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2024 WASTEWATER SYSTEM MASTER PLAN AMENDMENT

City of Lathrop

December 2024

EKI C20049.02

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2024 Wastewater System Master Plan Amendment

City of Lathrop

December 2024

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2024 Wastewater System Master Plan Amendment

City of Lathrop

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LIST OF ABBREVIATIONS

AAF	Average Annual Flow
AAFES	Army & Air Force Exchange Services
ac	acre
ADWF	Average Dry Weather Flow
AOI	Area of Interest
BSF	Base Sanitary Flow
BOD	Biological Oxygen Demand
CCI	Construction Cost Index
CII	Commercial, Industrial, and Institutional
CIP	Capital Improvement Projects
City	City of Lathrop
CLSP	Central Lathrop Specific Plan
d/D	depth to Diameter
Depot	Sharpe Army Depot
DOF	Department of Finance
du	dwelling unit
EKI	EKI Environment & Water, Inc.
ENR	Engineering News Record
fps	feet per second
GIS	Geographical Information System
gpd	gallons per day
I-5	Interstate 5
I&I	Infiltration and Inflow
IWRMP	Integrated Water Resources Master Plan
Lathrop CTF	Lathrop Consolidated Treatment Facility
LF	Linear Feet
LS	Lift Station
MGD	Million Gallons per Day
MWQCF	Manteca Wastewater Quality Control Facility
NPDES	National Pollution Discharge Elimination System
OPC	Opinion of Probable Cost
PS	Pump Station
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
SCADA	Supervisory Control and Data Acquisition
SLSP	South Lathrop Specific Plan
SOI	Sphere of Influence
TDH	Total Dynamic Head
UWMP	Urban Water Management Plan
VC	Vitrified Clay
WDR	Waste Discharge Requirements
WWSMP	Wastewater System Master Plan
WWTF	Wastewater Treatment Facility

EXECUTIVE SUMMARY

EKI Environment & Water, Inc. (EKI) has prepared this Wastewater System Master Plan Amendment (WWSMP Amendment) for the City of Lathrop, California (City). This WWSMP Amendment was developed as part of the 2024 Amendment to the City's Integrated Water Resources Master Plan (IWRMP Amendment), a comprehensive planning process involving the City's Potable Water System, Wastewater System, and Recycled Water System Master Plans. This WWSMP Amendment incorporates new information that has become available and changed planning assumptions since the completion of the 2019 IWRMP.

STUDY AND SERVICE AREAS

The City completed a General Plan Update in September 2022 (Lathrop, 2022a) which included updated growth projections for the City. In addition, development projections have changed significantly in the River Islands area with approval of the modified River Islands Phase 2 project in June 2021 and revisions to the Central Lathrop area development plans.

The current population within the City is approximately 35,080 as of January 2023 (California DOF, 2023). The City has experienced significant growth and anticipates growth to continue in the future given the existing entitlements for several large residential developments.

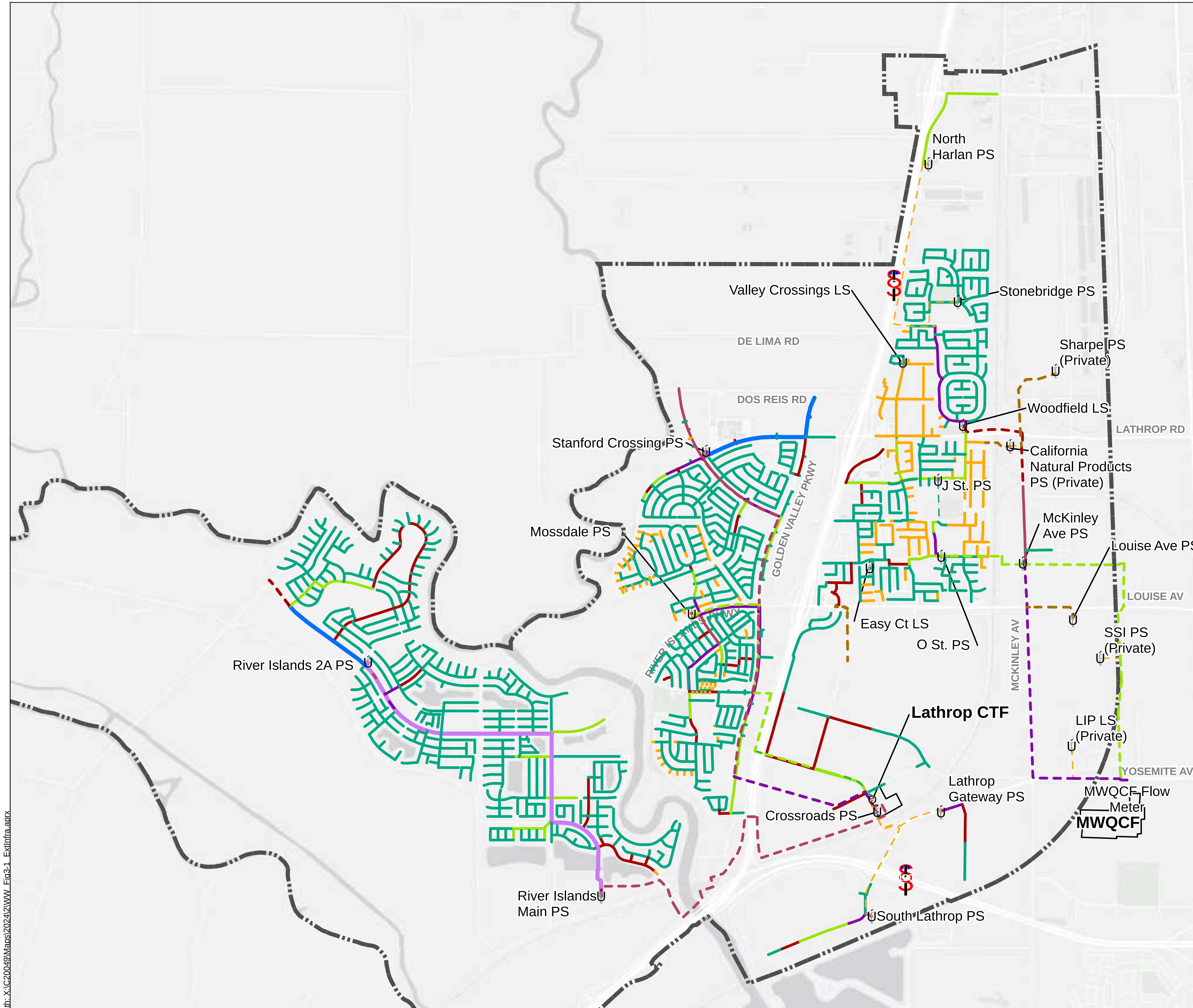
CITY'S EXISTING WASTEWATER INFRASTRUCTURE

Wastewater from the City is treated at two facilities: (1) the Lathrop Consolidated Treatment Facility (Lathrop CTF, or LCTF), and (2) the Manteca Wastewater Quality Control Facility (MWQCF). The City's allocated capacity at the MWQCF is 1.451 million gallons per day (MGD) of dry weather flow per the City's 2002 Agreement Amendment with Manteca. The Lathrop CTF has a treatment capacity of 2.5 MGD. The City is currently planning a Phase 3 Expansion that will expand CTF's capacity to a total of 5.0 MGD.

The City's wastewater collection system consists of approximately 102 miles of gravity mains, 23.6 miles of force mains, as well as 15 lift stations and pump stations. The City has a Supervisory Control and Data Acquisition (SCADA) system for control and monitoring of facilities. The City's wastewater infrastructure is shown on Figure ES-1.

EXISTING AND FUTURE WASTEWATER GENERATION

In 2022, the City generated a total average annual flow (AAF) of 2.17 MGD, including 1.11 MGD treated at the MWQCF (51%) and 1.06 MGD treated at the CTF (49%). The City's average dry weather flow (ADWF) was essentially equal to its AAF between 2017 and 2022, indicating minimal rainfall-induced infiltration and inflow (I&I). The total per capita ADWF is approximately 70 gallons of wastewater per capita per day.



Legend

- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station

Gravity Main Diameter, Inches

<= 4, 6, 8, 10, 12, 14 - 16, 18, 20 - 21, 24, > 30

Force Main Diameter, Inches

<= 4, 6, 8, 10, 12, 14 -16, 18, 20 - 21, 24, > 30

Abbreviations

CTF	= Consolidated Treatment Facility
LIP	= Lathrop Industrial Park
LS	= lift station
MWQCF	= Manteca Water Quality Control Facility
PS	= pump station
SSI	= Super Store Industries
WWTF	= wastewater treatment facility

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 14 May 2024.

0 3,000 6,000
(Scale in Feet)

City's Wastewater Infrastructure

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Figure ES-1

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Land use-specific wastewater generation factors were updated using the 2017 through 2022 historic wastewater flow and parcel-level water use data. The wastewater generation factors serve as the basis to estimate ADWF for future developments. The IWRMP updated wastewater generation factors (in units of gallons per day per dwelling unit or gallons per day per acre; gpd/du or gpd/ac) are presented in Table ES-1 below.

Table ES-1 Wastewater Flow Factors

	Wastewater Flow Factor	
	City-Wide	River Islands
Low Density Residential	240 gpd/du	200 gpd/du
Medium Density Residential	200 gpd/du	155 gpd/du
High Density Residential	110 gpd/ac	
Commercial	755 gpd/ac	
Industrial	240 gpd/ac	
Parks	55 gpd/ac	
Schools/Institutional	220 gpd/ac	

Wastewater ADWF projections were calculated as the sum of the two major components of future wastewater flow: (1) the volume of wastewater that best represents existing wastewater generation within the City, and (2) the anticipated wastewater generation associated with the future development projects and planning areas.

The City's projected wastewater generation by sector and by development area are estimated in five-year increments between 2025 and buildout in 2045. It is anticipated that the City's total ADWF at buildout in 2045 is estimated to be 5.67 MGD, which is 12.5% lower than the projections included in the 2019 WWSMP of 6.48 MGD. An ADWF of 1.36 MGD is anticipated to flow to MWQCF from Historic Lathrop and 4.31 MGD is projected to flow to the Lathrop CTF at buildout. The vast majority of the projected increase in wastewater generation at the CTF above current rates is associated with new development in River Islands and Central Lathrop.

WASTEWATER TREATMENT CAPACITY ASSESSMENT

The City's allocation at the MWQCF is sufficient to meet the projected wastewater flows to MWQCF at buildout. Flows to the CTF is anticipated to exceed the current CTF capacity between 2030 and 2035. The planned Phase 3 Expansion at the CTF will provide sufficient capacity to meet projected flows through buildout.

Both the MWQCF and the Lathrop CTF are observing increasing wastewater strength (i.e. concentration of pollutants and nutrients in wastewater) likely due to improved water use efficiency during the recent droughts and in response to state regulations. The increases in influent wastewater strength may further limit treatment capacities at the treatment plants. To review the pollutant concentration in Lathrop's wastewater conveyed to the MWQCF, EKI conducted monitoring study during October 2022.

HYDRAULIC ASSESSMENT

EKI updated the sewer system hydraulic model to represent the City's utility infrastructure as of January 2023. The hydraulic model was used to assess the ability of the City's existing infrastructure to support the wastewater flow projections summarized in Section 4. Existing infrastructure was assessed under two scenarios: Existing (2022) and Buildout (2045).

The City's collection system was primarily assessed against the capacity criteria, including depth to diameter (d/D) ratio in gravity mains and maximum velocity in force mains. Model results have shown that approximately 3% of City's existing gravity mains will not meet the capacity criteria by 2045. Most capacity deficiencies identified in the Buildout scenario already exist in the existing system, although the degree of deficiency may increase with projected development.

Pump stations are evaluated against the ability to convey peak wet weather flow (PWWF) within a station's firm capacity. A capacity deficiency has been identified in the Stonebridge Lift Station (LS) in both the Existing and Buildout scenario. All other pump stations are projected to have sufficient capacities to meet existing and future PWWFs.

The City's existing and planned force mains are able to convey projected wastewater flow through 2045.

RECOMMENDED CAPITAL IMPROVEMENT PROGRAM

The recommended collection system capital improvement projects (CIPs) from the 2019 WWSMP and the City's existing Capital Improvement Programs (Lathrop, 2023) have been reviewed and confirmed to address the potential deficiencies identified in the updated hydraulic assessment. However, EKI recommends additional analyses be conducted to confirm the required project extents and infrastructure sizing. Modifications and additions were made to treatment projects based on findings from the wastewater treatment capacity assessment in Section 5.

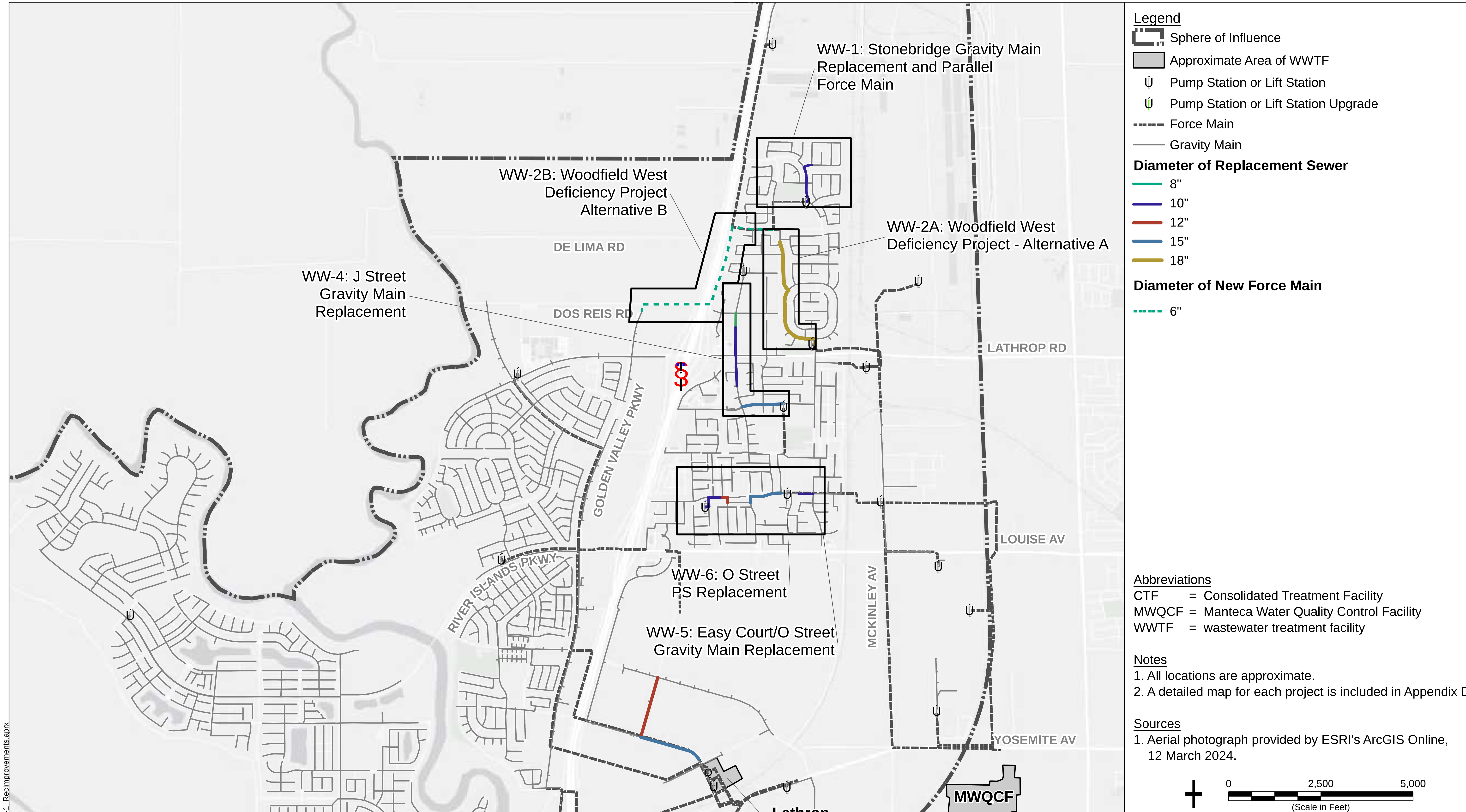
Figure ES-2 shows an overview of the collection system capacity project locations, and Table ES-2 summarizes all the identified collection system improvement projects, including location, proposed improvements, estimated planning level costs, and alternatives.

Table ES-2. Recommended Capital Improvement Projects

Project Number	Project	Timeframe	Addresses Modeled Surcharging in Existing Scenario	Total Project OPC (a)
Treatment Facility Improvement Projects				
WWT-1	Manteca Interim Improvements	Near-term (b)	--	--
WWT-2	CTF Phase 3 Expansion (WW 22-38)	Near-term (c)	--	$23,700,000
WWT-3	CTF Surface Water Discharge (WW 20-17) (d)	Existing	--	$12,699,000
Total Treatment Facility Improvements OPC				**$36,399,000**
Collection System Improvement Projects				
WW-1	Stonebridge Gravity Main Replacement and Pump Station Upgrade (WW 22-25) (e)	Existing	No	$850,000
WW-2A	Woodfield West Deficiency Project - Alternative A (WW 22-26)	Existing (f)	No	$2,730,000
WW-2B	Woodfield West Deficiency Project - Alternative B (WW 22-26)	Existing (f)	No	$2,400,000
WW-4	J Street Gravity Main Replacement Project	Existing (f)	Yes	$1,690,000
WW-5	Easy Court / O Street Gravity Main Replacement Project	Existing	No	$1,370,000
WW-6	O Street Pump Station Upgrade	Existing	No	$1,560,000
Total Collection System Improvements OPC				**$10,600,000**
Miscellaneous Collection System Projects				
WW-8	Temporary Flow Monitoring	--	--	$100,000
WW-9	Wastewater Lift Station Access Modifications (PW 24-14) (d)	FY 23-25 CIP		$475,000
WW-9	Ozone Upgrade for Wastewater Pump Stations (PW-24-15) (d)	FY 23-25 CIP		$75,000
Total Miscellaneous Collection System Improvements OPC				**$650,000**
TOTAL WASTEWATER SYSTEM IMPROVEMENTS OPC				**$47,649,000**

Notes:

(a) Costs shown are presented in December 2024 dollars based on an ENR CCI of 13,632.41 (20-city average).
(b) City is currently evaluating the appropriate level of contribution to improvements at the MWQCF.
(c) City is currently issuing a request for proposal to PACE which may update this project OPC.
(d) Project included as a part of the City of Lathrop Capital Improvement Programs Fiscal Years 2023-2025 report.
(e) Connecting North Harlan Rd businesses which currently pump into the Stonebridge collection system to the North Harlan Rd SSFM can be considered as an alternative.
(f) Project addresses existing deficiencies, however future development influences recommended pipe or pump sizes to be installed.



Abbreviations

CTF = Consolidated Treatment Facility

MWQCF = Manteca Water Quality Control Facility

WWTF = wastewater treatment facility

Notes

1. All locations are approximate.
2. A detailed map for each project is included in Appendix D.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 12 March 2024.

Recommended Collection System Improvement Projects

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Figure ES-2

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1 INTRODUCTION

EKI Environment & Water, Inc. (EKI) has prepared this Wastewater System Master Plan Amendment (WWSMP Amendment) for the City of Lathrop, California (City). This WWSMP Amendment was developed as part of the 2024 amendment to the City's Integrated Water Resources Master Plan (IWRMP Amendment), a comprehensive planning process involving the City's Potable Water System, Wastewater System, and Recycled Water System Master Plans. This WWSMP Amendment updates the City's 2019 WWSMP (EKI, 2019a). The IWRMP Amendment was completed through a coordinated effort between multiple City departments and provides a unifying framework to support utility operations and capital improvement program (CIP) development and implementation.

1.1 Project Background

The City's 2019 IWRMP, which includes the City's Water System Master Plan, Wastewater System Master Plan, and Recycled Water Master Plan, was finalized and approved by the City Council in December 2019 after a California Environmental Quality Act (CEQA) process (EKI, 2019a; 2019b; 2019c). Since the 2019 IWRMP was completed, new information has become available and certain planning assumptions have changed that require an amendment to the IWRMP. The factors that influence this WWSMP Amendment include the following:

- **Land Use Information**: The City completed a General Plan Update in September 2022 which included updated growth projections for the City. In addition, development projections have changed significantly in the River Islands area with approval of the modified River Islands Phase 2 project in June 2021 and in the Central Lathrop area.
- **River Discharge Permit**: The City has obtained a National Pollutant Discharge Elimination System (NPDES) permit to discharge a portion of the wastewater treated at the Lathrop Consolidated Treatment Facility (CTF) in the San Joaquin River and deliver the remaining recycled water to retail customers. To support use of recycled water for landscape irrigation, the City obtained coverage under General Order WQ-2019-0058-DDW-R5017 and submitted a Title 22 Report Addendum in 2020. The City began delivering recycled water for urban uses in the summer of 2021 and discharging to the San Joaquin River in February 2024. These changes reduce the City's potable water demand, and affect the operations and infrastructure needed of the City's wastewater effluent disposal and recycled water distribution systems.
- **Increases in Wastewater Strength**: both the Manteca Wastewater Quality Control Facility (MWQCF) and the Lathrop Consolidated Treatment Facility (Lathrop CTF) are observing increasing wastewater strength (i.e. concentration of pollutants and nutrients in wastewater) likely due to improved water use efficiency during the recent droughts and in response to state regulations. The recent increases in wastewater strength have resulted in decreased hydraulic capacities at the treatment plants and requires a reassessment of the City's treatment capacity against projected wastewater flows.

1.2 Report Organization

The WWSMP is organized into the following sections:

- Section 1 - Introduction
- Section 2 - Study and Service Areas
- Section 3 - City's Existing Wastewater Infrastructure

- Section 4 - Existing and Future Wastewater Generation
- Section 5 - Wastewater Treatment Capacity Assessment
- Section 6 - Hydraulic Assessment of the Collection System
- Section 7 - Capital Improvement Program Changes to the 2019 WWSMP
- Section 8 - References

1.3 Scope of Work

The scope of work for the WWSMP Amendment included the following primary tasks:

- Update of the wastewater system hydraulic model network to incorporate system improvements completed since the 2019 WWSMP or those currently in design or under construction;
- Review of the City's basic assumptions, criteria and conclusions in wastewater planning, e.g., wastewater system design criteria, pump station operations, and infiltration and inflow rates;
- Update of the land use-specific wastewater flow unit factors based on wastewater flow and water use between 2017 and 2021;
- Development of wastewater generation projections based on land use consistent with the General Plan Update (adopted September 2022) and River Islands Phase 2 project (approved June 2021);
- Verification and update of the peaking curve to evaluate peak wet-weather flows;
- Assessment of wastewater treatment capacity against updated wastewater flow projections;
- Assessment of the existing collection system under existing and future flow conditions using steady-state model simulations;
- Evaluation of pump stations, force mains, and conveyance alternatives;
- Verification of the list of Capital Improvement Programs (CIPs) included in the 2019 WWSMP; and
- Preparation of the amended WWSMP document.

2 STUDY AND SERVICE AREAS

The City of Lathrop (also referred to herein as the City) was incorporated on July 1, 1989 and is located in San Joaquin County, approximately 10 miles south of the City of Stockton and directly west of the City of Manteca. The City lies east of the Coastal Range that separates California's Central Valley from the San Francisco Bay Area. Interstate 5 (I-5), a major north-south interstate corridor, bisects the City. The City is also connected by Highway 120 which runs east-west through the southeastern-most part of the City, and by Interstate 205, which connects Interstate 580 to I-5. The City is also served by the Altamont Commuter Express (ACE) train, which travels along the southern and eastern border of the City. The community was originally developed primarily east of I-5. Beginning in 2003, major new developments have been constructed west of I-5 and others are currently planned or under construction in this area.

This section provides an overview of the City's service area, including discussions of the City's service area boundaries, planned developments, and population.

2.1 City Limits, Sphere of Influence, and Service Boundaries

The City currently encompasses an area of approximately 13,400 acres, or about 20.9 square miles. The City's Sphere of Influence (SOI) is slightly larger with an area of about 13,600 acres, or 21.2 square miles. The City's SOI includes two unincorporated areas:

1. Approximately 134 acres northeast of the City boundary and along Roth Road that is designated Freeway Commercial and Limited Industrial, and
2. Approximately 62 acres southeast of the City boundary that is designated Service Commercial and part of the Lathrop Gateway Business Park Specific Plan area.

The City reduced their SOI in 2016 to exclude an additional unincorporated area (approximately 2,100 acres) located north of the Central Lathrop Specific Plan (Central Lathrop or CLSP) area and west of I-5. Much of this area does not have a General Plan land use designation. The City has designated this area as an Area of Interest (AOI) (Lathrop, 2016). Figure 2-1 shows the City limits, SOI, and AOI.

The City's wastewater collection system service area is generally contiguous with the City limits. The City currently provides wastewater service to approximately 6,100 residential, commercial, industrial and institutional/governmental properties.

A few large industrial facilities (e.g., Simplot and California Natural Products) manage their wastewater onsite. California Natural Products independently treats and land applies most of their wastewater onsite and sends the remaining flows to the City's collection system. The City began sewer service to the 724-acre Sharpe Army Depot in 2022.

2.2 Specific Plans and Large Planned Unit Development

The City has experienced significant growth in recent years and is anticipating growth to continue, particularly in several approved or pending large development projects within the City. Infrastructure needs for these projects are evaluated in this document. These projects are described below and shown on Figure 2-1 and Table 2-1, based on City and developer projections. Specifically, Table 2-1 lists the number of new residential dwelling units and commercial, industrial, and institutional (CII) acreage that is anticipated to be connected to the City's sewer system in five-year increments between 2025 and the anticipated buildout at 2045. A general description of the development areas and the total development planned at buildout is described below.

- Central Lathrop Specific Plan. The Central Lathrop Specific Plan proposes development of 1,520 acres located west of I-5. Phase 1 of the project is anticipated to be completed by 2040 and consists of a total of 579 high density units, 1,483 variable density residential units, and 144 acres of commercial land uses. The project also includes two schools and 161 acres of recreational land use and open space. Phase 2 of the project includes 682 acres of light industrial use and a 5-acre park.

- Mossdale Landing. Mossdale Landing is a mixed-use master planned community that is anticipated to be completed by 2030. Construction at Mossdale Landing began in 2003 and approximately 1,640 residential units have been constructed thus far. An additional 66 low density are anticipated by project completion. In addition, the development is allocating a total of 35 acres of land for two schools, 40 acres for parks, and 25 acres for commercial development.

- Mossdale Landing East. Mossdale Landing East (formerly referred to as Lathrop Station) is anticipated to be completed by 2030. Approximately 490 residential units have been constructed so far. An additional 37 low density units are anticipated by project completion. The development plan also includes a total of 6.5 acres of village commercial, 13.2 acres of service commercial, and 27.5 acres of highway commercial land uses.

- Mossdale Landing South. Mossdale Landing South is a proposed 104-acre development that is anticipated to be completed by 2030. Approximately 140 medium and high density units have been constructed so far. An additional 85 medium density units are anticipated by project completion. In addition, the project includes a total of 28 acres of commercial, 25 acres of open space, and 9.5 acres of parks.

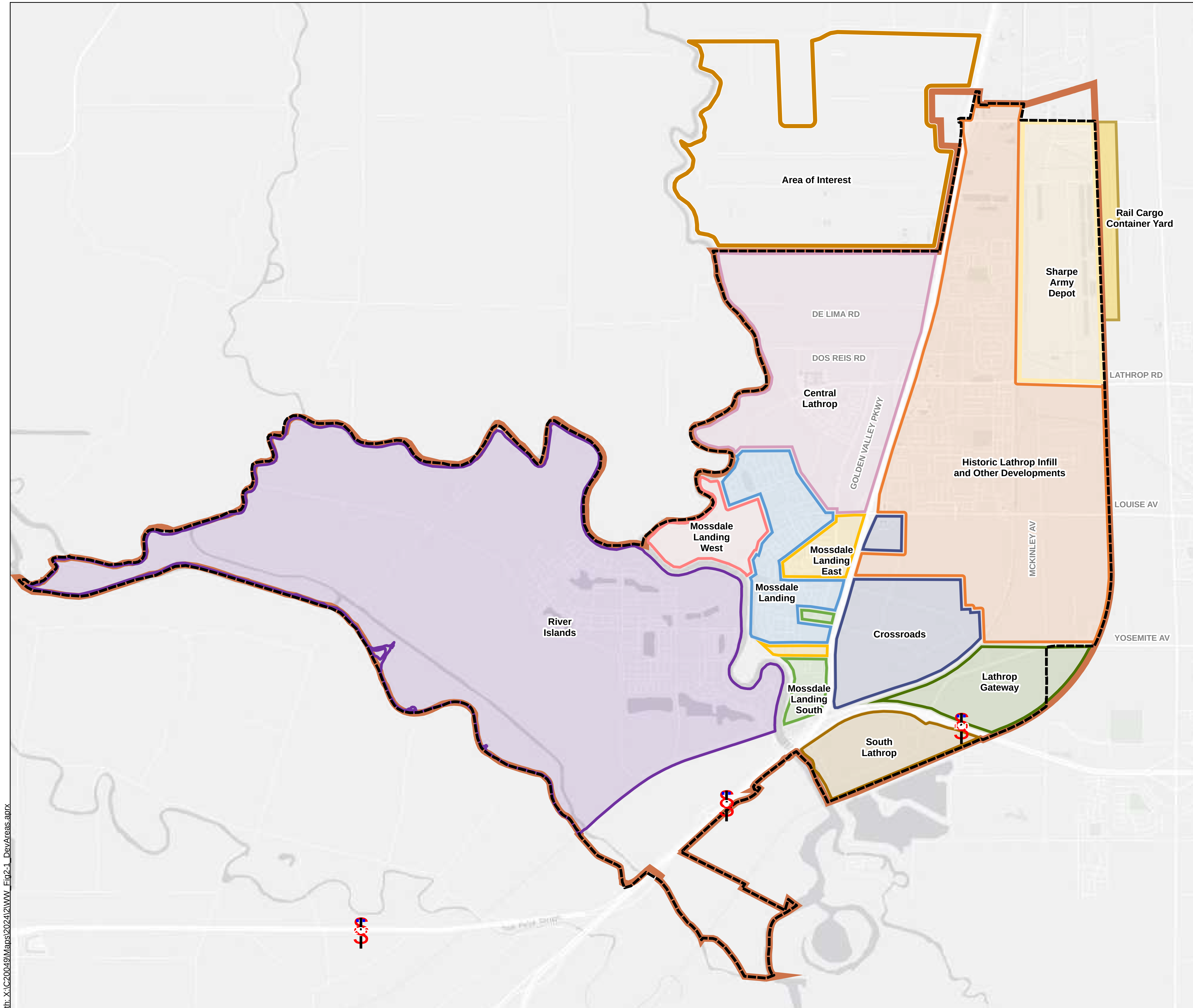
- Mossdale Landing West. Mossdale Landing West is a proposed residential development that is anticipated to be completed by 2032. The project will be located on the Silveira property and consist of 829 low density dwelling units and 11 acres of parks.

- River Islands. The 4,995-acre River Islands development is located west of the San Joaquin River and east of Paradise Cut on land known as the Stewart Tract. The development proposes a mixture of low, medium and high density residential units. According to its recently amended Specific Plan, River Islands will consist of two phases and a total of 15,000 homes, a 260-acre employment center, a 79-acre town center, 235 acres of parks and ten schools. About 2,800 low density residential units were constructed and occupied by late 2022. The estimated project completion date is 2040 (Lathrop, 2022b; Woodard & Curran, 2020).

- Lathrop Gateway Business Park Specific Plan. The Lathrop Gateway Business Park Specific Plan proposes commercial and industrial development of approximately 384 acres to be completed by 2040. The City annexed 213 acres of this area in June 2012 and 99 acres of the remaining 117 acres in May 2016. This would result in approximately 4.7 million square feet of service commercial, limited industrial, distribution, and research and development related uses, and approximately 741,000 square feet of commercial office and retail uses. The first phase of the project includes approximately 167 acres of limited industrial, 83 acres of service commercial, and 57 acres of office and commercial retail uses and is anticipated to be completed by 2030.

- South Lathrop Specific Plan. The South Lathrop Specific Plan was approved by the City Council on 20 July 2015 and includes a 315-acre plan area. The Specific Plan proposes approximately 10 acres of commercial office uses, 246 acres of limited industrial, 31 acres of open space, and 27 acres of roads and public facilities. The City South Lathrop Specific Plan area was annexed into the City in May 2016. The South Lathrop Commerce Center, approximately 272 acres within the South Lathrop Specific Plan, is anticipated to be completed by 2030. The South Lathrop Commerce Center will encompass all of the South Lathrop Specific Plan area with the exception of approximately 24 acres of light industrial, 1.2 acres of office commercial, and 19 acres of open space and public roads.

- Historic Lathrop Infill and Other Developments East of I-5. The portion of the City east of I-5 is anticipated to expand and add density in the future. Currently, this area consists of approximately 3,160 low density and 455 medium density units, commercial and industrial areas, and a few public parks. Future residential growth of this area is expected on undeveloped/underutilized and redeveloped parcels consolidated from large lots where low density residential units would be demolished. New residential projects are estimated to consist of 52 low density, 218 medium density, and 48 high density residential units, increasing the total existing residential unit count by 318 units.
- Sharpe Army Depot. During World War II, the US Army created the Sharpe Army Depot (Depot) in the rural Lathrop Community to allow shipment of major army supplies to the western United States. The Depot is comprised of a 724-acre facility south of Roth Road and has served both the Army and Airforce with a variety of supplies depending on the demand of goods and supplies created by war time efforts. The Depot is occupied by the AAFES West Coast Distribution Center that employs 348 workers. Prior to 30 September 2014 the Defense Logistics Agency was also housed at the Depot; its workforce of 700 workers has since been transferred to the larger Tracy Army Depot. The City began providing water and sewer services to the Sharpe Army Depot in 2022, including the AAFES and the California National Guard properties.



Legend
- City Limit
- Sphere of Influence
- Area of Interest
- Rail Cargo Container Yard

Development Areas
- Central Lathrop
- Crossroads
- Historic Lathrop Infill and Other Developments
- Lathrop Gateway
- Mossdale Landing
- Mossdale Landing West
- Mossdale Landing East
- Mossdale Landing South
- River Islands
- Sharpe Army Depot
- South Lathrop

Notes
1. All locations are approximate.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 12 March 2024.

0 4,000 8,000
(Scale in Feet)

City of Lathrop Boundaries and Development Areas

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Figure 2-1

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Table 2-1
City of Lathrop Wastewater Development Projections by Development Area

Land Use Designation	Units	Incremental New Development (a)(b)					Total New Development
		2025	2030	2035	2040	2045 (Buildout)	
Central Lathrop - Phase 1							
Low Density Residential	du	--	500	264	--	--	764
High Density Residential	du	--	246	210	123	--	579
Commercial	ac	13.0	60.6	--	--	72.0	145.6
Mixed Use	ac	--	--	--	--	51.0	51.0
Parks	ac	--	39	5.0	--	--	44.1
Central Lathrop - Phase 2							
Light Industrial / R&D Flex	ac	90	--	--	--	592	682
Parks	ac	--	--	--	--	5	5
Mossdale - All Developments (c)							
Low Density Residential	du	--	37	829	--	66	932
Medium Density Residential	du	85	--	--	--	--	85
High Density Residential	du	--	--	--	--	84	84
Commercial	ac	4.6	8.5	8.0	--	17.0	38.1
Parks	ac	--	4.0	11.0	--	--	15.0
Schools	ac	--	--	--	--	16.2	16.2
Mossdale Landing							
Low Density Residential	du	--	--	--	--	66	66
Medium Density Residential	du	--	--	--	--	--	0
High Density Residential	du	--	--	--	--	--	0
Commercial	ac	4.6	1.5	--	--	--	6
Schools	ac	--	--	--	--	16.2	16
Mossdale Landing East							
Low Density Residential	du	--	37	--	--	--	37
High Density Residential	du	--	--	--	--	84	84
Commercial	ac	--	7.0		--	--	7
Mossdale Landing South							
Medium Density Residential	du	85	--	--	--	--	85
Commercial	ac	--	--	8.0	--	17.0	25
Parks	ac	--	4.0	--	--	--	4
Mossdale Landing West							
Low Density Residential	du	--	--	829	--	--	829
Parks	ac	--	--	11.0	--	--	11
River Islands							
Low Density Residential	du	768	1,218	1,218	1,218	--	4,422
Medium Density Residential	du	676	945	945	945	--	3,511
High Density Residential	du	--	1,395	1,395	1,395	--	4,185
Town Center	ac	--	26.3	26.3	26.3	--	79

Table 2-1
City of Lathrop Wastewater Development Projections by Development Area

Land Use Designation	Units	Incremental New Development (a)(b)					Total New Development
		2025	2030	2035	2040	2045 (Buildout)	
Commercial	ac	--	86.1	86.1	86.1	--	258
Schools (d)	ac	32.5	15.0	15.0	14.0	--	77
Parks	ac	19.0	60.9	61.0	61.0	--	201.9
South Lathrop							
Light Industrial / R&D Flex	ac	--	67.0	--	--	32.8	99.8
Office Commercial	ac	--	8.8	--	--	1.2	10.0
Lathrop Gateway							
Light Industrial / R&D Flex	ac	--	66.0	--	16.6	--	82.6
Office Commercial	ac	--	51.0	--	11.7	--	62.7
Open Space	ac	--	2.5	--	1.6	--	4.1
Crossroads (c)							
Industrial	ac	--	23.0	--	--	--	23.0
Commercial	ac	--	1.5	--	--	--	1.5
Historic Lathrop and Other Development Areas (c)							
Low Density Residential	du	--	12	6	5	29	52
Medium Density Residential	du	27	26	26	26	113	218
High Density Residential	du	--	--	--	--	48	48
Commercial	ac	22.0	13.6	--	--	8.0	43.6
Industrial	ac	18.0	--	--	--	24.0	42.0
Sharpe Army Depot							
Industrial	ac	(d)	--	--	--	--	(d)

Notes:
(a) Dwelling unit counts and acreages were based on information provided by developers and the City in July 2020 and April 2023.
(b) Includes dwelling units and acreages that are assumed to be developed during the preceding five-year period. Dwelling units and acreages shown for 2025 are those assumed to be developed between January 2023 and December 2025. Dwelling units and acreages developed before December 2022 are included in baseline wastewater flow (see Table 4-6).
(c) Future development located in the Historic Lathrop Development Area that are anticipated to be discharging to the CTF are listed under the Crossroads Development Area for the purposes of this document.
(d) The AAFES facility and the CMD facility at the Sharpe Army Depot are connected to City's sewer system as of January 2023.

