12.4	15	$ 710	$ 112,943
WWGM0416	WWMH1107	WWMH1109	175	12.4	15	$ 710	$ 124,309
WWGM0422	WWMH1118	WWMH1121	168	9.8	15	$ 603	$ 101,386
WWGM0423	WWMH1119	WWMH1118	167	10.9	15	$ 639	$ 106,730
WWGM0424	WWMH1115	WWMH1119	173	11.1	15	$ 675	$ 116,726
WWGM0575	WWMH1127	WWMH0349	348	11.3	15	$ 675	$ 234,802
WWGM0577	WWMH4278	WWMH1127	326	8.8	15	$ 603	$ 196,737
WWGM0580	WWMH1121	WWMH1123	158	10.0	15	$ 639	$ 100,978
WWGM0581	WWMH1123	WWMH1125	221	9.8	15	$ 603	$ 133,371
WWGM0582	WWMH1125	WWMH1128	221	9.2	15	$ 603	$ 133,371
WWGM1537	WWMH0480	WWMH0478	182	9.7	15	$ 603	$ 109,835
WWGM1538	WWMH0478	WWMH0479	190	9.4	15	$ 603	$ 114,663
WWGM3808	WWMH3168	WWMH0445	366	11.4	15	$ 675	$ 246,947
WWGM5363	WWMH1128	WWMH4278	25	9.1	15	$ 603	$ 15,087
		Total Length:	4,510			**Base Construction Costs:**	**$ 2,892,000**
						Construction Estimating Contingency @ 30%	$ 868,000
						Total Construction Costs:	**$ 3,760,000**
						Engineering, CM, and Admin @ 35%	$ 1,316,000
						Total Project Costs:	**$ 5,080,000**

ATTACHMENT 2

Project: WCS-3
Name: 10-inch East North Street Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 Upsize existing 10-inch sewer to 12-inches.
2 WCS-2 is downstream of the project and WCS-4 is further upstream of the project.
3 Evaluate upstream pipe segments condition.
4 Average pipe slope to match existing (0.0015 ft/ft).

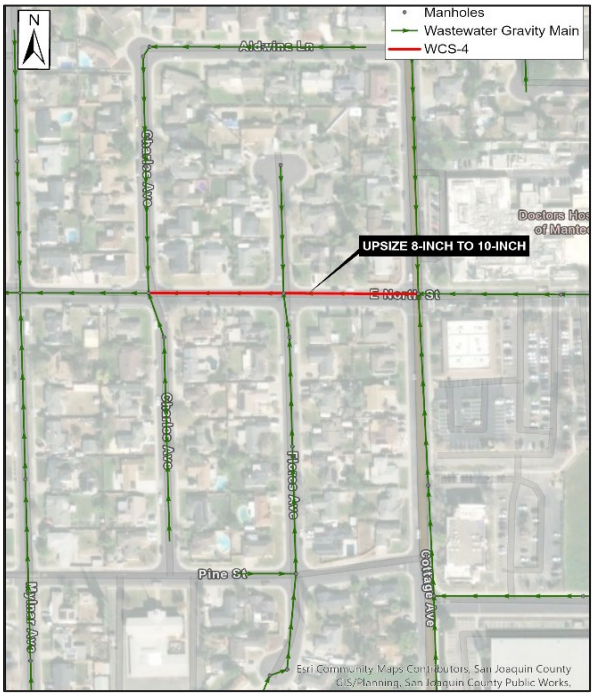
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM1992	WWMH0885	WWMH0883	255	6.0	12	$ 514	$ 131,184
WWGM1995	WWMH3060	WWMH0885	231	7.1	12	$ 514	$ 118,838
WWGM1996	WWMH0884	WWMH3060	19	6.5	12	$ 514	$ 9,775
WWGM2007	WWMH0844	WWMH0747	261	6.4	12	$ 514	$ 134,271
WWGM2009	WWMH0901	WWMH0844	281	6.6	12	$ 514	$ 144,560
WWGM2036	WWMH0747	WWMH0755	162	6.3	12	$ 514	$ 83,341
WWGM2128	WWMH0757	WWMH0884	312	5.2	12	$ 514	$ 160,508
WWGM2129	WWMH0442	WWMH0757	136	7.1	12	$ 514	$ 69,965
WWGM2130	WWMH0755	WWMH0442	173	7.5	12	$ 514	$ 89,000
		Total Length:	1,830			**Base Construction Costs:**	**$ 941,000**
						Construction Estimating Contingency @ 30%	$ 282,000
						Total Construction Costs:	**$ 1,223,000**
						Engineering, CM, and Admin @ 35%	$ 428,000
						Total Project Costs:	**$ 1,660,000**

ATTACHMENT 2

Project: WCS-4
Name: 8-inch East North Street Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 Upsize existing 8-inch sewer to 10-inches.
2 Evaluate pipe segments between WCS-3 and WCS-4 for replacement and addition to project.
3 Average pipe slope to match existing (0.0015 ft/ft).

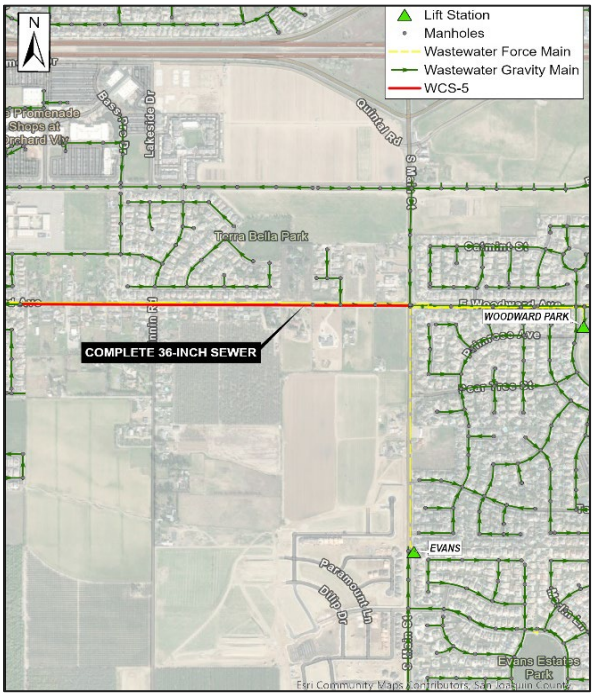
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
WWGM2025	WWMH1433	WWMH0896	280	7.1	10	$ 514	$ 144,046
WWGM2027	WWMH1432	WWMH1433	280	7.3	10	$ 514	$ 144,046
		Total Length:	560			**Base Construction Costs:**	**$ 288,000**
						Construction Estimating Contingency @ 30%	$ 86,000
						Total Construction Costs:	**$ 374,000**
						Engineering, CM, and Admin @ 35%	$ 131,000
						Total Project Costs:	**$ 510,000**

ATTACHMENT 2

Project: WCS-5
Name: South Woodward Trunk Extension
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 36-inch sewer to be constructed.
2 Tie into upstream and downstream 36-inch sewers to complete South Trunk gravity sewer.
3 Decommission Woodward Park Lift Station.
4 New 36-inch sewer slope = 0.00064 ft/ft.

Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC5_1	WWMH0481	BOSSMH9	2,653	21.2	36	$ 1,819	$ 4,827,062
BOC5_2	BOSSMH9	WWMH4162	1,377	18.4	36	$ 1,724	$ 2,372,526
		Total Length:	4,030			**Base Construction Costs:**	**$ 7,200,000**
						Construction Estimating Contingency @ 30%	$ 2,160,000
						Total Construction Costs:	**$ 9,360,000**
						Engineering, CM, and Admin @ 35%	$ 3,276,000
						Total Project Costs:	**$12,640,000**

ATTACHMENT 2

Project: WCS-6
Name: Central Union Road Trunk Extension
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 36-inch sewer to be constructed.
2 Refer to 320 Airport Way Subdivision plans for detailed alignment.
3 Decommission Union Road Lift Station.
4 Consider upstream improvements (WCS-1).

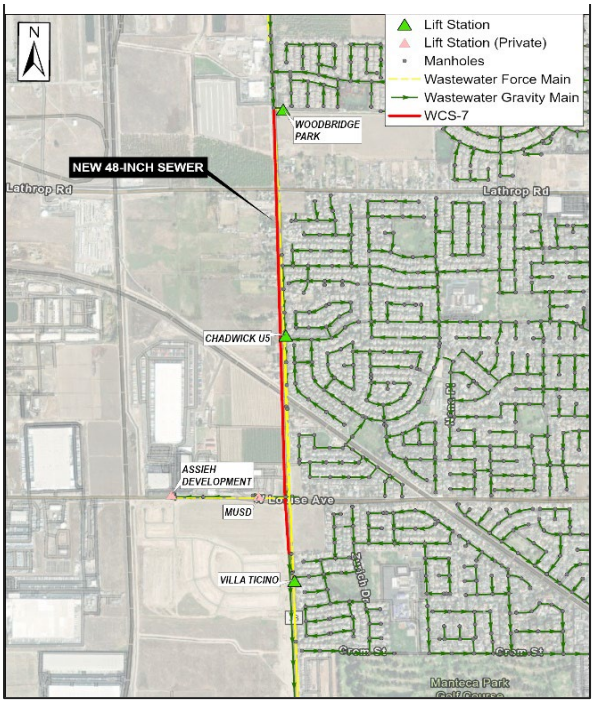
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC4_1	WWMH3125	SSMH2	2,788	20.2	36	$ 1,786	$ 4,979,469
BOC4_28	SSMH2	SSMH-13	2,242	23.4	36	$ 1,887	$ 4,229,959
		Total Length:	5,031			**Base Construction Costs:**	**$ 9,209,000**
						Construction Estimating Contingency @ 30%	$ 2,763,000
						Total Construction Costs:	**$11,972,000**
						Engineering, CM, and Admin @ 35%	$ 4,190,000
						Total Project Costs:	**$16,170,000**

ATTACHMENT 2

Project: WCS-7A
Name: Central Union Road Trunk Extension
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 48-inch sewer to be constructed.
2 Decommission and tie in existing lift stations (Woodbridge Park, Chadwick U5, Villa Ticino).
3 Tie into upstream 48-inch sewer and downstream 36-inch sewer.
4 New 48-inch sewer slope = 0.0005 ft/ft or greater.

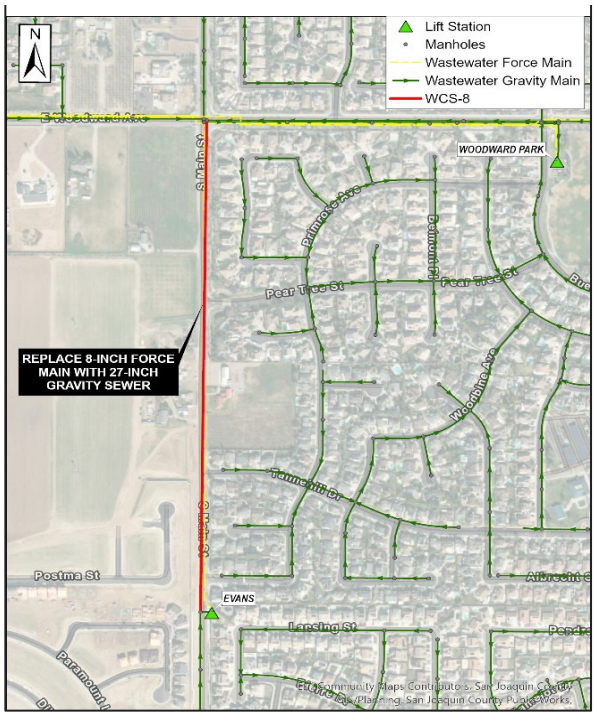
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC16_1	SSMH1	73	952	24.9	48	$ 2,721	$ 2,591,359
BOC16_6	WWMH3392	BOSSMH92	3,851	21.2	48	$ 2,503	$ 9,638,820
BOC16_8	BOSSMH92	BOSSMH93	134	22.3	48	$ 2,557	$ 342,779
BOC16_9	BOSSMH93	SSMH1	2,734	22.9	48	$ 2,557	$ 6,991,119
		Total Length:	7,671			**Base Construction Costs:**	**$19,564,000**
						Construction Estimating Contingency @ 30%	$ 5,869,000
						Total Construction Costs:	**$25,433,000**
						Engineering, CM, and Admin @ 35%	$ 8,902,000
						Total Project Costs:	**$34,340,000**

ATTACHMENT 2

Project: WCS-8
Name: S. Main Trunk to Evans
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



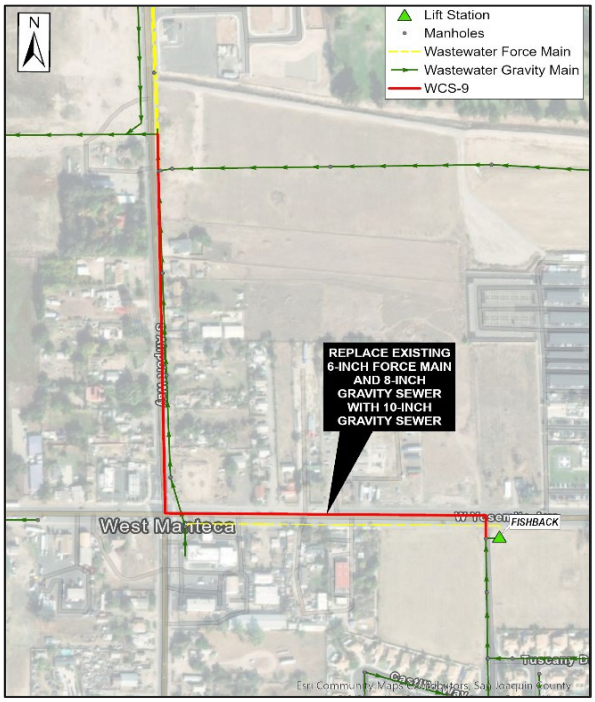
CIP Description:

1 New 27-inch sewer to be constructed.
2 Tie into Evans Lift Station and new 36-inch sewer downstream (WCS-5).
3 Decommission Evans Lift Station.
4 New 27-inch sewer slope = 0.0008 ft/ft.

Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
1	WWMH5022	WWMH0481	2,688	23.3	27	$ 1,521	$ 4,087,094
		Total Length:	2,688			**Base Construction Costs:**	**$ 4,087,000**
						Construction Estimating Contingency @ 30%	$ 1,226,000
						Total Construction Costs:	**$ 5,313,000**
						Engineering, CM, and Admin @ 35%	$ 1,860,000
						Total Project Costs:	**$ 7,180,000**

ATTACHMENT 2

Project: WCS-9
Name: S. Airport Way and Yosemite Ave.
ENRCCI: 13,176 (March 2023)



CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023

CIP Description:

1 New 10-inch sewer to be constructed.
2 Tie into Fishback Lift Station sewer shed and downstream 36-inch sewer.
3 Review 320 Airport Way Subdivision plans.
4 10-inch sewer at standard slope (0.0025 ft/ft).
5 Decommission Fishback Lift Station.

Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_12	10	SSMH-13	1,490	18.2	10	$ 747	$ 1,113,278
2_14	BOSSMH400	10	1,179	10.9	10	$ 551	$ 649,450
		Total Length:	2,669			**Base Construction Costs:**	**$ 1,763,000**
						Construction Estimating Contingency @ 30%	$ 529,000
						Total Construction Costs:	**$ 2,292,000**
						Engineering, CM, and Admin @ 35%	$ 802,000
						Total Project Costs:	**$ 3,100,000**

ATTACHMENT 2

Project: WCS-10
Name: S. Airport Way Roberts Estates
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 10-inch sewer to be constructed.
2 Tie into Robert's Estates Lift Station and existing 15-inch sewer in Daniels Street.
3 Decommission Roberts Estates Lift Station.
4 10-inch sewer at standard slope (0.0025 ft/ft).

Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_11	WWMH2754	WWMH2321	1,317	19.5	10	$ 757	$ 996,427
		Total Length:	1,317			**Base Construction Costs:**	**$ 996,000**
						Construction Estimating Contingency @ 30%	$ 299,000
						Total Construction Costs:	**$ 1,295,000**
						Engineering, CM, and Admin @ 35%	$ 453,000
						Total Project Costs:	**$ 1,750,000**

ATTACHMENT 2

Project: WCS-11
Name: Yosemite Square Lift Station
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 2.4 Mgal/d pump station to be constructed.
2 New 8-inch force main to be routed through the existing 18-inch highway crossing.
3 New 15-inch sewer tributary to LS to be constructed.
4 New 15-inch sewer extension in Woodward Drive to be constructed with steepest possible slope.

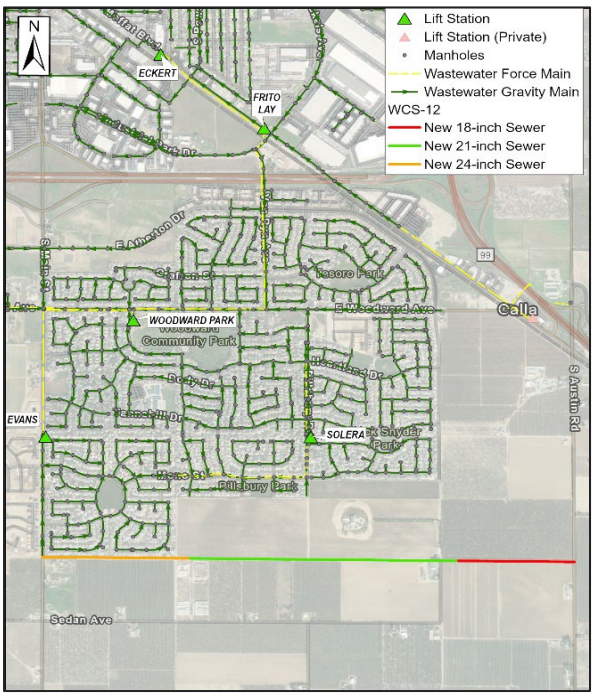
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
12_2	24	50	205	12.8	8	$ 221	$ 45,195
12_4	50	51	354	12.8	8	$ 221	$ 78,202
12_5	51	20	188	14.6	8	$ 221	$ 41,584
8	49	29	321	11.1	8	$ 221	$ 70,842
8_11	29	24	645	12.9	8	$ 221	$ 142,532
13	20	WWMH3342	1,425	16.5	15	$ 820	$ 1,168,426
2	BOSSMH41	BOSSMH45	1,315	8.1	15	$ 603	$ 793,454
BOC6_1	BOSSMH45	12	1,919	10.3	15	$ 639	$ 1,226,201
Lift Station							$ 2,900,000
Force Main			3,143		8	$ 221	$ 870,000
		Total Length:	9,514			**Base Construction Costs:**	**$ 7,336,000**
						Construction Estimating Contingency @ 30%	$ 2,201,000
						Total Construction Costs:	**$ 9,537,000**
						Engineering, CM, and Admin @ 35%	$ 3,338,000
						Total Project Costs:	**$12,880,000**

ATTACHMENT 2

Project: WCS-12
Name: Austin Road Industrial Area Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 24-, 21-, and 18-inch sewer to be constructed.
2 To be constructed at the following slopes: 24-inch & 21-inch = 0.0012 ft/ft, 18-inch = 0.0015 ft/ft.
3 Tie into existing 24-inch trunk in S. Main Street.

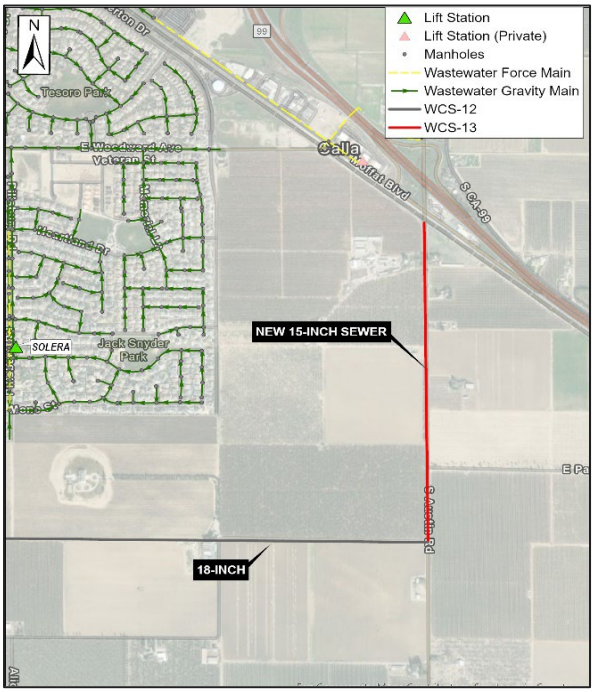
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC7_1	BOSSMH23	BOSSMH32	589	19.4	18	$ 984	$ 579,171
BOC7_10	BOSSMH6	BOSSMH31	589	17.0	18	$ 937	$ 551,710
BOC7_11	BOSSMH31	BOSSMH23	589	18.4	18	$ 968	$ 570,017
BOC7_12	BOSSMH32	BOSSMH24	589	19.6	18	$ 984	$ 579,171
BOC7_13	BOSSMH33	BOSSMH25	589	17.6	21	$ 1,076	$ 633,260
BOC7_14	BOSSMH34	BOSSMH26	589	17.7	21	$ 1,076	$ 633,260
BOC7_15	BOSSMH35	BOSSMH27	589	19.0	21	$ 1,124	$ 661,553
BOC7_16	BOSSMH36	BOSSMH28	589	19.8	21	$ 1,124	$ 661,553
BOC7_2	BOSSMH24	BOSSMH33	589	19.1	21	$ 1,124	$ 661,553
BOC7_3	BOSSMH25	BOSSMH34	589	17.3	21	$ 1,076	$ 633,260
BOC7_4	BOSSMH26	BOSSMH35	589	18.1	21	$ 1,100	$ 647,406
BOC7_5	BOSSMH27	BOSSMH36	589	19.7	21	$ 1,124	$ 661,553
BOC7_6	BOSSMH28	BOSSMH37	589	19.5	21	$ 1,124	$ 661,553
BOC7_17	BOSSMH37	BOSSMH29	589	19.3	24	$ 1,273	$ 749,344
BOC7_18	BOSSMH38	BOSSMH30	589	18.7	24	$ 1,249	$ 735,613
BOC7_19	BOSSMH39	BOSSMH8	589	19.3	24	$ 1,273	$ 749,344
BOC7_7	BOSSMH29	BOSSMH38	589	19.1	24	$ 1,273	$ 749,344
BOC7_8	BOSSMH30	BOSSMH39	589	18.8	24	$ 1,249	$ 735,613
		Total Length:	10,598		**Base Construction Costs:**		**$11,854,000**
					Construction Estimating Contingency @ 30%		$ 3,556,000
					Total Construction Costs:		**$15,410,000**
					Engineering, CM, and Admin @ 35%		$ 5,394,000
					Total Project Costs:		**$20,810,000**

ATTACHMENT 2

Project: WCS-13
Name: South Austin Road - Industrial Area
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 15-inch sewer to be constructed.
2 Tie into new 18-inch sewer in Sedan Ave (WCS-12).
3 New 15-inch sewer at standard slope = 0.0015 ft/ft.

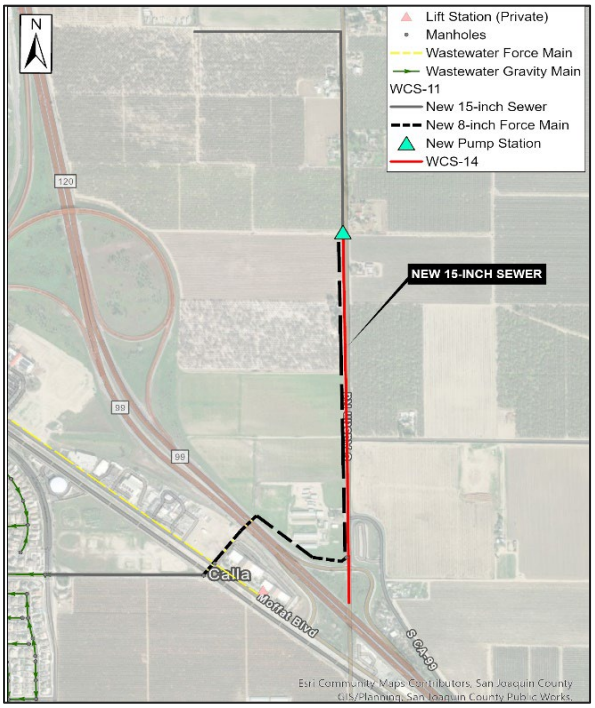
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
12_1	BOSSMH54	BOSSMH6	1,444	17.6	15	$ 832	$ 1,202,375
BOC6_12	BOSSMH50	BOSSMH51	722	10.0	15	$ 639	$ 461,493
BOC6_13	BOSSMH51	BOSSMH52	722	11.1	15	$ 675	$ 487,223
BOC6_15	BOSSMH53	BOSSMH54	722	17.0	15	$ 820	$ 591,967
BOC6_25	42	BOSSMH53	497	14.0	15	$ 782	$ 388,780
BOC6_7	BOSSMH52	42	225	12.1	15	$ 710	$ 159,610
		Total Length:	4,333		**Base Construction Costs:**		**$ 3,291,000**
					Construction Estimating Contingency @ 30%		$ 987,000
					Total Construction Costs:		**$ 4,278,000**
					Engineering, CM, and Admin @ 35%		$ 1,497,000
					Total Project Costs:		**$ 5,780,000**

ATTACHMENT 2

Project: WCS-14
Name: Yosemite Square Service Area
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 15-inch sewer to be constructed.
2 Tie into pump station to expand Yosemite Square service area.
3 New 15-inch sewer at standard slope = 0.0015 ft/ft.