2.3 Current and Projected Population

Values for the historical and current population within the City's water service area were obtained from data reported by the California Department of Finance (DOF) within the City Limits. Although Lathrop's water service area includes a railroad cargo container commercial enterprise that is outside the City limits, the service area population is estimated to be equivalent to the City population. As of January 2023, the population estimate for Lathrop was 35,080 (California DOF, 2023). The historical and current population data within the City's water service area are presented in Table 2-2.

Population in the City has grown by approximately 410% over the 32-year period between 1990 through 2023, from approximately 6,800 to 35,100 (California DOF, 2007, 2012, and 2023). Between 2005 and 2023, the population increased by 174%, from approximately 12,800 to 35,100.

The City anticipates that population will continue to grow in the future given the existing entitlements for several large residential developments, discussed above in Section 2.2. The population projections for 2025 through 2045, summarized in Table 2-3, are estimated using the existing population (as determined by California DOF) and adding the amount of new housing anticipated to be permitted in each five-year increment based on Table 2-1. The population added each year is projected by multiplying the most recent number of new housing units by (1) 4.02 person per dwelling unit based on Census data for low density developments, which consists of a large majority of the City's existing land uses and (2) 3.0 persons per dwelling units for future medium density and high-density dwelling units (U.S. Census, 2023). Current and projected population trends are shown on Figure 2-2.

Table 2-2. Historical City of Lathrop Population

Year	Service Area Population (a)	Annual Growth Rate
1990	6,841	--
1991	7,018	2.6%
1992	7,063	0.6%
1993	7,434	5.3%
1994	8,410	13.1%
1995	8,713	3.6%
1996	9,031	3.6%
1997	9,172	1.6%
1998	9,508	3.7%
1999	9,786	2.9%
2000	10,445	6.7%
2001	10,802	3.4%
2002	11,616	7.5%
2003	12,089	4.1%
2004	12,482	3.3%
2005	12,768	2.3%
2006	14,489	13.5%
2007	16,271	12.3%
2008	17,282	6.2%
2009	17,589	1.8%
2010	18,023	2.5%
2011	18,688	3.7%
2012	19,090	2.2%
2013	19,642	2.9%
2014	20,158	2.6%
2015	20,796	3.2%
2016	22,174	6.6%
2017	23,117	4.3%
2018	24,185	4.6%
2019	25,401	5.0%
2020	26,833	5.6%
2021	29,384	9.5%
2022	31,575	7.5%
2023	35,080	11.1%

Notes:

(a) Historical and current population is based on population estimates by the California DOF for the City of Lathrop included in DOF, 2007; DOF, 2012; DOF, 2022; and DOF, 2023.

Table 2-3. Current and Projected City of Lathrop Population

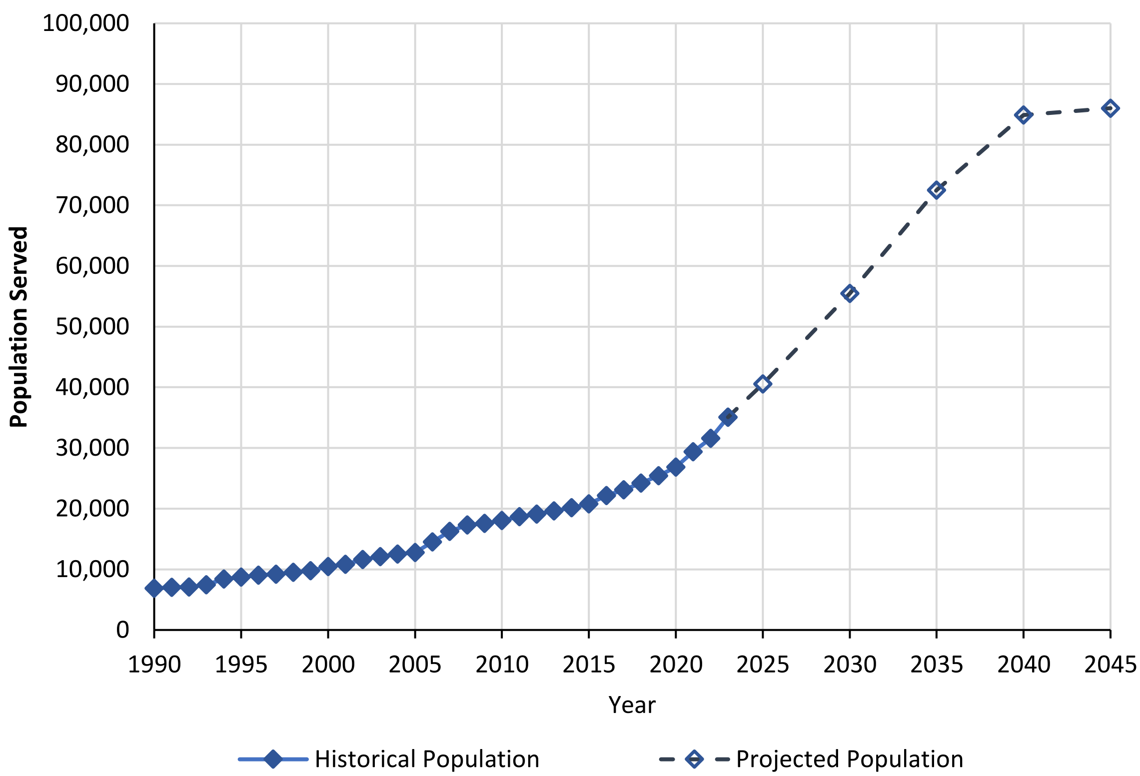
Current and Projected Service Area Population (a)(b)						
Year	**2023**	**2025**	**2030**	**2035**	**2040**	**2045 (Buildout)**
Population Served	35,080	40,531	55,471	72,513	84,897	86,013

Notes:

(a) Current population is based on population estimates by the California DOF for the City of Lathrop included in DOF, 2023.

(b) Projected populations for 2025 through buildout (2045) are based on residential unit counts from Table 2-1, multiplied by 4.02 persons per dwelling unit for low density developments (U.S. Census, 2023) and 3.0 persons per dwelling unit for medium and high density developments.

Figure 2-2. Historical and Projected City of Lathrop Population



3 CITY'S EXISTING WASTEWATER INFRASTRUCTURE

Wastewater from the City is treated at two facilities: the regional MWQCF and the City-owned Lathrop CTF. The City's wastewater collection system, including the City's lift station and pump station drainage areas,[1] is shown on Figure 3-1. The City's wastewater utilities are discussed in more detail in the sections below.

3.1 Wastewater Collection

The City's wastewater collection system consists of approximately 102 miles of gravity mains, 23.6 miles of force mains, as well as 16 lift and pump stations. The City has a supervisory control and data acquisition (SCADA) system for control and monitoring of facilities.

As shown on Figure 2-2, most of the City's wastewater generated in the areas east of I-5 is conveyed to the MWQCF; wastewater generated in the Crossroads, South Lathrop, and Lathrop Gateway industrial areas and the areas west of I-5, including the Mossdale, River Island, and Central Lathrop areas, is conveyed to the Lathrop CTF.

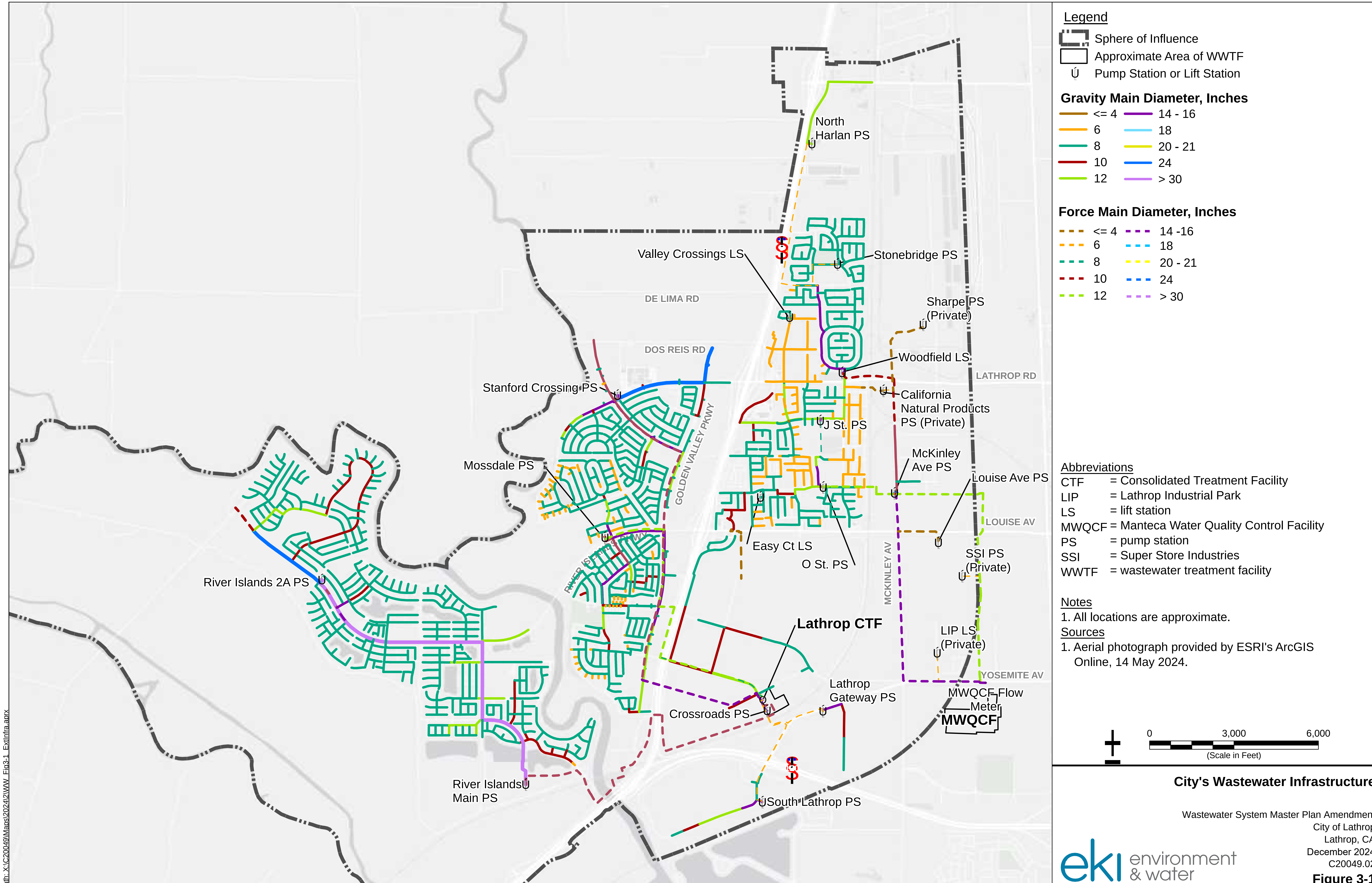
A few large industrial facilities (e.g., Simplot and California Natural Products) manage their wastewater onsite. California Natural Products manages the majority of their wastewater and sends the remaining flows to either the J Street Lift Station (LS) or the McKinley Avenue Pump Station (PS).

3.1.1 Gravity System

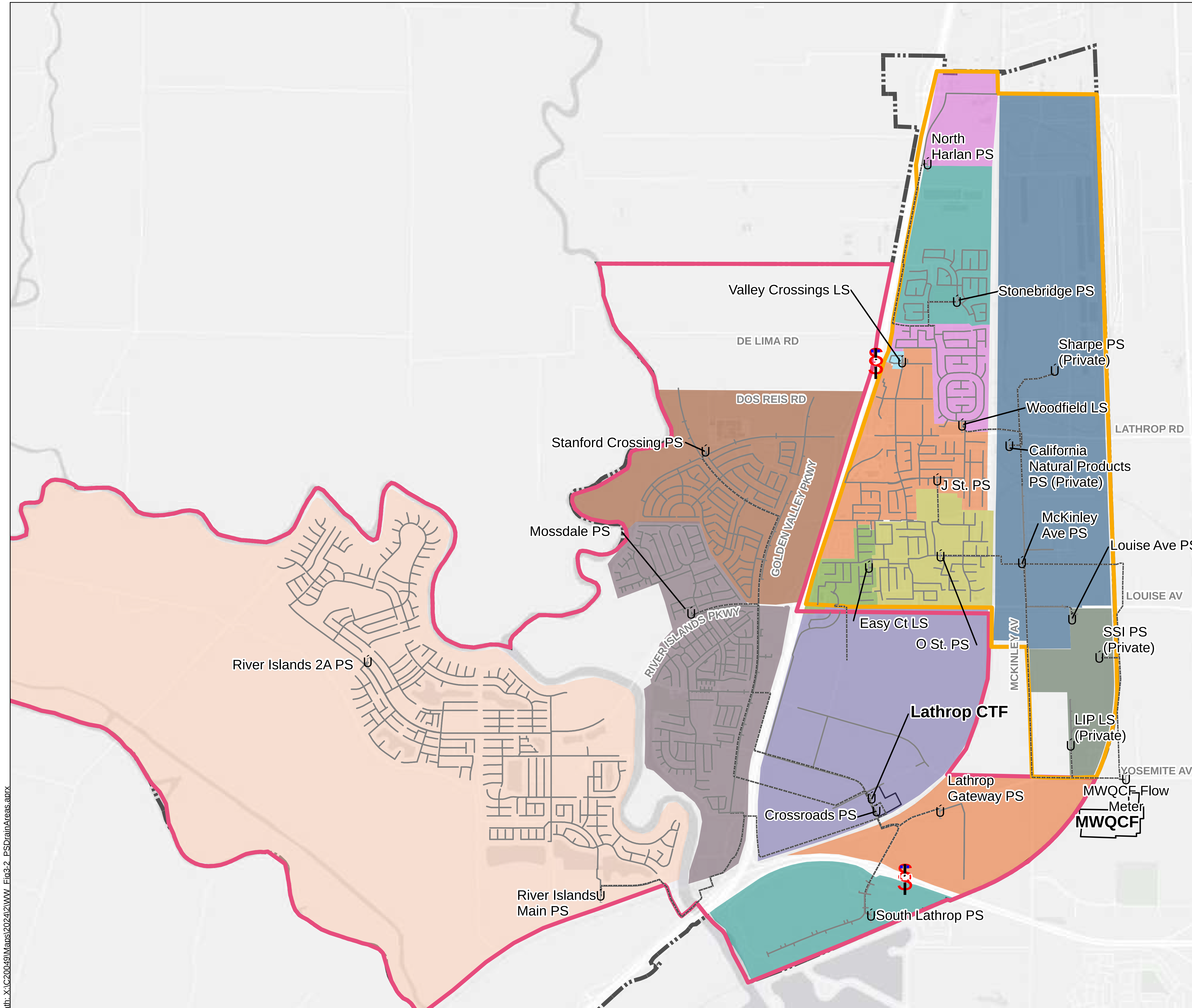
Table 3-1 summarizes the City's gravity main inventory by diameter. Gravity main sizes are also shown on Figure 3-1.

Approximately 66% of gravity mains are polyvinyl chloride (PVC) pipes, and the remaining 34% are vitrified clay (VC) pipes. All the VC pipes are located in the older Historic Lathrop and Crossroads areas. Newer areas of the City west of I-5 are exclusively served by PVC pipe, which is the City's current standard pipe material.

[1] Generally, lift stations add hydraulic head to the wastewater flow within the gravity collection system; pump stations pressurize wastewater flow for conveyance via force mains.



Legend
Sphere of Influence
Approximate Area of WWTF
Pump Station or Lift Station
Gravity Main Diameter, Inches
<= 4
6
8
10
12
14 - 16
18
20 - 21
24
> 30
Force Main Diameter, Inches
<= 4
6
8
10
12
14 -16
18
20 - 21
24
> 30
Abbreviations
CTF = Consolidated Treatment Facility
LIP = Lathrop Industrial Park
LS = lift station
MWQCF = Manteca Water Quality Control Facility
PS = pump station
SSI = Super Store Industries
WWTF = wastewater treatment facility
Notes
1. All locations are approximate.
Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 14 May 2024.
North Harlan PS
Valley Crossings LS
Stonebridge PS
DE LIMA RD
DOS REIS RD
Sharpe PS (Private)
Woodfield LS
LATHROP RD
Stanford Crossing PS
California Natural Products PS (Private)
J St. PS
GOLDEN VALLEY PKWY
McKinley Ave PS
Mossdale PS
Louise Ave PS
LOUISE AV
Easy Ct LS
O St. PS
SSI PS (Private)
River Islands 2A PS
MCKINLEY AV
Lathrop CTF
LIP LS (Private)
YOSEMITE AV
Lathrop Gateway PS
MWQCF Flow Meter
MWQCF
Crossroads PS
River Islands Main PS
South Lathrop PS
0
3,000
6,000
(Scale in Feet)
City's Wastewater Infrastructure
Wastewater System Master Plan Amendment
City of Lathrop
Lathrop, CA
December 2024
C20049.02
Figure 3-1
eki environment & water
Path: X:\C20049\Maps\2024\2\WW_Fig3-1_ExtInfra.aprx



Legend

- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Force Main
- Gravity Main

WWTP Drainage Area Boundaries

- Lathrop CTF Collection System
- MWQCF Collection System

Pump Station Drainage Areas

- Stanford Crossing
- Crossroads
- Easy Ct
- J St
- Lathrop Gateway
- Manteca
- McKinley
- Mossdale
- O St
- River Islands
- South Lathrop
- Stonebridge
- Valley Crossing
- Woodfield

Abbreviations

CTF = Consolidated Treatment Facility
LIP = Lathrop Industrial Park
LS = lift station
MWQCF = Manteca Water Quality Control Facility
PS = pump station
SSI = Super Store Industries
WWTF = wastewater treatment facility

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 12 March 2024.

City's Wastewater Pump Station Drainage Areas

Wastewater System Master Plan Amendment
City of Lathrop
Lathrop, CA
December 2024
C20049.02

eki environment & water

Figure 3-2

Path: X:\C20049\Maps\2024\2\WW_Fig3-2_PSDrainAreas.aprx

Table 3-1. Collection System Inventory

Pipe Diameter (inches)	Total Pipe Length (miles)	Percent of System
Gravity Mains		
6	8.6	8%
8	71.9	70%
10	6.7	6.6%
12	5.8	5.7%
14	0.5	0.5%
15	2.9	2.8%
16	0.1	0.1%
18	1.3	1.3%
20	0.4	0.4%
21	0.02	0.02%
24	1.5	1.5%
30	1.9	1.9%
36	0.6	0.6%
42	0.1	0.1%
Total	**102.2**	**100%**
Force Mains		
4	1.2	5%
6	4.3	18%
8	2.5	11%
10	0.7	3%
12	7.3	31%
14	3.1	13%
16	1.8	8%
18	2.7	11%
Total	**23.6**	**100%**

Notes:

(a) Does not include laterals.

3.1.2 Pump Stations and Force Mains

Table 3-2 summarizes the characteristics of each of the City's lift and pump stations and their associated force mains. The direct tributary areas of each lift station or pump station, or "drainage areas", are shown on Figure 3-2. A schematic of the City's lift stations and pump stations that shows how wastewater flows through the collection system is illustrated on Figure 3-3. An inventory of the City's force main sizes is summarized in Table 3-1.

The City'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 either the O Street PS or 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 MWQCF. These force mains also convey wastewater from the Louise Avenue pump station and other private pump stations that serve the industrial areas east of I-5 to the MWQCF.

Wastewater from the CLSP, Mossdale, River Islands, South Lathrop, and Lathrop Gateway areas are conveyed via gravity sewers to a main pump station within each development area. These pump stations then send wastewater directly to the Lathrop CTF.

3.1.3 Collection System Intertie

The City's two collection systems are connected by the 8-inch Mossdale Intertie, which crosses beneath I-5 on River Islands Parkway and Louise Avenue. The intertie may convey flow from the Mossdale PS to sewer mains upstream of the East Street LS but is limited by the capacity of sewers in the Easy Street area. The intertie is not routinely operated but could potentially be utilized in the future to reroute a portion of flows from the Mossdale PS to the MWQCF tributary area.

3.1.4 Major Collection System Improvements Completed Since 2019

The following major wastewater collection system improvements were completed since the 2019 WSMP:

<u>CLSP sewer infrastructure and Stanford Crossing Pump Station</u>: infrastructure improvements in the Central Lathrop Phase 1 (Stanford Crossing) area were constructed including gravity mains, pump station, and connection to existing 14-inch and 18-inch force mains which convey wastewater flow from buildout of Central Lathrop Specific Plan (CLSP) area to the CTF.

<u>River Islands</u>: sewer infrastructure was expanded for Phase 2A/2B of the River Islands development, including a gravity collection system, the River Islands 2A PS, and the River Islands Main PS which connects to existing 12-inch and 18-inch diameter force mains conveying flows to the Lathrop CTF.

<u>South Lathrop:</u> a new gravity collection system along Yosemite Ave was constructed to collect wastewater from commercial facilities in its vicinity to a new pump station, which then conveys flows to the CTF via dual 6-inch force mains.

<u>Lathrop Gateway:</u> a new 10-inch diameter gravity collection system along Business Park Court. was constructed to collect wastewater from commercial facilities in its vicinity to a new pump station, which then conveys flows to the CTF via a new 4-inch and 6-inch diameter force mains.

<u>Woodfield Pump Station:</u> the Woodfield PS was upgraded and connected to the 10-inch diameter force main that flows to the gravity mains upstream of the McKinley Avenue PS.

<u>North Harlan PS:</u> the private pump station has been upgraded to a public pump station.

These completed projects are incorporated in the WWSMP evaluation of the existing wastewater collection system.

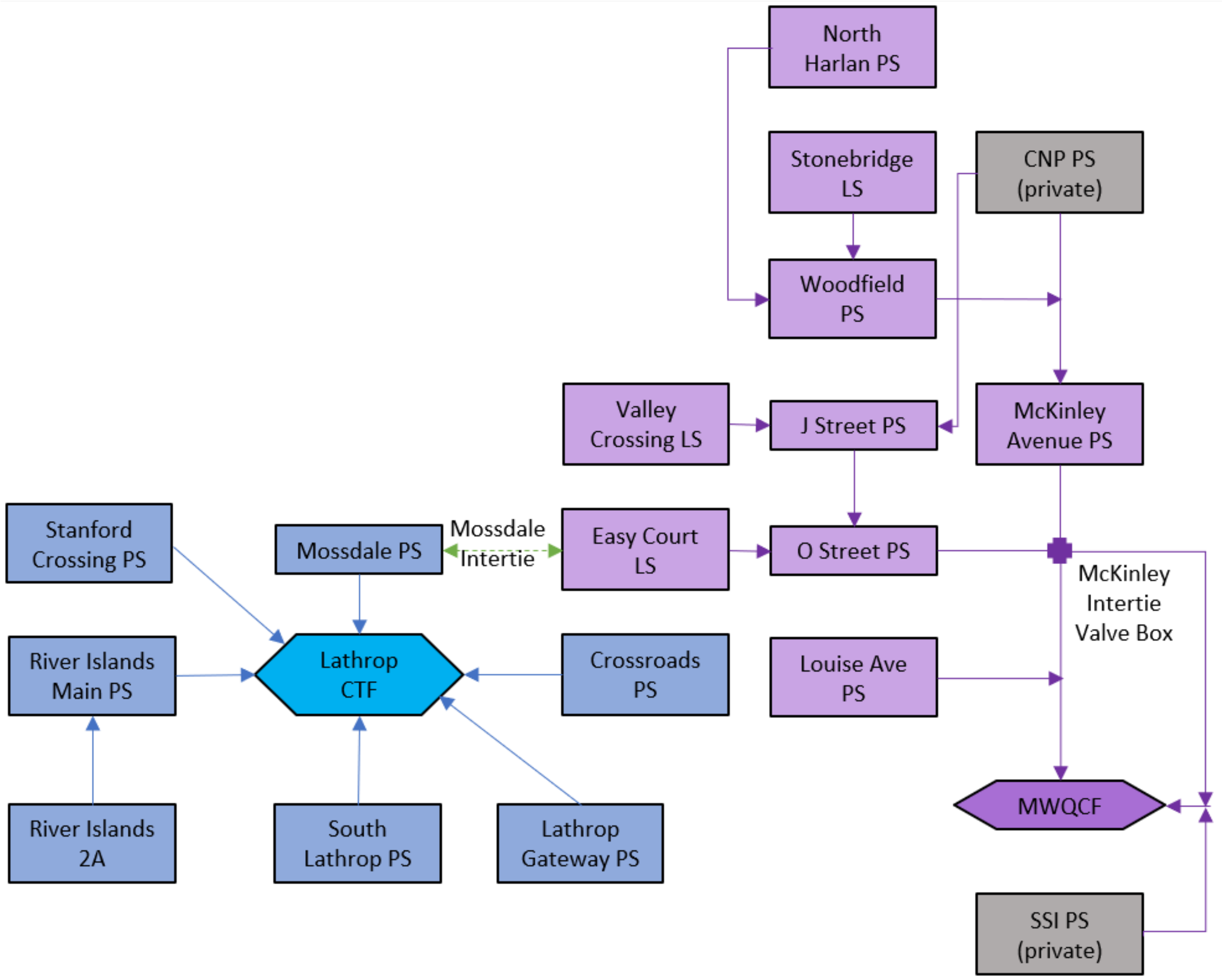
Table 3-2. Summary of Wastewater Pump Station Characteristics

Pump Station	Number of Pumps	Rated Power	Force Main Diameter (in)	Existing Design Capacity (gpm)	Existing Firm Capacity (gpm)(a)
MWQCF Collection System					
North Harlan PS	2	10 HP	6"	2,150	1,075
Stonebridge LS	2	10 HP	6"	700	350
Woodfield LS	3	5 HP	8" (b)	1,230	820
Valley Crossing LS (b)	2	3 HP	4"	83	83
J Street LS	2	10 HP	8"	1,400	700
Easy Court LS	2	3 HP	-	1,000	500
O Street PS	3	Two at 70 HP; one at 5 HP	12"	4,200	2,800
McKinley Avenue PS	3	Two at 25 HP; one at 5 HP	16"	2,513	1,675
Louise Avenue PS	2	5 HP	4"	(d)	(d)
Lathrop CTF Collection System					
Stanford Crossing	2	One at 90 HP; One at 45 HP	14" & 18"	4,100	2,300
Mossdale PS	4	30 HP	8" & 12"	5,400	4,050
River Islands Main PS	2 (c)	110 HP	12" & 18"	3,400	1,700
River Islands 2A PS	4	15 HP	30"	5,300	3,975
Lathrop Gateway PS	2	23 HP	4" & 6"	560	280
South Lathrop PS	3	12 HP	6" & 6"	2,775	1,850

Notes:

(a) Firm pumping capacity defined as the total capacity of all pumps minus the capacity of the largest pump.
(b) Capacity of the 8"outlet is listed as the lift station capacity, as it is the capacity limiting component of this pump station.
(c) River Islands Sewer PS will be constructed in phases with addition of two pumps during each phase.

Figure 3-3. City's Wastewater Collection System Schematic



Notes:

(a) The Stonebridge PS receives wastewater from four private pump stations: Panattoni, Gordon Trucking, Boise Cascade, and Utility Trailer. These pump stations convey wastewater collected by the private North Harlan Gravity System, which serves industrial parcels north of Brookfield Street.

(b) Heinz-Kraft, Sharpe, and LIP private pump stations not shown.

3.2 Wastewater Treatment

Wastewater treatment at the MWQCF and the Lathrop CTF are discussed in the following sections.

3.2.1 Manteca Water Quality Control Facility

The City owns approximately 14.7% of the existing MWQCF capacity by contract with the City of Manteca. However, the City does not participate in the operation of the plant, nor does it receive recycled water from MWQCF. Per the City's 2002 Agreement Amendment with Manteca and as listed in Table 3-3, the total current MWQCF design capacity is 9.87 million gallons per day (MGD) and the City's allocated capacity is 1.451 MGD (Lathrop County Water District and the City of Manteca, 2002). Under the Agreement Amendment, the City has the right to 1.451 MGD dry weather flow, 2.321 MGD peak wet weather flow, 3,751 pounds per day of biochemical oxygen demand (BOD), and 3,812 pounds per day of total suspended solids (TSS). However, as discussed in Section 5.2, recent increases in wastewater strength may limit MWQCF's treatment capacity and, as a result, the City's share of MWQCF capacity.

The MWQCF is permitted for future expansions of up to 26.97 MGD, of which the City would be allocated up to 3.97 MGD, should the City elect to fund its share of the expansions to maintain its proportional allotment.

Treatment at the MWQCF consists of primary sedimentation followed by roughing biotowers, conventional activated sludge, secondary clarification, tertiary filtration, and ultraviolet disinfection. Disinfected tertiary effluent is discharged to the San Joaquin River. A portion of the secondary effluent is not disinfected and is used to irrigate crops on 190 acres of land owned by the City of Manteca (WDR Order No. R5-2015-0026).

Table 3-3. Wastewater Capacity Allocation at MWQCF

Phase	Allocated Capacity at MWQCF (MGD)		
	City of Manteca	City of Lathrop	Total
Existing	8.42	1.45	**9.87**
Build-Out (2050)	23.00	3.97	**26.97**

3.2.2 Lathrop Consolidated Treatment Facility

The City owns a membrane bio reactor (MBR) treatment facility, the Lathrop CTF, that also incorporates portions of the old Crossroads Industrial Wastewater Treatment Plant. Daily operations of the Lathrop CTF are contracted to Veolia Water, North America. The City completed the Phase 2 Expansion of the Lathrop CTF in 2019 which increased the plant's treatment capacity to 2.5 MGD. The City has the ability to further upgrade Lathrop CTF to increase the treatment capacity up to 9.0 MGD as needed.[2] As discussed in Section 5.2, recent increases in wastewater strength may limit the CTF's treatment capacity.

Wastewater treatment and recycled water disposal at the City's Lathrop CTF is regulated under Waste Discharge Requirements (WDR) Order No. R5-2016-0028-01 by the Central Valley Regional Water Quality Control Board (RWQCB). Wastewater treatment processes at the Lathrop CTF include secondary

[2] The City had previously completed a project-level Environmental Impact Report (EIR) for treatment capacity up to 6.0 MGD at the CTF. Post combination with Crossroads WWTF, the program-level EIR treatment capacity at the CTF has increased to 9.0 MGD.

treatment, tertiary membrane filtration, and disinfection prior to storage and disposal. The current Lathrop CTF is capable of treating Peak Day Flows of 4.0 MGD at a loading of 14,000 pounds of BOD per day and Peak Hour Flows of 7.5 MGD.

With the rapid increase of wastewater generation anticipated within the City and the CTF drainage area, the City is planning Phase 3 expansion of the Lathrop CTF in the near future. The Phase 3 expansion is anticipated to add 2.5 MGD of capacity to a total of 5.0 MGD capacity.

The Lathrop CTF produces disinfected tertiary recycled water suitable for irrigation at parks, landscape strips, median islands, pond berms, and agricultural fields. The City is covered under General Order WQ-2016-0068-DDW (General Order) for recycled water use in a total of 196 acres of landscape irrigation areas in the River Islands, Mossdale, and Central Lathrop areas.

In 2021, the City obtained a National Pollutant Discharge Elimination System (NPDES) permit for surface water discharge (Order R5-2022-0004). This permit allows the City to discharge a portion of the treated effluent to the river, while using the remaining portion for meeting landscape irrigation demands and other permitted non-potable uses.

The City completed the following infrastructure improvements to implement its NPDES permit and began discharging to the San Joaquin River in February 2024:

- <u>CTF</u>
  - Retrofitting of the existing chlorine contact exit structure to a new dechlorination station with overflow pipes to send chlorinated effluent (Title 22 recycled water) to S5 and dechlorinated effluent to the Crossroads Pump Station.
  - New piping from the dechlorination station to the existing Crossroads Pump Station.
  - Abandoning of the piping from Ponds A, B and C to the Crossroads Pump Station
  - New piping that connects the existing discharge line from the Crossroads Pump Station to the CTF headworks, which will divert substandard effluent from the outfall, and disconnection of the existing discharge line from PB-1.
  - New piping to connect PMP-1 to percolation pond PB-1.
- <u>Effluent Discharge Pipeline</u>
  - Approximately 2,000 linear feet (LF) of a new dedicated discharge line and railway crossing from the Crossroads Pump station along Tesla Way to connect to an existing 18" pipeline at Murphy Parkway and Tesla Way.
  - Reuse of approximately 3,300 LF of existing 18-inch pipeline along Tesla Way and Harlan Road from Murphy Parkway to Sadler Oak.
  - Reuse of approximately 1,800 LF of existing 20-inch pipeline along Sadler Oak from Harlan Road to the RD-17 levee.
  - Reconstruction of the 20-inch pipeline where it crosses the levee and extension of the pipeline to a new outfall approximately 350 feet further downstream (north).
- <u>Outfall Structure</u>
  - A new side bank outfall located approximately 350 feet downstream from the Crossroads storm drain pump station outfall.

The City began discharging CTF effluent to the San Joaquin River in February 2024 and plans to retire its agricultural land application areas and decommission the majority of its recycled water storage ponds and percolation pond PB-1 (EKI, 2024).

4 EXISTING AND FUTURE WASTEWATER GENERATION

As part of the IWRMP, the City evaluated its existing wastewater flows and updated its flow projections. The following sections summarize the City's historical and current wastewater generation, wastewater flow projections, and wastewater peaking factors.

Wastewater flows in a sanitary sewer system typically consist of the following components:

- **Base sanitary flow (BSF)**: BSF is the sanitary wastewater flow from domestic, commercial, industrial, and institutional uses.
- **Infiltration**: Infiltration refers to groundwater that enters a sewer system through defective pipes, pipe joints, connections, or manholes.
- **Inflow**: Inflow refers to stormwater that enters a sewer system through direct connections, such as manhole covers and defective sewer service cleanouts or (illegal) roof drains, foundation drains, catch basins, or area drain connections.

Infiltration and Inflow are collectively referred to as "I&I". The amount of I&I tends to be smaller in new collection systems but is generally observed to increase over time due to wear and tear on the collection system.

The following terminology is used throughout this document to describe variations in wastewater flow:

- **Average annual flow (AAF)**: AAF refers to the average daily flow over the entire year and is inclusive of BSF and I&I.
- **Average dry-weather flow (ADWF)**: ADWF refers to the average daily flow for the months of June, July, and August (i.e., during the dry season). ADWF includes BSF and infiltration, but not inflow.
- **Peak wet weather flow (PWWF)**: PWWF refers to the peak hourly flow, which includes peak diurnal BSF, infiltration, and inflow from storm events.

EKI reviewed the following available information for evaluation of wastewater flows as part of this WWSMP update:

- Daily flow data collected between January 2017 and December 2022 from the headworks of the Lathrop CTF;
- Daily flow data collected between January 2017 and December 2022 from the flow meter on Yosemite Avenue that measures the City's flow to the MWQCF;
- Available discharge flow and level data recorded in 5-minute intervals from the City's lift stations and pump stations by the SCADA system between January 2017 and December 2021; and
- Daily discharge flow for the City's lift stations and pump stations recorded by the City's operators between January 2017 and December 2021.

4.1 Current and Historical Wastewater Flow

Table 4-1 and Table 4-2 provide historical context by summarizing the City's wastewater generation, service area population, and per-capita wastewater generation for the years 2009 through 2022. Table 4-1 lists the total AAF, citywide and by treatment facility, and per-capita AAF. Table 4-2 lists the same information on an ADWF-basis, and compares AAF to ADWF along with Figure 4-1 and Figure 4-2.

The City's total AAF and ADWF showed a steady increasing trend between 2009 and 2022. Although there was a period of slower growth between 2014 and 2016, the City's wastewater flow appears to be insensitive to the recent droughts. During the period between 2017 and 2022, the City's AAF increased at an annual rate of approximately 7%, comparable to the City's population growth. In 2022, the City generated a total AAF of 2.171 MGD, including 1.106 MGD treated at the MWQCF (51%) and 1.065 MGD treated at the CTF (49%).

The comparison between AAF and ADWF is calculated in Table 4-2, which is an indication of the amount of rainfall-induced I&I collected during a given year. The ADWF to AAF ratio between 2017 and 2022 averaged 103%, indicating that the ADWF is essentially equal or at times, higher than the AAF.

The total per capita AAF and ADWF also showed an increasing trend between 2009 and 2022, despite temporary declines during the economic recession between 2009 and 2012 and the historic drought between 2014 and 2015. The per capita ADWF varied between 67 and 75 gallons of wastewater per day per capita between 2017 and 2022.

Table 4-1. Current and Historical Wastewater AAF and Per Capita AAF

Year	Average Annual Flow (AAF) (a)			City Population (c)	Per Capita Wastewater Flow (d) (gallons per capita per day)
	MWQCF (MGD)	CTF (b) (MGD)	Total (MGD)		
2009	0.706	0.287	1.154	17,589	66
2010	0.705	0.286	1.145	18,023	64
2011	0.724	0.294	1.157	18,688	62
2012	0.781	0.280	1.171	19,090	61
2013	0.919	0.301	1.333	19,642	68
2014	0.897	0.315	1.359	20,158	67
2015	0.873	0.348	1.360	20,796	65
2016	0.918	0.405	1.463	22,112	66
2017	0.911	0.642	1.553	23,098	67
2018	1.046	0.678	1.724	24,124	71
2019	1.104	0.708	1.812	25,332	72
2020	1.068	0.831	1.899	26,806	71
2021	0.939	1.002	1.941	29,608	66
2022	1.106	1.065	2.171	31,575	69

Notes:

(a) Wastewater flow data from 2009 to 2022 are obtained from the treatment plants' semi-annual monitoring reports. Totals may not sum due to rounding.

(b) Flows to the CTF includes flows to the Crossroads WWTF prior to its conversion and connection to the CTF in August 2015.

(c) City sewered population is assumed to be approximate to City population, which is based on population estimates by the California DOF for the City of Lathrop included in E-5 Population and Housing Estimates.

(d) Per capita wastewater flow is calculated by dividing the total annual wastewater flow by City population and the number of days in a year.

Table 4-2. Current and Historical ADWF and Per Capita ADWF

Year	Average Dry Weather Flow (ADWF) (a)			ADWF vs. AAF (c)	Annual Rainfall (d) (in)	Per Capita ADWF (e) (gallon per capita per day)
	MWQCF (MGD)	CTF (b) (MGD)	Total (MGD)			
2009	0.701	0.257	1.134	98%	10.48	64
2010	0.697	0.266	1.116	97%	18.70	62
2011	0.710	0.276	1.120	97%	10.09	60
2012	0.779	0.274	1.152	98%	13.54	60
2013	0.950	0.299	1.358	102%	14.59	69
2014	0.896	0.304	1.342	99%	14.23	67
2015	0.857	0.335	1.328	98%	7.43	64
2016	0.874	0.383	1.405	96%	18.28	64
2017	0.97	0.701	1.673	108%	16.60	72
2018	1.10	0.705	1.803	105%	14.15	75
2019	1.11	0.663	1.771	98%	17.05	70
2020	1.14	0.880	2.020	106%	5.97	75
2021	0.97	1.007	1.974	102%	14.18	67
2022	1.12	1.083	2.203	101%	11.41	70

Notes:

(a) ADWF is calculated as the average daily flow between June and August of the year. Totals may not sum due to rounding.
(b) Flows to the CTF includes flows to the Crossroads WWTF prior to its conversion and connection to the CTF in August 2015.
(c) The ratio of AAF to ADWF is calculated using AAF values from Table 4-1.
(d) Precipitation data obtained from National Oceanic and Atmospheric Administration Stockton Airport Station (USW00023237).
(e) Per capita ADWF is calculated using City population data in Table 4-1.

Figure 4-1. Current and Historical Wastewater Flow by Collection System

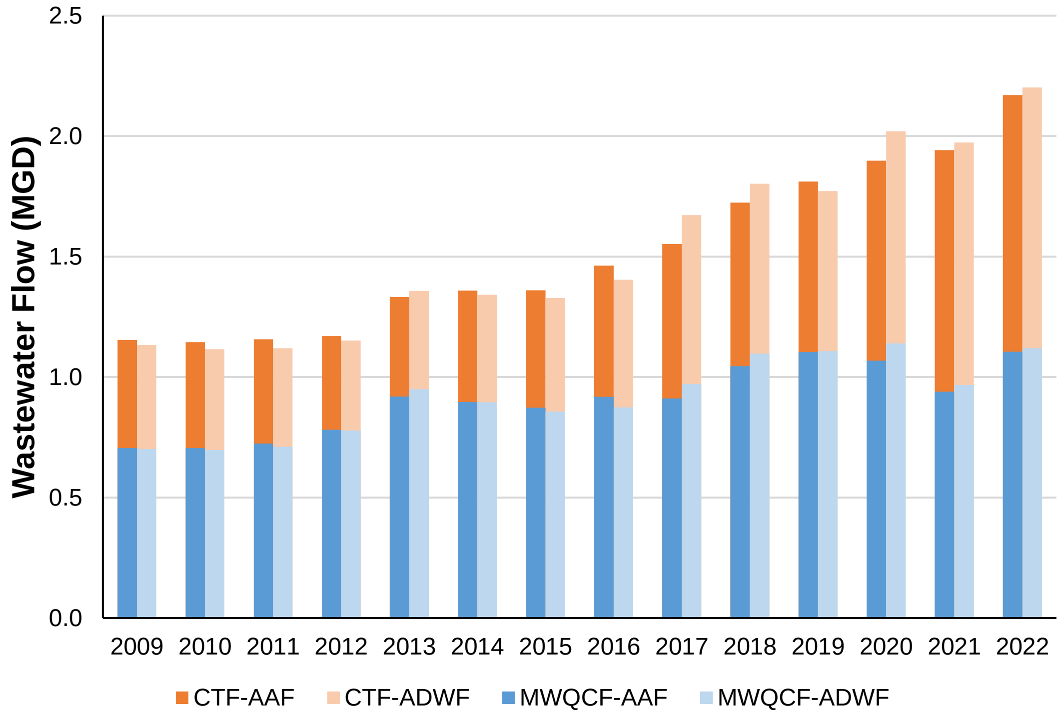
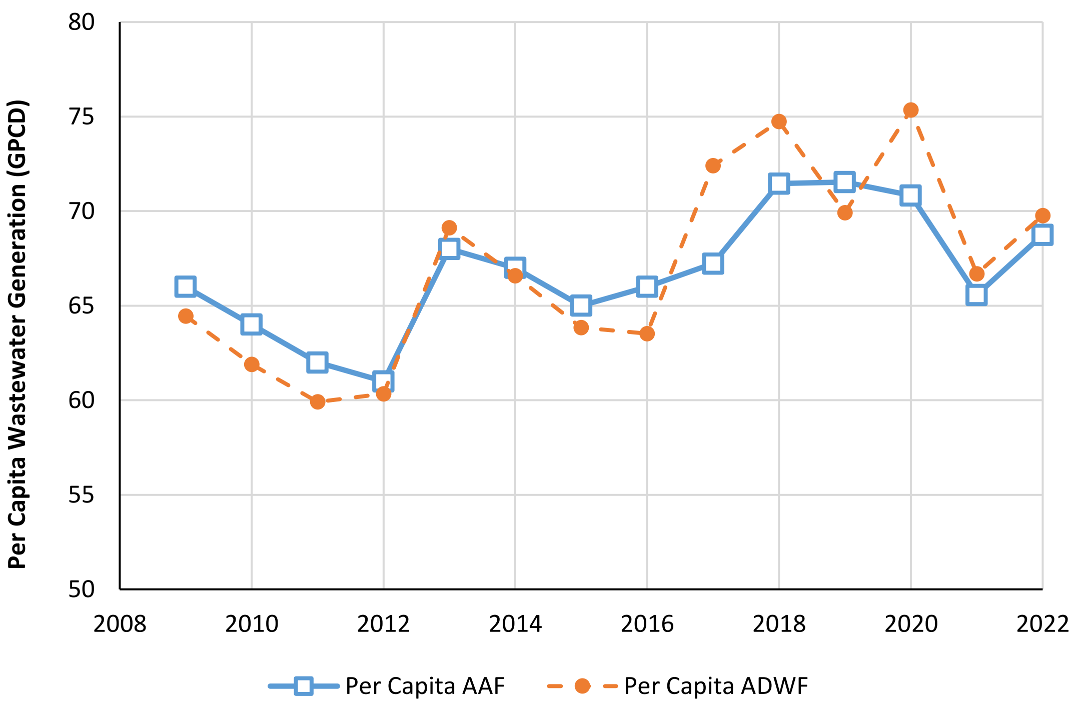


Figure 4-2. Current and Historical Per Capita Wastewater Flow



4.2 Wastewater Generation Projections

Wastewater ADWF projections were calculated as the sum of the two major components of future wastewater flow: (1) the volume of wastewater that represents existing wastewater generation within the City in 2022, and (2) the anticipated wastewater generation associated with the future development projects and planning areas post 2022. Components of wastewater generation projections are described in the sections below.

4.2.1 Existing Wastewater Generation

The City's existing wastewater generation is based on the City's wastewater flow data in 2022, representing development within the City as of the end of 2022. The City decided to apply a 10% safety factor to the 2022 flows to account for anticipated future increases in I&I. A major portion of the City's collection system consists of the newer systems in the areas west of I-5, which will likely produce more I&I in the future as the infrastructure ages.

4.2.2 Wastewater Generation Associated with Planned Development

Wastewater generation associated with anticipated future development are estimated using land use-specific wastewater flow factors and the anticipated acreages and number of dwelling units associated with each proposed development (Table 2-1). The land use-specific wastewater flow factors were developed using historic wastewater flow and parcel-level water use data with a safety factor, as described in detail in Appendix A. These factors are developed based on 2017 to 2021 wastewater flows and update those included in the 2019 WWSMP. The updated wastewater generation factors (in units of gallons per day per dwelling unit or gallons per day per acre; gpd/du or gpd/ac) are presented in Table 4-3, below.

Table 4-3. Wastewater Flow Factors

Land Use	Wastewater Flow Factor	
	Historic Lathrop	West Lathrop
Low Density Residential	240 gpd/du	200 gpd/du
Medium Density Residential	200 gpd/du	155 gpd/du
High Density Residential	110 gpd/du	
Commercial	755 gpd/ac	
Industrial	240 gpd/ac	
Parks	55 gpd/ac	
Schools / Institutional	220 gpd/ac	

Table 4-4 summarizes the volume of wastewater generation associated with anticipated future developments by development area in five-year increments between 2025 and 2045.

4.2.3 Total Projected Wastewater Generation

Table 4-5 summarizes the City's total projected wastewater generation in five-year increments between 2025 and buildout, as a sum of the existing and new wastewater flow. Based on these projections, it is anticipated that total ADWF in 2045 will be 5.67 MGD. Of these totals, ADWFs of 1.36 MGD and 4.31 MGD are anticipated to flow to MWQCF and the Lathrop CTF, respectively. The majority of the anticipated increase in wastewater generation at the CTF is associated with the River Islands and Central Lathrop development areas.

Table 4-4
Projected New Wastewater Flow by Development Area

Land Use Designation	Wastewater Flow Factor	Projected New Wastewater Flow (gpd) (a)				
		2025	2030	2035	2040	Buildout 2045
Central Lathrop Phase 1						
Low Density Residential	240 gpd/du	0	120,000	183,360	183,360	183,360
High Density Residential	110 gpd/du	0	27,060	50,160	63,690	63,690
Commercial	755 gpd/ac	9,815	55,538	55,538	55,538	109,898
Mixed Use	755 gpd/ac	0	0	0	0	38,505
Parks	55 gpd/ac	0	2,149	2,424	2,424	2,424
New Central Lathrop ADWF		9,815	204,747	291,482	305,012	397,877
Central Lathrop - Phase 2						
Light Industrial / R&D Flex	240 gpd/ac	21,557	21,557	21,557	21,557	163,620
Parks	55 gpd/ac	0	0	0	0	275
New Central Lathrop ADWF		21,557	21,557	21,557	21,557	163,895
Mossdale Landing						
Low Density Residential	240 gpd/du	0	0	0	0	15,840
Medium Density Residential	200 gpd/du	0	0	0	0	0
High Density Residential	110 gpd/du	0	0	0	0	0
Commercial	755 gpd/ac	3,443	4,575	4,575	4,575	4,575
Schools	220 gpd/ac	0	0	0	0	3,573
New Mossdale ADWF		3,443	4,575	4,575	4,575	23,988
Mossdale Landing East						
Low Density Residential	240 gpd/du	0	8,880	8,880	8,880	8,880
High Density Residential	110 gpd/du	0	0	0	0	9,240
Commercial	755 gpd/ac	0	5,285	5,285	5,285	5,285
New Mossdale ADWF		0	14,165	14,165	14,165	23,405
Mossdale Landing South						
Medium Density Residential	200 gpd/du	17,000	17,000	17,000	17,000	17,000
Commercial	755 gpd/ac	0	0	6,040	6,040	18,875
Parks	55 gpd/ac	0	220	220	220	220
New Mossdale ADWF		17,000	17,220	23,260	23,260	36,095
Mossdale Landing West						
Low Density Residential	240 gpd/du	0	0	198,960	198,960	198,960
Parks	55 gpd/ac	0	0	603	603	603
New Mossdale ADWF		0	0	199,563	199,563	199,563
River Islands						
Low Density Residential	200 gpd/du	153,600	397,200	640,800	884,400	884,400
Medium Density Residential	155 gpd/du	104,780	251,255	397,730	544,205	544,205
High Density Residential	110 gpd/du	0	153,450	306,900	460,350	460,350
Town Center	755 gpd/ac	0	19,857	39,713	59,570	59,570
Commercial	755 gpd/ac	0	65,006	130,011	195,017	195,017
Schools	220 gpd/ac	7,150	10,450	13,750	16,830	16,830
Parks	55 gpd/ac	1,045	4,395	7,750	11,105	11,105
New River Islands ADWF		266,575	901,612	1,536,654	2,171,476	2,171,476
South Lathrop						
Light Industrial / R&D Flex	240 gpd/ac	0	16,080	16,080	16,080	23,940
Office Commercial	755 gpd/ac	0	6,644	6,644	6,644	7,550
Open Space	55 gpd/ac	0	0	0	0	0
New South Lathrop ADWF		0	22,724	22,724	22,724	31,490
Lathrop Gateway						
Light Industrial / R&D Flex	240 gpd/ac	0	15,840	15,840	19,824	19,824
Office Commercial	755 gpd/ac	0	38,505	38,505	47,339	47,339
Open Space	55 gpd/ac	0	138	138	226	226
New Lathrop Gateway ADWF		0	54,483	54,483	67,388	67,388

Table 4-4
Projected New Wastewater Flow by Development Area

Land Use Designation	Wastewater Flow Factor	Projected New Wastewater Flow (gpd) (a)				
		2025	2030	2035	2040	Buildout 2045
Crossroads						
Industrial	240 gpd/ac	0	5,520	5,520	5,520	5,520
Commercial	755 gpd/ac	0	1,133	1,133	1,133	1,133
New Crossroads ADWF		0	6,653	6,653	6,653	6,653
Historic Lathrop and Other Development Areas						
Low Density Residential	240 gpd/du	0	2,880	4,320	5,520	12,480
Medium Density Residential	200 gpd/du	5,400	10,600	15,800	21,000	43,600
High Density Residential	110 gpd/du	0	0	0	0	5,280
Commercial	755 gpd/ac	16,610	26,878	26,878	26,878	32,918
Industrial	240 gpd/ac	4,320	4,320	4,320	4,320	10,080
New Historic Lathrop / Other ADWF		26,330	44,678	51,318	57,718	104,358
Sharpe Army Depot						
Industrial	--	32,000	32,000	32,000	32,000	32,000
New Sharpe Army Depot ADWF		32,000	32,000	32,000	32,000	32,000
Total Projected New ADWF		**376,720**	**1,324,413**	**2,258,433**	**2,926,091**	**3,258,188**
PROJECTED NEW ADWF AT CTF		***318,390***	***1,247,735***	***2,175,115***	***2,836,373***	***3,121,830***
PROJECTED NEW ADWF AT MWQCF		***58,330***	***76,678***	***83,318***	***89,718***	***136,358***

Notes:

(a) Projected residential wastewater generation calculated as the total number of projected residential dwelling units multiplied by the applicable wastewater flow factor (Table 4-3). Projected non-residential wastewater flow are calculated as the total projected acreage multiplied by the applicable wastewater flow factor (Table 4-3). Projected residential dwelling units and non-residential acreage are listed in Table 2-1.

Table 4-5. Existing and Future Wastewater Flow by Development Area

Development Area (a)	Wastewater Generation (MGD) (a)					
	Baseline (b)	2025	2030	2035	2040	Buildout 2045
Lathrop CTF						
Central Lathrop and Mossdale (c)	0.46	0.51	0.73	1.02	1.03	1.31
River Islands	0.44	0.71	1.35	1.98	2.62	2.62
South Lathrop	0.002	0.002	0.025	0.025	0.025	0.034
Lathrop Gateway and Crossroads (c)	0.28	0.28	0.34	0.34	0.36	0.36
ADWF at CTF	**1.19**	**1.51**	**2.44**	**3.37**	**4.03**	**4.31**
Manteca						
Historic Lathrop and Other Development Areas	1.22	1.28	1.30	1.30	1.31	1.36
ADWF at MWQCF	**1.22**	**1.28**	**1.30**	**1.30**	**1.31**	**1.36**
TOTAL EXISTING ADWF (b)	**2.41**	**2.79**	**3.73**	**4.67**	**5.34**	**5.67**

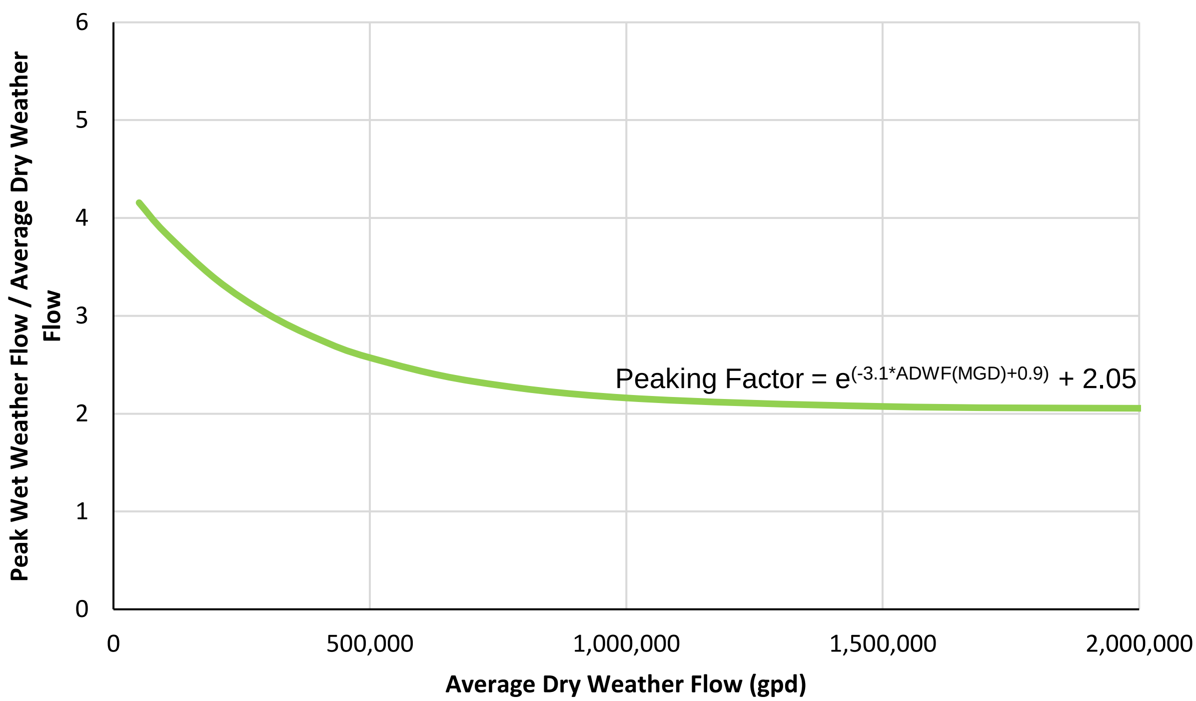
Notes:

(a) Projected wastewater generation calculated as the sum of baseline wastewater generation and the incremental new wastewater generation associated with future development shown in Table 4-4.
(b) Baseline wastewater generation is based on the existing wastewater generation in 2022 at 2.12 MGD with a 10% factor of safety to account for future I&I.
(c) Development areas served by the Lathrop CTF are grouped due to the availability of existing pump station flow data. Central Lathrop and Mossdale ADWF is estimated using flow from the Mossdale PS. Crossroads and Lathrop Gateway ADWF are estimated as the LCTF flow minus flow from the River Islands, Mossdale, and South Lathrop pump stations.
(d) Totals may not sum due to rounding.

4.3 Wastewater Peaking Factors

EKI reviewed the City's historical wastewater flow data between 2017 and 2022 to verify and update the peaking factor curve that best estimates PWWF. PWWF is the highest hourly flow experienced during the year due to rainfall-induced I&I and peak diurnal sanitary flows and is used to evaluate the hydraulic capacity of a wastewater collection system. The PWWF peaking factors are typically higher in smaller drainage areas, in which there is little flow attenuation. Larger drainage areas provide a greater capacity to attenuate flows, as peak flows generated in the upstream reaches of the system take a longer amount of time to travel downstream. EKI developed a new peaking factor curve shown on Figure 4-3. The methodologies used to develop this curve are described in Appendix B.

Figure 4-3. Average Dry Weather Flow and Peaking Factors



5 WASTEWATER TREATMENT CAPACITY ASSESSMENT

This section compares the City's projected wastewater generation through 2045 to its treatment capacity at the two treatment plants. The City's collection system and treatment plant capacity are described in Section 3.2.

5.1 Wastewater Treatment Capacity Assessment

Table 5-1 and Figure 5-1 compares the projected ADWF with the City's allocation at 1.451 MGD at the MWQCF (Section 3.2.1). The City's allocation at the MWQCF is sufficient to meet projected wastewater flows to the MWQCF through buildout.

As shown in Table 5-2 and on Figure 5-2, flows to the Lathrop CTF is anticipated to exceed the current CTF capacity of 2.5 MGD between 2030 and 2035. The City anticipates completing the Lathrop CTF Phase 3 Expansion within the next three years to meet the projected wastewater flows. The Phase 3 Expansion will expand the CTF's capacity to a total of 5.0 MGD, which is sufficient to meet projected flows through buildout.

Collectively, wastewater treatment capacity at the CTF (including the Phase 3 Expansion) and MWQCF is projected to be sufficient to meet Citywide projected wastewater flows through buildout (Table 5-3 and Figure 5-3). However, as discussed below in Section 5.2, recent increases in wastewater strength observed at the treatment plants may limit their treatment capacities.

Table 5-1. Projected Wastewater Flow and Treatment Capacity at MWQCF

	Estimated ADWF Influent and Treatment Capacity (MGD)					
	Existing (2022)	**2025**	**2030**	**2035**	**2040**	**2045**
Projected Influent ADWF (a)						
ADWF Projection	1.11	1.28	1.30	1.30	1.31	1.36
MWQCF Capacity						
Allocated Capacity	1.451	1.451	1.451	1.451	1.451	1.451
Projected Deficit	--	--	--	--	--	--

Notes:

(a) Wastewater influent to MWQCF is the wastewater flow from the Historic Lathrop area and Sharpe Army Depot.

Figure 5-1. Projected Wastewater Flow and Treatment Capacity at MWQCF

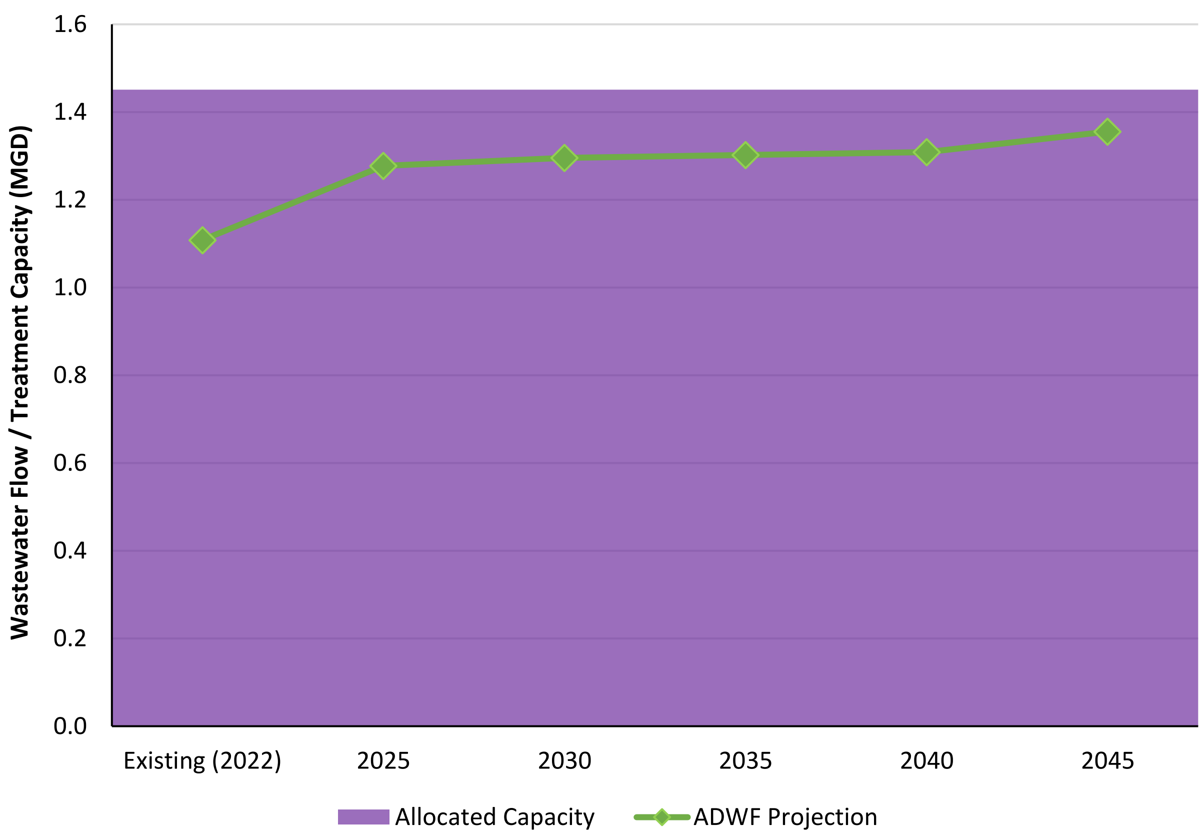


Table 5-2. Projected Wastewater Flow and Treatment Capacity at Lathrop CTF

	Estimated ADWF Influent and Treatment Capacity (MGD)					
	Existing (2022)	2025	2030	2035	2040	2045
Projected Influent ADWF (a)						
ADWF Projection	1.08	1.51	2.44	3.37	4.03	4.31
Existing Capacity and Future Expansions						
Lathrop CTF Phase 0 - 2 (b)	2.50	2.50	2.50	2.50	2.50	2.50
Lathrop CTF Phase 3	0.00	0.00	2.50	2.50	2.50	2.50
Total Capacity	*2.50*	*2.50*	*5.00*	*5.00*	*5.00*	*5.00*
Projected Deficit	--	--	--	--	--	--

Notes:

(a) Wastewater influent to Lathrop CTF is the combination of wastewater flow from all city areas except for the Historic Lathrop area and Sharpe Army Depot.

(b) Higher influent wastewater nutrient concentrations recently observed at the CTF may limit its hydraulic capacity to approximately 2.0 MGD (see Section 5.2).

Figure 5-2. Projected Wastewater Flow and Treatment Capacity at Lathrop CTF

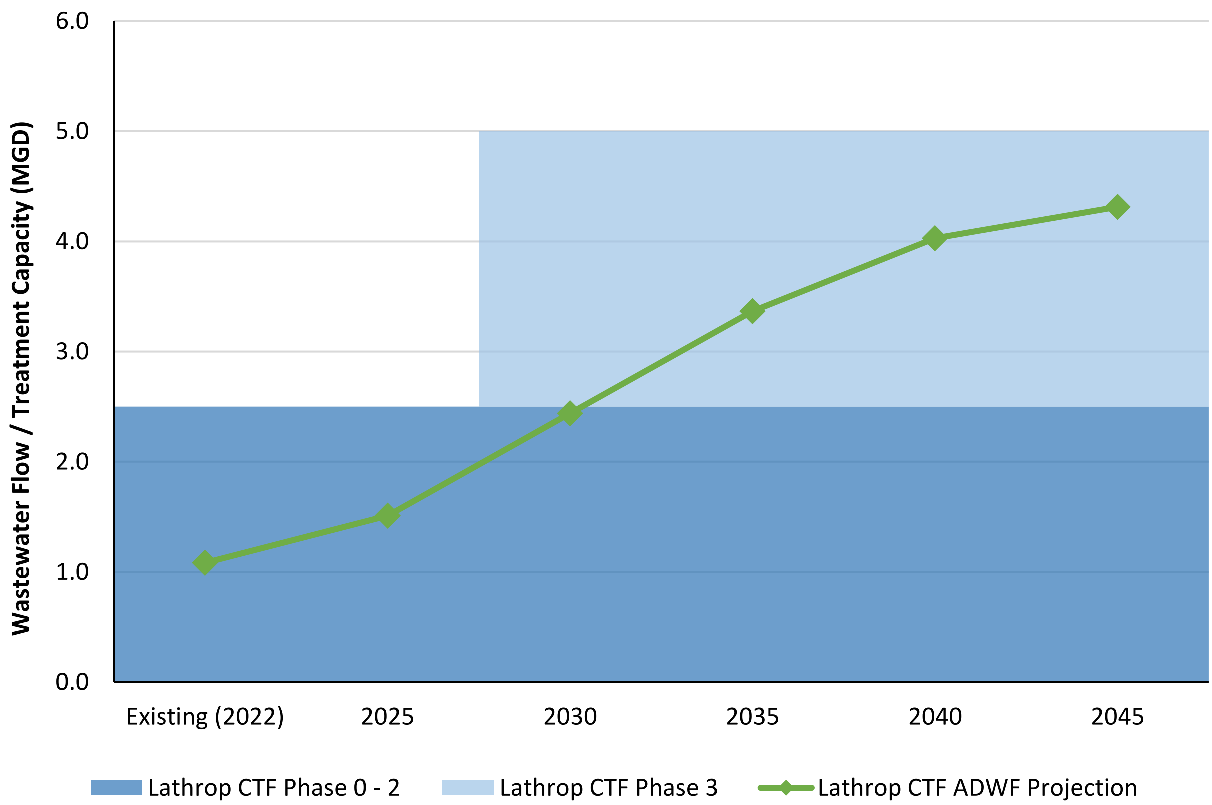
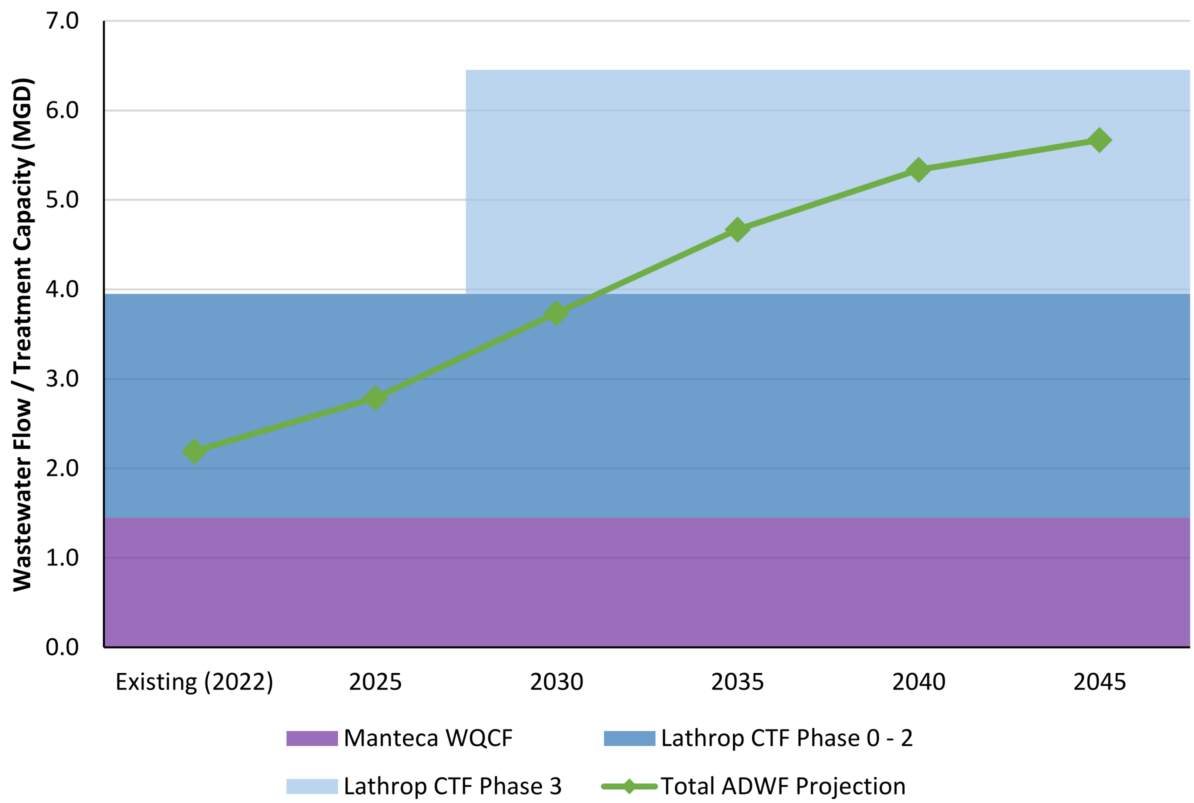


Table 5-3. Projected Wastewater Flow and Treatment Capacity, Citywide

	Estimated ADWF Influent and Treatment Capacity (MGD)					
	Existing (2022)	**2025**	**2030**	**2035**	**2040**	**2045**
Projected Influent ADWF (a)						
Total ADWF Projection	2.19	2.79	3.73	4.67	5.34	5.67
Existing Capacity and Future Expansions						
Manteca WQCF	1.451	1.451	1.451	1.451	1.451	1.451
Lathrop CTF Phase 0 - 2	2.50	2.50	2.50	2.50	2.50	2.50
Lathrop CTF Phase 3	0.00	0.00	2.50	2.50	2.50	2.50
Total Capacity	*3.95*	*3.95*	*6.45*	*6.45*	*6.45*	*6.45*
Projected Deficit	--	--	--	--	--	--

Figure 5-3. Projected Wastewater Flow and Treatment Capacity, Citywide



5.2 Impacts of Wastewater Strength on Treatment Capacity

Both the MWQCF and the Lathrop CTF are observing increasing influent wastewater strength (i.e. concentration of pollutants and nutrients in wastewater) likely due to improved water use efficiency during the recent droughts and in response to state regulations. The increases in influent wastewater strength may further limit treatment capacities at the treatment plants.