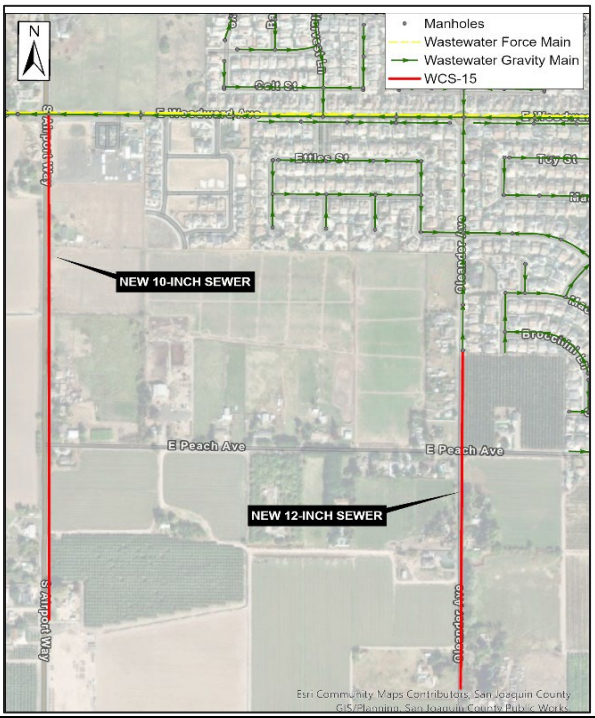
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC6_10	BOSSMH49	BOSSMH48	722	8.3	15	$ 603	$ 435,753
BOC6_11	BOSSMH47	12	2,132	12.5	15	$ 710	$ 1,514,541
BOC6_9	BOSSMH48	BOSSMH47	722	10.3	15	$ 639	$ 461,457
		Total Length:	3,576			**Base Construction Costs:**	**$ 2,412,000**
						Construction Estimating Contingency @ 30%	$ 724,000
						Total Construction Costs:	**$ 3,136,000**
						Engineering, CM, and Admin @ 35%	$ 1,098,000
						Total Project Costs:	**$ 4,240,000**

ATTACHMENT 2

Project: WCS-15
Name: Yosemite Square Service Area
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 10- and 12-inch sewers to be constructed.
2 New 10-inch sewer in Airport Way and extension of 12-inch sewer in Oleander Avenue.
3 Sewers to be constructed at standard slopes.

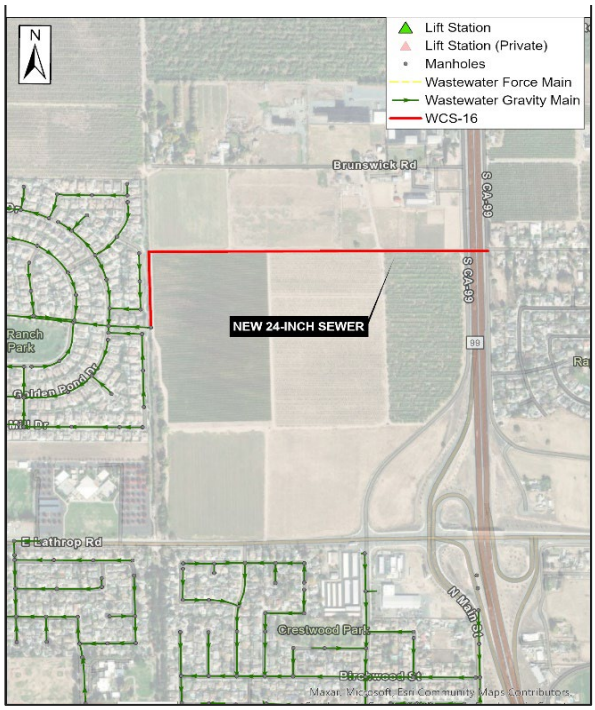
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC20_1	BOSSMH21	BOSSMH56	561	12.0	10	$ 624	$ 350,025
BOC20_2	BOSSMH56	BOSSMH57	561	10.9	10	$ 551	$ 308,976
BOC20_3	BOSSMH57	BOSSMH58	561	12.1	10	$ 624	$ 350,025
BOC20_4	BOSSMH58	BOSSMH59	561	13.5	10	$ 697	$ 391,074
BOC20_5	BOSSMH59	BOSSMH60	561	15.3	10	$ 717	$ 402,168
BOC20_6	BOSSMH60	WWMH4149	561	17.6	10	$ 737	$ 413,263
BOC18_15	77	78	451	17.5	12	$ 737	$ 332,068
BOC18_16	78	79	451	15.2	12	$ 717	$ 323,154
BOC18_17	79	WWMH4922	451	12.6	12	$ 624	$ 281,255
BOC18_2	BOSSMH19	25	451	13.6	12	$ 697	$ 314,239
BOC18_3	25	77	451	16.6	12	$ 727	$ 327,611
		Total Length:	5,617		**Base Construction Costs:**		**$ 3,794,000**
					Construction Estimating Contingency @ 30%		$ 1,138,000
					Total Construction Costs:		**$ 4,932,000**
					Engineering, CM, and Admin @ 35%		$ 1,726,000
					Total Project Costs:		**$ 6,660,000**

ATTACHMENT 2

Project: WCS-16
Name: Highway 99 Crossing At Northland Road
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 24-inch sewer to be constructed.
2 Upstream end includes highway crossing, downstream end to tie into existing 36-inch sewer.
3 24-inch sewer slope = 0.0011 ft/ft.

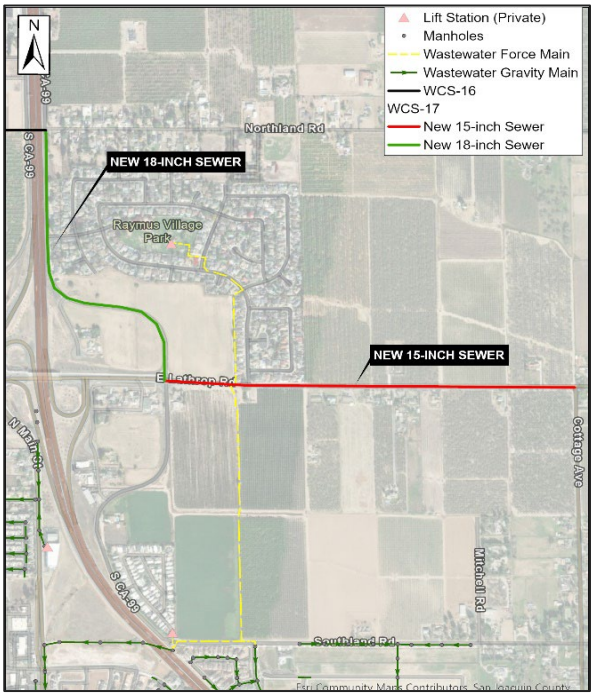
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_10	9	BOSSMH108	662	25.6	24	$ 1,537	$ 1,017,578
2_15	BOSSMH020	6	184	25.0	24	$ 1,454	$ 268,004
2_7	6	7	662	25.2	24	$ 1,496	$ 990,282
2_8	7	8	662	25.5	24	$ 1,496	$ 990,282
2_9	8	9	662	25.9	24	$ 1,537	$ 1,017,578
BOC25	BOSSMH108	WWMH3470	682	25.3	24	$ 1,496	$ 1,019,541
		Total Length:	3,515			**Base Construction Costs:**	**$ 5,303,000**
						Construction Estimating Contingency @ 30%	$ 1,591,000
						Total Construction Costs:	**$ 6,894,000**
						Engineering, CM, and Admin @ 35%	$ 2,413,000
						Total Project Costs:	**$ 9,310,000**

ATTACHMENT 2

Project: WCS-17
Name: East Lathrop Road Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 18- and 15-inch sewers to be constructed.
2 Tie into new 24-inch sewer downstream (WCS-16).

3 New 18- and 15-inch sewer slope = 0.0015 ft/ft.

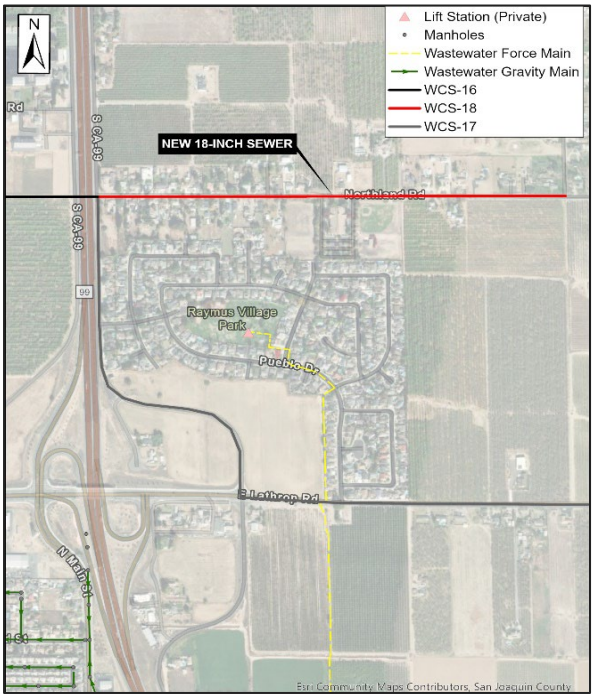
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
10	18	19	366	21.5	18	$ 1,024	$ 375,175
11	19	BOSSMH020	1,098	23.3	18	$ 1,073	$ 1,178,417
14	11	34	457	22.0	15	$ 891	$ 407,718
3_2	23	BOMH00012	796	20.6	15	$ 871	$ 693,378
3_4	34	35	457	19.2	15	$ 858	$ 392,397
3_5	35	36	457	18.2	15	$ 845	$ 386,579
3_6	36	37	457	17.9	15	$ 832	$ 380,761
3_7	37	38	457	17.9	15	$ 832	$ 380,761
3_8	38	39	457	19.0	15	$ 858	$ 392,397
3_9	39	23	457	21.2	15	$ 891	$ 407,718
4	BOMH00012	13	397	19.4	18	$ 984	$ 390,919
5	13	14	205	20.4	18	$ 999	$ 204,842
6	14	15	193	20.6	18	$ 999	$ 192,729
7	15	16	208	20.7	18	$ 999	$ 207,531
8_1	16	21	353	20.8	18	$ 999	$ 352,769
8_3	21	22	180	20.9	18	$ 999	$ 180,060
8_4	22	17	159	21.0	18	$ 1,024	$ 162,805
9	17	18	178	21.1	18	$ 1,024	$ 182,168
		Total Length:	7,336		**Base Construction Costs:**		**$ 6,869,000**
					Construction Estimating Contingency @ 30%		$ 2,061,000
					Total Construction Costs:		**$ 8,930,000**
					Engineering, CM, and Admin @ 35%		$ 3,126,000
					Total Project Costs:		**$12,060,000**

ATTACHMENT 2

Project: WCS-18
Name: Northland Road Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 18-inch sewer to be constructed.
2 Tie into new 24-inch sewer downstream (WCS-16) with drop manhole (~ 5 ft) to reduce sewer depth.
3 New 18-inch sewer slope = 0.0012 ft/ft.