5.2.1 Manteca Water Quality Control Facility

In March 2022, Stantec Consulting Services (Stantec) and Herwit Engineering (Herwit) completed a MWQCF Capacity Study that indicates a reduction in MWQCF treatment capacity due to increased wastewater strength over recent years among other factors. To review the pollutant concentration in Lathrop's wastewater conveyed to the MWQCF, EKI conducted monitoring study during October 2022, summarized in Appendix C.

The current wastewater influent to MWQCF, including flows from the Cities of Lathrop and Manteca, has an average BOD concentration of 372 mg/L over the period of 2016 to 2021 (Stantec and Herwit, 2022). To investigate the contribution of wastewater strength, EKI performed monitoring of flow and BOD, TSS, and total kjeldahl nitrogen (TKN) concentrations during October 2022 at selected locations in the City's wastewater collection system connected to the MWQCF. The results indicate there was relatively little variation in BOD, TSS, and TKN concentrations across the six monitored locations. BOD and TKN concentrations in the collection system samples were generally similar to concentrations typically measured from the Lathrop combined influent samples that are collected at the MWQCF, however, the TSS concentrations in the collection system were generally significantly lower than the concentrations from MWQCF samples. BOD concentrations in the collection system samples ranged from 208 mg/L to 312 mg/L. A summary of sampling results is detailed in Appendix C.

5.2.2 Lathrop Consolidated Treatment Facility

The current capacity of the Lathrop CTF at 2.5 MGD was designed in 2015 based on a pollutant loading of 420 mg/L BOD (carbon) and 60 mg/L total nitrogen (TN) (nitrogen). However, current sewer flows to the CTF contain higher dissolved and particulate BOD and TN concentrations. In its 2021 sewershed analysis, PACE Engineers (PACE) showed an increase of 15 to 20% in pollutant load per gallon of water or hydraulic load in wastewater samples collected in the Mossdale, River Islands, and Crossroads areas compared to the CTF design concentrations (PACE 2021). The higher pollutant loading limits the treatment capacity and reduces the CTF hydraulic capacity to 2.0 MGD at current pollutant loading conditions (PACE, 2021).

In the City's collection system draining to the Lathrop CTF, PACE conducted sampling and analysis of BOD and TN during August of 2021. Samples were collected from four locations including Mossdale, River Islands, Crossroads, and combined CTF influent. Filtered chemical oxygen demand (COD), TN, and total dissolved solids (TDS) were analyzed for each sample and BOD was estimated from COD / filtered COD. The average BOD for the Mossdale, River Islands, Crossroads, and combined CTF locations were 554.2 mg/L, 466.8 mg/L, 544.3 mg/L, and 355.8 mg/L, respectively (PACE, 2021).[3]

[3] PACE indicated that the results for the combined CTF influent were artificially low due to the auto-sampling equipment being located too far from the sample location and treatment occurring within the sample tubing.

6 COLLECTION SYSTEM PERFORMANCE AND DESIGN CRITERIA

The criteria used to evaluate the City's existing collection system is based on 2022 *Lathrop Design and Construction Standards* ("Standards"; Lathrop, 2022) and the 2019 WWSMP. A summary of the wastewater system design criteria is provided below:

- For hydraulic analyses, a Manning's "n" of 0.013 is assumed for all sewers.
- Pipes 15 inches in diameter and smaller are designed for peak flows with a maximum depth to diameter (d/D) ratio of 0.50. Pipes 18 inches in diameter and larger are designed for peak flows at a maximum d/D ratio of 0.75.
- Design velocity and head loss for force mains calculated using Hazen-Williams formula with a roughness constant of 110.
- Minimum velocity greater than 2 feet per second (fps) for pipes flowing half full.
- Minimum gravity main slopes are summarized in Table 6-1.
- Maximum velocity less than 10 fps.
- Pump stations should be designed to convey PWWF within its firm capacity[4].

Table 6-1. Minimum Gravity Main Slopes

Pipe Size (inch)	Minimum Slope (ft/ft)
6	0.0050
8	0.0035
10	0.0025
12	0.0020
15	0.0015
18	0.0012

6.1 Capacity Criteria

The collection system is primarily evaluated against its ability to carry projected PWWF. Specifically, the d/D ratio for gravity mains under PWWF are compared to the design criteria. Force mains are considered to be capacity deficient if maximum velocity exceeds 10 fps. For pump stations, the required total head and flow under PWWF are compared to their firm capacity.

6.2 Minimum Velocity and Slope Criteria

Minimum velocity and slope criteria for gravity mains are of the same nature and independent of flow, i.e. velocity in a pipe flowing at half full is determined by its slope. These criteria ensure an appropriate flushing velocity and prevents sediment buildout in the pipes. However, it is unnecessary to correct an existing pipe with a mild slope if the pipe is sufficient to carry PWWF. The minimum velocity and slope criteria evaluation were not updated as part of this WWSMP Amendment.

[4] Defined as pumping capacity with the largest pumping unit out of service.

7 HYDRAULIC ASSESSMENT OF THE COLLECTION SYSTEM

EKI updated the City's wastewater system hydraulic model to assess the ability of City's existing collection system and key planned infrastructure under various wastewater flow scenarios to meet the recommended performance and operational criteria described in Section 6. A hydraulic model transforms information about the physical facilities and system into a mathematical model used to analyze the sewer system under various demand conditions. The hydraulic model then generates information on flow, velocity, flow depth, and head that can be used to assess system performance and identify system capabilities and deficiencies. The hydraulic model can also be used to verify the adequacy of recommended or proposed system improvements.

7.1 Hydraulic Modeling Approach

To evaluate collection system performance against hydraulic design criteria, EKI (1) conducted steady-state model simulations of PWWF conditions, and (2) evaluated capacity and head requirements at PWWF for each lift station or pump station for existing and buildout scenarios.

The PWWF were modeled for all pipes as the total ADWF upstream of the pipe multiplied by the corresponding peaking factor from Figure 4-3. Pump stations were first modeled as ideal pumps that can pump at a rate equal to the inflow to determine the estimated PWWF influent to each pump station. The modeling results were then evaluated against actual pump hydraulics to determine if each pump station has sufficient capacity to pump the modeled PWWF.

7.2 Hydraulic Model Update

This section provides an overview of the updates to the City's sewer system hydraulic model as part of this WWSMP amendment.

7.2.1 Model Platform

The City's existing sewer system hydraulic model was developed on the Innovyze InfoSWMM model platform for the 2019 WWSMP. This selection was partially based on the platform's geographical information system (GIS) integration capabilities. To optimize the modeling building and maintenance process, a key objective of the IWRMP modeling effort was to construct hydraulic models that are integrated with the City's infrastructure GIS and allow for automatic synchronization between the model and infrastructure GIS to limit future maintenance efforts.

7.2.2 Model Update

The City maintains a GIS geodatabase of its infrastructure assets, which was used as the basis of information to construct the existing water system hydraulic model. EKI updated the City's GIS database to incorporate recent infrastructure improvements, identified and filled data gaps to make sure the GIS database accurately represented the City's existing utility infrastructure as of January 2023.

After importing the City's GIS data into the hydraulic model, the following steps are performed to address data gaps, validate network data, and create a fully connected network:

- New wastewater system infrastructure, including lift stations, pipeline improvements constructed post 2019 WSMP, were digitized in the geodatabase and incorporated into the new hydraulic model.

- The model network was reviewed and refined for connectivity. Using the software's tools, each pipe was connected to a model node[5] and identified for upstream and downstream directions. Orphan and duplicate elements were corrected.
- Node and pipe invert data were reviewed and corrected for data errors. Missing invert data were inferred based on the City's minimum slope requirement, known invert of connecting pipes, and ground slope.
- Global parameters including Manning's constant and the Hazen-Williams C-Factors were applied to pipes based on City's design criteria.
- All scenarios were created with associated active facilities and conveyance configurations
- Parcel-level wastewater flow projections were allocated to the nearest upstream manhole.

EKI also obtained data for pump stations including wet well dimensions and elevations, pump types, operating levels, and head-discharge curves. These data are summarized in Table 3-2 and are the basis for the pump station evaluation in Section 7.5. Modeled PWWF at each pump station are summarized in Table 7-1.

EKI did not recalibrate the hydraulic model due to lack of sewer flow monitoring data. However, flow monitoring recommended as a CIP (see Section 8) could be used to calibrate the model in the future.

7.3 Sewer System Hydraulic Modeling Scenarios

The Existing (2022) and Buildout (2045) scenarios respectively assess existing infrastructure and regional infrastructure needs for the City's current and planned developments described in Section 2.2.

Parcel-level wastewater ADWFs for the existing scenario were developed based on parcel land use and wastewater generation factors summarized in Section 4.2. Future ADWF included in the Buildout scenario is consistent with flow projections described in Section 4.2.3. Figure 7-1 shows parcels and future development included in each scenario.

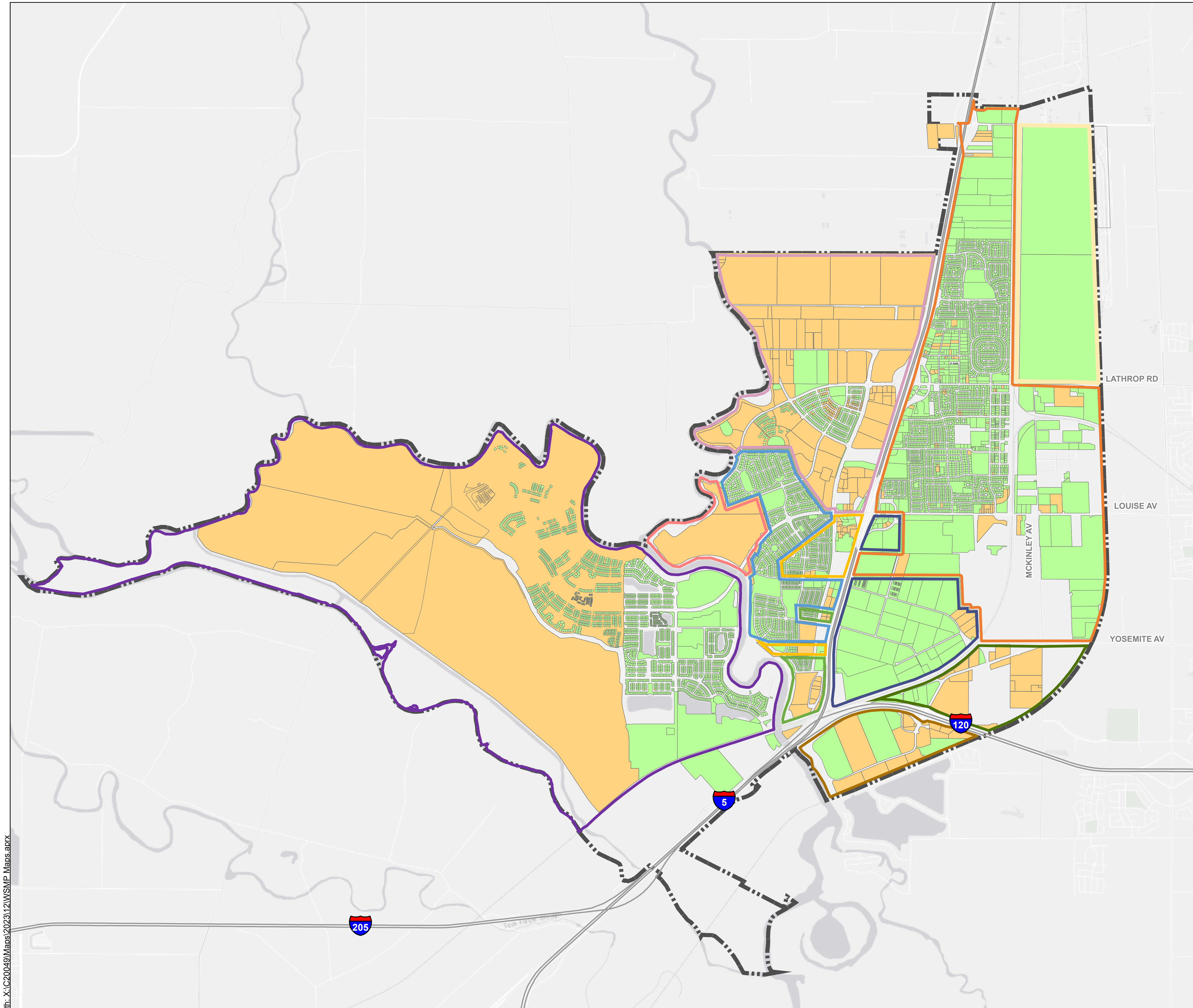
[5] either a manhole, a force main fitting, or a network structure

Table 7-1. Peak Wet Weather Flow at Pump Stations.

Lift Station or Pump Station	Existing			Buildout		
	ADWF (mgd)	Peaking Factor	PWWF (mgd)	ADWF (mgd)	Peaking Factor	PWWF (mgd)
MWQCF Collection System						
North Harlan PS	0.017	4.4	0.076	0.040	4.2	0.168
Stonebridge LS	0.158	3.6	0.561	0.158	3.6	0.561
Woodfield LS	0.382	2.8	1.071	0.389	2.8	1.083
Valley Crossing LS	0.009	4.4	0.039	0.009	4.4	0.039
J Street LS	0.270	3.1	0.842	0.315	3.0	0.938
Easy Court LS	0.081	4.0	0.322	0.083	4.0	0.327
O Street PS	0.518	2.5	1.317	0.583	2.5	1.431
McKinley Avenue PS	0.564	2.5	1.398	0.575	2.5	1.417
Lathrop CTF Collection System						
Central Lathrop PS	0.069	4.0	0.279	0.630	2.4	1.511
Mossdale PS	0.579	2.5	1.424	0.861	2.2	1.913
River Islands 2A PS	0.183	3.4	0.629	1.395	2.1	2.905
River Islands Main PS	0.493	2.6	1.273	2.658	2.1	5.45
Crossroads PS	0.043	4.2	0.182	0.054	4.1	0.223
South Lathrop PS	0.0003	4.5	0.001	0.032	4.3	0.136
Lathrop Gateway PS	0.01	4.5	0.03	0.07	4.0	0.286

Notes:

(a) Flow information is not available for the Louise Avenue PS.



Legend

- Sphere of Influence

Development Areas

- Central Lathrop
- Crossroads
- Historic Lathrop Infill and Other Developments
- Lathrop Gateway
- Mossdale Landing
- Mossdale Landing East
- Mossdale Landing West
- Mossdale Landing South
- River Islands
- Sharpe Army Depot
- South Lathrop

Incremental Development by Model Scenario

- Existing (2022)
- Buildout (Beyond 2040)

Notes
1. All locations are approximate.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 16 January 2024.

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Modeling Scenarios

Wastewater System Master Plan Amendment
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Figure 7-1

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7.4 Collection System Hydraulic Evaluation

As discussed in Section 6.1, the City's collection system is primarily assessed against the capacity criteria, including d/D ratio in gravity mains and maximum velocity in force mains. Figure 7-2 and Figure 7-3 show the modeled d/D ratio under PWWF for each scenario. Gravity mains are highlighted where the modeled d/D ratio exceeds the design criteria.

Modeled results are generally similar to the 2019 WWMP update and show that approximately 3% of City's existing gravity mains will not meet the capacity criteria by 2045 (see Table 7-2). As shown on Figure 7-2 and Figure 7-3, areas with capacity deficiencies are mostly consistent in the two scenarios, indicating that most capacity deficiencies identified in the Buildout scenario already exist in the existing system, although the degree of deficiency may increase with projected development.

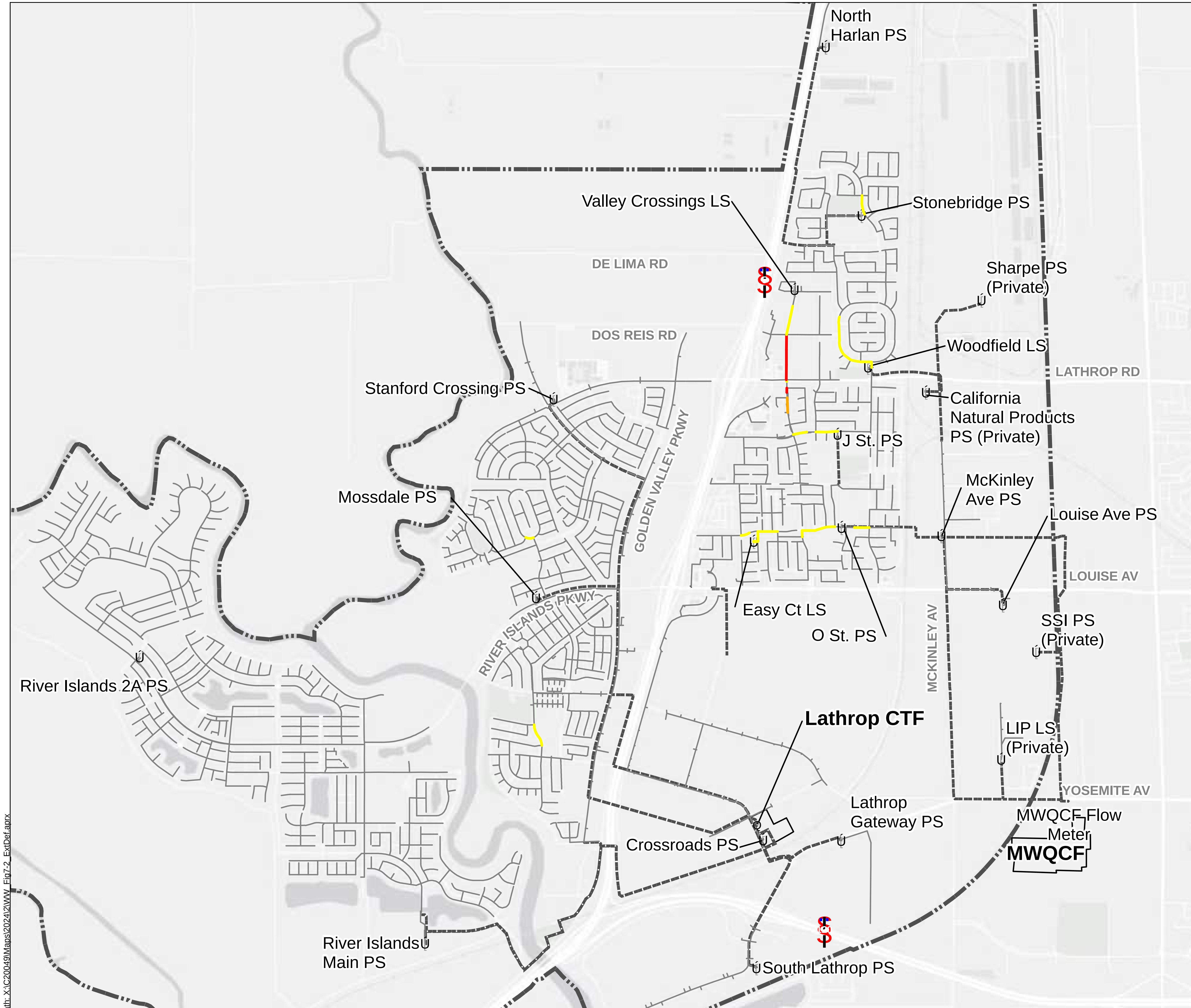
Table 7-2 summarizes modeled d/D ratio results for each scenario.

Table 7-2. Summary of Collection System Capacity Deficiencies

Scenario	Percent Length of Gravity Mains			
	Meeting Capacity Criteria	d/D Ratio Greater Than 0.5 (a)	d/D Ratio Greater Than 0.75	d/D Ratio Greater Than 1 (Surcharged)
Existing	98%	1.4%	0.1%	0.2%
Buildout	97%	2.0%	0.2%	0.3%

Notes:

(a) Gravity mains less than 18-inch diameter and exceeding the capacity criteria.



Legend
- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Force Main

Gravity Mains
- Meeting Capacity Criteria

Modeled Deficiencies
- d/D ratio 0.51 - 0.75
- d/D ratio 0.76 - 0.99
- d/D ratio >= 1.0 (Surcharged)

Abbreviations

CTF	=	Consolidated Treatment Facility
d/D	=	flow depth vs. pipe diameter
LIP	=	Lathrop Industrial Park
LS	=	lift station
MWQCF	=	Manteca Water Quality Control Facility
PS	=	pump station
SSI	=	Super Store Industries
WWTF	=	wastewater treatment facility

Notes
1. All locations are approximate.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 12 March 2024.

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Existing Collection System Capacity Deficiencies

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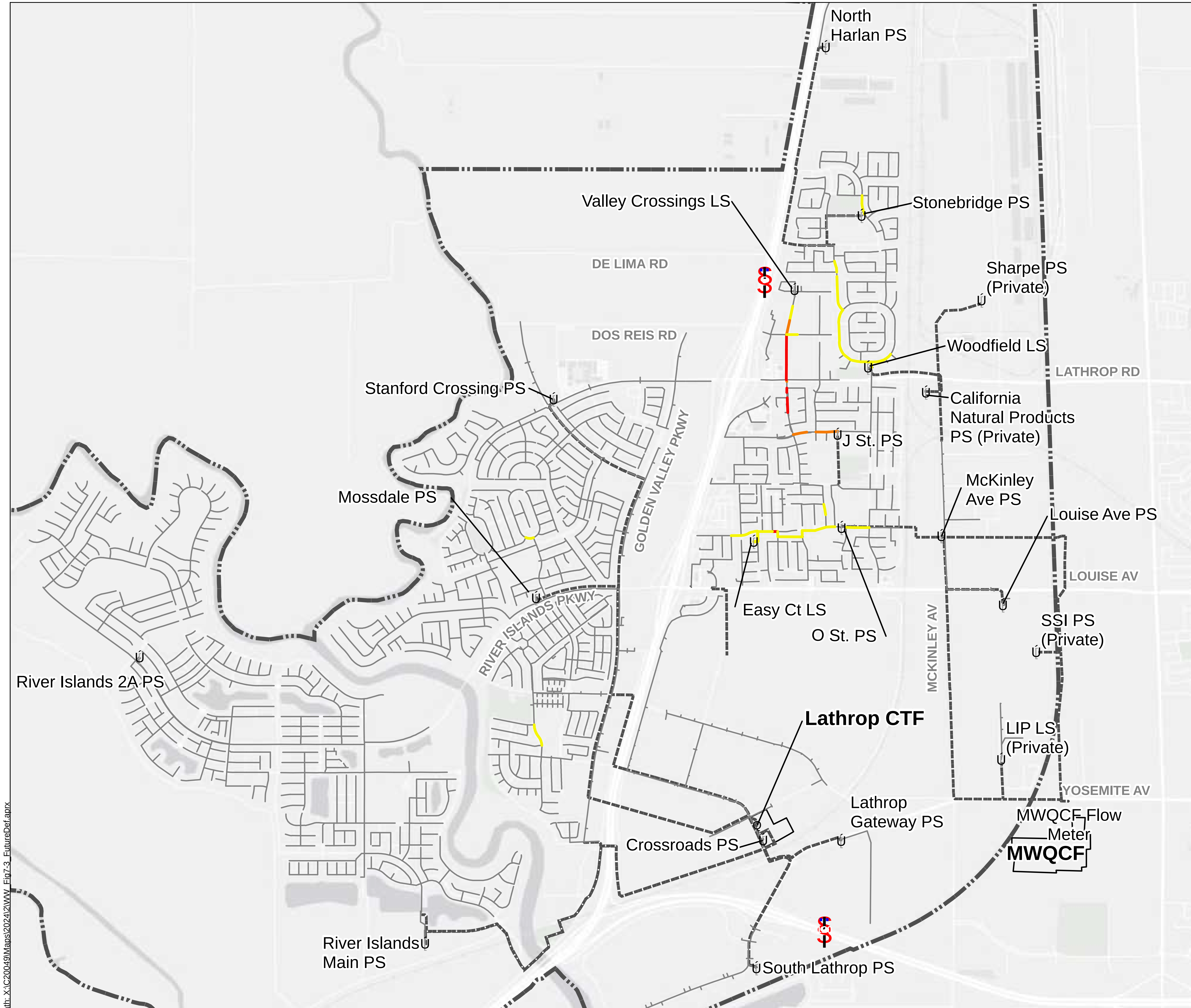
Figure 7-2



Legend

- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Force Main

Gravity Mains

- Meeting Capacity Criteria

Modeled Deficiencies

- d/D ratio 0.51 - 0.75
- d/D ratio 0.76 - 0.99
- d/D ratio >= 1.0 (Surcharged)

Abbreviations

CTF = Consolidated Treatment Facility
d/D = flow depth vs. pipe diameter
LIP = Lathrop Industrial Park
LS = lift station
MWQCF = Manteca Water Quality Control Facility
PS = pump station
SSI = Super Store Industries
WWTF = wastewater treatment facility

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 28 March 2024.

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(Scale in Feet)

Buildout Collection System Capacity Deficiencies

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Figure 7-3

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7.5 Force Main and Pump Station Capacity Evaluation

The hydraulic requirements at each lift station or pump station depend on configuration of its downstream force main, specifically, size and head loss. Therefore, EKI ran the model and reviewed the resulting velocities to optimize force main configuration in the Buildout scenario before conducting the hydraulic assessment.

Table 7-3 summarized the force main configurations under PWWF in each scenario, as well as the head loss and velocity of each force main. As shown on the table, the City's existing and planned force mains are able to convey projected wastewater flow through buildout.

Table 7-4 summarizes the flow and total head requirements under PWWF for each pump station. The table also lists the firm capacities of each pump station under Existing and Buildout scenarios, which may be affected by a pump station expansion or significant change in the total head requirement due to development. When compared to the pump stations' capacities, deficiencies are identified in the Stonebridge LS in both scenarios.

Table 7-3. Force Main Hydraulic Analysis Results

Upstream Pump Station	Force Main Diameter (in)	Existing Velocity (fps)(b)	Buildout Velocity (fps)(b)
CLSP PS	18	14" Capacity Sufficient (b)	
	14	**0.40**	2.14
Mossdale PS	8	**1.60**	**1.75**
	12	2.05	2.24
River Islands 2A	30	**1.89**	2.57
River Islands Main PS	18	**1.09**	3.45
	12	18" Capacity Sufficient (b)	2.71
Crossroads PS	8	**1.21**	**1.44**
South Lathrop PS	6	**0.10**	**0.53**
	6	6" Capacity Sufficient (c)	
Lathrop Gateway PS	6	**0.68**	2.39
	4	6" Capacity Sufficient (c)	
North Harlan PS	6	**0.59**	**1.31**
Stonebridge PS	6	4.36	4.36
Woodfield LS	10	2.98	3.02
Valley Crossings LS	4	**0.98**	**0.98**
J St. PS	8	4.10	4.47
Easy Ct LS	8	2.32	2.33
O St. PS	12	2.55	2.76
McKinley Ave PS	10	5.44	5.47

Notes:

(a) **Blue bolded** text indicates velocity does not meet minimum criteria of 2 fps.
(b) Velocity in the force mains under steady-state hydraulic modeling is evaluated as a secondary criterion. In reality, force main and pump station operations can be adjusted from time-to-time to ensure there is enough velocity to prevent sedimentation.
(c) For pump stations with parallel force mains, a single force main was modeled when velocities were below 2 fps.

Table 7-4. Summary of Hydraulic Capacity Analysis for Pump Stations

Pump Station	Existing Firm Capacity (gpm)	Existing Scenario		Buildout Firm Capacity (gpm) (b)	Buildout Scenario	
		PWWF (gpm)	TDH (ft)		PWWF (gpm)	TDH (ft)
MWQCF Collection System						
North Harlan PS	1,075	53	11.4	--	117	21.2
Stonebridge LS	350	**390**	**47.5**	--	**390**	**43.0**
Woodfield LS	820	744	47.5	--	752	50.2
Valley Crossing LS (c)	83	27	47.5	--	27	50.2
J Street LS	700	584	27.8	--	651	28.1
Easy Court LS	500	223	37.9	--	227	65.1
O Street PS	2,800	915	27.8	--	994	28.1
McKinley Avenue PS	1,675	971	34.1	--	984	35.5
Lathrop CTF Collection System						
Stanford Crossing PS	2,300	194	37.9	--	1,049	65.1
Mossdale PS	4,050	989	43.2	3,450	1,328	58.9
River Islands 2A PS	3,975	437	19.4	--	2,018	19.9
River Islands Main PS (e)	1,700	884	37.9	15,000	3,785	65.1
Lathrop Gateway PS	280	126	13.5	--	155	22.2
South Lathrop PS	1,850	1	27.8	--	94	28.1

Notes:

(a) **Red bolded** text indicates PWWF exceeded pump station's firm capacity.
(b) If different from existing firm capacity.
(c) Capacity of the 8"outlet is listed as the lift station capacity, as it is the capacity limiting component of this pump station.
(d) Flow information is not available for the Louise Avenue PS, therefore, its capacity is not analyzed.
(e) It is anticipated that the River Islands Sewer PS will be constructed in phases to include a total of six pumps.

8 CAPITAL IMPROVEMENT PROGRAM CHANGES TO THE 2019 WWSMP

This section recommends modifications and additions to the list of recommended CIPs included in the 2019 WWSMP and the City's current Capital Improvement Program (Lathrop, 2023). Table 8-1 summarizes the current CIPs and incorporates the modifications recommended herein. The Opinion of Probable Cost (OPC) for each project is escalated to December 2024 dollars based on an Engineering News Record (ENR) Construction Cost Index (CCI) of 13,632 (20-city average). The OPCs are conceptual level estimates, considered to have an estimated accuracy range of -30% to +50%, suitable for use for budget forecasting, CIP development, and project evaluations, with the understanding that refinements to the project details and costs would be necessary as projects proceed to design and construction.

Figure 8-1 shows an overview of the collection system project locations and improvements. Each project is shown in detail in Appendix D .

8.1 Modifications to Wastewater Treatment CIPs

The following modifications to the City's wastewater treatment CIPs are identified to reflect recent wastewater strength at MWQCF and the City's progression on CTF expansions.

8.1.1 Manteca Interim Improvements

As discussed in Section 5.1, the City of Manteca indicated that increases in influent wastewater nutrient concentrations reduce MWQCF's treatment capacity to 6.36 MGD and, therefore, Lathrop's share of MWQCF's capacity to 0.935 MGD (Stantec and Herwit, 2022; Manteca, 2022). The City's ADWF conveyed to the MWQCF was 1.11 MGD in 2022 and was above this estimated reduced allocation. Moreover, the City anticipates a total of 1.31 MGD of wastewater will flow to MWQCF at buildout.

The City of Manteca is planning interim improvement projects which would increase the MWQCF's capacity to 8.23 MGD and Lathrop's share of capacity to 1.21 MGD. The cost estimate of interim improvement projects to MWQCF was estimated at a total $32.8 million in the August 2022 letter and updated to $79.6 million in Manteca's 2023 draft Wastewater Master Plan (Manteca, 2022; 2023).

The draft Manteca Wastewater Master Plan additionally evaluated a Phase IV Expansion Project that would further increase MWQCF's capacity from 8.23 MGD to 17.5 MGD to serve projected population growth in its service area. The recommended Phase IV Expansion Project includes two 4.65 MGD stages, with the cost of Stage 1 estimated at $146.3 million and Stage 2 at $70.6 million.

The City is currently assessing its rights to capacity at the MWQCF and the appropriate level of contribution to improvements at the MWQCF to meet its current and buildout wastewater treatment needs. It is anticipated that the City will identify such improvements as a CIP once an agreement is established.

8.1.2 Lathrop CTF Phase 3 Expansion

The current Phase 2 expansion Lathrop CTF has a hydraulic capacity of 2.5 MGD at elevated wastewater strength levels. As discussed in Section 5.1, wastewater ADWF to the Lathrop CTF is projected to soon exceed this capacity before 2025. The City has initiated Phase 3 expansion of the facility to a total ADWF capacity of 5.0 MGD. As shown in Table 8-1, the total projected OPC for the Phase 3 expansion is approximately $23.7 million based on the City's FY 2023-24 CIP plan (WW 22-38).

The Phase 3 expansion is projected to meet flows from the new development areas through 2040, until when the City may need a fourth expansion of the facility.

8.2 Modification to Collection System CIPs

The hydraulic evaluation presented in Section 7 showed a reduction in hydraulic deficiency locations compared to those presented in the 2019 WWSMP as a result of CIPs completed since the 2019 WWSMP and lower wastewater flow projections. In particular, (1) the Woodfield Pump Station upgrade (WW 22-26) was completed in 2019; and (2) the Crossroads gravity main replacement project (WW 22-27) is no longer necessary. As such, these projects are removed or modified from the list of recommended CIPs.

The Stonebridge LS is approximately 40-gpm over capacity and the North Harlan PS has significant excess capacity. As an alternative to Project WW-1, North Harlan Rd businesses which currently pump into the Stonebridge collection system could instead tie-into North Harlan Rd SSFM.

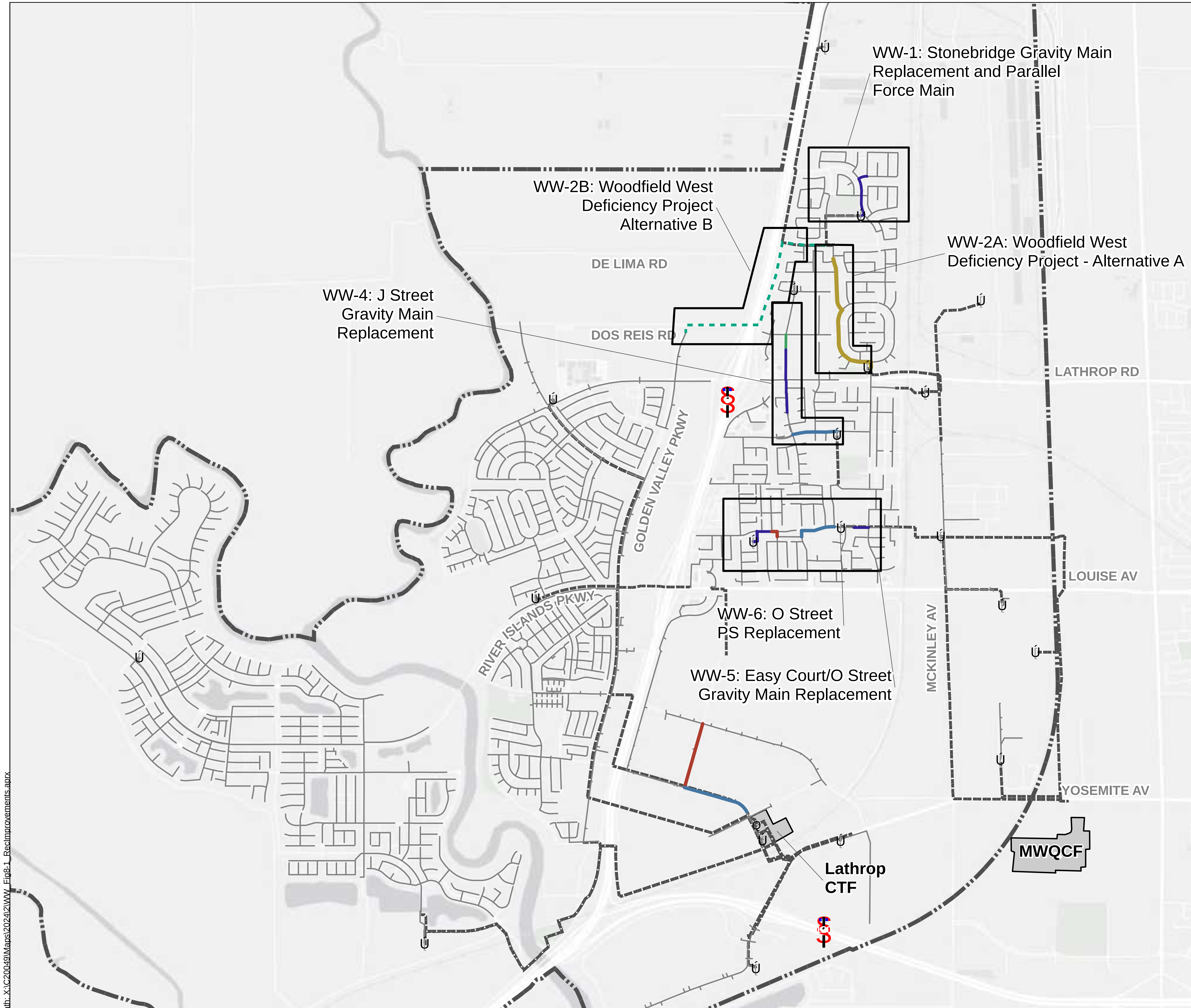
The remaining collection system CIPs from the 2019 WWSMP have been reviewed and have been retained to address the potential deficiencies identified in the hydraulic assessment. However, EKI recommends additional analysis be conducted to confirm the required project extents and sizing.