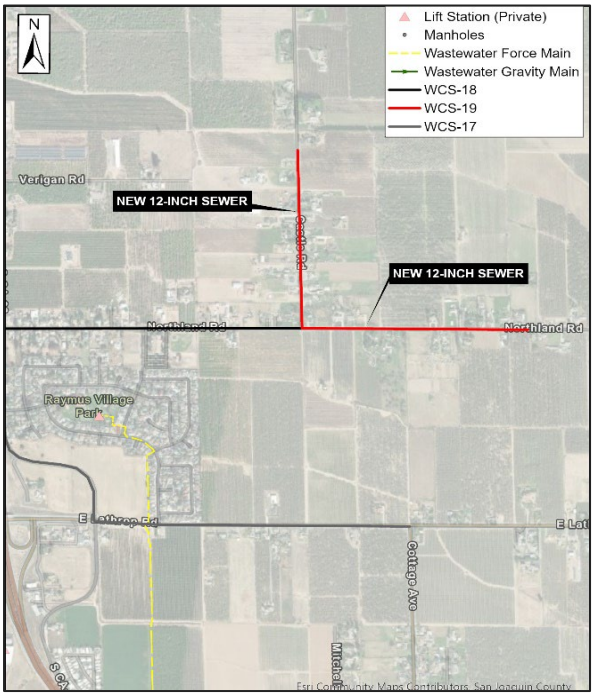
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_1	BOSSMH89	1	662	20.7	18	$ 999	$ 661,644
2_13	5	BOSSMH020	478	20.5	18	$ 999	$ 477,505
2_2	1	2	662	20.6	18	$ 999	$ 661,644
2_3	2	3	662	21.9	18	$ 1,024	$ 678,021
2_4	3	4	662	21.3	18	$ 1,024	$ 678,021
2_5	4	5	662	17.0	18	$ 937	$ 620,467
		Total Length:	3,789			**Base Construction Costs:**	**$ 3,777,000**
						Construction Estimating Contingency @ 30%	$ 1,133,000
						Total Construction Costs:	**$ 4,910,000**
						Engineering, CM, and Admin @ 35%	$ 1,719,000
						Total Project Costs:	**$ 6,630,000**

ATTACHMENT 2

Project: WCS-19
Name: Northland Road Branches
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



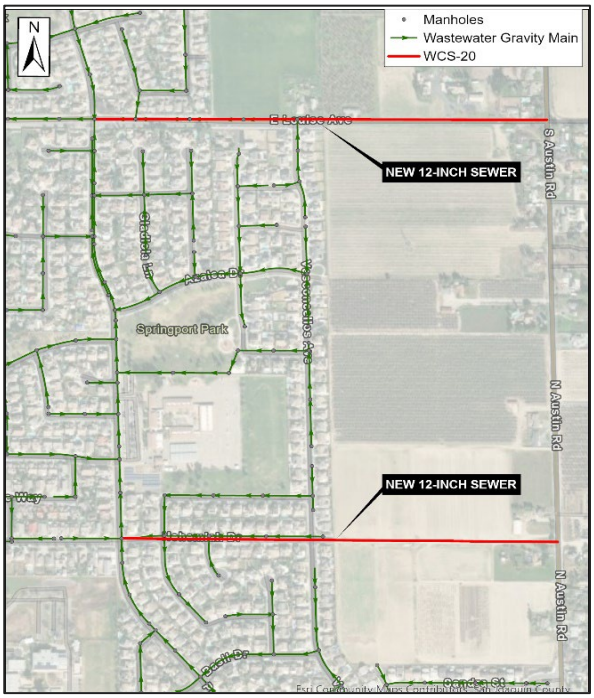
CIP Description:

1 New 12-inch sewers to be constructed.
2 Tie into new 18-inch sewer at downstream (WCS-18).
3 12-inch sewers at standard slopes (0.002 ft/ft).

Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC18_10	BOSSMH169	BOSSMH170	476	12.5	12	$ 624	$ 297,390
BOC18_11	BOSSMH170	BOSSMH171	476	13.6	12	$ 697	$ 332,265
BOC18_12	BOSSMH171	BOSSMH172	476	14.8	12	$ 707	$ 336,978
BOC18_13	BOSSMH172	BOSSMH173	476	16.1	12	$ 727	$ 346,404
BOC18_14	BOSSMH173	BOSSMH89	476	17.9	12	$ 737	$ 351,117
BOC18_9	BOSSMH168	BOSSMH169	476	12.2	12	$ 624	$ 297,389
BOC19_7	BOSSMH178	BOSSMH177	479	11.5	12	$ 588	$ 281,612
BOC19_8	BOSSMH177	BOSSMH89	1,917	15.4	12	$ 717	$ 1,374,998
		Total Length:	5,255			**Base Construction Costs:**	**$ 3,618,000**
						Construction Estimating Contingency @ 30%	$ 1,085,000
						Total Construction Costs:	**$ 4,703,000**
						Engineering, CM, and Admin @ 35%	$ 1,646,000
						Total Project Costs:	**$ 6,350,000**

ATTACHMENT 2

Project: WCS-20
Name: Louise/ Nehemiah Branches
ENRCCI: 13,176 (March 2023)



CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023

CIP Description:

1 New 12-inch sewers to be constructed.
2 Tie into existing 18-inch sewer in Louise Avenue and Nehemiah Drive at Pestana Avenue.
3 New 12-inch sewers at standard slopes (0.002 ft/ft).

Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_31	BOSSMH99	53	535	13.7	12	$ 697	$ 372,885
2_32	53	54	535	11.7	12	$ 588	$ 314,176
2_33	54	55	535	11.9	12	$ 588	$ 314,176
2_34	55	56	535	11.6	12	$ 588	$ 314,176
2_35	56	WWMH2114	535	10.4	12	$ 551	$ 294,606
BOC3_2	BOSSMH3	WWMH1430	2,579	10.0	12	$ 514	$ 1,326,509
		Total Length:	5,252			**Base Construction Costs:**	**$ 2,937,000**
						Construction Estimating Contingency @ 30%	$ 881,000
						Total Construction Costs:	**$ 3,818,000**
						Engineering, CM, and Admin @ 35%	$ 1,336,000
						Total Project Costs:	**$ 5,160,000**

ATTACHMENT 2

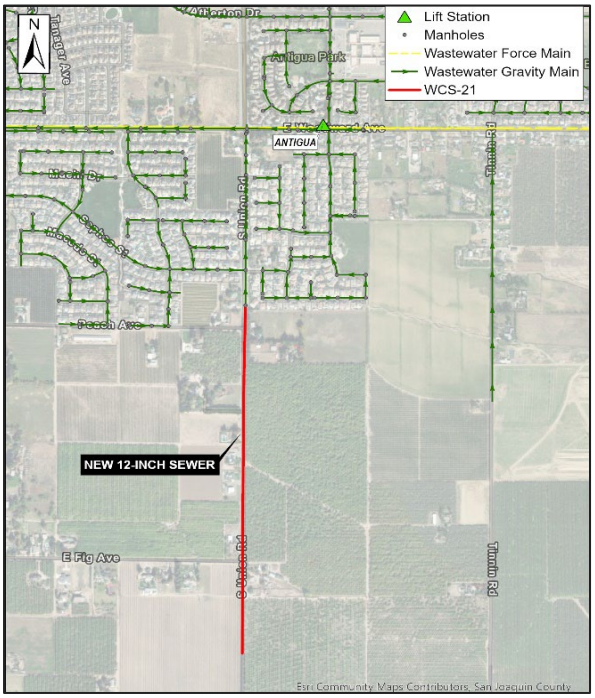
Project: WCS-21
Name: South Union Road Extension
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023

CIP Description:

1 New 12-inch sewer to be constructed.
2 Tie into existing sewer in South Union Road to extend sewer south.
3 New 12-inch sewer at standard slope (0.002 ft/ft).



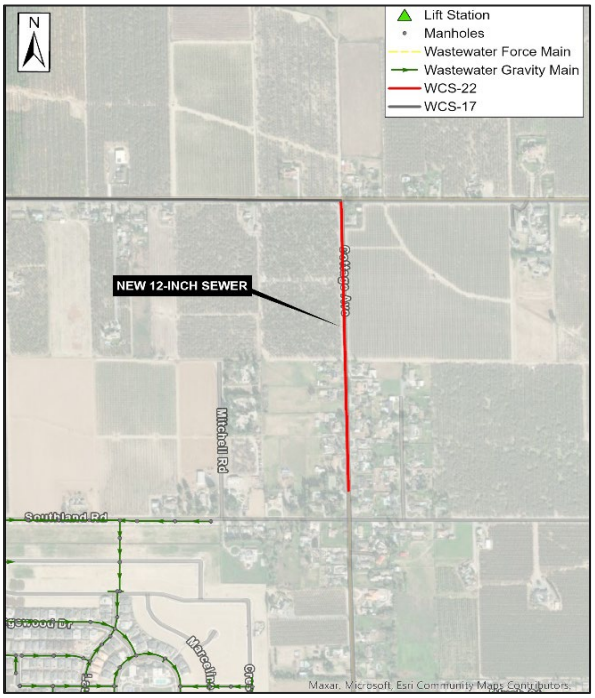
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
15_2	BOSSMH20	27	475	9.7	12	$ 514	$ 244,293
15_3	27	28	475	12.8	12	$ 624	$ 296,440
15_4	28	74	475	14.3	12	$ 707	$ 335,903
15_5	74	75	475	13.6	12	$ 697	$ 331,205
15_6	75	76	475	13.3	12	$ 661	$ 313,823
15_7	76	26	475	13.6	12	$ 697	$ 331,205
BOC17_1	26	WWMH4954	1,090	13.6	12	$ 697	$ 760,054
		Total Length:	3,939			**Base Construction Costs:**	**$ 2,613,000**
						Construction Estimating Contingency @ 30%	$ 784,000
						Total Construction Costs:	**$ 3,397,000**
						Engineering, CM, and Admin @ 35%	$ 1,189,000
						Total Project Costs:	**$ 4,590,000**

ATTACHMENT 2

Project: WCS-22
Name: Cottage Avenue
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 12-inch sewer to be constructed.
2 Ties into new 15-inch sewer in East Lathrop Road (WCS-17).
3 New 12-inch sewer at standard slope (0.002 ft/ft).

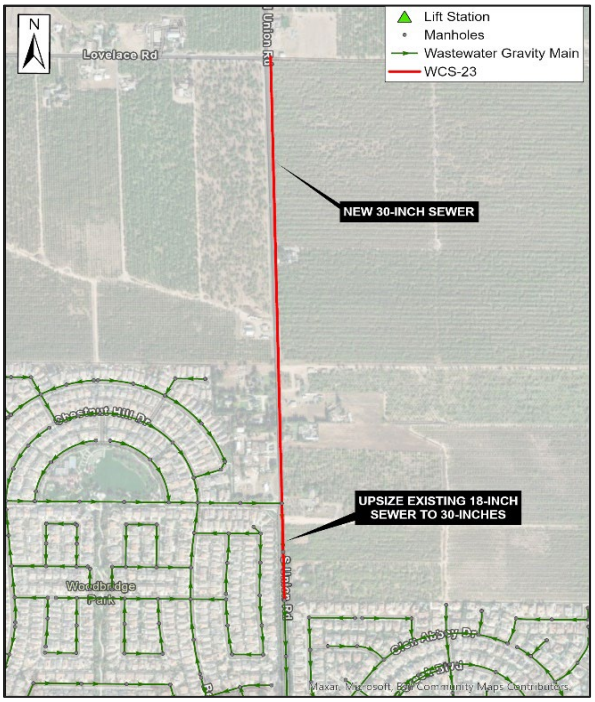
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
2_21	BOMH00029	30	482	13.0	12	$ 661	$ 318,278
2_22	30	BOMH00031	482	13.7	12	$ 697	$ 335,907
2_23	BOMH00031	32	482	15.3	12	$ 717	$ 345,437
2_24	32	33	482	18.9	12	$ 747	$ 359,731
2_25	33	11	482	22.3	12	$ 818	$ 394,036
		Total Length:	2,408			**Base Construction Costs:**	**$ 1,753,000**
						Construction Estimating Contingency @ 30%	$ 526,000
						Total Construction Costs:	**$ 2,279,000**
						Engineering, CM, and Admin @ 35%	$ 798,000
						Total Project Costs:	**$ 3,080,000**

ATTACHMENT 2

Project: WCS-23
Name: North Shed Union Road Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 30-inch sewer to be constructed.
2 Existing 18-inch sewer in North Union Road to be upsized to 30-inches.
3 New 30-inch sewer slope = 0.0006 ft/ft or greater.

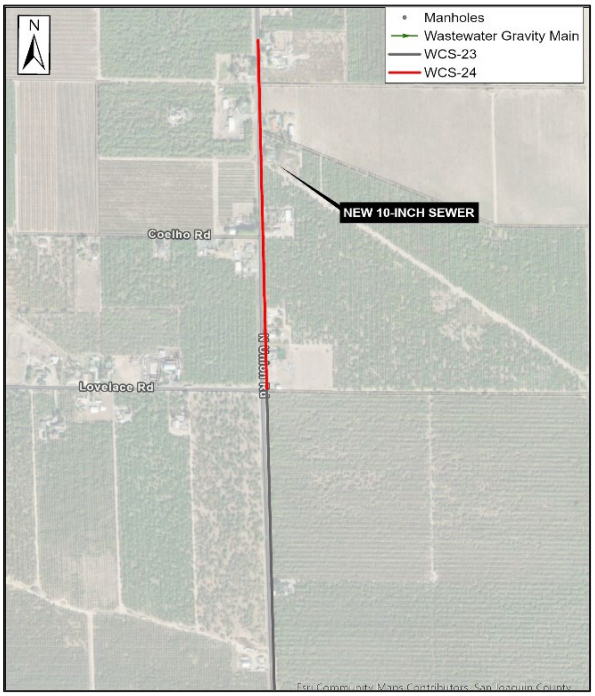
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC4_13	BOSSMH18	BOSSMH205	469	20.7	30	$ 1,533	$ 719,386
BOC4_14	BOSSMH205	BOSSMH206	469	20.6	30	$ 1,533	$ 719,511
BOC4_15	BOSSMH206	BOSSMH207	469	21.3	30	$ 1,567	$ 735,294
BOC4_16	BOSSMH207	BOSSMH208	469	22.1	30	$ 1,601	$ 751,079
BOC4_17	BOSSMH208	BOSSMH209	469	22.9	30	$ 1,601	$ 751,077
BOC4_18	BOSSMH209	BOSSMH210	469	23.4	30	$ 1,634	$ 766,861
BOC4_19	BOSSMH210	BOSSMH211	469	23.6	30	$ 1,634	$ 766,860
BOC4_20	BOSSMH211	BOSSMH212	469	23.7	30	$ 1,634	$ 766,861
BOC4_21	BOSSMH212	WWMH3784_	100	23.6	30	$ 1,634	$ 164,252
BOC4_21.5	WWMH3784_	BOSSMH213	369	23.7	30	$ 1,634	$ 602,608
BOC4_22	BOSSMH213	WWMH3782	469	21.6	30	$ 1,567	$ 735,426
		Total Length:	4,692			**Base Construction Costs:**	**$ 7,479,000**
						Construction Estimating Contingency @ 30%	$ 2,244,000
						Total Construction Costs:	**$ 9,723,000**
						Engineering, CM, and Admin @ 35%	$ 3,403,000
						Total Project Costs:	**$13,130,000**

ATTACHMENT 2

Project: WCS-24
Name: Manteca Junction Trunk
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 10-inch sewer to be constructed.
2 New 10-inch sewer to tie into new 30-inch sewer (WCS-23).
3 New 10-inch sewer at standard slope (0.0025 ft/ft).

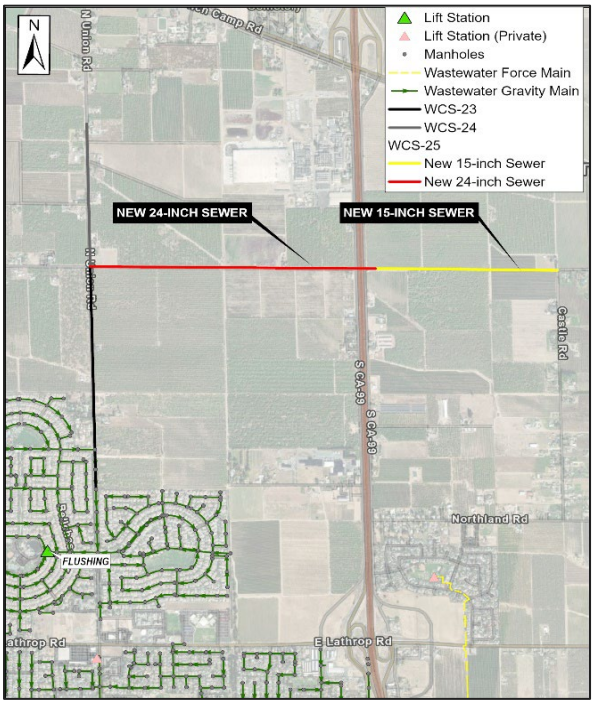
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC4_2	BOSSMH4	BOSSMH214	501	12.2	10	$ 624	$ 312,961
BOC4_23	BOSSMH214	BOSSMH215	501	13.7	10	$ 697	$ 349,703
BOC4_24	BOSSMH215	BOSSMH216	501	14.8	10	$ 707	$ 354,662
BOC4_25	BOSSMH216	BOSSMH217	501	15.8	10	$ 717	$ 359,623
BOC4_26	BOSSMH217	BOSSMH218	501	16.9	10	$ 727	$ 364,583
BOC4_27	BOSSMH218	BOSSMH18	501	19.2	10	$ 757	$ 379,506
		Total Length:	3,008			**Base Construction Costs:**	**$ 2,121,000**
						Construction Estimating Contingency @ 30%	$ 636,000
						Total Construction Costs:	**$ 2,757,000**
						Engineering, CM, and Admin @ 35%	$ 965,000
						Total Project Costs:	**$ 3,730,000**

ATTACHMENT 2

Project: WCS-25
Name: Lovelace Road - 99 Crossing
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 New 24- and 15-inch sewers to be constructed.
2 New 24-inch sewer slope = 0.0008 ft/ft, New 15-inch sewer slope = 0.0015 ft/ft.
3 New 24-inch highway crossing along alignment.

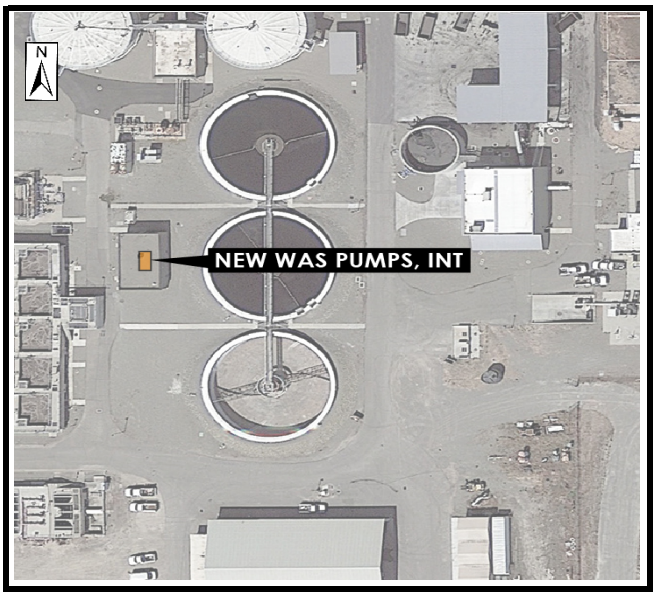
Pipeline ID	Upstream Manhole	Downstream Manhole	Total Length (LF)	Average Depth (ft)	Pipe Size (in)	Unit Cost ($/LF)	Pipe Segment Cost
BOC17_10	BOSSMH192	BOSSMH193	471	21.1	24	$ 1,328	$ 625,246
BOC17_11	BOSSMH193	BOSSMH194	471	20.4	24	$ 1,296	$ 610,337
BOC17_12	BOSSMH194	BOSSMH195	471	19.6	24	$ 1,273	$ 599,355
BOC17_13	BOSSMH195	BOSSMH196	471	19.2	24	$ 1,273	$ 599,355
BOC17_14	BOSSMH196	BOSSMH197	471	19.0	24	$ 1,273	$ 599,355
BOC17_15	BOSSMH197	BOSSMH198	471	19.2	24	$ 1,273	$ 599,355
BOC17_16	BOSSMH198	BOSSMH199	471	19.6	24	$ 1,273	$ 599,355
BOC17_17	BOSSMH199	BOSSMH200	471	19.6	24	$ 1,273	$ 599,355
BOC17_18	BOSSMH200	BOSSMH201	471	19.6	24	$ 1,273	$ 599,354
BOC17_19	BOSSMH201	BOSSMH18	471	20.3	24	$ 1,296	$ 610,337
BOC17_6	BOSSMH87	BOSSMH189	471	19.2	15	$ 858	$ 404,007
BOC17_7	BOSSMH189	BOSSMH190	471	20.3	15	$ 871	$ 409,998
BOC17_8	BOSSMH190	BOSSMH191	471	21.2	24	$ 1,328	$ 625,245
BOC17_9	BOSSMH191	BOSSMH192	471	21.4	24	$ 1,328	$ 625,248
BOC20_10	BOSSMH186	BOSSMH187	444	17.1	15	$ 832	$ 369,563
BOC20_11	BOSSMH187	BOSSMH188	444	17.8	15	$ 832	$ 369,563
BOC20_12	BOSSMH188	BOSSMH87	444	18.5	15	$ 845	$ 375,209
BOC20_7	BOSSMH88	BOSSMH184	444	15.2	15	$ 807	$ 358,269
BOC20_8	BOSSMH184	BOSSMH185	444	16.1	15	$ 820	$ 363,916
BOC20_9	BOSSMH185	BOSSMH186	444	16.7	15	$ 820	$ 363,916
		Total Length:	9,257		**Base Construction Costs:**		**$10,306,000**
					Construction Estimating Contingency @ 30%		$ 3,092,000
					Total Construction Costs:		**$13,398,000**
					Engineering, CM, and Admin @ 35%		$ 4,689,000
					Total Project Costs:		**$18,090,000**

ATTACHMENT 2

Project: WQCF-1
Name: North and South Plant WAS Pump Replacement Project
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023



CIP Description:

1 Replace the waste activated sludge (WAS) pumps in both the Northside and Southside Plants

Total Construction Costs:	**$**	**2,094,000**
Engineering, Construction Management and Administration (35%)	$	733,000
Total Project Costs:	**$**	**2,827,000**

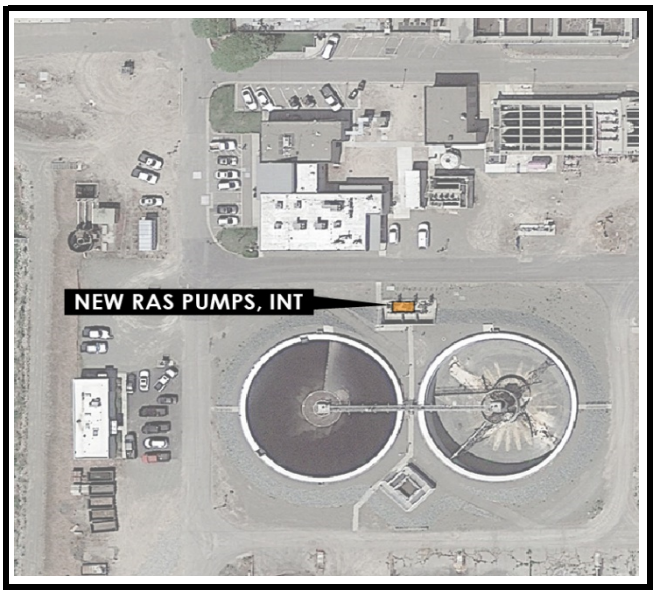
(1) Construction costs obtained from the bids received for the City of Manteca North and South Plant WAS Pump Replacement Project. Since these costs were obtained from an actual bid, a construction contingency was not included.

ATTACHMENT 2

Project: WQCF-2
Name: South Plant RAS Pump Replacement Project
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
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CIP Description:

1 Replace the Return Activated Sludge (RAS) pumps in the Southside Plant.

Total Construction Costs:	**$**	**1,224,000**
Engineering, Construction Management and Administration (35%)	$	428,000
Total Project Costs:	**$**	**1,652,000**

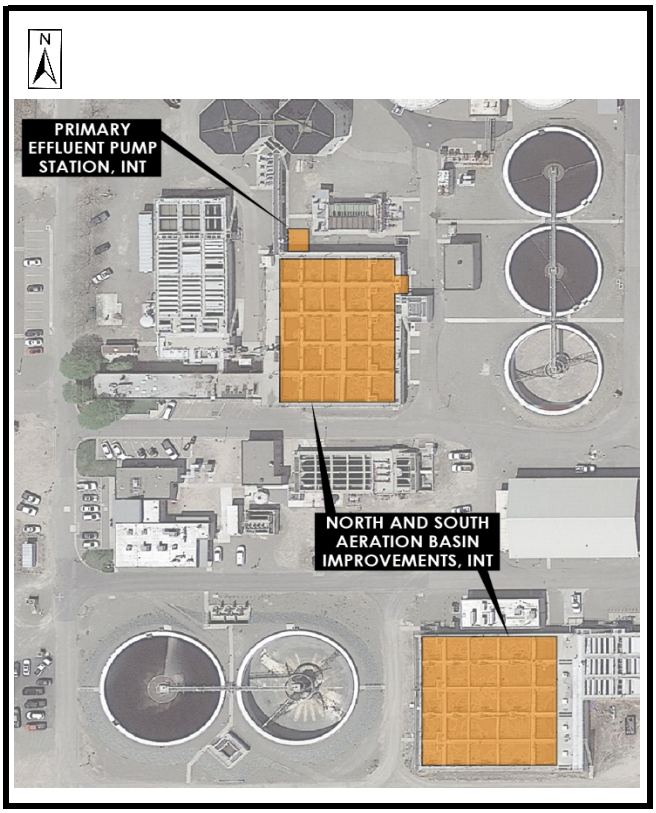
(1) Construction costs obtained from the bids received for the City of Manteca South Plant RAS Pump Replacement Project. Since these costs were obtained from an actual bid, a construction contingency was not included.