Table 8-1. Summary of Capital Improvement Projects

Project Number	Project	Timeframe	Addresses Modeled Surcharging in Existing Scenario	Total Project OPC (a)
Treatment Facility Improvement Projects				
WWT-1	Manteca Interim Improvements	Near-term (b)	--	--
WWT-2	CTF Phase 3 Expansion (WW 22-38)	Near-term (c)	--	$23,700,000
WWT-3	CTF Surface Water Discharge (WW 20-17) (d)	Existing	--	$12,699,000
Total Treatment Facility Improvements OPC				**$36,399,000**
Collection System Improvement Projects				
WW-1	Stonebridge Gravity Main Replacement and Pump Station Upgrade (WW 22-25) (e)	Existing	No	$850,000
WW-2A	Woodfield West Deficiency Project - Alternative A (WW 22-26)	Existing (f)	No	$2,730,000
WW-2B	Woodfield West Deficiency Project - Alternative B (WW 22-26)	Existing (f)	No	$2,400,000
WW-4	J Street Gravity Main Replacement Project	Existing (f)	Yes	$1,690,000
WW-5	Easy Court / O Street Gravity Main Replacement Project	Existing	No	$1,370,000
WW-6	O Street Pump Station Upgrade	Existing	No	$1,560,000
Total Collection System Improvements OPC				**$10,500,000**
Miscellaneous Collection System Projects				
WW-8	Temporary Flow Monitoring	--	--	$100,000
WW-9	Wastewater Lift Station Access Modifications (PW 24-14) (d)	FY 23-25 CIP		$475,000
WW-9	Ozone Upgrade for Wastewater Pump Stations (PW-24-15) (d)	FY 23-25 CIP		$75,000
Total Miscellaneous Collection System Improvements OPC				**$650,000**
TOTAL WASTEWATER SYSTEM IMPROVEMENTS OPC				**$47,649,000**

Notes:

(a) Costs shown are presented in December 2024 dollars based on an ENR CCI of 13,632.41 (20-city average).
(b) City is currently evaluating the appropriate level of contribution to improvements at the MWQCF.
(c) City is currently issuing a request for proposal to PACE which may update this project OPC.
(d) Project included as a part of the City of Lathrop Capital Improvement Programs Fiscal Years 2023-2025 report.
(e) Connecting North Harlan Rd businesses which currently pump into the Stonebridge collection system to the North Harlan Rd SSFM can be considered as an alternative.
(f) Project addresses existing deficiencies, however future development influences recommended pipe or pump sizes to be installed.



Legend
- Sphere of Influence
- Approximate Area of WWTF
- Pump Station or Lift Station
- Pump Station or Lift Station Upgrade
- Force Main
- Gravity Main

Diameter of Replacement Sewer
- 8"
- 10"
- 12"
- 15"
- 18"

Diameter of New Force Main
- 6"

Abbreviations
CTF = Consolidated Treatment Facility
MWQCF = Manteca Water Quality Control Facility
WWTF = wastewater treatment facility

Notes
1. All locations are approximate.
2. A detailed map for each project is included in Appendix D.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 12 March 2024.

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Recommended Collection System Improvement Projects

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Figure 8-1

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APPENDIX A
WASTEWATER GENERATION FACTOR EVALUATION

A. WASTEWATER GENERATION FACTOR EVALUATION

The following section describes the analysis performed to verify and update land-use specific wastewater generation factors developed by EKI in the City's 2019 Integrated Water Resources Master Plan (IWRMP). As the City meters wastewater flows only at pump stations or at treatment plants, it is difficult to determine existing wastewater flow rates by individual land uses or sectors. However, wastewater use by individual sector can be estimated using historical water billing data. The analysis herein estimates wastewater flow rates using historical minimum month water use data and its ratio compared with measured average dry weather flow (ADWF).

EKI first evaluated the City's water billing data for each applicable land use category and calculated the unit volume of minimum month water use for an individual dwelling unit (gpd/du) or each acre of commercial, industrial, and institutional (CII) development (gpd/acre). This factor was then multiplied by either the uniform City-wide or development-area-specific ratios between water use and the ADWF (see Section A.1) to estimate the unit volume of wastewater ADWF, or gallons of wastewater per day per dwelling unit or acre (gpd/du and gpd/acre, respectively). These unit flow factors represent estimated ADWF measured downstream at the wastewater treatment plants, which includes base sanitary flow (BSF) and year-round groundwater infiltration into the collection system.

The updated wastewater flow factors are listed in Table A-4. As discussed below, a separate set of factors for River Islands low and medium density residential land uses has been developed to account for the unique residential per unit water use and existing lower I&I due to the age of the collection system in this development area. A safety factor of 15% has been applied to the unit wastewater flow for the River Islands factors to account for the expected increase in I&I in the future as the sewer system ages. A lower safety factor of 10% has been applied to the City-wide per unit wastewater generation factors to account for the relatively new developments and their local wastewater collection systems in Mossdale and Central Lathrop Specific Plan (CLSP) development areas.

The process used to develop updated wastewater factors for each land use category is described in the following sections.

A.1 Wastewater Flow and Water Use Comparison

To evaluate the relationship between water use and wastewater generation, EKI compared monthly water use derived from the City's account-level water billing data to wastewater generation within each drainage area. By comparing water use to wastewater flows during the winter months, when little water is typically used outdoors, one can assess the amount of I&I. For example, without significant I&I, wastewater flows are typically only slightly lower than water use in winter, assuming the majority of indoor water use drains to the wastewater collection system. Wastewater flows in excess of water use during the winter would be indicative of contributions from I&I.

Monthly average wastewater flow and water use from non-irrigation accounts between January 2017 and December 2021 for each collection system are shown on Figure A-1. Wastewater flows in the MWQCF (Manteca Water Quality Control Facility) drainage area was based on the SCADA at the MWQCF site, while the LCTF (Lathrop Consolidatedh Treatment Facility) no River Islands drainage area wastewater flows was calculated by subtracting the River Islands pump station SCADA from the SCADA data at the LCTF site, which treats wastewater from Mossdale, River Islands, CLSP, South Lathrop, and Lathrop Gateway development areas as shown in the system schematic shown in Section 3.[1,2]

While water use generally exhibits strong seasonal trends largely due to landscape irrigation, wastewater generation appears similar from month to month. During the winter months, overall wastewater flows in the MWQCF drainage area (i.e., Historic Lathrop Infill areas) and LCTF drainage area (i.e., the rest development areas within the City) without River Islands are nearly equivalent to water use. Specifically, in the River Islands development area, wastewater flows are approximately 80% of winter water use.[3]

Table A-1 compares ADWF to water use during the month with the least water use (i.e. “minimum month water use”) for each winter from 2017 to 2022 to assess the amount of infiltration. Wastewater flows range from 84% to approximately 115% of minimum month water use in the MWQCF drainage area. In LCTF drainage area, the 5-year average ADWF is 95% of minimum month water use, while in River Islands, the ADWF is approximately 84% of minimum month water use. Without River Islands’ wastewater flow contributions, the LCTF ADWF to water use increased to as high as 110%. It may be indicative of I&I from the rest LCTF development areas draining to the LCTF collection system.[4] Citywide, the ADWF to water use ratio during minimum water use months is about 98% during the five-year window.

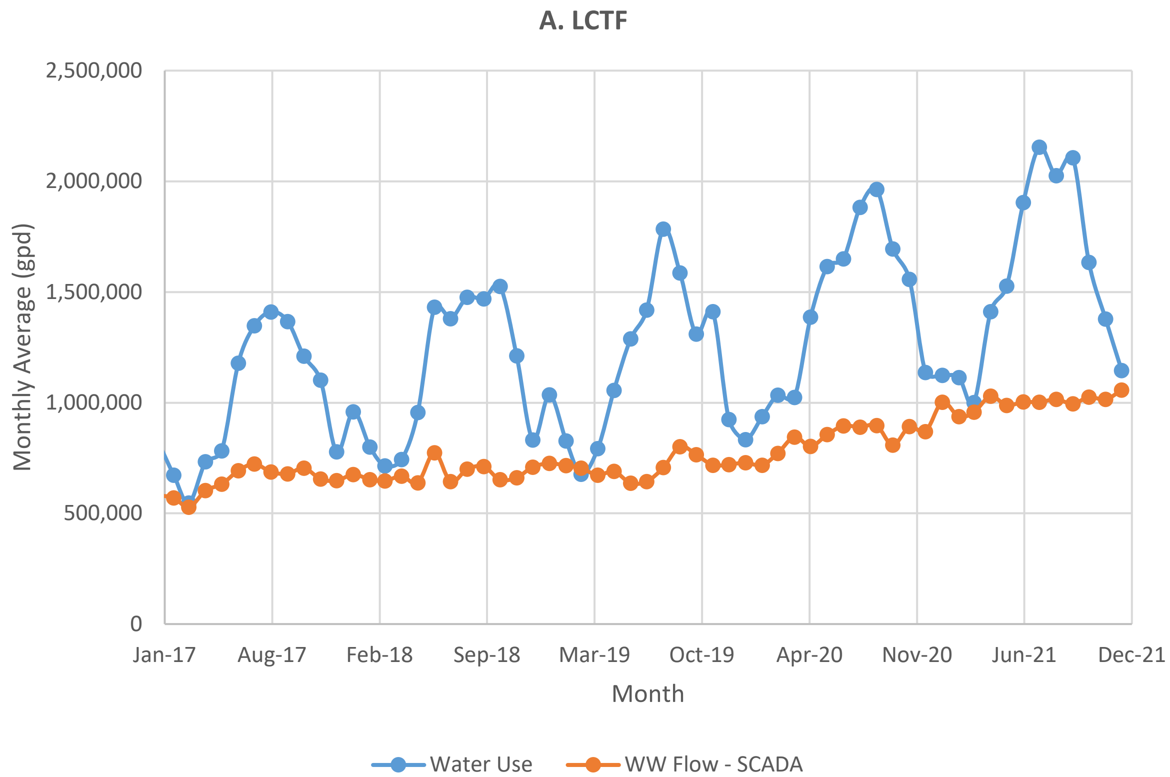
[1] The May 2019 wastewater flow spike at the MWQCF station resulted from an abnormal meter reading, impacting the City-wide data, which is the sum of LCTF and MWQCF flows.

[2] May 2018 and July 2019 wastewater flow SCADA data in the LCTF drainage area and River Islands were excluded due to negative readings at the River Islands pump station. The spike observed in June 2021 was considered an irregular meter reading compared to the historical flow pattern at the station. All reading errors at this station were not reflected in the LCTF flow data.

[3] A 80% ratio between wastewater flows and winter water use is lower than typically expected and may indicate that there is significant winter-time landscape irrigation in River Islands. One potential reason may be because these newer homes are equipped with irrigation timers that residents forget to reset in the winter.

[4] Significant I&I had been identified in Crossroads in the previous Wastewater System Mater Plan (EKI, 2019), however, Crossroads Pump Station SCADA data was not available during this preparation of this update.

Figure A-1 Monthly Water Use and Wastewater Flow by Collection System



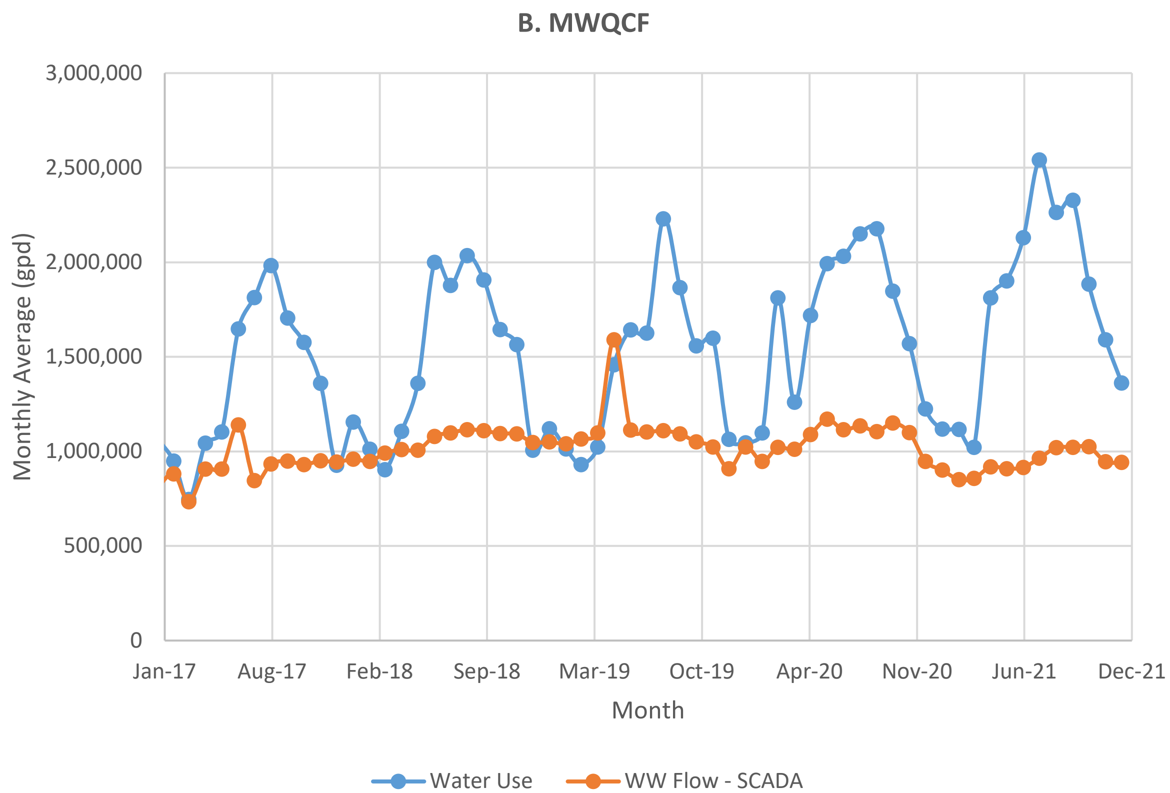
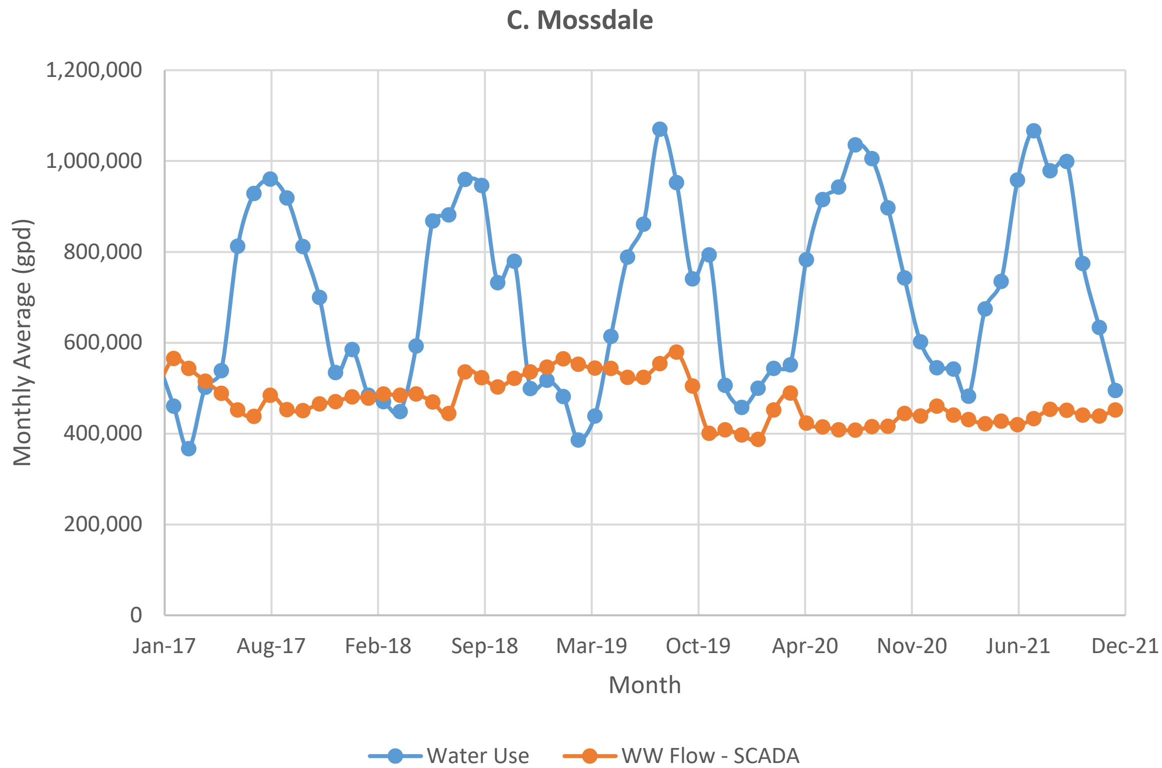


Figure A-1 (Continued)
Monthly Water Use and Wastewater Flow by Collection System



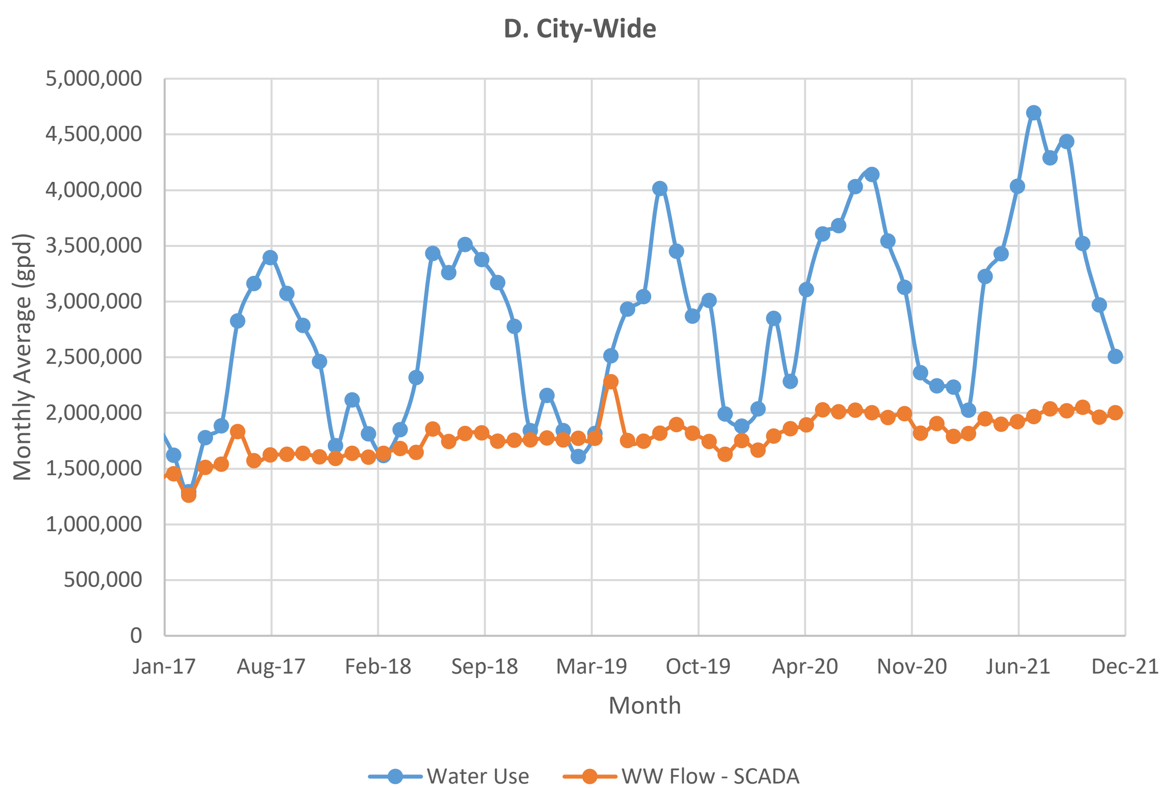


Table A-1 Minimum Month Water Use and ADWF

	ADWF as a Percentage of Minimum Month Water Use (%) (a)				
	MWQCF (b)	LCTF (c)	LCTF (no RI)	River Islands	City-Wide
2017	99%	97%	94%	112%	98%
2018	110%	90%	96%	68%	101%
2019	115%	104%	110%	86%	110%
2020	98%	87%	91%	80%	93%
2021	84%	96%	108%	76%	90%
2022	73%	89%	85%	77%	80%
Average	101%	95%	100%	84%	98%

Notes:

(a) Calculated as the ADWF of a given year divided by the water use during the minimum water use month of the previous winter. Dedicated irrigation accounts are excluded from this evaluation.

(b) Because it is difficult to discern the portion of wastewater that is managed onsite or discharged to the city's wastewater system, historical water use in the McKinley drainage area is assumed to be equal to wastewater generation in this evaluation.

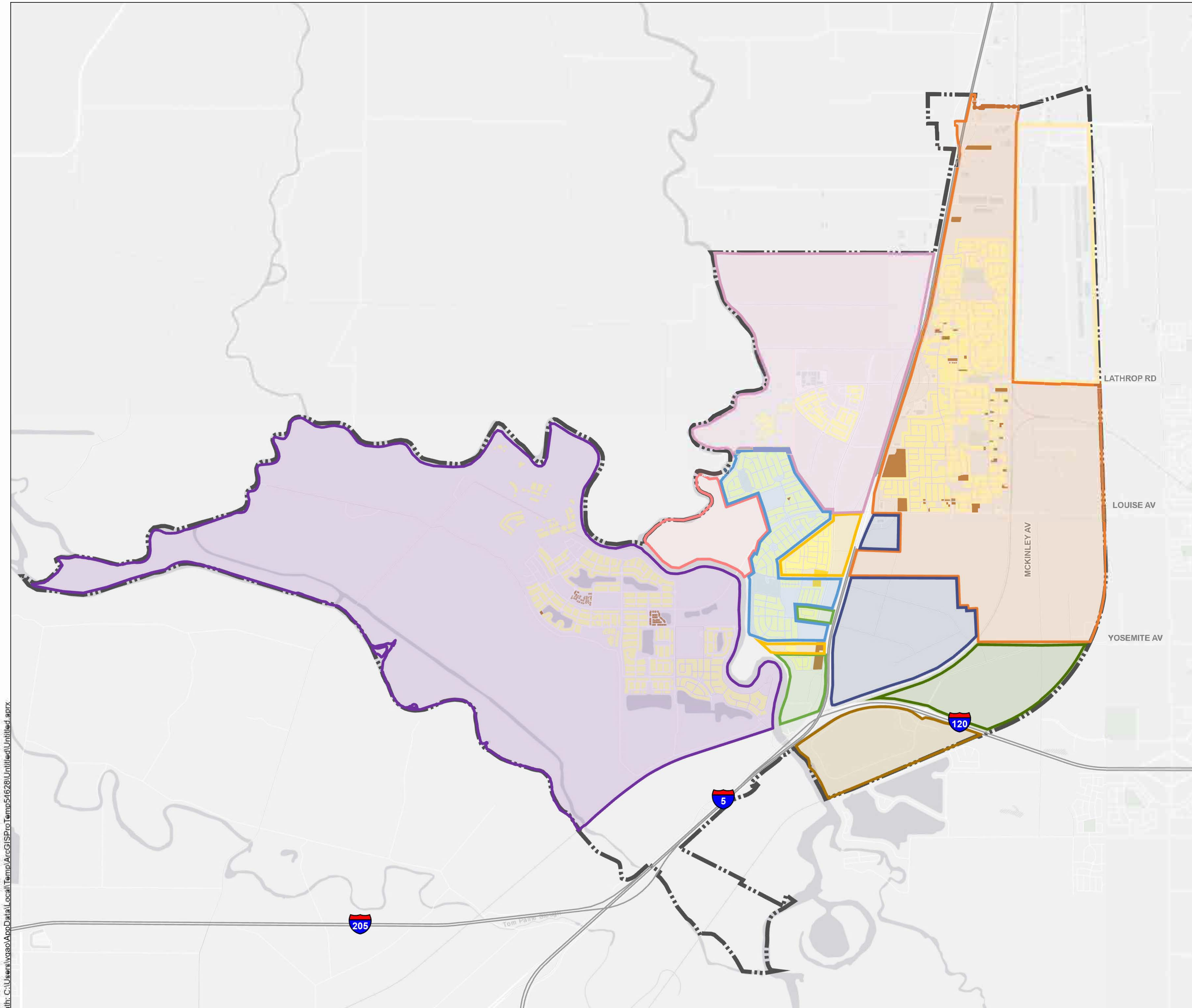
(c) Including River Islands, Mossdale, CLSP, South Lathrop, and Lathrop Gateway development areas.

A.2 Residential Wastewater Flow Factors

Similar to the residential water use evaluation presented in the IWRMP Water System Master Plan Amendment (EKI, 2024), various development-area-specific zoning classes were simplified into one of three categories: *Low Density Residential (LDR), Medium Density Residential (MDR),* and *High Density Residential (HDR)*. LDR accounts for Single-Family accounts with lot sizes larger than 4,000 square feet, while MDR includes Multi-Family accounts and Single-Family accounts with lot sizes equal to or less than 4,000 square feet.[5] HDR exclusively represents apartment land use. According to the San Joaquin County Assessor data and the account type from the billing records, the residential classes were assigned to each residential land use category are shown on Figure A-2.

After grouping the residential parcels, minimum month water use in each year between 2017 and 2021 was evaluated on a parcel-by-parcel basis and multiplied by the ADWF ratios (Table A-1) to develop residential wastewater flow factors for each existing residential land use category. The HDR wastewater flow factor was exclusively derived from the water usage of the Towne Centre Apartments from November 2022 to June 2023 due to limited prior occupancy rates and billing data availability. Therefore, HDR flow factor was evaluated separately.

[5] Account type extracted from the City's potable water billing data. Lot size information based on San Joaquin County Assessor data.



Legend

Sphere of Influence

Development Areas

- Central Lathrop
- Crossroads
- Historic Lathrop Infill and Other Developments
- Lathrop Gateway
- Mossdale Landing
- Mossdale Landing East
- Mossdale Landing West
- Mossdale Landing South
- River Islands
- Sharpe Army Depot
- South Lathrop

Land Use Categories

- Low Density Residential
- Medium Density Residential
- High Density Residential

Notes

1. All locations are approximate.
2. Includes all residential accounts with at least one full year of billing data.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 7 March 2024.

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(Scale in Feet)

Residential Land Use Categories

Water System Master Plan Amendment
City of Lathrop
Lathrop, CA
December 2024
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Figure A-1

As shown in Table A-3,the available data were then evaluated to assess the extent to which each collection system had unique wastewater generation patterns. Figure A-3 and Figure A-4 show the results of this evaluation for LDR and MDR units, respectively. The data show that estimated unit wastewater generation in River Islands was approximately 20% lower than the minimum month water use per unit, and average water usage per unit at these homes was generally lower than City-wide average water use per unit. It may be caused by significant winter-time landscape irrigation in this development area (see footnote 3 above). For the rest of the City, the estimated residential wastewater generation was generally equal to or slightly higher than the estimated minimum month water use per unit. This is likely due to the aging of the wastewater collection system within older historic Lathrop collection system which makes it more subject to I&I compared to the newer West Lathrop collection system.

The ADWF in the MWQCF drainage area (i.e., Historic Lathrop) and LCTF drainage area (excluding River Islands) observed during 2017-2021 are similar to the observed Historic Lathrop average flow during the 2018 flow monitoring period, while ADWF in River Islands is slightly lower than the observed West Lathrop flow. Additionally, the 2018 flow monitoring results provided further evidence that unit wastewater generation is different between the two portions of the City.

Based on the analysis and flow monitoring results described above, separate LDR and MDR wastewater flow factors were developed for the River Islands and the remaining City-wide units. There were no HDR (i.e., apartments) in River Islands as of the preparation of this evaluation. Therefore, a uniform high density flow factor was assumed. Due to the newer age of the sewer system in River Islands, a 15% safety factor is applied to units in this development area to account for the expected increase in infiltration in the future as the sewer system ages. Therefore, a wastewater flow factor of **200 gpd/du** was selected for the **River Islands LDR** units based on calculated maximum wastewater generation per unit between 2017 and 2021 and the 15% safety factor. A safety factor of 10% was applied to the City-wide wastewater flow factors, assuming sewer conditions and infiltration will not be significantly worsened in the Historic Lathrop area and the collection system will gradually age in the remaining LCTF drainage area. As such, a wastewater flow factor of **240 gpd/du** was selected for **City-wide LDR** units, which is consistent with the previously developed Historic Lathrop LDR wastewater flow factor.

Similarly, wastewater flow factors of **200 gpd/du** and **155 gpd/du** were selected for **City-wide and River Islands MDR** units, respectively. A wastewater flow factor of **170 gpd/du** was selected for **HDR** units. The HDR flow factor is assumed to apply to all apartment units within the City.

Table A-2
Residential Wastewater Flow Factor Evaluation

Year	MWQCF (Historic Lathrop)					LCTF (West Lathrop, no RI)					River Islands					Citywide
	Minimum Month Water Use (a) (gpd)	Number of Active Accounts (a)	Unit Water Use (b) (gpd/du)	ADWF vs. Water Use Ratio (c)	Estimated Unit ADWF (d) (gpd/du)	Minimum Month Water Use (a) (gpd)	Number of Active Accounts (a)	Unit Water Use (b) (gpd/du)	ADWF vs. Water Use Ratio (c)	Estimated Unit ADWF (d) (gpd/du)	Minimum Month Water Use (a) (gpd)	Number of Active Accounts (a)	Unit Water Use (b) (gpd/du)	ADWF vs. Water Use Ratio (c)	Estimated Unit ADWF (d) (gpd/du)	Estimated Unit ADWF (e) (gpd/du)
Low Density																
2017	495,452	2,730	181	99%	179	265,935	1,466	181	94%	171	64,742	418	155	112%	173	176
2018	574,871	2,740	210	110%	230	344,677	1,482	233	96%	223	116,226	575	202	68%	137	228
2019	460,484	2,517	183	115%	210	256,323	1,347	190	110%	209	138,516	792	175	86%	151	209
2020	563,613	2,674	211	98%	206	322,484	1,455	222	91%	201	212,000	1,023	207	80%	167	205
2021	581,742	2,720	214	84%	179	399,677	1,494	268	108%	289	309,742	1,389	223	76%	170	218
Medium Density																
2017	50,323	324	155	99%	153	60,806	363	168	94%	158	871	6	145	112%	162	156
2018	53,774	334	161	110%	177	79,935	382	209	96%	200	1,000	7	143	68%	97	189
2019	46,000	344	134	115%	153	64,839	356	182	110%	200	5,452	36	151	86%	131	177
2020	57,226	429	133	98%	131	74,484	358	208	91%	189	17,355	105	165	80%	133	157
2021	54,097	433	125	84%	105	95,323	373	256	108%	276	21,355	150	142	76%	108	184

Notes:
(a) Water use data are obtained from the City's billing system.
(b) Unit water use equals the minimum month water use divided by the number of active accounts.
(c) The ADWF to Water Use Ratio for each drainage area is obtained from Table A-2.
(d) Estimated ADWF is calculated by multiplying the Unit Water Use by the ADWF to Water Use Ratio.
(e) Citywide Estimated Unit ADWF is calculated using the citywide estimated ADWF in gallons per day, divided by the city's total number of active accounts.

Figure A-3 Low Density Residential Wastewater Flow Factor Evaluation

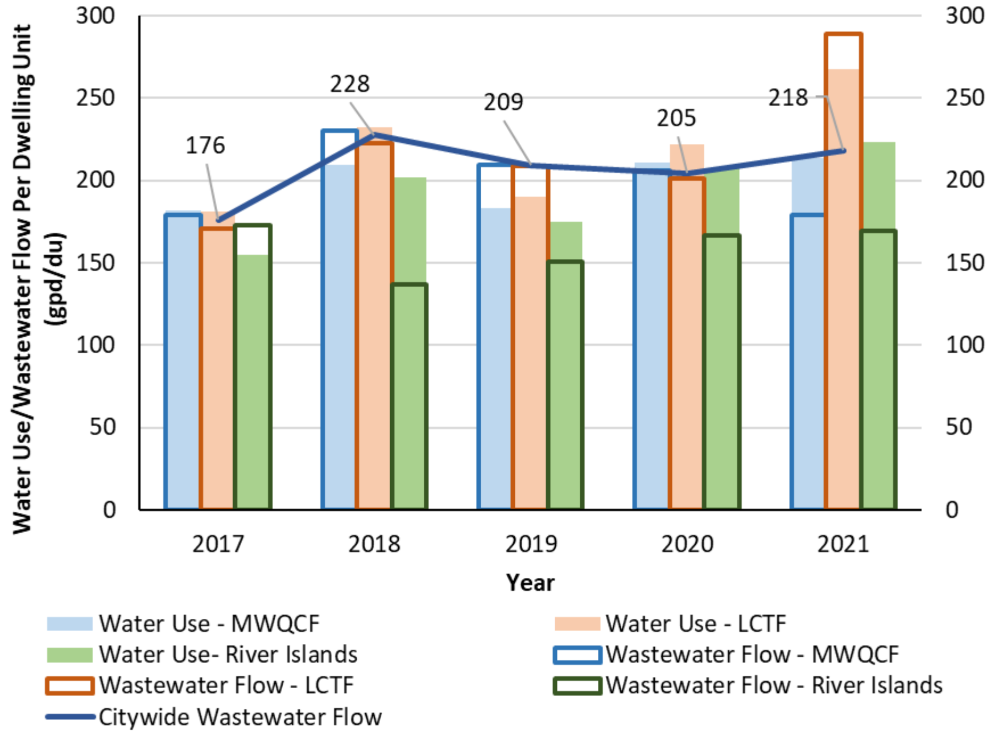
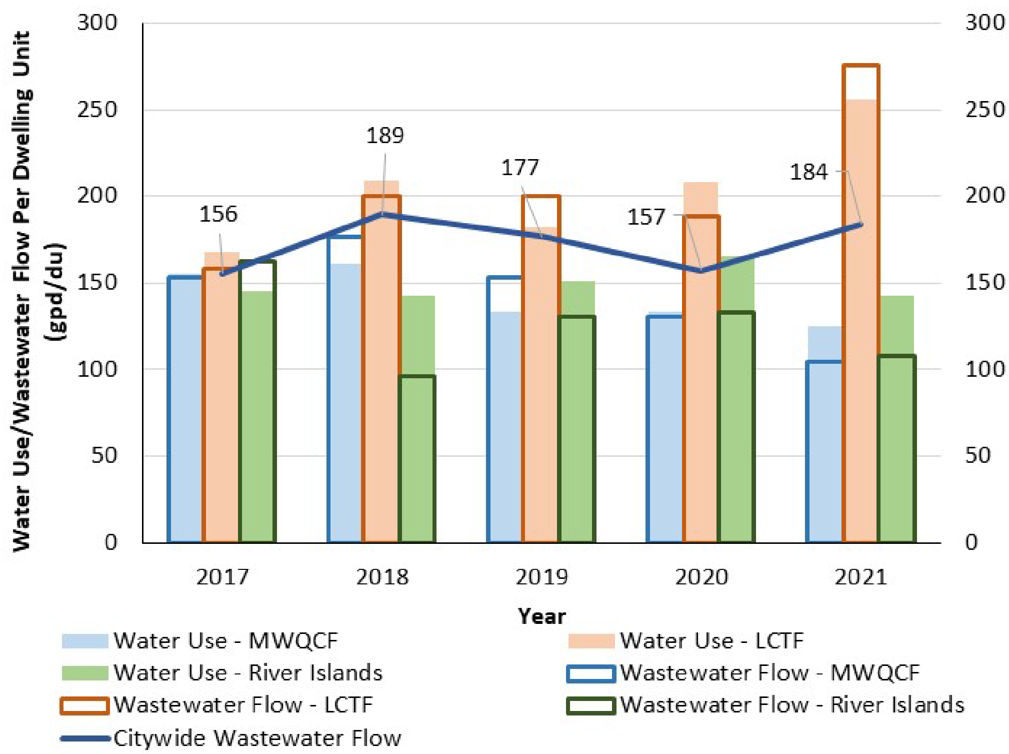


Figure A-4 Medium Density Residential Wastewater Flow Factor Evaluation



A.3 CII Wastewater Flow Factors

Per acre wastewater flow factors were developed for commercial, industrial, parks, and schools/institutional land uses based on minimum month water use and ADWF between 2017 and 2021. For each CII land use, minimum month water use for each year between 2017 and 2021 was divided by the total land use acreage of active accounts, then multiplied by the ADWF ratio, to determine wastewater flow factors. Acreages were calculated by cross-referencing the City's billing database with the San Joaquin County parcel database.

As discussed in the City's Water System Master Plan Amendment, City staff identified certain CII users need reclassification in regard to the account type from the billing data, which significantly altered the results compared to the CII wastewater generation factors developed in the City's 2019 IWRMP. Figure A-5 shows which individual parcels fell into each land use category, as confirmed by City staff.