ATTACHMENT 2

Project: WQCF-3
Name: North and South Plant Aeration Basins Improvements
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

1 Northside Plant Improvements:
- -Increase the volume of the aeration basins 22 percent by raising the water depth and reconfiguring the biological treatment zones so the first and fourth zones are anoxic.
- -Remove cyclic aeration in the second zone.
- -Install a new Internal Recycle Pump Station (IRPS).
- -Install a new Primary Effluent Pump Station (PEPS).
- -Modify the existing Influent Channel to accommodate a two-train operation to replace the existing five parallel trains.

2 Southside Plant Improvements:
- -Reconfigure the biological treatment zones so the first and fourth zones are anoxic.
- -Remove cyclic aeration in the second zone.
- -Install a new Internal Recycle Pump Station (IRPS).

Total Construction Costs:	**$**	**8,664,000**
Engineering, Construction Management and Administration (35%)	$	3,032,000
Total Project Costs:	**$**	**11,696,000**

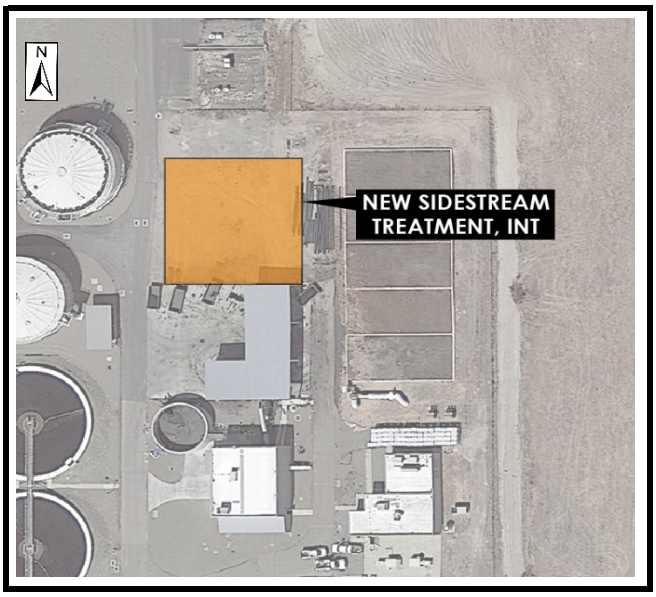
(1) Construction costs obtained from the City of Manteca WQCF Capacity Improvements 50% Basis of Design Report (Pace, August 2023). Construction contingency was assumed to be included and therefore was not added here.

ATTACHMENT 2

Project: WQCF-4
Name: Sidestream Treatment System
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

1 Add sidestream treatment for sludge dewatering return flows.

Base Construction Costs:	**$**	**11,513,000**
Estimating Contingency (30%)	$	3,454,000
Total Construction Costs:	**$**	**14,967,000**
Engineering, Construction Management and Administration (35%)	$	5,238,000
Total Project Costs:	**$**	**20,205,000**

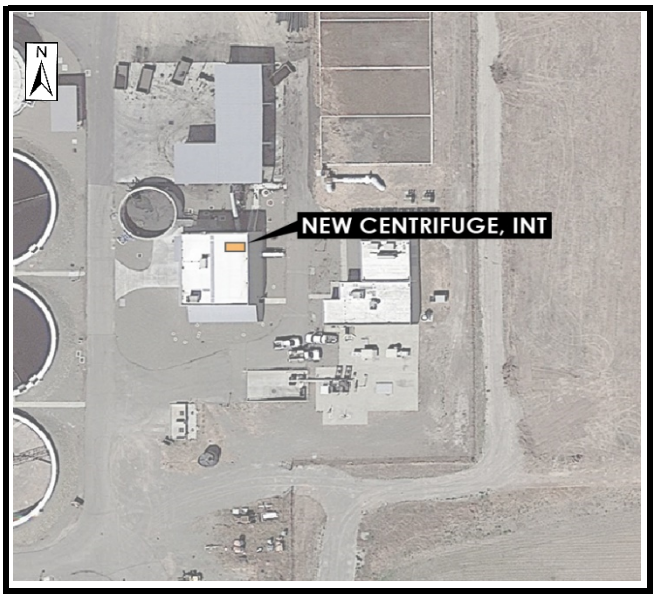
(1) Costs escalated from WQCF 2021 Capacity Assessment.

ATTACHMENT 2

Project: WQCF-5
Name: Add Centrifuge No. 3
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

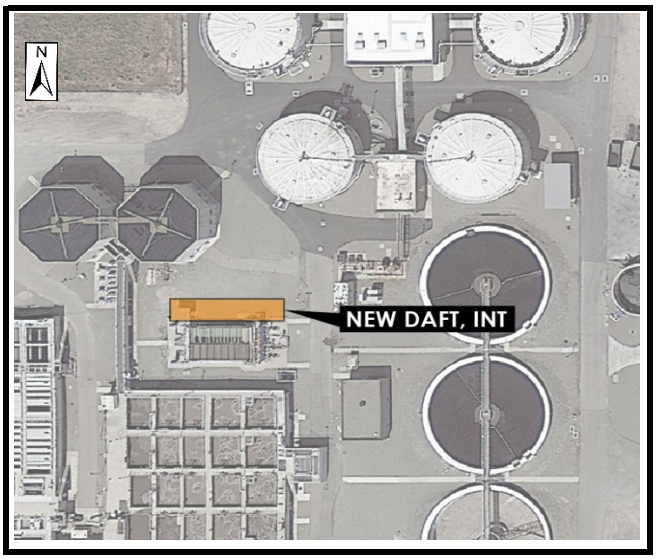
1 Add a third centrifuge, new sludge feed pump, and new polymer blending unit.

Base Construction Costs:	**$**	**2,923,000**
Estimating Contingency (30%)	$	877,000
Total Construction Costs:	**$**	**3,800,000**
Engineering, Construction Management and Administration (35%)	$	1,330,000
Total Project Costs:	**$**	**5,130,000**

(1) Costs escalated from WQCF 2021 Capacity Assessment.

ATTACHMENT 2

Project: WQCF-6
Name: Add DAFT No. 3
ENRCCI: 13,176 (March 2023)



CITY OF MANTECA

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CIP Description:

1 Add DAFT No. 3.

Base Construction Costs:	**$**	**2,239,000**
Estimating Contingency (30%)	$	672,000
Total Construction Costs:	**$**	**2,911,000**
Engineering, Construction Management and Administration (35%)	$	1,019,000
Total Project Costs:	**$**	**3,930,000**

(1) Costs escalated from WQCF 2021 Capacity Assessment.

ATTACHMENT 2

Project: WQCF-7
Name: Core Supervisory Control and Data Acquisition (SCADA) System
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

1 Provide new core SCADA server and network system migrating to Ignition SCADA HMI software.

Base Construction Costs:	**$**	**642,000**
Estimating Contingency (30%)	$	193,000
Total Construction Costs:	**$**	**835,000**
Engineering, Construction Management and Administration (35%)	$	292,000
Total Project Costs:	**$**	**1,127,000**

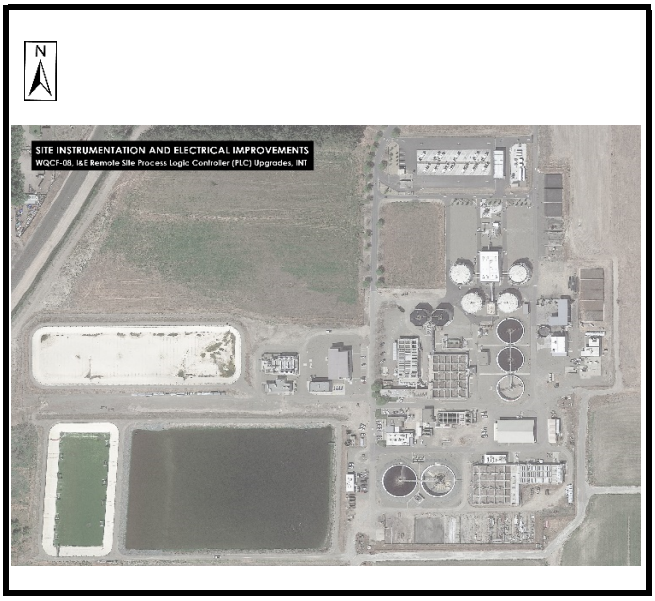
(1) Costs escalated from the report, City of Manteca WQCF SCADA Master Plan – Technology Drive Solutions for Safe and Reliable Water Quality (Carollo Engineers, Inc., April 2020).

ATTACHMENT 2

Project: WQCF-8
Name: Remote Site Process Logic Controller (PLC) Upgrades
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

1 Provide remote site PLC upgrades for sewer and stormwater lift stations.

Base Construction Costs:	**$**	**984,000**
Estimating Contingency (30%)	$	295,000
Total Construction Costs:	**$**	**1,279,000**
Engineering, Construction Management and Administration (35%)	$	448,000
Total Project Costs:	**$**	**1,727,000**

(1) Costs escalated from the report, City of Manteca WQCF SCADA Master Plan – Technology Drive Solutions for Safe and Reliable Water Quality (Carollo Engineers, Inc., April 2020).

ATTACHMENT 2

Project: WQCF-9
Name: Process Logic Controller (PLC) and Operator Interfaced Terminal (OIT) Replacement
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

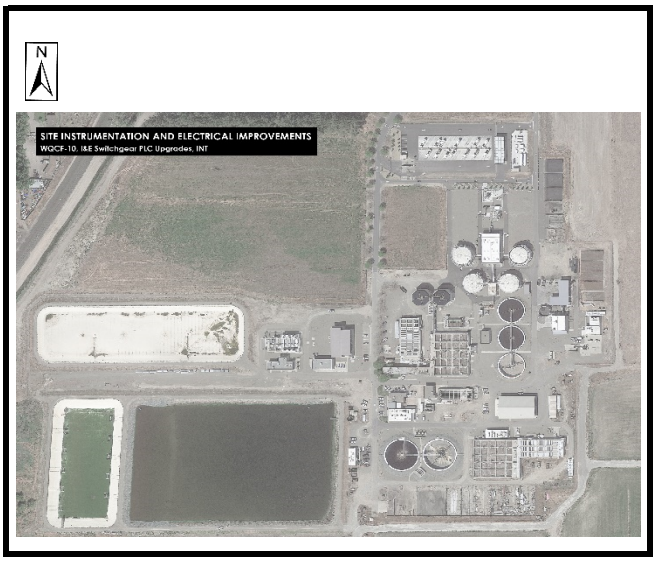
1 Replace existing WQCF legacy PLC systems and associated network hardware as well as the operator interfaced terminals (OITs).

Base Construction Costs:	**$**	**783,000**
Estimating Contingency (30%)	$	235,000
Total Construction Costs:	**$**	**1,018,000**
Engineering, Construction Management and Administration (35%)	$	356,000
Total Project Costs:	**$**	**1,374,000**

(1) Costs escalated from the report, City of Manteca WQCF SCADA Master Plan – Technology Drive Solutions for Safe and Reliable Water Quality (Carollo Engineers, Inc., April 2020).

ATTACHMENT 2

Project: WQCF-10
Name: Switchgear PLC Upgrades
ENRCCI: 13,176 (March 2023)



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CIP Description:

1 Upgrade switchgear and power systems PLCs to latest supported model.

Base Construction Costs:	**$**	**72,000**
Estimating Contingency (30%)	$	22,000
Total Construction Costs:	**$**	**94,000**
Engineering, Construction Management and Administration (35%)	$	33,000
Total Project Costs:	**$**	**127,000**

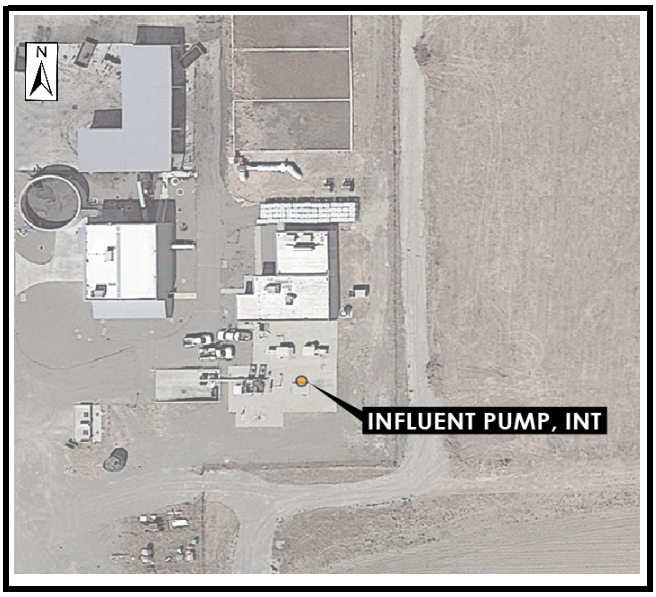
(1) Costs escalated from the report, City of Manteca WQCF SCADA Master Plan – Technology Drive Solutions for Safe and Reliable Water Quality (Carollo Engineers, Inc., April 2020).