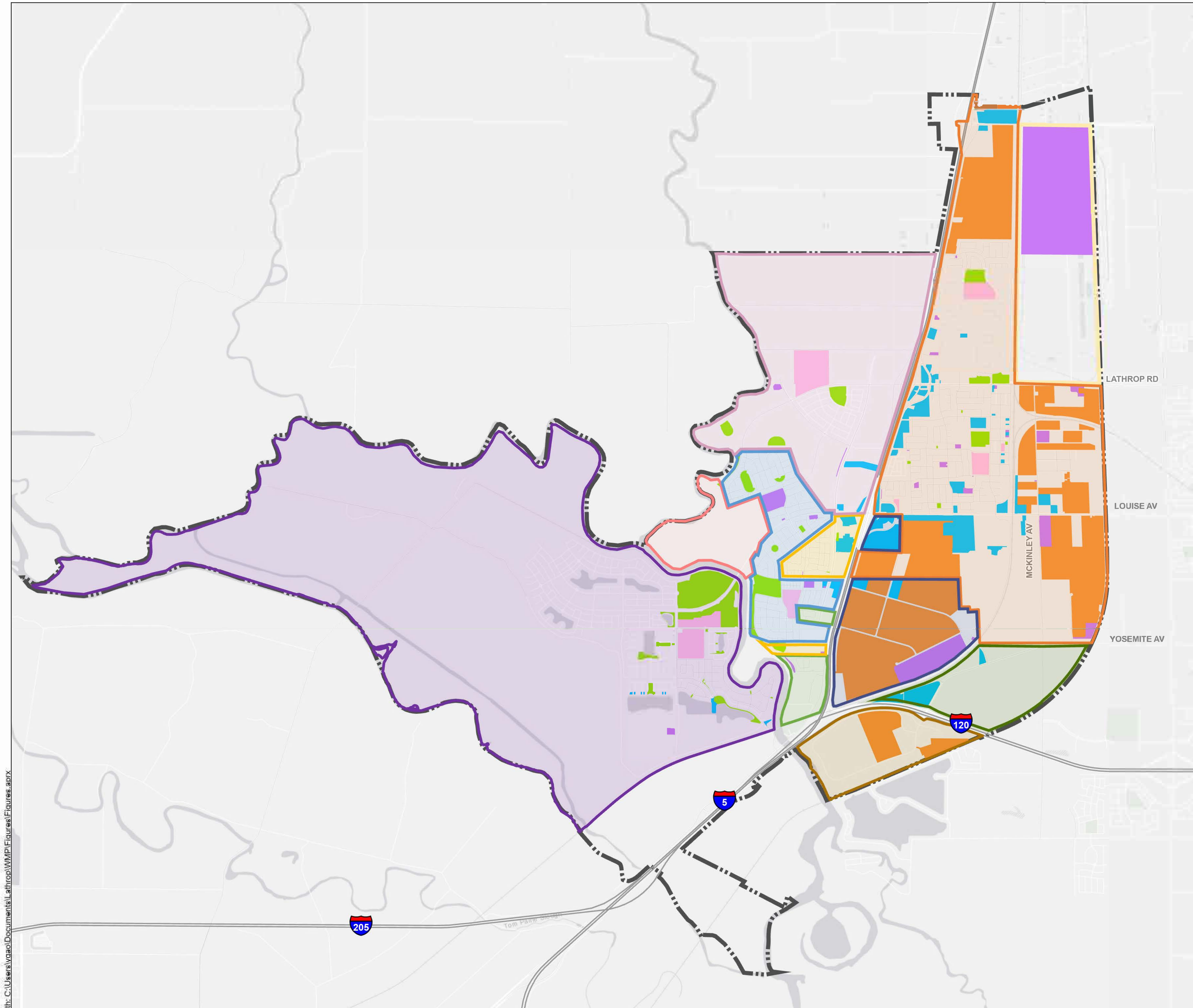
General commercial and industrial water use factors were updated based on commercial and industrial minimum month water use, respectively. Table A-3 shows an evaluation of commercial and industrial estimated water flow between 2017 and 2021. Estimated wastewater flows are compared between each collection system, as the MWQCF system represents the Historic Lathrop area, the LCTF drainage area represents new developments in West Lathrop.[6] Estimated commercial wastewater flow varies significantly across the systems, ranging from less than 300 gpd/acre in the LCTF area to more than 900 gpd/acre in the MWQCF area.[7] This is likely due to highly variable water use between the types of commercial businesses across the City. The evaluations of commercial and industrial wastewater flows are illustrated on Figure A-6 and Figure A-7, respectively.

As parcel-level commercial and industrial wastewater flow is largely determined by the specific type of business, uniform or "Citywide" factors were developed to project future commercial and industrial wastewater generation, assuming that the existing profile of business and industries within the City will continue into the future. The wastewater flow factors were determined to be **755 gpd/acre** for Commercial land uses and **240 gpd/acre** for Industrial land uses including a 10% safety factor to account for the average future increase in infiltration in old and new sewers City-wide. Compared to the 2019 IWRMP, the commercial wastewater flow factor increased by approximately 28% from 590 gpd/acre, which is likely due to a significant portion of commercial accounts were corrected as industrial, government, or park land uses.

The industrial wastewater flow factor decreased by approximately 28% from 335 gpd/acre, which may be partially attributed to the improved I&I conditions within the Crossroads development area. As shown in Table A-1, the 5-year average ADWF to Minimum Month Water Use ratio in the LCTF drainage area, where the Crossroads located within, is 95%, approximately 32% lower than the prior Crossroads 5-year average ratio of 140%.

[6] Since no industrial units currently exists or has been planned in River Islands, no separation of River Islands and the rest of LCTF was performed for CII wastewater flow factor evaluation.

[7] Water use in during the minimum water use month in the Crossroads area in 2014 is likely to be an anomaly.



Legend

Sphere of Influence

Development Areas

- Central Lathrop
- Crossroads
- Historic Lathrop Infill and Other Developments
- Lathrop Gateway
- Mossdale Landing
- Mossdale Landing East
- Mossdale Landing West
- Mossdale Landing South
- River Islands
- Sharpe Army Depot
- South Lathrop

Land Use Categories

- Commercial
- Industrial
- Park
- School
- Government

Notes
1. All locations are approximate.
2. Includes all residential accounts with at least one full year of billing data.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 6 March 2024.

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(Scale in Feet)

CII Land Use Categories

Water System Master Plan Amendment
City of Lathrop
Lathrop, CA
December 2024
C20049.01

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Figure A-5

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Table A-3
Commercial and Industrial Wastewater Generation Factor Evaluation

Year	MWQCF (Historic Lathrop)					LCTF (West Lathrop)					Citywide
	Minimum Month Water Use (gpd)	Land Use of Active Accounts (acres)	Unit Water Use (gpd/ac)	ADWF vs. Water Use Ratio	Estimated Unit ADWF (gpd/ac)	Minimum Month Water Use (gpd)	Land Use of Active Accounts (acres)	Unit Water Use (gpd/ac)	ADWF vs. Water Use Ratio	Estimated Unit ADWF (gpd/ac)	Estimated Unit ADWF (gpd/ac)
Commercial											
2017	62,613	68	919	99%	906	18,806	50	374	97%	361	675
2018	77,839	71	1096	110%	1204	20,065	80	251	90%	227	686
2019	63,903	74	864	115%	990	25,774	84	306	104%	318	633
2020	70,710	82	862	98%	843	20,000	55	365	87%	320	634
2021	82,323	97	853	84%	715	17,419	51	340	96%	325	580
Industrial											
2017	85,097	449	189	99%	187	85,548	427	200	97%	194	190
2018	105,097	436	241	110%	264	79,452	436	182	90%	165	215
2019	57,290	447	128	115%	147	73,129	409	179	104%	186	165
2020	96,419	516	187	98%	183	56,419	381	148	87%	130	160
2021	63,935	501	128	84%	107	70,194	371	189	96%	181	139

Notes:
(a) Water use data are obtained from the City's billing system.
(b) The ADWF to Water Use Ratio for each drainage area is obtained from Table A-2.
(c) Estimated ADWF is calculated by multiplying the Unit Water Use by the ADWF to Water Use Ratio.
(d) Citywide Estimated Unit ADWF is calculated using the citywide estimated ADWF in gallons per day, divided by the city total number land use in acres.

Figure A-6 Commercial Wastewater Flow Factor Evaluation

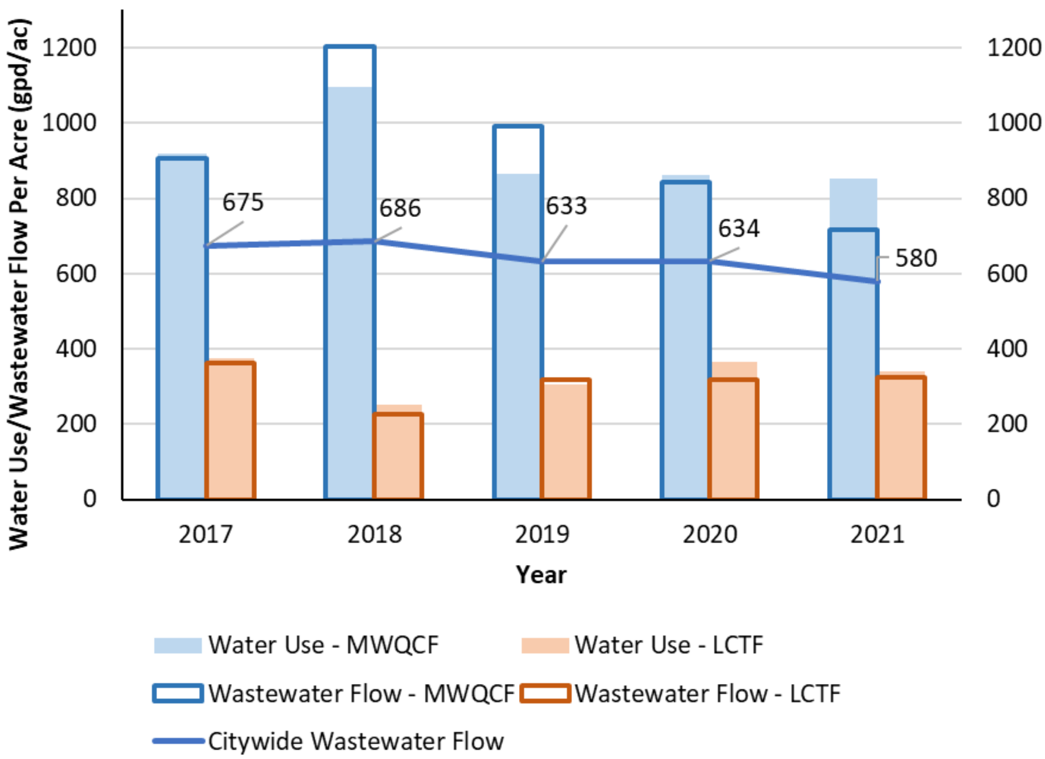
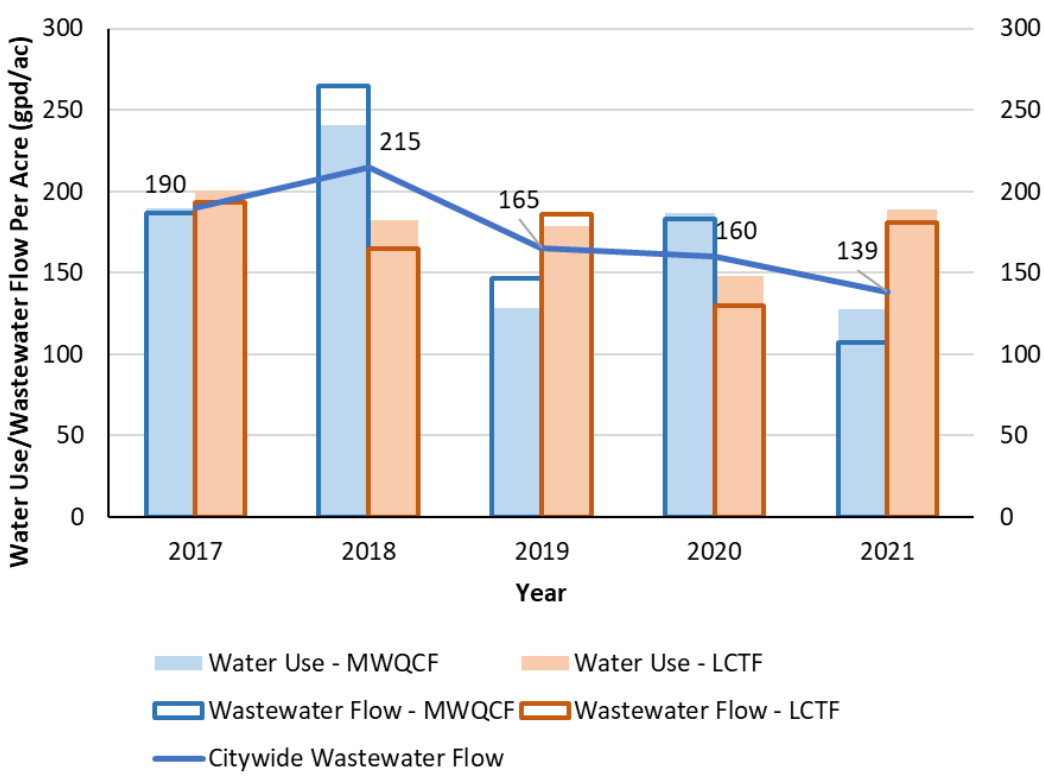


Figure A-7 Industrial Wastewater Flow Factor Evaluation



The wastewater flow factor for parks was quantified based on minimum month water use data for the following parks with indoor (i.e., restroom) water use:

- Apolinar Sangalang,
- Crescent Park,
- Greens Park,
- Islanders Field,
- Lathrop Generations Fitness Park,
- Manuel Valverde Park,
- Michael Vega Park,
- Milestone Park,
- Mossdale Landing Community Park,
- Park West,
- William S. Moss Park,
- Woodfield Park, and
- River Island Fields.

The wastewater flow factor for parks was determined to be **55 gpd/ac** including a City-wide 10% safety factor, which is consistent with the 2019 park wastewater flow factor.

School water use varies seasonally depending on the school calendar (i.e., the highest water use months) were reviewed to evaluate wastewater flow. Water use data were reviewed for the Lathrop High School, one. Lathrop, NextGeneration STEAM Academy, River Islands Technology Academy, and the Lathrop Elementary School.[8,9]

Minimum month water use data for several institutional uses (i.e., fire stations, City Hall, post office) had been reviewed and determined to be similar to schools in the 2019 IWRMP, and there was no significant change observed in institutional water use since then. Therefore, wastewater generation for institutional uses and schools was combined into a single factor. Based on minimum month water use between 2017 and 2021 and the City-wide 10% safety factor, the wastewater flow factor for Schools/Institutional was determined to be **220 gpd/ac**.

A.4 Summary of Wastewater Flow Factors

Based on the information presented above, Table A-4 summarizes the wastewater flow factors developed for the 2024 IWRMP Amendment.

Note that these wastewater flow factors are planning-level factors for evaluating infrastructure, while the City uses site-specific wastewater allocations to manage discharge and capacity fees.

[8] Water use data from non-irrigation meters for schools such as the Mossdale Elementary School and the Joseph Widemer Jr. Elementary School showed significant seasonal patterns due to irrigation water use and were therefore excluded from this analysis.

[9] Water use in 2020 from the NextGeneration STEAM Academy and River Islands Technology Academy were excluded from analysis due to irregular water billing data.

Table A-4 Updated Wastewater Flow Generation Factors

	Wastewater Flow Factor	
	City-Wide	River Islands
Low Density Residential	240 gpd/du	200 gpd/du
Medium Density Residential	200 gpd/du	155 gpd/du
High Density Residential	110 gpd/ac	
Commercial	755 gpd/ac	
Industrial	240 gpd/ac	
Parks	55 gpd/ac	
Schools/Institutional	220 gpd/ac	

APPENDIX B
WASTEWATER PEAKING FACTOR EVALUATION

B. WASTEWATER PEAKING FACTOR EVALUATION

As part of the Wastewater System Master Plan (WWSMP) Amendment, EKI updated the peaking factor curve that estimates peak wet weather flow (PWWF) using wastewater flow data collected between 2017 and 2022. PWWF is the highest hourly flow experienced during the year due to rainfall-induced I&I and peak diurnal sanitary flows and is used to evaluate the hydraulic capacity of a wastewater collection system. PWWF peaking factors are typically higher in smaller drainage areas, in which there is little flow attenuation. Larger drainage areas provide a greater capacity to attenuate flows, as peak flows generated in the upstream reaches of the system take a longer amount of time to travel downstream.

B.1 Historical Peak Hourly Flow

The City provided discharge flow data and sump elevation data from several pump stations in 5-minute increments between January 2017 and July 2022. Using these data, EKI calculated hourly inflow to each pump station by summing discharge and sump storage change.

EKI has observed occasional abnormal patterns in the SCADA flow data, possibly due to incorrectly registered flows in the SCADA system, or artificial flow peaks due to large scale construction and wastewater infrastructure maintenance. The data sets were processed in the programming language “R” in order to convert the 5-minute SCADA data into useable hourly and daily averages. Additionally, manual processing was conducted in order to remove erroneous zero data and outliers. Summarized by pump station the following adjustments were made to the SCADA data:

- Mossdale PS – Removed small portion of erroneous data from 2018 (124 data points)
- Stonebridge PS – Removed erroneous peak in 2021 (5 data points)
- Woodfield PS – Data from 1 January 2017 to 15 May 2021 was determined to be unreliable reliable due to incorrectly registered flows
- River Islands Main PS – November and December 2021 data was combined with the 2022 dataset
- McKinley and O Street PS – Data was split into two sets for before and after 2 April 2021 for changes in pumping configuration.

To review data in detail, EKI calculated the Cumulative Distribution Function (CDF) of peak hourly flow within each day, normalized by ADWF, for each pump station. The result of this analysis is shown together with CDFs calculated for the 2019 WWSMP on Figure B-1. A typical CDF resembles a sigmoid function (or “S-curve”), which can be observed during most years at each pump station. Several exceptionally high peak periods were observed at the Mossdale, Stonebridge, and O Street Pump Stations that were not found to be associated with rainfall. To eliminate anomalies in flow data, EKI selected the 99.5-percentile peak hourly flow as the PWWF during each year, as listed in Table B-1.

B.2 Peaking Factor Curve

Figure B-2 plots historical PWWF versus ADWF for the City's pump stations from 2013 through 2022 as well as peak hourly flow versus average flow for the 2018 flow monitoring locations by year and then by pump station. As shown on Figure B-2, there is not an observed yearly trend of PWWF versus ADWF.

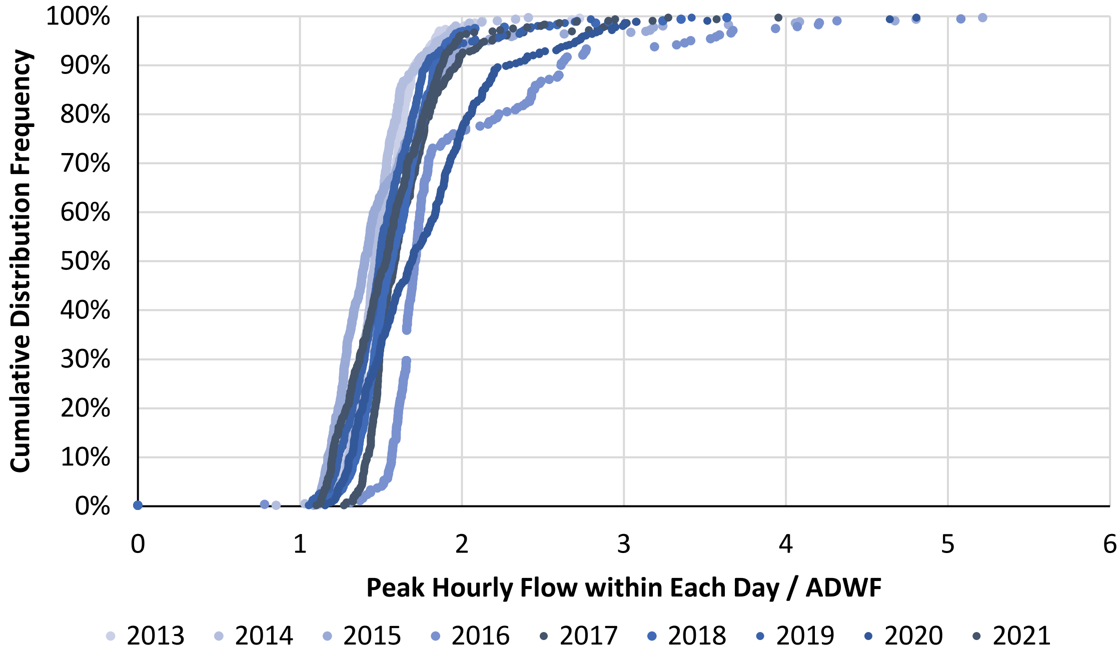
EKI fit a peaking factor curve based on these flow data, as shown on Figure B-2, which EKI recommends be adopted for future evaluations to assess pumping and conveyance capacities. It can be observed that while other pump stations with long periods of records, such as Stonebridge, Mossdale, and McKinley, have data points scattered both above and below the estimate line, data from the O Street Pump Station concentrated below the estimated line. This indicates that peak flow observed at the O Street Pump Station are smaller than what is anticipated for pump stations at its size.

Given that the City's design standard requires that 50% capacity be retained in most pipes[1] under PWWF and that pump stations meet PWWF with their firm capacity, EKI believes that use of the calculated PWWF curve is appropriate. The design standard provides surplus capacity to accommodate flows from larger rain events to prevent capacity-related sanitary sewer overflows.

[1] The City's design standard requires 50% capacity to be retained in pipes with a diameter of 15 inches or smaller and 75% capacity to be retained in pipes with a diameter greater than 15 inches.

Figure B-1. Cumulative Distribution Functions of Historical Peak Hourly Flow

Mossdale



Stonebridge

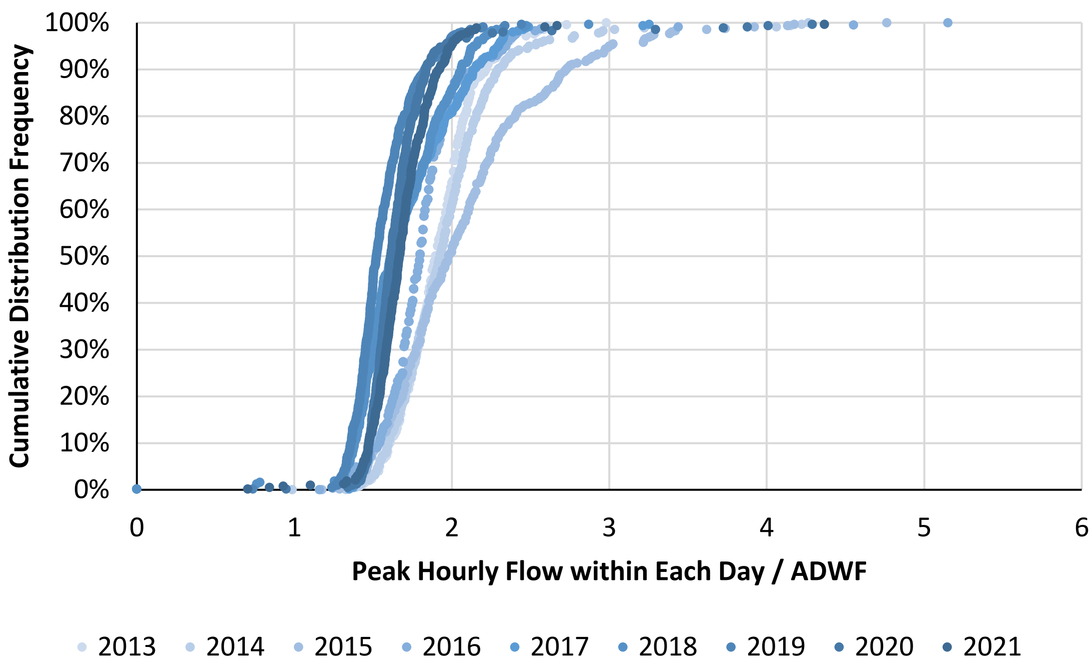
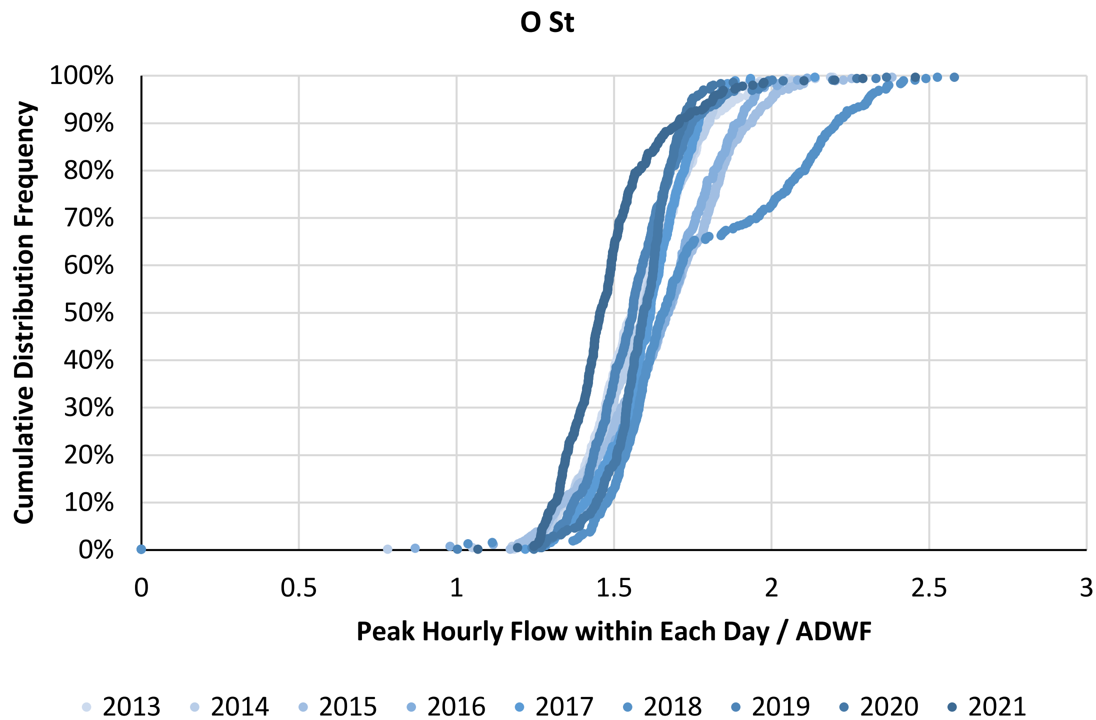


Figure B-1. Cumulative Distribution Functions of Historical Peak Hourly Flow (Cont.)



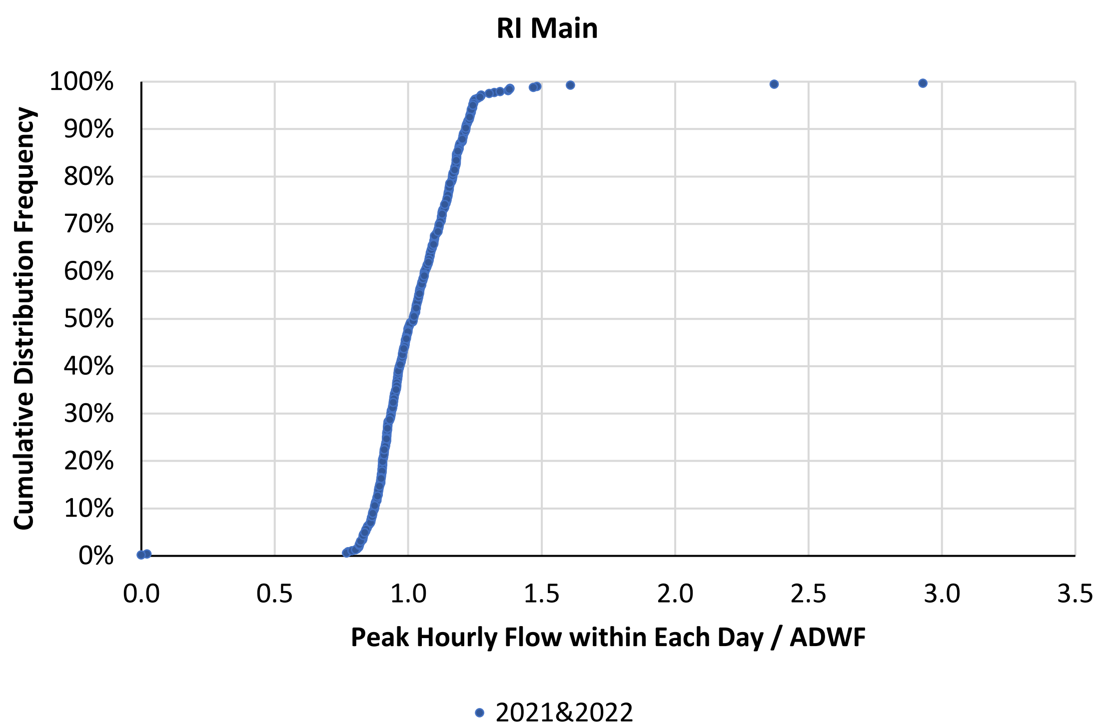
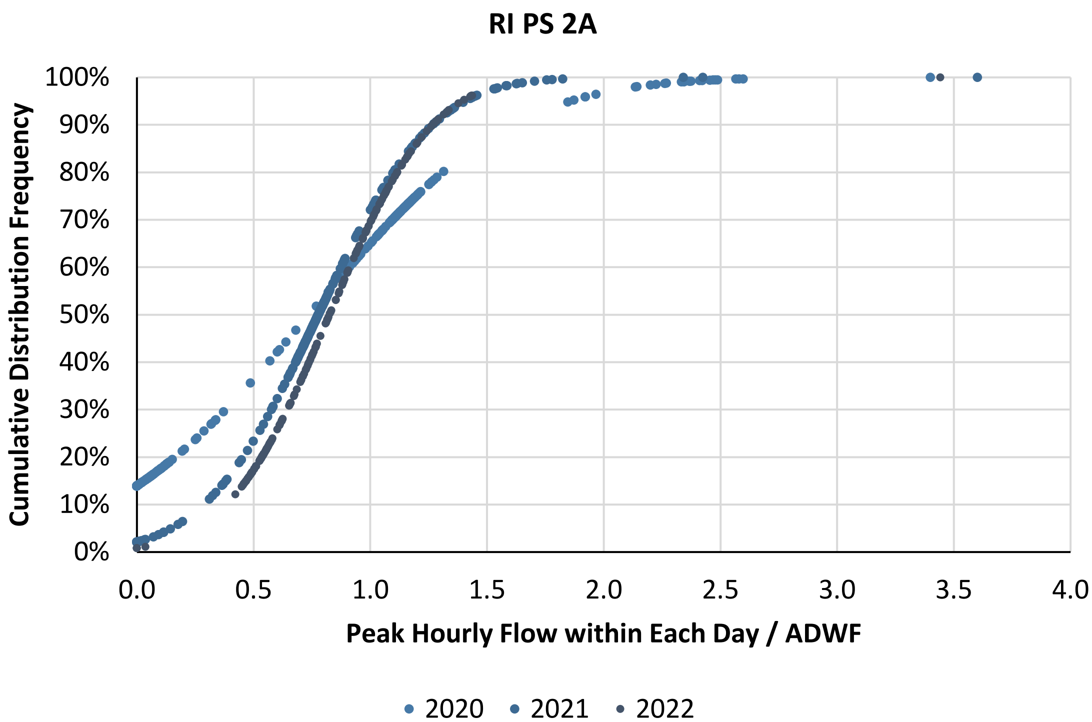


Figure B-1. Cumulative Distribution Functions of Historical Peak Hourly Flow (Cont.)



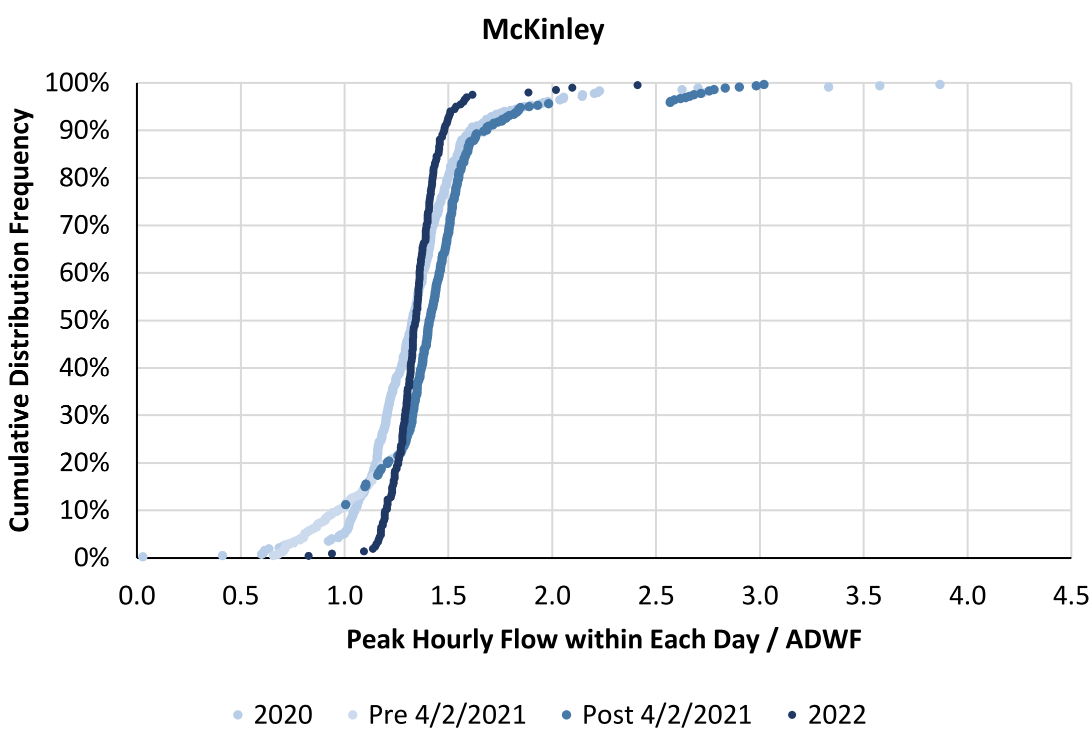


Figure B-1. Cumulative Distribution Functions of Historical Peak Hourly Flow (Cont.)

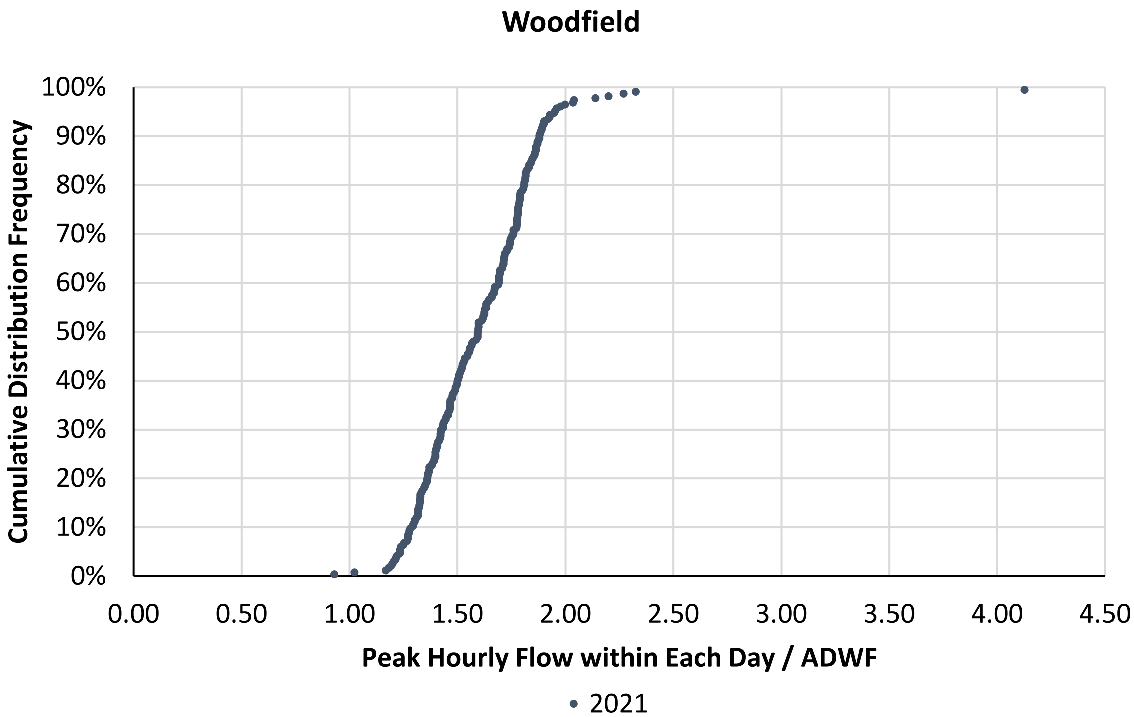


Table B-1. Historical Wastewater Flow and Peaking Factors

Year	ADWF (gpd)	PWWF (gpd) (a)	Peaking Factor (b)
Mossdale Pump Station (c)			
2013	307,410	830,547	2.70
2014	312,268	732,557	2.35
2015	335,693	1,636,267	4.87
2016	408,363	2,008,720	4.92
Stonebridge Pump Station			
2013	128,478	367,326	2.86
2014	121,054	512,057	4.23
2015	116,383	497,970	4.28
2016	120,371	603,360	5.01
O St Pump Station			
2013	675,465	1,406,948	2.08
2014	638,801	1,371,470	2.15
2015	612,014	1,393,241	2.28
2016	622,123	1,310,883	2.11
MWQCF Flow Meter			
2014	0	0	2.02

Notes:

(a) A 99.5-percentile daily peak flow was selected for the PWWF of each pump station to eliminate anomalies in the City's SCADA system data.
(b) Peaking factor is calculated as the ratio of PWWF to ADWF.
(c) The City began weekly flushing of River Islands sewer system in 2015, which likely accounts for the significantly higher peak flows in 2015 and 2016.