ATTACHMENT 2

Project: WQCF-11
Name: Add Influent Pump No. 5
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

1 Add Influent Pump No. 5 in the Influent Pump Station.

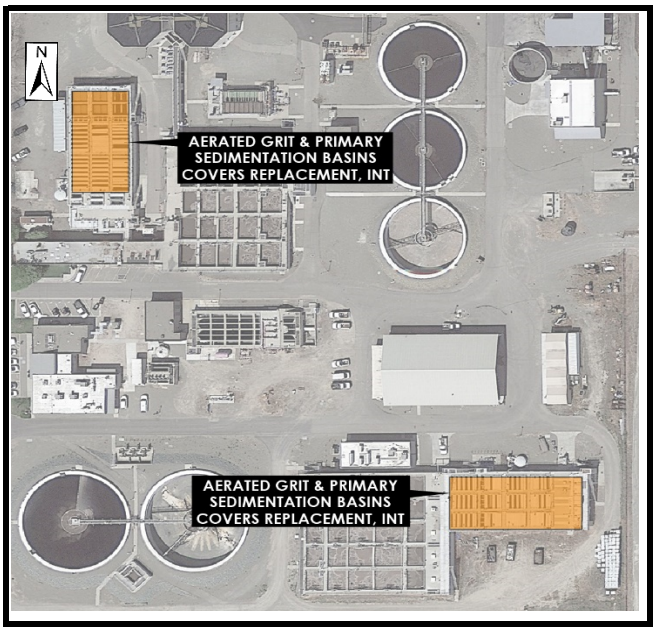
Base Construction Costs:	**$**	**597,000**
Estimating Contingency (30%)	$	179,000
Total Construction Costs:	**$**	**776,000**
Engineering, Construction Management and Administration (35%)	$	272,000
Total Project Costs:	**$**	**1,048,000**

ATTACHMENT 2

Project: WQCF-12
Name: Lightweight Covers for Process Basins
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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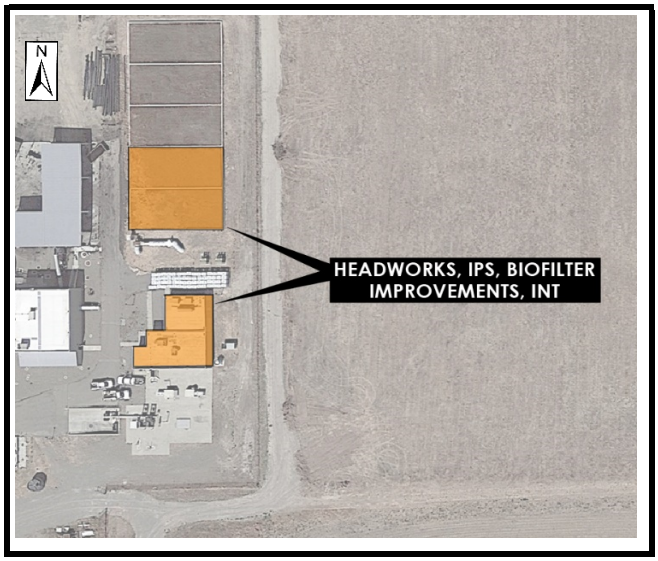
CIP Description:

1 Add lightweight covers for the aerated grit tanks, primary sedimentation basins, and chlorine contact tank.

Base Construction Costs:	**$**	**3,300,000**
Estimating Contingency (30%)	$	990,000
Total Construction Costs:	**$**	**4,290,000**
Engineering, Construction Management and Administration (35%)	$	1,502,000
Total Project Costs:	**$**	**5,792,000**

ATTACHMENT 2

Project: WQCF-13
Name: Headworks, IPS and Biofilter Improvements
ENRCCI: 13,176 (March 2023)



CITY OF MANTECA

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CIP Description:

1 Provide a new ventilation where foul air from the junction structure, covered channels and room air will be exhausted to the biofilter for treatment.
2 Ventilate the operating space at 5,500 cfm (12 air changes per hour) to the upgraded biofilter for treatment.
3 Replace existing exhaust ductwork in the Influent Junction Structure, Screen Room and Wet Well. Provide a new exhaust ductwork system for the operating space. All ductwork should be provided with air balancing/isolation dampers for all pickup points.
4 Replace existing odor control fan with a spark and corrosion resistant, FRP unit
5 Replace lava rock media in the biofilter with inorganic media provided by Biorem©, ECS or equivalent
6 The biofilter media cells (2 total) should be provided with a cover system
7 Reconfigure the exhaust duct from the odor control fan downstream of the existing grease/particulate filter. Specifically, the ductwork should be routed above grade to feed the two biofilter cells that will be refurbished and provided with an accessible balancing isolation damper.

Base Construction Costs:	**$**	**1,185,000**
Estimating Contingency (30%)	$	356,000
Total Construction Costs:	**$**	**1,541,000**
Engineering, Construction Management and Administration (35%)	$	539,000
Total Project Costs:	**$**	**2,080,000**

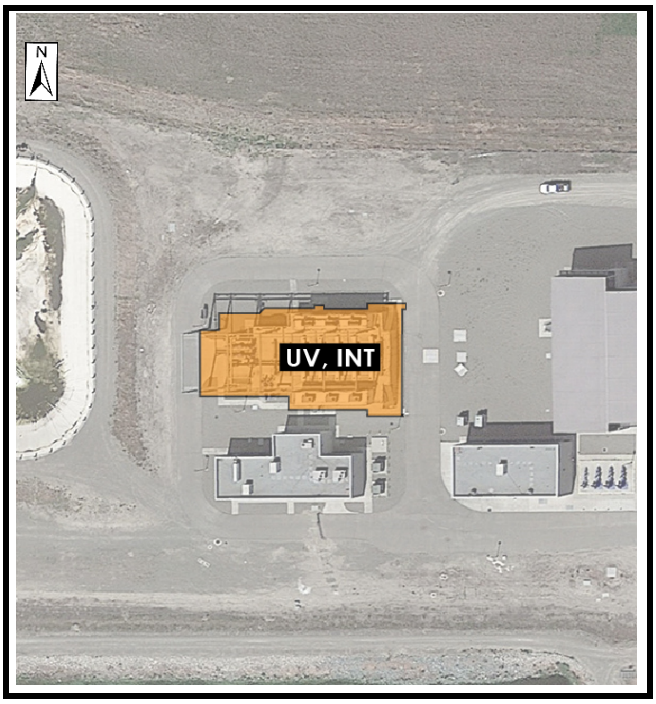
(1) Cost escalated from the technical memo, Manteca WQCF Biofilter Evaluation (HERWIT and Stantec, February 2015).

ATTACHMENT 2

Project: WQCF-14
Name: UV Disinfection System Upgrade
ENRCCI: 13,176 (March 2023)

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CIP Description:

1 Split the two existing channels into four channels
2 Increase the depth of the existing channels
3 Install the Duron 8 equipment
4 Replace the existing shipping containers and the enclosures inside them with freestanding Type 4X stainless steel ballast enclosures each with a side mounted AC unit for internal cooling.
5 Construct a wall on the south side to block sun exposure to the ballast panels.

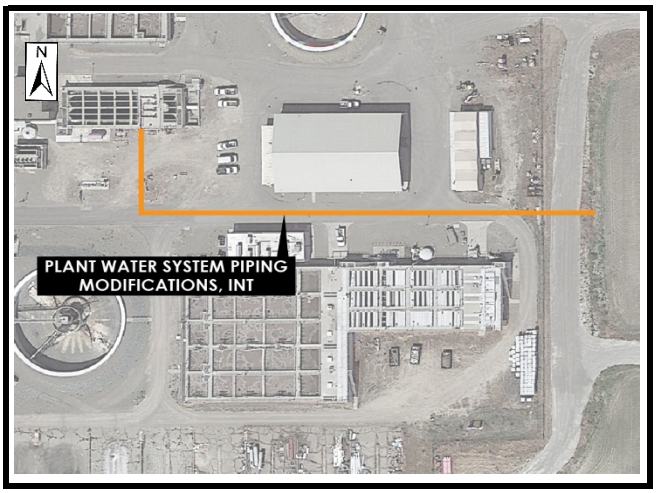
Base Construction Costs:	**$**	**8,879,000**
Estimating Contingency (30%)	$	2,664,000
Total Construction Costs:	**$**	**11,543,000**
Engineering, Construction Management and Administration (35%)	$	4,040,000
Total Project Costs:	**$**	**15,583,000**

ATTACHMENT 2

Project: WQCF-15
Name: Plant Water System Piping Modifications
ENRCCI: 13,176 (March 2023)

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CIP Description:

1 Separate the in-plant water system piping from the pipeline going off site by installing a forcemain to connect the effluent pumps to the forcemain going to Great Wolf Lodge.

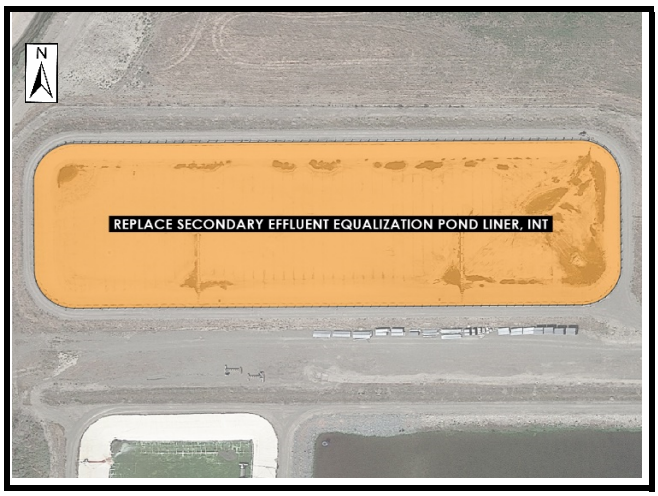
Base Construction Costs:	**$**	**362,000**
Estimating Contingency (30%)	$	109,000
Total Construction Costs:	**$**	**471,000**
Engineering, Construction Management and Administration (35%)	$	165,000
Total Project Costs:	**$**	**636,000**

ATTACHMENT 2

Project: WQCF-16
Name: Replace Secondary Effluent Equalization Pond Liner
ENRCCI: 13,176 (March 2023)

CITY OF MANTECA

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CIP Description:

1 Replace the Secondary Effluent Equalization Pond Liner

Base Construction Costs:	**$**	**1,197,000**
Estimating Contingency (30%)	$	359,000
Total Construction Costs:	**$**	**1,556,000**
Engineering, Construction Management and Administration (35%)	$	545,000
Total Project Costs:	**$**	**2,101,000**

ATTACHMENT 2

Project: WQCF-17
Name: Headworks Screen No. 3
ENRCCI: 13,176 (March 2023)

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CIP Description:

1 Replace Headworks Screen No. 3.

Base Construction Costs:	**$**	**513,000**
Estimating Contingency (30%)	$	154,000
Total Construction Costs:	**$**	**667,000**
Engineering, Construction Management and Administration (35%)	$	233,000
Total Project Costs:	**$**	**900,000**

(1) Cost obtained from the recent project, WQCF Bar Screen Project, which was started up in October 2022.