Figure B-2. Historical Wastewater Flow and Peaking Factors

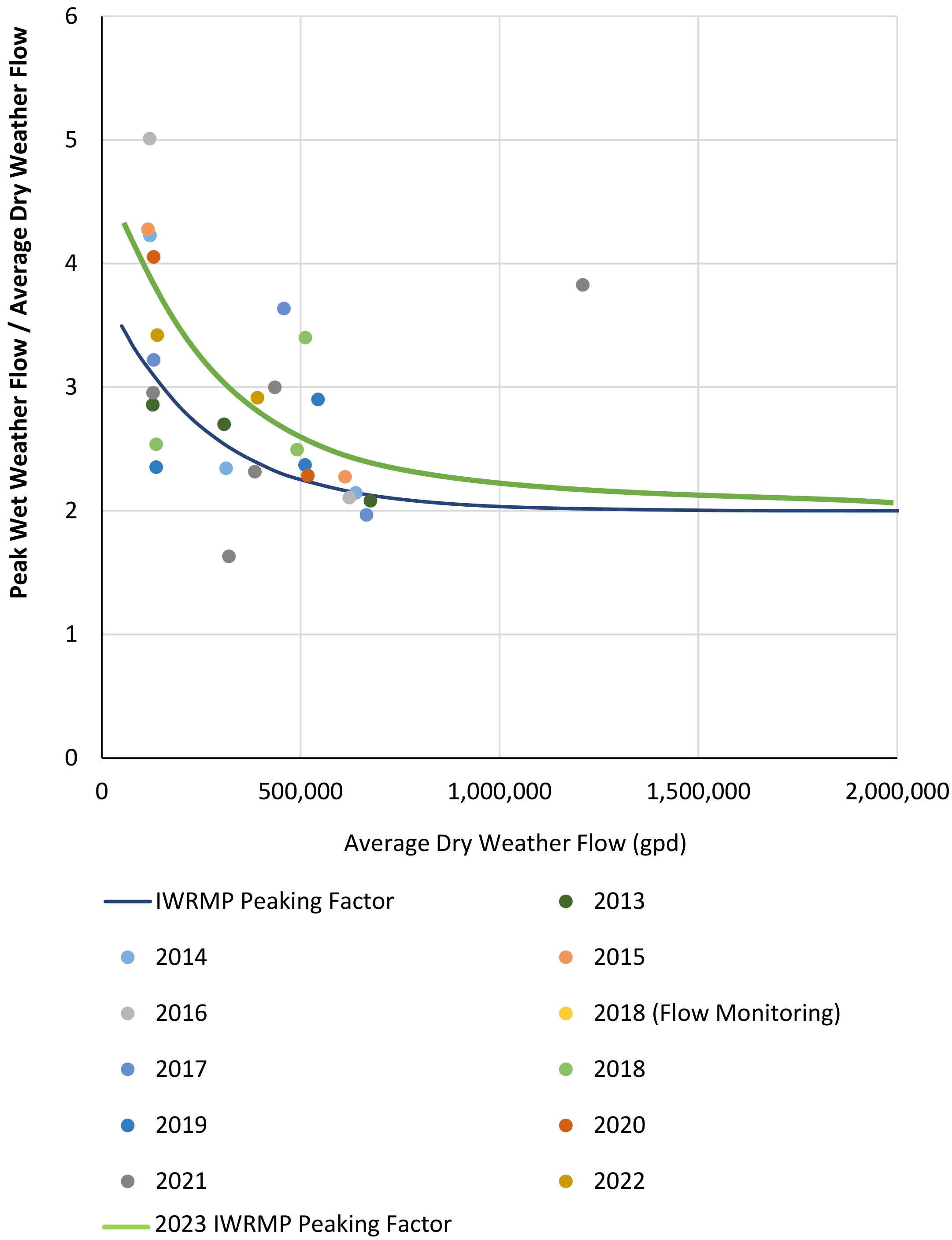
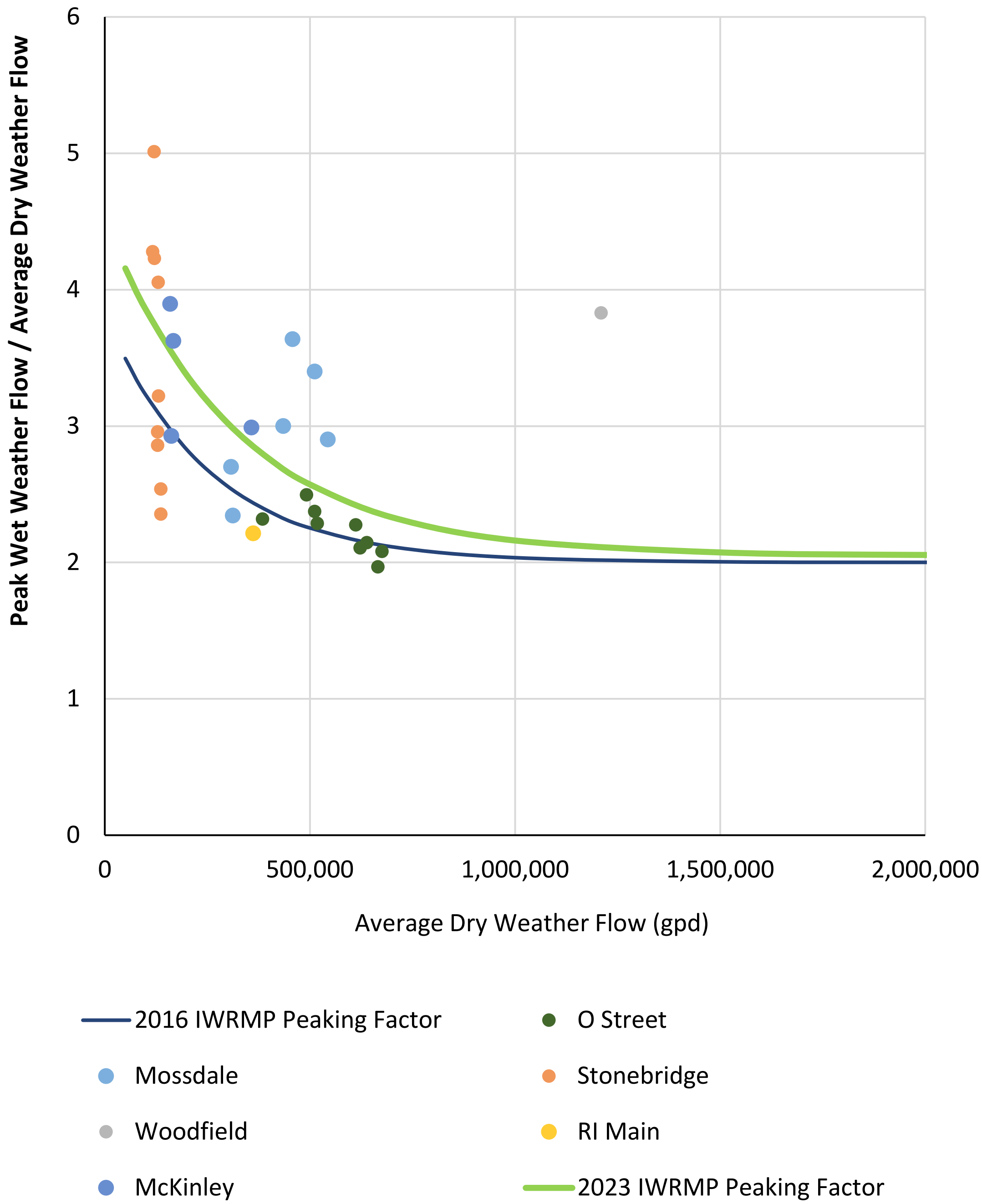


Figure B-2. Historical Wastewater Flow and Peaking Factors (Cont.)



APPENDIX C
Summary of Monitoring Results from Evaluation of Biochemical Oxygen Demand Contribution to Manteca Water Quality Control Facility

DRAFT – 13 December 2023

MEMORANDUM

To: Greg Gibson, P.E. (City of Lathrop)

From: Dave Umezaki, P.E. (EKI Environment & Water, Inc.)
Tina Wang, P.E., (EKI Environment & Water, Inc.)

Subject: Summary of Monitoring Results from Evaluation of Biochemical Oxygen Demand Contributions to Manteca Water Quality Control Facility
Wastewater System Master Plan Amendment Evaluation
City of Lathrop, California
(EKI C20049.02)

On behalf of the City of Lathrop (City), EKI Environment & Water, Inc. has prepared this memorandum to summarizing the results of monitoring performed for evaluation of the City's biochemical oxygen demand (BOD), total suspended solids (TSS), and Total Kjeldahl Nitrogen (TKN) contributions to the Manteca Water Quality Control Facility (MWQCF).

BACKGROUND AND MONITORING APPROACH

During October 2022, EKI performed monitoring to evaluate flows and BOD, TSS, and TKN concentrations at selected locations within the City's wastewater collection system. The purpose of the monitoring was to provide additional data in response to correspondence from the City of Manteca indicating that the City of Lathrop was exceeding its allotted BOD loading limit from the Wastewater Capacity Agreement between the two cities.

Based on a review of the City of Lathrop wastewater collection system, EKI selected a total of five monitoring locations, generally shown on Figure 1 and in more detailed views on Figures 2 through 6. These monitoring locations included the following:

- A monitoring location at the North Harlan Pump Station wet well (Figure 2) to capture the sewershed served by that pump station;
- A monitoring location at the Stonebridge Lift Station wet well (Figure 3) to capture the sewershed served by that lift station;
- A monitoring location at the Woodfield Lift Station wet well (Figure 4), to capture the sewershed that is served by the North Harlan Pump Station, Stonebridge Lift Station, and Woodfield Lift Station;
- A monitoring location at an O Street manhole located upstream of the Easy Court Lift Station (Figure 5), to capture the sewershed that is served by that lift station;
- A monitoring location at the O Street Pump Station wet well (Figure 6), to capture the sewershed that is served by the Valley Crossing Lift Station, J Street Pump Station, Easy Court Lift Station, and O Street Pump Station; and

- A monitoring location at the McKinley Avenue Pump Station wet well (Figure 7), to capture the sewershed that is served by the Woodfield Pumping Station, California Natural Products Pump Station, and McKinley Avenue Pump Station.

A schematic of the sewersheds captured by the meter locations is shown on Figure 8.

Sampling equipment was installed by EKI's subconsultant, Total Flow, Inc. (TFI) in each of the six monitoring locations, while flow monitoring equipment was installed in one of the monitoring locations, specifically at the O Street manhole location (Figure 5). Samplers were set to collect 24-hour composite samples on approximately 20-minute increments. The flow monitoring equipment was set by TFI to monitor flow at five-minute increments.

Composite samples were collected on the following dates:

- 10 October 2022 (Monday)[1];
- 16 October 2022 (Sunday);
- 20 October 2022 (Thursday); and
- 28 October 2022 (Friday).

Composite samples were analyzed by FGL Environmental (FGL) laboratories located in Santa Paula and Stockton, California. Samples were analyzed for the following constituents:

- BOD by Standard Method (SM) 5210B;
- TSS by SM 2540D; and
- TKN by EPA Method 351.2.

MONITORING RESULTS

Results from the four sampling events are summarized in Table 1. Results from the flow monitoring at the O Street sanitary sewer manhole are provided in raw form in Attachment A and are summarized in Table 2 and Figures 9 through 13.

As shown in Table 1, there was relatively little variation in BOD, TSS, TKN concentrations across the six monitored locations. The average BOD concentrations across all sampling events were all within a relatively narrow range between 214 milligrams per liter (mg/L) and 311 mg/L, while TSS and TKN concentrations also did not vary widely. There also did not appear to be any consistent correlations between concentrations and the day of the week that the sampling occurred.

---

[1] Due to an unanticipated sampling equipment issue, a sample could not be collected from the O Street PS location on 10 October 2022.

One observation is that while BOD and TKN concentrations in the collection system samples were generally similar to concentrations typically measured from the Lathrop combined influent samples that are collected at the WQCF, the TSS concentrations in the collection system were generally significantly lower than the concentrations from the WQCF samples. The cause of this discrepancy is not immediately known.

As shown in Table 2, the daily flows at the O Street Pump Station appeared to increase later in the month, with slightly higher flows observed on weekends as compared to weekdays. As shown on Figures 9 through 13, the diurnal patterns in the flow generally were consistent with what would be expected, with flows being very low during the midnight to 6 am portion of the day and weekday flow peaks observed in the early evenings.

DISCUSSION AND CONCLUSIONS

One original goal of this monitoring was to evaluate whether there are portions of the collection system that may be higher contributors to BOD, TSS, and TKN loading at the MWQCF, with the hope that portions of the wastewater flow could possibly be rerouted to the City's Consolidated Treatment Facility (CTF). As shown in Table 1, the sampling indicated that BOD, TSS, and TKN concentrations were relatively uniform across the various sewersheds. As a result, the monitoring did not identify any specific sewersheds that could be specifically targeted to redirect a disproportionate amount of BOD, TSS, and/or TKN mass to the CTF.

DRAFT - Table 1
Sampling Results from Composite Samples Collection from Wastwater Collection System

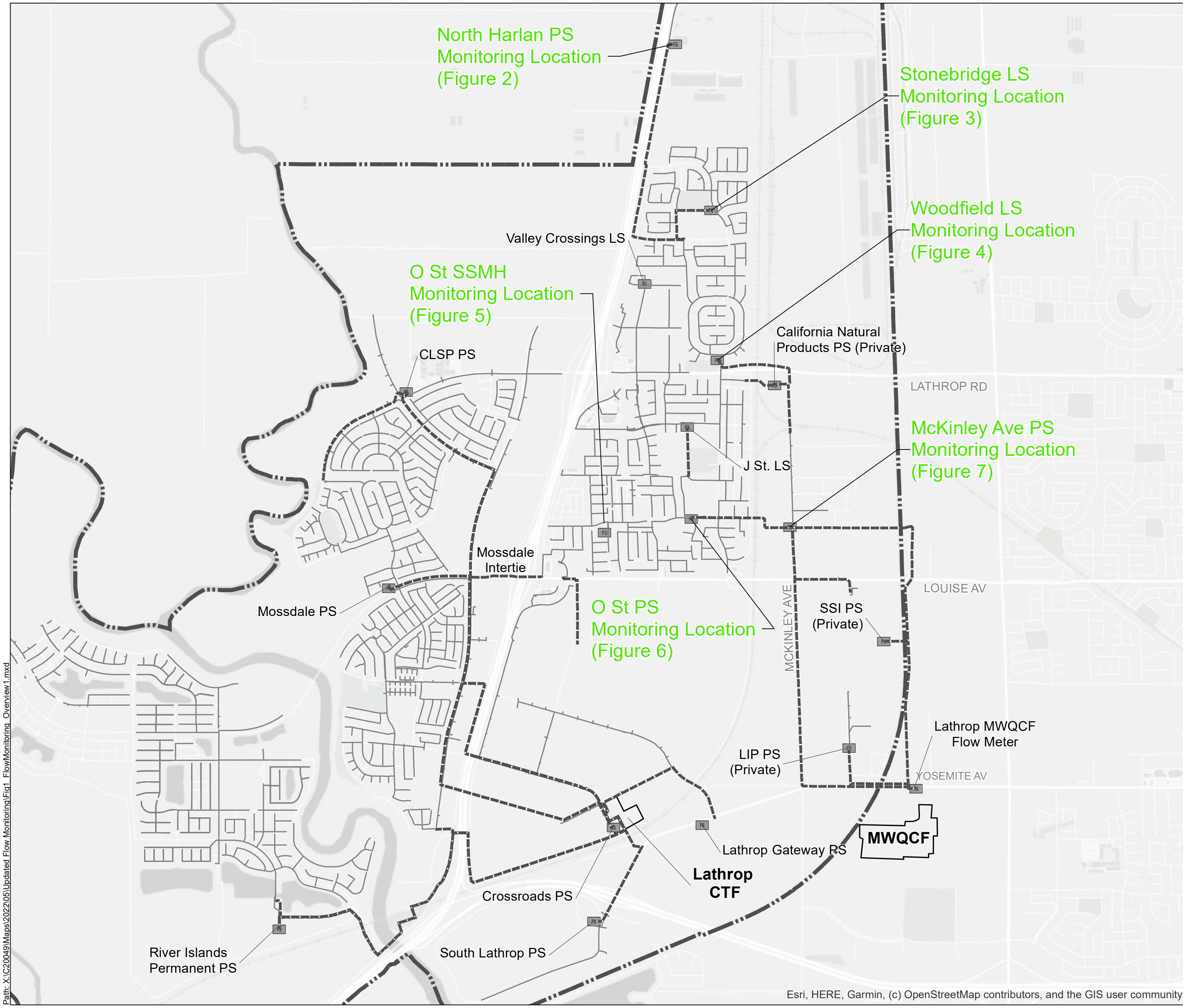
Sampling Location	Sample Date	Concentration (mg/L)		
		BOD	TSS	TKN
North Harlan Pump Station	10/10/2022	231	63	68
	10/16/2022	224	55	54
	10/20/2022	273	49	95
	10/28/2022	222	133	100
Average - North Harlan Pump Station		**238**	**75**	**79**
Stonebridge Lift Station	10/10/2022	211	50	13
	10/16/2022	222	44	50
	10/20/2022	<260	41	45
	10/28/2022	208	260	46
Average - Stonebridge Lift Station		**214**	**99**	**39**
Woodfield Pump Station	10/10/2022	286	73	13
	10/16/2022	295	68	62
	10/20/2022	282	62	57
	10/28/2022	288	86	59
Average - Woodfield Pump Station		**288**	**72**	**48**
O Street Santiary Sewer Manhole	10/10/2022	238	30	12
	10/16/2022	265	32	56
	10/20/2022	269	34	54
	10/28/2022	221	32	47
Average - O Street Sanitary Sewer Manhole		**248**	**32**	**42**
O Street Pump Station	10/16/2022	310	86	61
	10/20/2022	<260	67	52
	10/28/2022	312	123	53
Average - O Street Pump Station		**311**	**92**	**55**
McKinley Pump Station	10/10/2022	212	49	17
	10/16/2022	137	52	160
	10/20/2022	312	41	28
	10/28/2022	270	63	33
Average - McKinley Pump Station		**233**	**51**	**60**

Abbreviations:
BOD = biochemical oxygen demand
mg/L = milligrams per liter
TKN = Total Kjeldahl Nitrogen
TSS = total suspended solids

DRAFT - Table 2
Summary of Flow Monitoring Results from O Street Sanitary Sewer Manhole

Sample Date	Day of Week	Flow (MGD)		
		Average	Minimum	Maximum
10/5/2023	Wednesday	0.0341	0.0094	0.0671
10/6/2023	Thursday	0.0306	0.0045	0.0648
10/7/2023	Friday	0.0382	0.0037	0.0889
10/8/2023	Saturday	0.0403	0.0089	0.0795
10/9/2023	Sunday	0.0379	0.0066	0.0862
10/10/2023	Monday	0.0379	0.0065	0.0846
10/11/2023	Tuesday	0.0398	0.0021	0.0761
10/12/2023	Wednesday	0.0397	0.0059	0.0799
10/13/2023	Thursday	0.0408	0.0099	0.0860
10/14/2023	Friday	0.0396	0.0111	0.1072
10/15/2023	Saturday	0.0432	0.0101	0.0992
10/16/2023	Sunday	0.0414	0.0096	0.0888
10/17/2023	Monday	0.0439	0.0119	0.0822
10/18/2023	Tuesday	0.0410	0.0083	0.0774
10/19/2023	Wednesday	0.0408	0.0087	0.0849
10/20/2023	Thursday	0.0419	0.0051	0.0887
10/21/2023	Friday	0.0416	0.0075	0.0784
10/22/2023	Saturday	0.0531	0.0120	0.1186
10/23/2023	Sunday	0.0460	0.0110	0.0933
10/24/2023	Monday	0.0407	0.0115	0.1097
10/25/2023	Tuesday	0.0427	0.0076	0.0932
10/26/2023	Wednesday	0.0452	0.0095	0.0891
10/27/2023	Thursday	0.0442	0.0078	0.0918
10/28/2023	Friday	0.0426	0.0070	0.0841
10/29/2023	Saturday	0.0444	0.0064	0.0954
10/30/2023	Sunday	0.0454	0.0076	0.0927
10/31/2023	Monday	0.0446	0.0120	0.0915
Month of October (not including partial days)		***0.0415***	***0.0021***	***0.1186***
Mondays		*0.0418*	*0.0065*	*0.1097*
Tuesdays		*0.0413*	*0.0021*	*0.1186*
Wednesdays		*0.0400*	*0.0059*	*0.0891*
Thursdays		*0.0394*	*0.0045*	*0.0918*
Fridays		*0.0405*	*0.0037*	*0.1072*
Saturdays		*0.0452*	*0.0064*	*0.1186*
Sundays		*0.0427*	*0.0066*	*0.0933*

Abbreviations:
MGD = million gallons



Abbreviations
CLSP = Central Lathrop Specific Plan
CTF = Consolidated Treatment Facility
LIP = Lathrop Industrial Park
LS = Lift Station
MWQCF = Manteca Water Quality Control Facility
PS = Pump Station
SSI = Super Store Industries
WWTF = Wastewater Treatment Facility
SSMH = Sanitary Sewer Manhole

Notes
1. All locations are approximate.

Sources
1. Aerial photograph provided by ESRI's ArcGIS Online, 23 September 2022.

Flow Monitoring Locations

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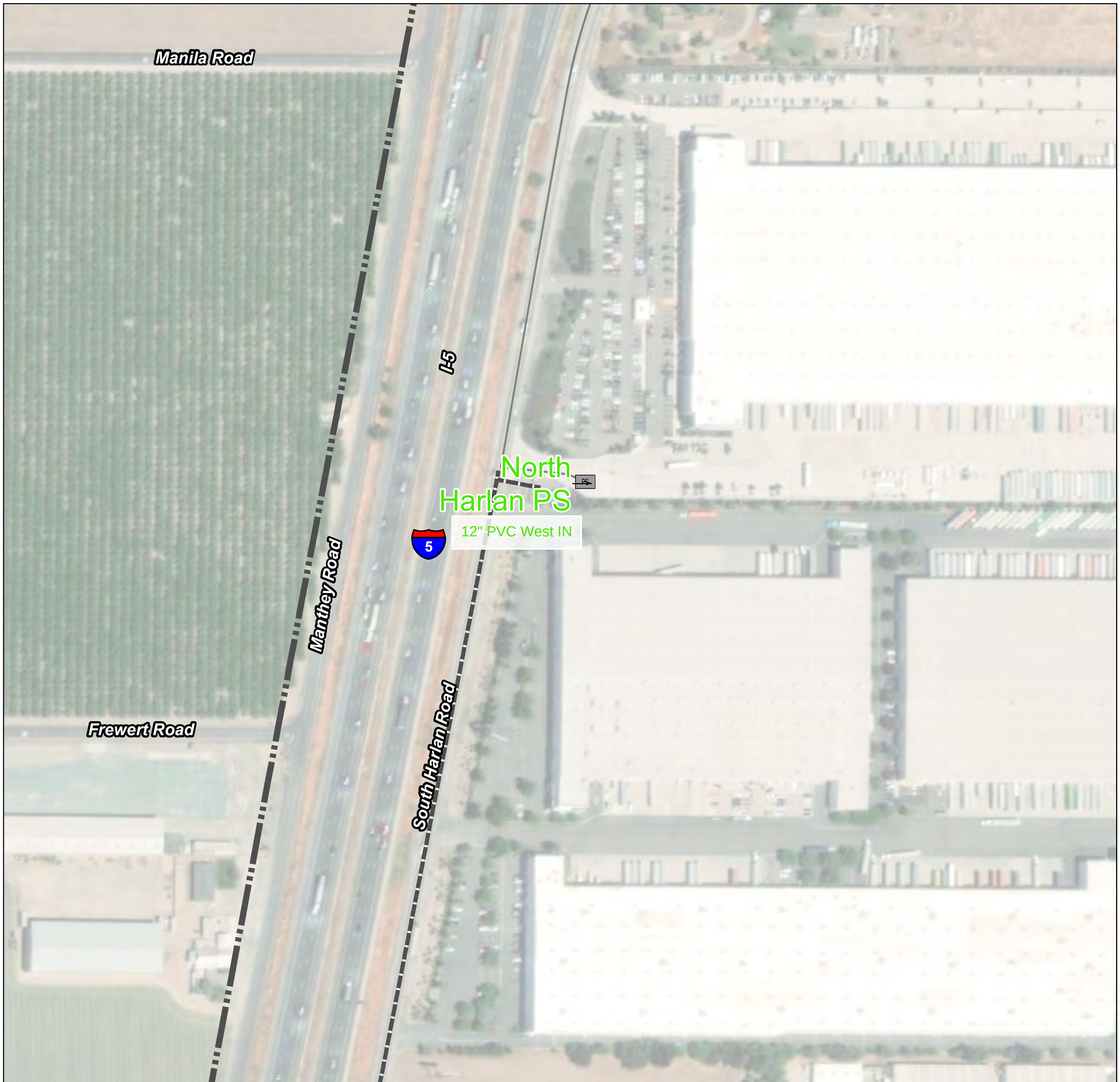
City of Lathrop
Lathrop, CA
December 2022
EKI C20049.02

Figure 1



Legend

Sphere of Influence

Pump Station or Lift Station

Force Main

Gravity Main

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 29 April 2021.

N

0 300 600

(Scale in Feet)

Notes

1. All locations are approximate.

Flow Monitoring Location - North Harlan PS

City of Lathrop
Lathrop, CA
December 2022
EKI C20049.02

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Figure 2

Path: X:\C20049\Maps\2022\05\Fig1_NorthHarlan.mxd

Legend

PS Pump Station or Lift Station

Force Main

Gravity Main

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 29 April 2021.

Notes

1. All locations are approximate.

N

0 300 600

(Scale in Feet)

Flow Monitoring Location - Stonebridge PS

City of Lathrop
Lathrop, CA
December 2022
EKI C20049.02

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Figure 3

Path: X:\C20049\Maps\2022\05\Fig2_Stonebridge.mxd

Legend

- Pump Station or Lift Station
- Force Main
- Gravity Main

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 29 April 2021.

N

0 300 600

(Scale in Feet)

Notes

1. All locations are approximate.

Flow Monitoring Location - Woodfield LS

City of Lathrop
Lathrop, CA
December 2022
EKI C20049.02

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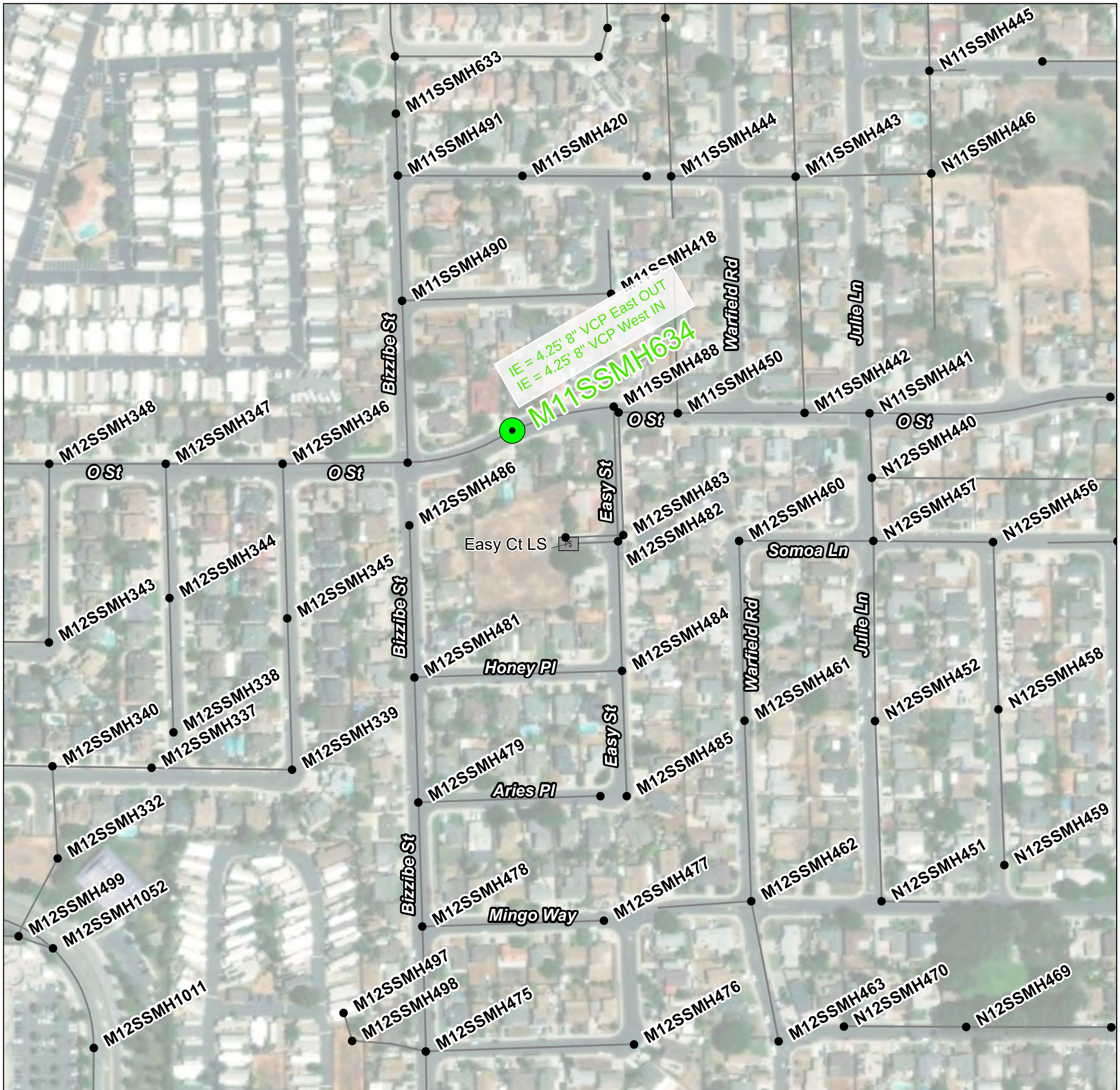
Figure 4

Path: X:\C20049\Maps\2022\05\Fig3_Woodfield.mxd



Legend

PS Pump Station or Lift Station

Force Main

Gravity Main

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 29 April 2021.

N

0 300 600

(Scale in Feet)

Notes

1. All locations are approximate.

Flow Monitoring Location - O St SSMH

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Lathrop, CA
December 2022
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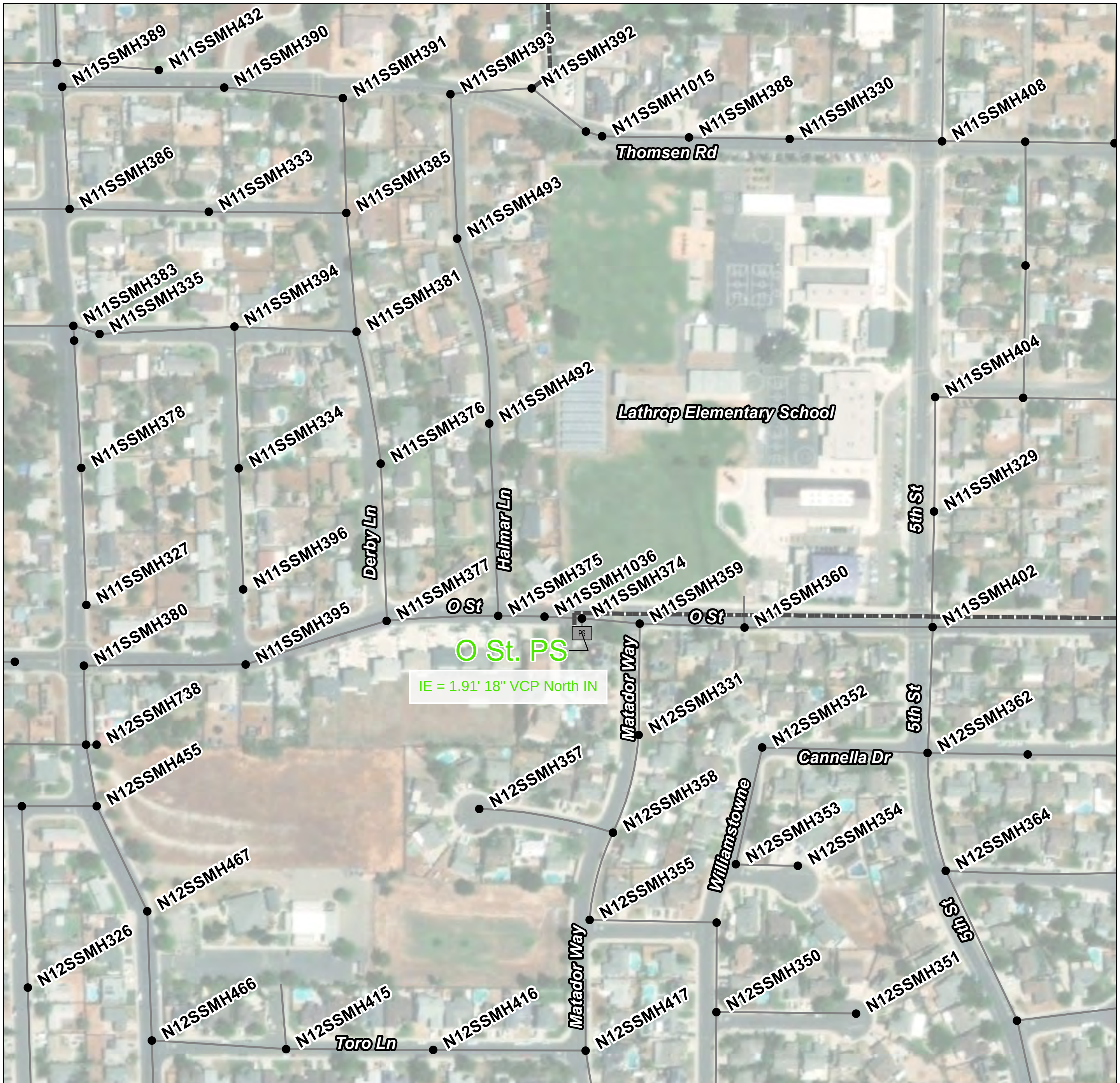
Figure 5

Path: X:\C20049\Maps\2022\05\Fig5_OStSSMH.mxd



Legend

PS Pump Station or Lift Station

Force Main

Gravity Main

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 29 April 2021.

N

0 300 600

(Scale in Feet)

Notes

1. All locations are approximate.

Flow Monitoring Location - O Street PS

City of Lathrop
Lathrop, CA
December 2022
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Figure 6

Path: X:\C20049\Maps\2022\05\Fig5_OSt1.mxd

Legend

PS Pump Station or Lift Station

Force Main

Gravity Main

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, 29 April 2021.