ATTACHMENT 2

Project: WQCF-18
Name: FOG Receiving Station Screening System
ENRCCI: 13,176 (March 2023)



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CIP Description:

1 Replace the FOG Receiving Station Screening System

Base Construction Costs:	**$**	**114,000**
Estimating Contingency (30%)	$	34,000
Total Construction Costs:	**$**	**148,000**
Engineering, Construction Management and Administration (35%)	$	52,000
Total Project Costs:	**$**	**200,000**

ATTACHMENT 2

Project: WQCF-19
Name: Bulk Ferric Chloride Solution Tanks
ENRCCI: 13,176 (March 2023)

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CIP Description:

1 Replace the two 1,500-gallon chemical tanks with two 2,700-gallon chemical tanks

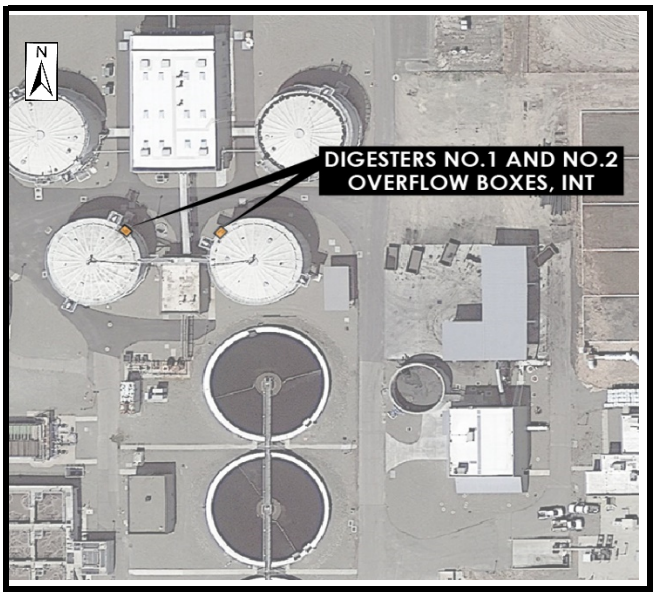
Base Construction Costs:	**$**	**200,000**
Estimating Contingency (30%)	$	60,000
Total Construction Costs:	**$**	**260,000**
Engineering, Construction Management and Administration (35%)	$	91,000
Total Project Costs:	**$**	**351,000**

ATTACHMENT 2

Project: WQCF-20
Name: Digesters No. 1 and 2 Overflow Boxes
ENRCCI: 13,176 (March 2023)

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CIP Description:

1 Construct new overflow boxes and piping for Digesters No. 1 and 2

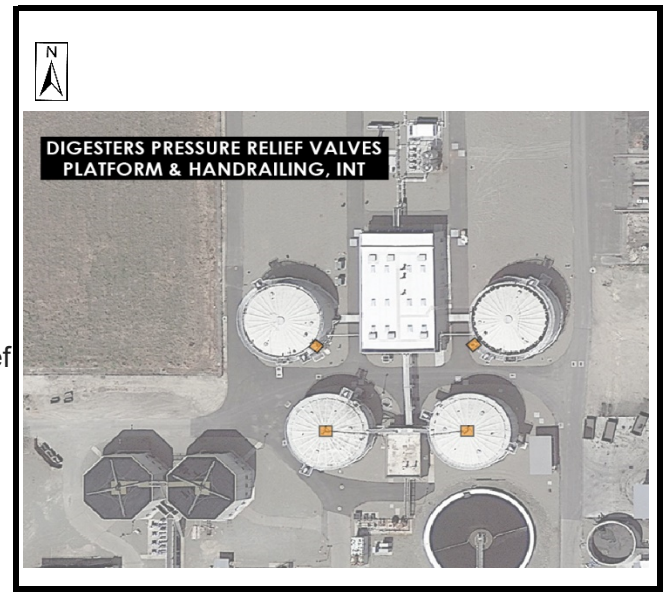
Base Construction Costs:	**$**	**402,000**
Estimating Contingency (30%)	$	121,000
Total Construction Costs:	**$**	**523,000**
Engineering, Construction Management and Administration (35%)	$	183,000
Total Project Costs:	**$**	**706,000**

ATTACHMENT 2

Project: WQCF-21
Name: Digester Pressure Relief Valves Platform & Handrailing
ENRCCI: 13,176 (March 2023)

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CIP Description:

1 Provide platform and handrail for gas pressure relief valves at all digesters

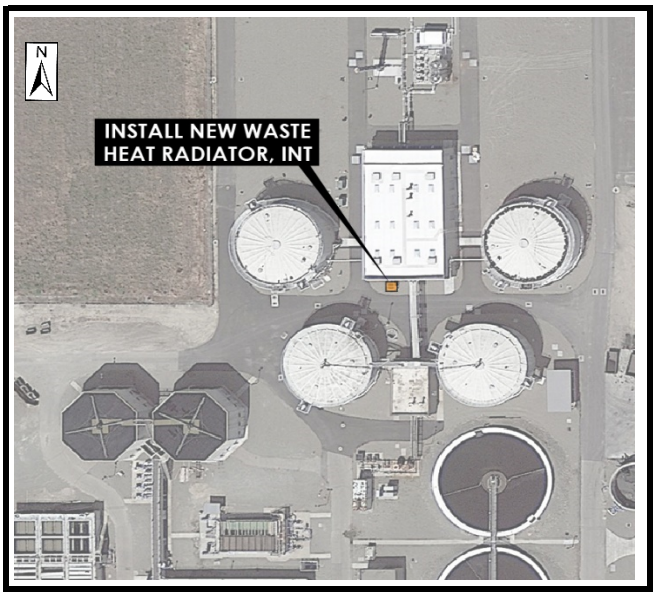
Base Construction Costs:	**$**	**117,000**
Estimating Contingency (30%)	$	35,000
Total Construction Costs:	**$**	**152,000**
Engineering, Construction Management and Administration (35%)	$	53,000
Total Project Costs:	**$**	**205,000**

ATTACHMENT 2

Project: WQCF-22
Name: Install New Waste Heat Radiator
ENRCCI: 13,176 (March 2023)

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CIP Description:

1 Install new (larger) waste heat radiator.

Base Construction Costs:	**$**	**113,000**
Estimating Contingency (30%)	$	34,000
Total Construction Costs:	**$**	**147,000**
Engineering, Construction Management and Administration (35%)	$	51,000
Total Project Costs:	**$**	**198,000**

ATTACHMENT 2

Project: WQCF-23
Name: WQCF Phase IV Stage 1 Expansion Project
ENRCCI: 13,176 (March 2023)

SEE IMAGE ON NEXT SHEET

CITY OF MANTECA

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CIP Description:

1 Install two new flow meters upstream of the return of the in-plant recycle streams (one on both the north and south sanitary sewer trunks)
2 Install Influent Pump No. 6
3 Construct 2 new aerated grit tanks
4 Construct 2 new Primary Sedimentation Basins
5 Convert Southside aeration basin zone B to an anoxic zone and increase the aerobic volume by extending the Southside aeration basins to the west about 20 ft.
6 Construct Splitter Structure
7 Add Fine Screen No. 1 and 2
8 Add 2 MBR trains and 4 membrane tanks
9 Construct MBR Blower Building and install blowers
10 Modify Effluent Pump Station and install Effluent Pump No. 3
11 Construct Cooling Effluent Basin
12 Complete a new River Temperature Study and depending on the outcomes of the study, construct Effluent Cooling Towers No. 1 through 4
13 Construct Cooling Basin Effluent Pump Station and install Cooling Basin Effluent Pumps No. 1 through 3
14 Add DAFT No. 4
15 Demolish the Biotowers and Biotower Pump
16 Add Anaerobic Digester No. 5
17 Expand the Digester Control Building and add new sludge pump, hot water pump with a 3-way valve, and grinder.
18 Replace existing centrifuge with larger centrifuge
19 Construct a Municipal Utilities Building as well as an asphalt paved parking lot and automated road access gates on the entrance road
20 Construct biosolids drying facilities

Description	Project Cost
Influent Flow Meter	$896,000
Influent Pump	$597,000
Aerated Grit Tanks at Southside Plant	$1,055,000
Primary Sedimentation Basins at Southside Plant	$4,611,000
Extend Aeration Basins at Southside Plant	$936,000
Splitter Structure	$468,000
Fine Screens for MBRs	$2,802,000
Membrane Bioreactors (MBRs) Structure & Equipment	$15,399,000
MBR Blower Building and Equipment	$1,878,000
Effluent Pump Station Expansion & Pumps	$806,000
Cooling Effluent Basin	$2,013,000
Effluent Cooling Towers	$11,835,000
Cooling Basin Effluent Pump Station	$2,658,000
DAFTs	$2,240,000
Biotower Demolition	$500,000
Anaerobic Digester	$2,660,000
Digester Control Building Extension & Equipment	$1,095,000
Centrifuge and Ancillary Equipment	$2,923,000
Municipal Utilities Building and Entrance Road	$10,685,000
Biosolids Drying Facilities	$17,308,000
Base Construction Costs:	**$ 83,365,000**
Estimating Contingency (30%)	$ 25,010,000
Total Construction Costs:	**$ 108,375,000**
Engineering, Construction Management and Administration (35%)	$ 37,931,000
Total Project Costs:	**$ 146,306,000**

ATTACHMENT 3

Stantec

60" NORTH INFLUENT FLOW METERING MANHOLE, S1

NEW ACCESS ROAD AT INTERSECTION OF W YOSEMITE & SWANSON RD, S1

ROAD DEMO, S1

PARKING AREA, S1

MUNICIPAL UTILITIES BUILDING, S1

NEW GATES

COOLING TOWERS 1-4, S1

COOLING EFFLUENT BASIN, S1

MCC, S1

BIOSOLIDS DRYING FACILITY, S1

DIGESTER CONTROL BUILDING, S1

DIGESTER, S1

BIO TOWERS DEMO, S1

NEW DAFT, S1

NEW CENTRIFUGE, S1

INFLUENT PUMP, S1

COOLING BASIN EFFLUENT PUMP STATION, S1

EFFLUENT PUMP, S1

CHECK VALVE, S1

SPLITTER STRUCTURE, S1

AERATION BASINS, S1

PSB, S1

AERATED GRIT TANKS, S1

BLOWER AND EQUIPMENT BUILDING, S1

MBR, S1

FINE SCREENS, S1

60" SOUTH INFLUENT FLOW METERING MANHOLE, S1

N

0 80 160 240 320 400 FEET

LEGEND

Interim Project Completed

S1 Stage 1 - 12.87 MGD

NOTE:
ONLY NEW INTERIM STRUCTURES ARE SHOWN NOT IMPROVEMENTS TO EXISTING STRUCTURES.

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WQCF-23

WQCF Phase IV Stage 1 Expansion Project

ATTACHMENT 2

Project: WQCF-24
Name: WQCF Phase IV Stage 2 Expansion Project
ENRCCI: 13,176 (March 2023)

SEE IMAGE ON NEXT SHEET

CITY OF MANTECA

Wastewater Master Plan
CIP Budgetary Cost Estimate
Stantec
November 2023

CIP Description:

1 Install Influent Pump No. 7 and a parallel force main to the Southside plant
2 Construct 2 new aerated grit tanks
3 Construct 2 new Primary Sedimentation Basins
4 Expand Splitter Structure
5 Add Fine Screen No. 3
6 Add 2 MBR trains and 4 membrane tanks
7 Expand MBR Blower Building and install blowers
8 Install Effluent Pump No. 4
9 Construct Effluent Cooling Tower No. 5 (depending on the outcome of the River Temperature Study)
10 Add Anaerobic Digester No. 6
11 Add Cooling Basin Effluent Pump No. 4
12 Add new sludge pump, hot water pump with a 3-way valve, and grinder.
13 Replace existing centrifuge with larger centrifuge
14 Construct biosolids drying facilities

Description	Project Cost
Influent Pump	$989,000
Aerated Grit Tanks at Southside Plant	$1,055,000
Primary Sedimentation Basins at Southside Plant	$4,611,000
Splitter Structure Piping	$63,000
Fine Screen for MBR	$900,000
Membrane Bioreactors (MBRs) Structure & Equipment	$15,399,000
MBR Blower Building and Equipment	$1,878,000
Effluent Pump Station Pump	$582,000
Effluent Cooling Towers	$2,555,000
Cooling Basin Effluent Pump Station Pump	$582,000
Anaerobic Digester	$2,660,000
Digester Control Building Equipment	$255,000
Centrifuge and Ancillary Equipment	$2,923,000
Biosolids Drying Facilities	$5,769,000
Base Construction Costs:	**$ 40,221,000**
Estimating Contingency (30%)	$ 12,066,000
Total Construction Costs:	**$ 52,287,000**
Engineering, Construction Management and Administration (35%)	$ 18,300,000
Total Project Costs:	**$ 70,587,000**

ATTACHMENT 3

Stantec

COOLING TOWER 5, S2

BIOSOLIDS DRYING FACILITY, S2

NEW GATES

DIGESTER, S2

COOLING BASIN EFFLUENT PUMP 4, S2

EFFLUENT PUMP, S2

NEW CENTRIFUGE, S2

INFLUENT PUMP, S2

PSB, S2

AERATED GRIT TANKS, S2

BLOWER AND EQUIPMENT BUILDING, S2

MBR, S2

FINE SCREENS, S2

N

0 80 160 240 320 400 FEET

LEGEND

- Interim Project Completed
- Stage 1 - 12.87 MGD Completed
- S2 Stage 2 - 17.5 MGD

NOTE:
ONLY NEW INTERIM AND STAGE 1 STRUCTURES ARE SHOWN NOT IMPROVEMENTS TO EXISTING STRUCTURES.

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WQCF-24

WQCF Phase IV Stage 2 Expansion Project