N

0 300 600

(Scale in Feet)

Notes

1. All locations are approximate.

Flow Monitoring Location - McKinley Ave PS

City of Lathrop
Lathrop, CA
December 2022
EKI C20049.02

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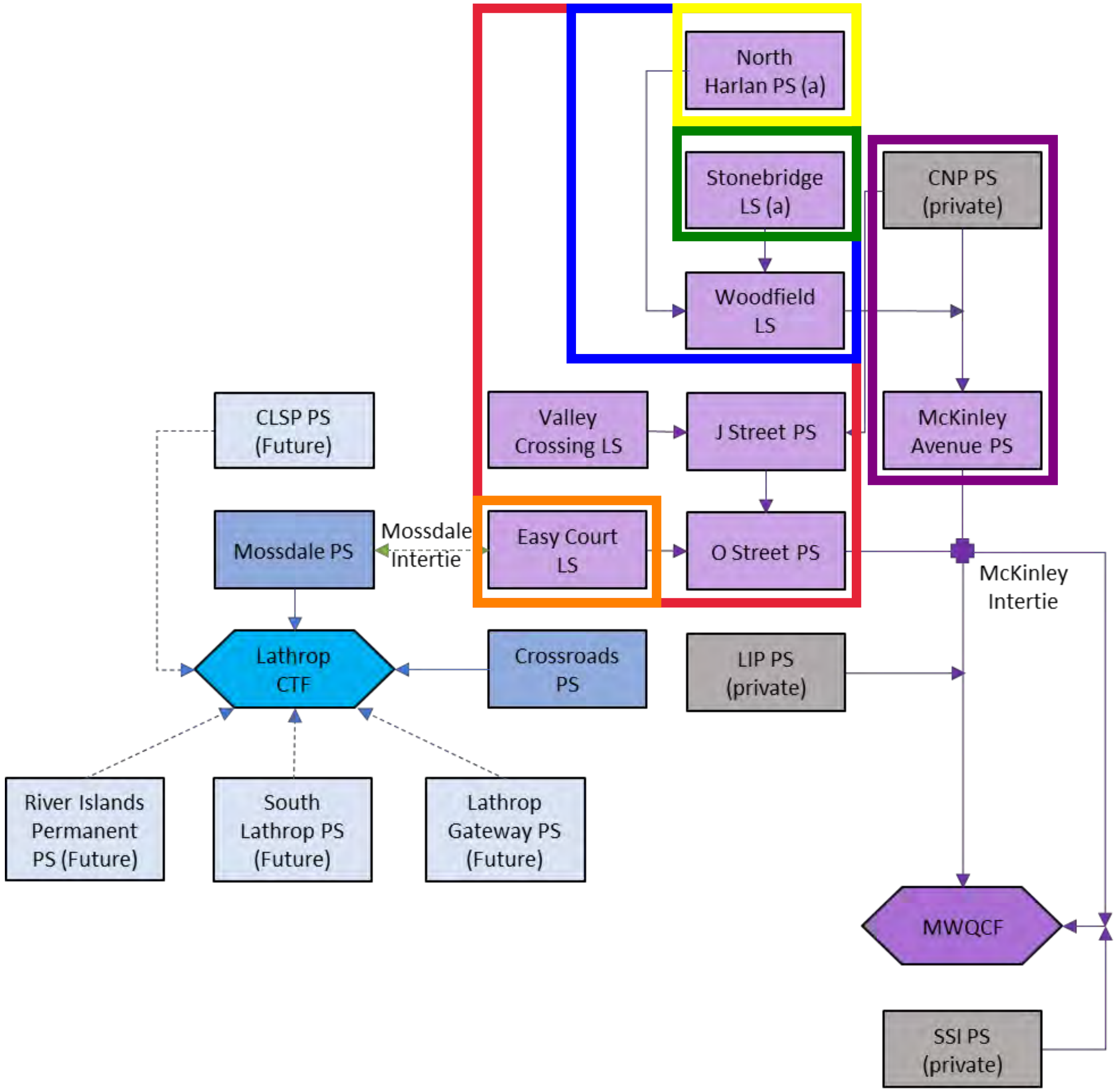
Figure 7

Path: X:\C20049\Maps\2022\05\Fig6_McKinley.mxd



Notes:

(a) The Stonebridge PS receives wastewater from four private pump stations: Panattoni, Gordon Trucking, Boise Cascade, and Utility Trailer. These pump stations convey wastewater collected by the private North Harlan Gravity System, which serves industrial parcels north of Brookfield Street.

Sewershed Legend

- North Harlan PS Monitoring Location (Figure 2)
- Stonebridge LS Monitoring Location (Figure 3)
- Woodfield LS Monitoring Location (Figure 4)
- O St SSMH Monitoring Location (Figure 5)
- O St PS Monitoring Location (Figure 6)
- McKinley Ave PS Monitoring Location (Figure 7)

Schematic of Flow Monitoring Approach

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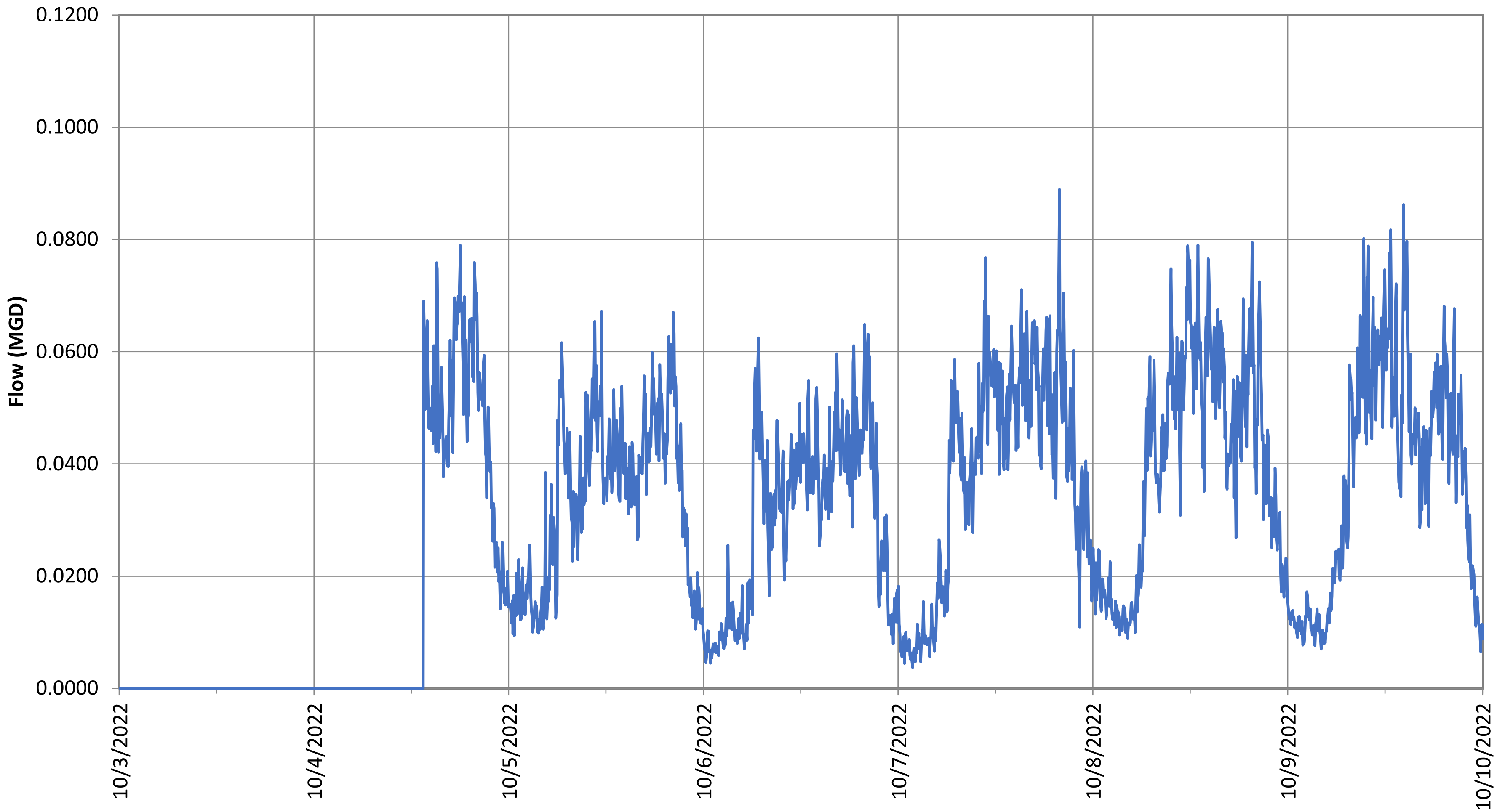
City of Lathrop
Lathrop, CA
December 2022
EKI C20049.02

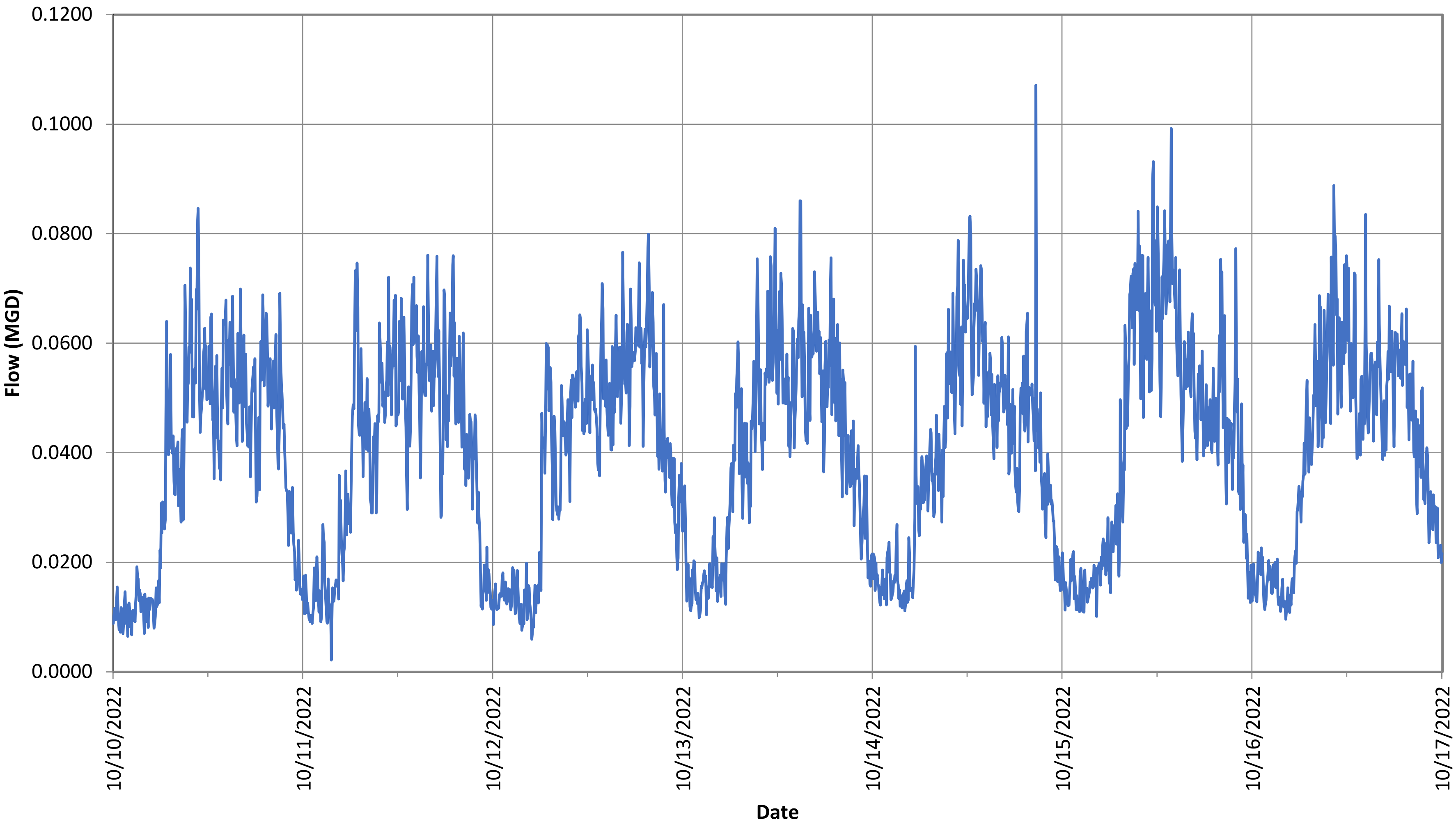
Figure 8

Figure 9:
Flow Data from O Street Sanitary Sewer Manhole - October 3 to 9



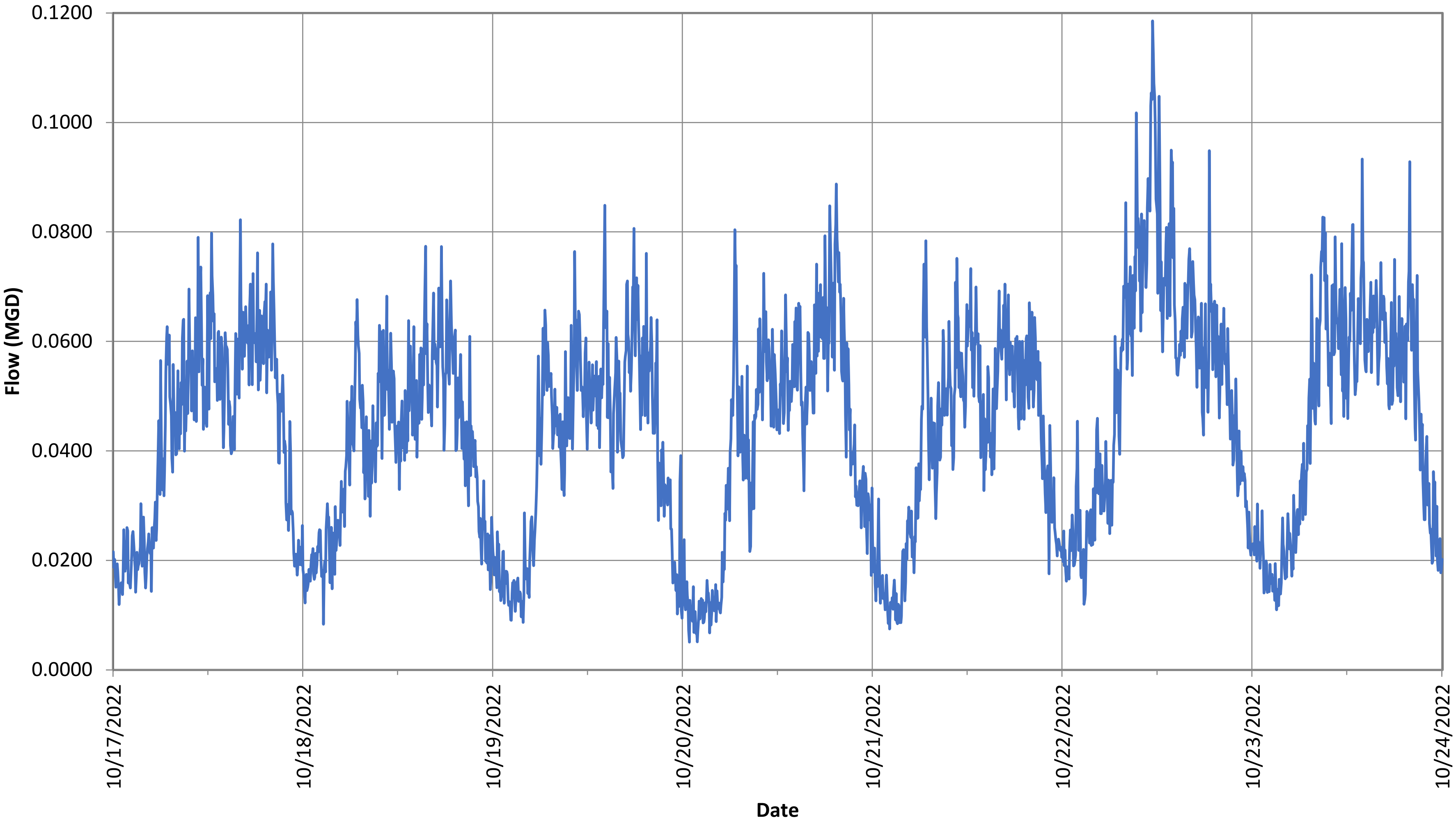
	10/3/2022(Mon)	10/4/2022(Tue)	10/5/2022(Wed)	10/6/2022(Thu)	10/7/2022(Fri)	10/8/2022(Sat)	10/9/2022(Sun)
Maximum	0.000	0.079	0.067	0.065	0.089	0.079	0.086
Average	0.000	0.021	0.034	0.031	0.038	0.040	0.038
Minimum	0.000	0.000	0.009	0.004	0.004	0.009	0.007

Figure 10:
Flow Data from O Street Sanitary Sewer Manhole - October 10 to 16



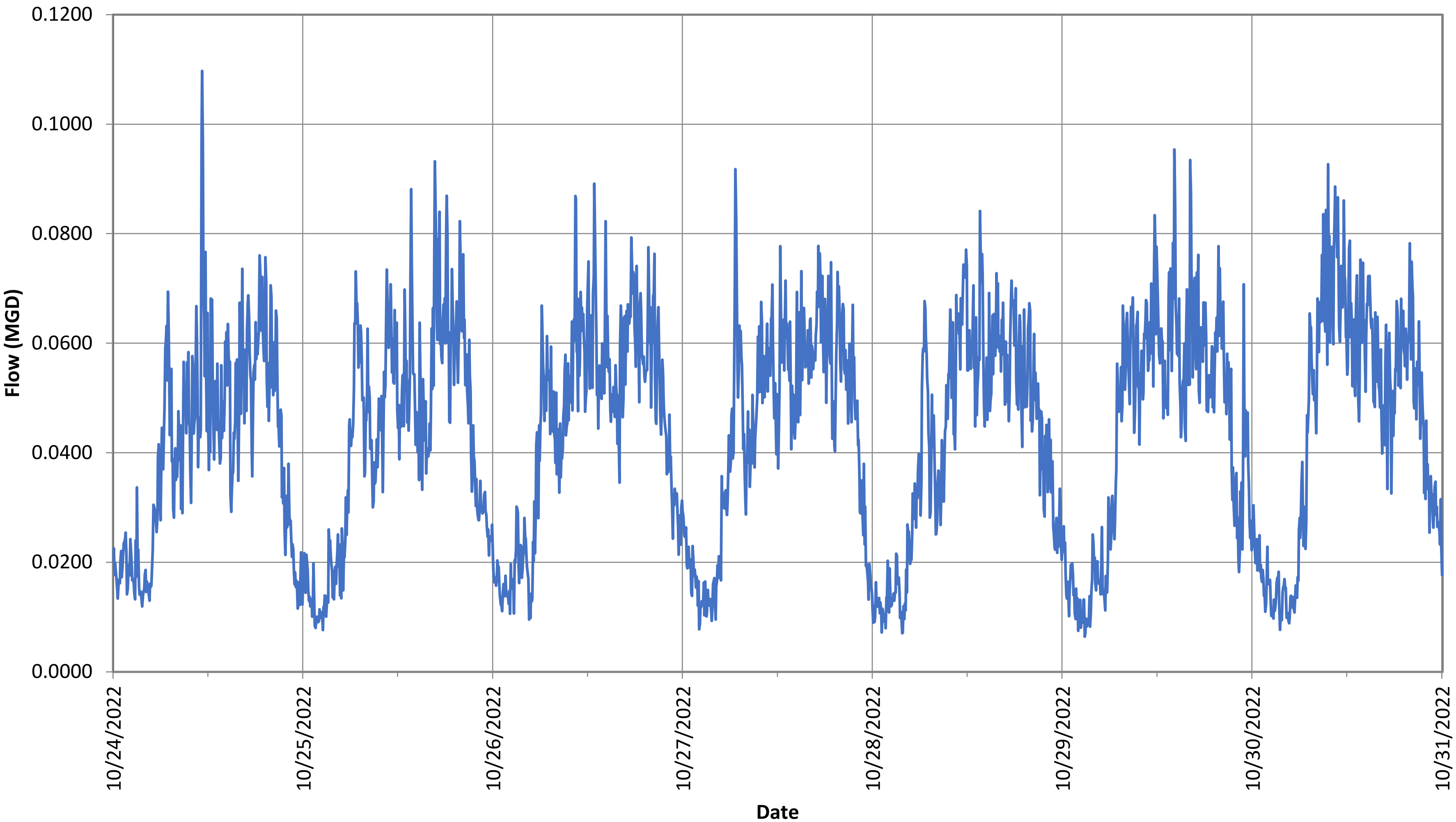
	10/10/2022(Mon)	10/11/2022(Tue)	10/12/2022(Wed)	10/13/2022(Thu)	10/14/2022(Fri)	10/15/2022(Sat)	10/16/2022(Sun)
Maximum	0.085	0.076	0.080	0.086	0.107	0.099	0.089
Average	0.038	0.040	0.040	0.041	0.040	0.043	0.041
Minimum	0.006	0.002	0.006	0.010	0.011	0.010	0.010

Figure 11:
Flow Data from O Street Sanitary Sewer Manhole - October 17 to 23



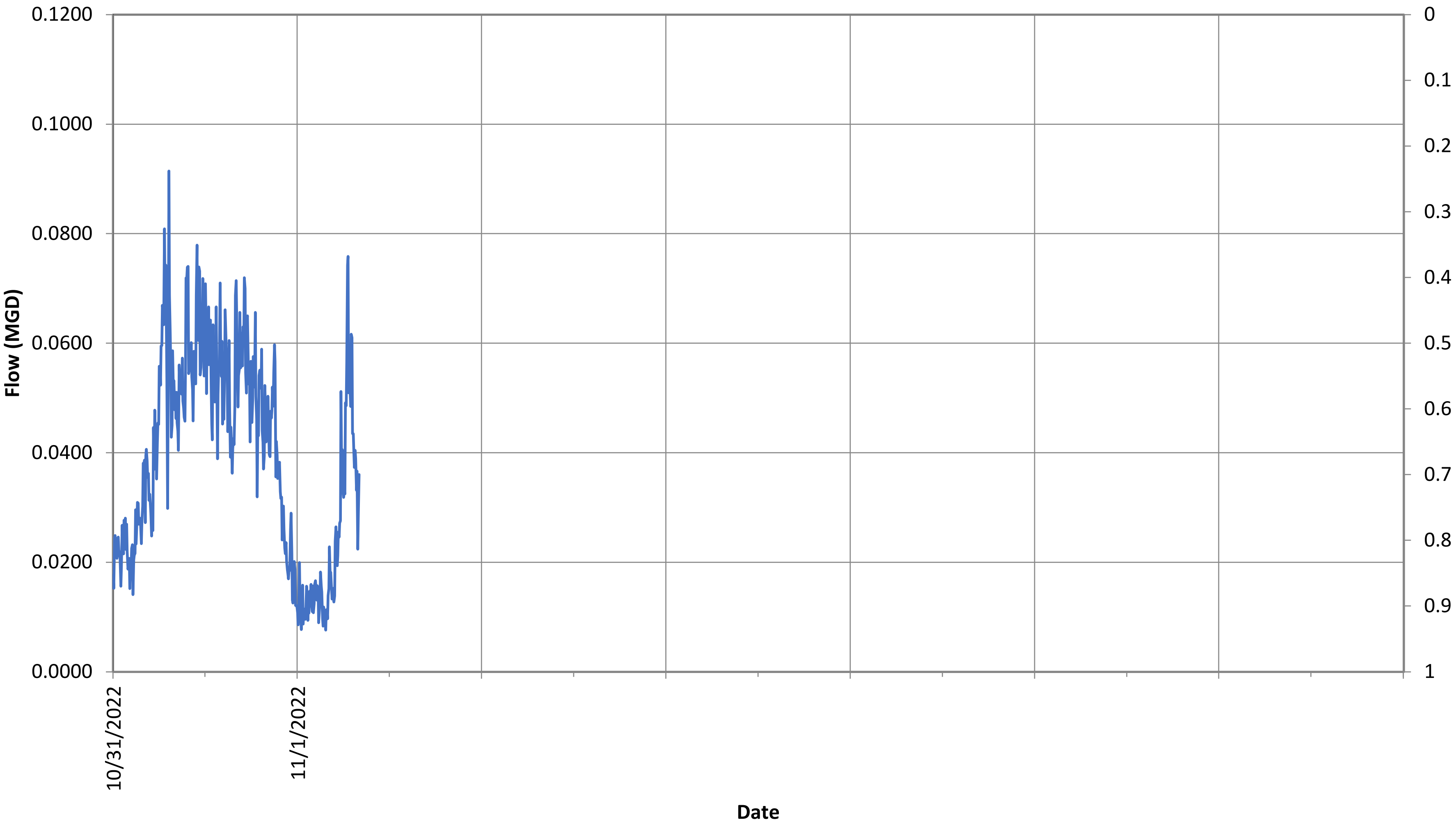
	10/17/2022(Mon)	10/18/2022(Tue)	10/19/2022(Wed)	10/20/2022(Thu)	10/21/2022(Fri)	10/22/2022(Sat)	10/23/2022(Sun)
Maximum	0.082	0.077	0.085	0.089	0.078	0.119	0.093
Average	0.044	0.041	0.041	0.042	0.042	0.053	0.046
Minimum	0.012	0.008	0.009	0.005	0.007	0.012	0.011

Figure 12:
Flow Data from O Street Sanitary Sewer Manhole - October 24 to 30



	10/24/2022(Mon)	10/25/2022(Tue)	10/26/2022(Wed)	10/27/2022(Thu)	10/28/2022(Fri)	10/29/2022(Sat)	10/30/2022(Sun)
Maximum	0.110	0.093	0.089	0.092	0.084	0.095	0.093
Average	0.041	0.043	0.045	0.044	0.043	0.044	0.045
Minimum	0.012	0.008	0.010	0.008	0.007	0.006	0.008

Figure 13:
Flow Data from O Street Sanitary Sewer Manhole - October 31



	10/31/2022(Mon)						
Maximum	0.091						
Average	0.045						
Minimum	0.012						

APPENDIX D
Recommended CIP Details

Path: X:\B60038\Maps\2018\1\Deliverables\WRMP\Wastewater\FigE_1_StonebridgeCIP.mxd

Legend

- Sphere of Influence
- Existing Gravity Main
- Existing Force Main
- PS Lift Station
- Manhole
- 8" PVC Inch-Diameter and Pipe Material

Replacement Gravity Main

- 8"
- 10"
- 12"
- 15"
- 18"

Parallel Force Main

- 6"

N

0 500 1,000
Feet

Abbreviations

PVC = polyvinyl chloride
VCP = vitrified clay

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 9 January 2018.

Stonebridge Gravity Main Replacement and Parallel Force Main Project

Wastewater System Master Plan
City of Lathrop
December 2024
EKI C20049.02

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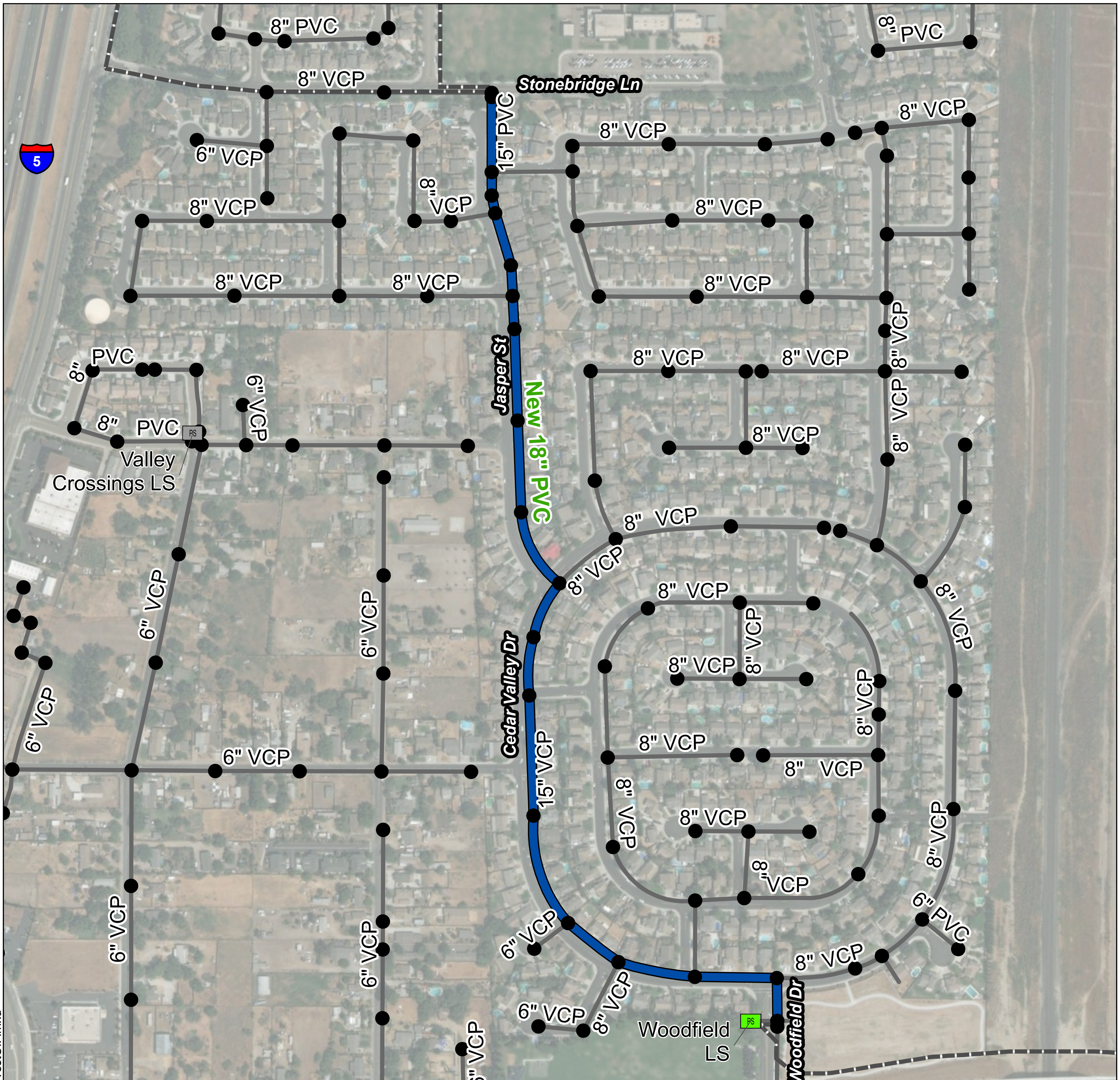
Figure D-1



Legend

- Sphere of Influence
- Existing Gravity Main
- Existing Force Main
- Lift Station
- Manhole
- 8" PVC — Inch-Diameter and Pipe Material
- Lift Station Upgrade

Replacement Gravity Main

- 8"
- 10"
- 12"
- 15"
- 18"

Abbreviations

PVC = polyvinyl chloride
VCP = vitrified clay

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 9 January 2018.

N

0 500 1,000
Feet

Woodfield West Deficiency Project - Alternative A

Wastewater System Master Plan
City of Lathrop
December 2024
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Figure D-2

Path: X:\B60038\Maps\2018\1\Deliverables\WRMP\Wastewater\FigE_2_WoodfieldWestCIP.mxd

Legend

- Sphere of Influence
- Existing Gravity Main
- Existing Force Main
- PS Lift Station
- Manhole
- 8" PVC Inch-Diameter and Pipe Material
- PS Lift Station Upgrade

Parallel / New Force Main

- 6"
- 8"

N

0 1,000 2,000

Feet

Abbreviations

PVC = polyvinyl chloride
VCP = vitrified clay

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 9 January 2018.

Woodfield West Deficiency Project - Alternative B

Wastewater System Master Plan
City of Lathrop
December 2024
EKI C20049.02

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Figure D-3

Path: X:\B60038\Maps\2018\1\Deliverables\IWRMP\Wastewater\FigE_3_WoodfieldWestCIP_B.mxd

Legend

	Sphere of Influence
	Existing Gravity Main
	Existing Force Main
PS	Lift Station
	Manhole
8" PVC	Inch-Diameter and Pipe Material

Replacement Gravity Main

- 8"
- 10"
- 12"
- 15"
- 18"

N

0 500 1,000

(Scale in Feet)

Abbreviations

PVC = polyvinyl chloride
VCP = vitrified clay

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 9 January 2018.

Woodfield East Gravity Main Replacement Project

Wastewater System Master Plan
City of Lathrop
December 2024
EKI C20049.02

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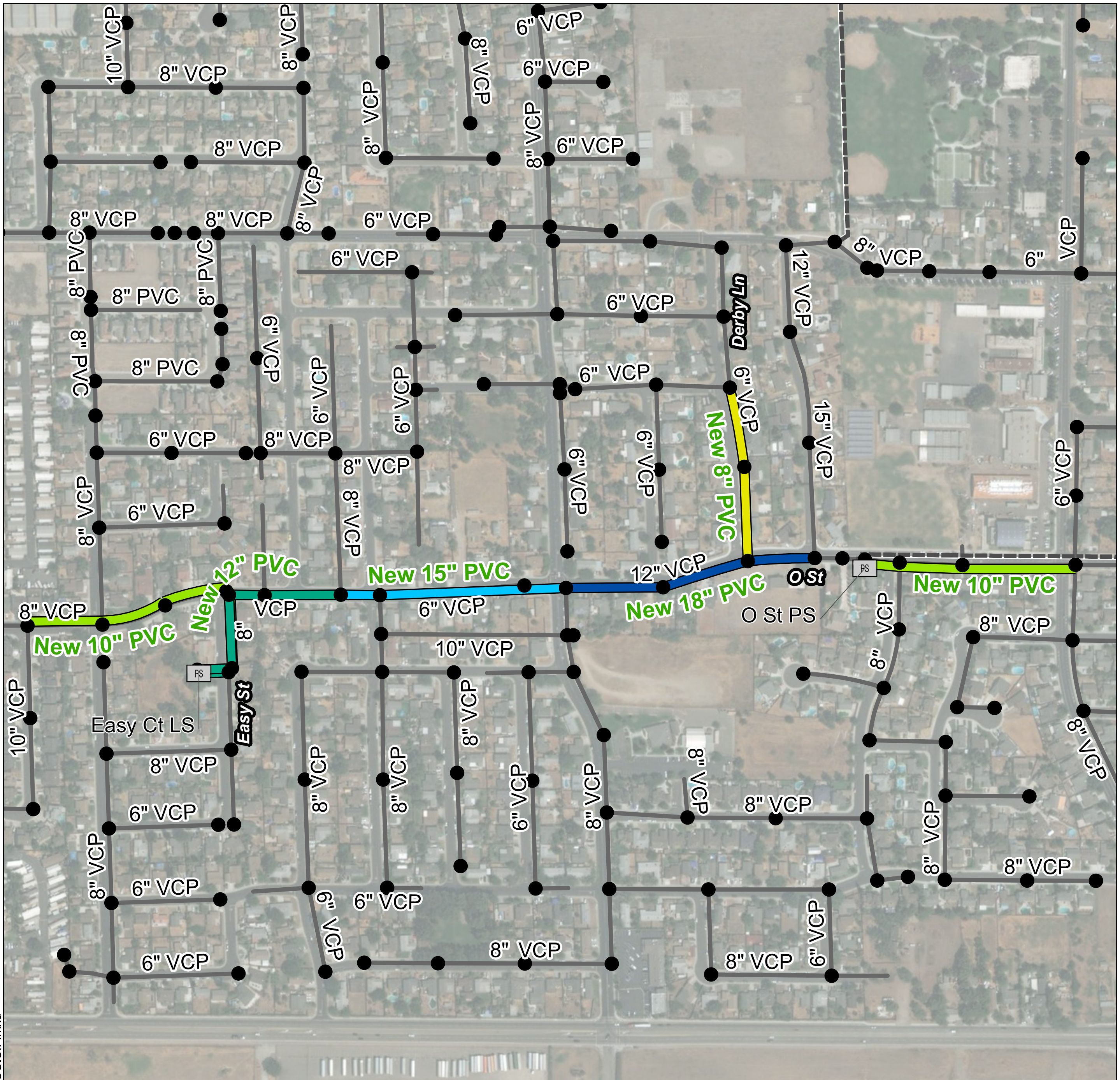
Figure D-4

Path: X:\B60038\Maps\2018\1\Deliverables\IWRMP\Wastewater\FigE_4_WoodfieldEastCIP.mxd



Legend

- Sphere of Influence
- Existing Gravity Main
- Existing Force Main
- PS Lift Station
- Manhole
- 8" PVC Inch-Diameter and Pipe Material

Replacement Gravity Main

- 8"
- 10"
- 12"
- 15"
- 18"

N

0 500 1,000
(Scale in Feet)

Abbreviations

PVC = polyvinyl chloride
VCP = vitrified clay

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 9 January 2018.

Easy Court/O Street Gravity Main Replacement Project

Wastewater System Master Plan
City of Lathrop
December 2024
EKI C20049.02

eki environment & water

Figure D-5

Path: X:\B60038\Maps\2018\1\Deliverables\IWRMP\Wastewater\FigE_6_EasyCourtOStCIP.mxd